SAPTHAGIRI COLLEGE OF ENGINEERING

Affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
Accredited By NAAC with "A" Grade
ISO 9001-2015 & 14001-2015 Certified Institute

SAPTHAGIRI
College of Engineering
Creating Tomorrow

In Association With

International Conference on

"Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices"

(ICGCP—2021)

16th - 17th July, 2021

Conference Proceedings

Jointly Organized by
Department of
Electrical and Electronics Engineering
&
Electronics and Communication Engineering

Editorial Board

Conference Chair

Dr. Ramakrishna H
Principal

Conference Co-Chair

Dr. Shripad Markande
Prof. & Head, Department of Mathematics

Coordinators:

Dr. Ragavendra Deshponde
Associate Professor
Department of Mechanical Engineering

Dr. Roopa K P
Associate Professor
Department of Chemistry

Mr. Nagaraja B S
Assistant Professor
Department of Electrical and Electronics Engineering



Preface

Sapthagiri College of Engineering, Bengaluru was established in the year 2001 by Srinivasa Education and Charitable Trust with a vision to transform its students into competent, inspired and responsible professionals. It is one of the best Engineering Colleges in India.

It is our great honour and pleasure to publish the Proceedings of the International Conference on Global Convergence in Technology and Entrepreneurship, Computing and Value Engineering, Principles and Practices - 2021 (ICGCP – 2021). The conference was held on 16th and 17th July, 2021 in virtual mode. The conference was organized to encourage the young research minds and also to bring all researchers, academics, scientists, industry experts, on a common platform.

Present global scenario demands unprecedented actions and efforts to converge social, economic and environment issues. Science, Technology and Innovations in the area of Internet of Things, Artificial Intelligence, Bio-Technology, Nano Materials and Renewable Energy must play a key role in achieving these goals. The call for Make in India products by the central and state governments has given impetus to start-ups and entrepreneurships. The conference covered all emerging areas of Science, Engineering and Technology towards fulfilling the objectives.

The response to call for papers was excellent. More than 500 papers were received from across the country, out of which 320 papers were selected for presentation and publication in the proceedings. These papers provided a wide spectrum of research covering all the areas for which the conference was intended.

We wish to express our deepest thanks and gratitude to speakers B.R. Indushekar Head, Operations Development Volvo Construction Equipment, Bangalore and Dr.Yared Abera Ergu Dean, School of Technology Ambo University, Ethiopia for delivering keynote addresses. We would like to express our gratitude and appreciation to the authors for their contributions. Many thanks go as well to all of the reviewers who helped us maintain the quality of the research papers included in the Proceedings. Our sincere thanks go to the Management for their encouragement and support for conducting the conference. We also express our sincere thanks to the members of the organizing team for their dedication and hard work.

Conference Chair of ICGCP – 2021

Dr. Ramakrishna H

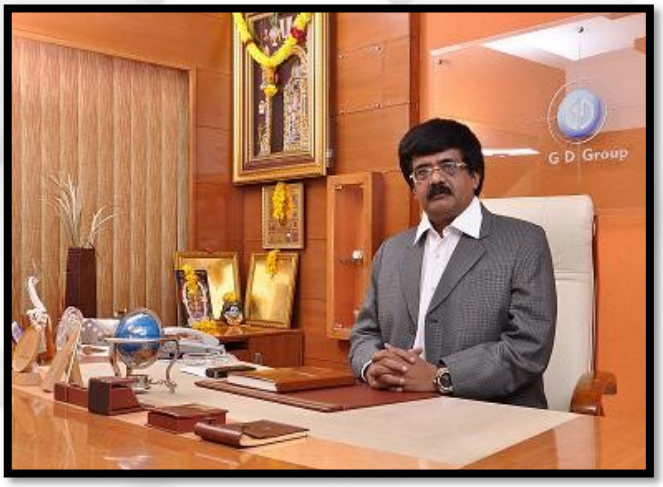
Principal.

Conference Co-Chair

Dr. Shripad Markande

Prof. & Head, Department of Mathematics.

On behalf of the ICGCP – 2021 Organizing Committee



Sri. G Dayananda
Chairman

Message from The Chairman

It gives me immense pleasure in congratulating the Chairman and team members of ICGCP- 2021, on successfully hosting the two days international conference at Sapthagiri college of Engineering. We are overwhelmed by the kind of response received by the research scholars across the country and I wish all of them a bright future and successful career. Also I would like to appreciate the contributions from the Principal, Heads of Departments, faculty and staff of the college for joining their hands in successful conduct of the international conference.



Sri. G.D Manoj
Executive Director

Message from Executive Director

On this occasion, I express my heartiest congratulations to all the participants of ICGCP-2021 for presenting and publishing their research findings in the international conference. I hope that, the two-day international conference has motivated faculty, research scholars and students to continue their research. Also on behalf of the Management, I would like to extend my appreciation to the sincere efforts of Principal, Heads of Departments, and Staff members of Sapthagiri College Engineering.



Message from Principal

Dr. H Ramakrishna
Principal

At the outset I would like to congratulate the entire team of ICGCP-2021 for successfully organizing "Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices – 2021" which witnessed active participation of more than 320 research scholars from across the Karnataka and outside. On this occasion, I would like to thank our Chairman, Shri. G. Dayananda and Executive Director, Shri. G. D. Manoj for the magnanimous support extended in organizing the conference. I would also like to congratulate all the faculty, research scholars and undergraduate students for publishing their research works in the conference and I hope that the two-day interaction has motivated them to further pursue their research work and contribute to society. Also I would like to appreciate the efforts of session chairs / reviewers / heads of departments / technical support team for their contributions in adding value to all the sessions. Finally, I would like to congratulate the team ICGCP-2021 for bringing out the proceedings of the conference in a precise manner and for making it available for the researchers' community.

CONTENTS

1	SIMULATION OF VIRTUAL POWER PLANT	1
2	REAL TIME EXPERT SYSTEM FOR TRANSMISSION LINE FAULT DETECTION IN UNDERGROUND CABLES USING IOT	6
3	TRANSMISSION LINE FAULT DETECTION, MONITORING AND DATAANALYSIS USING IOT	10
4	ANALYSIS AND REDUCTION OF HARMONIC DISTORTIONS USING FILTERS IN A TYPICAL POWER SYSTEM	16
5	SELF TARGETING AUTONOMOUS TURRET SYSTEM (S.T.A.T.S)	21
6	ANALYSIS OF TRANSMISSION AND DISTRIBUTION INTEGRATED SYSTEM USING UNBALANCED NETWORK MODELS	26
7	DEVELOPMENT OF VALIDATION SYSTEM FOR 2 WHEELER ELECTRICAL VEHICLES	29
8	PERFORMANCE EVALUATION OF OPTIMIZATION TECHNIQUES IN DG PLACEMENT IN A STANDARD BUS SYSTEM	38
9	ALLOCATION OF DG'S INTEGRATED WITH DISTRIBUTION NETWORK RECONFIGURATION FOR POWER QUALITY ENHANCEMENT	44
10	SMART UG CABLE FAULT DETECTION SYSTEM BASED ON IOT	51
11	DESIGN OF A CONTROLLER FOR CASCADED H BRIDGE MULTILEVEL INVERTER SYSTEM FOR REDUCED TOTAL HARMONIC DISTORTION AND IMPROVED PERFORMANCE	56
12	GRAIN DRYER USING SOLAR PV SYSTEM	64
13	DESIGN AND IMPLEMENTATION OF MODERN AGRICULTURAL TECHNIQUES FOR CROP PROTECTION USING IOT	69
14	ARTIFICIAL EYE FOR BLIND ULTRASONIC VIBRATOR GLOVE	74
15	UNDERGROUND CABLE FAULT DETECTION USING IOT	78
16	SPWM DRIVE FOR SINGLE PHASE INDUCTION MOTOR	81
17	SELF TARGETING AUTONOMOUS/ SEMIAUTO TURRET SYSTEM (S.T.A.T.S)	84
18	ANYTIME MEDICINE USING VENDING MACHINE	88
19	AUTOMATIC GAS CYLINDER BOOKING OVER IOT	92
20	AUTOMATIC FISHERMEN BORDER ALERT SYSTEM	96
21	MATEMATICAL MODELING AND SIMULATION OF SERIES DC MOTOR IN ELECTRIC CAR	100
22	SMART DIESEL GENERATOR CONTROL AND MONITORING USING ANDROID APPLICATION	106
23	IMPLEMENTATION OF IOT ON SPEED CONTROL OF SINGLE PHASE AC MOTOR	111
24	SELF-CHARGING ELECTRIC VEHICLE	116
25	AN ULTRA-VIOLET STERILIZATION ROBOT FOR DISINFECTION	120
26	AUTHORIZED ENTRY USING FACE MASK DETECTION AND SANITIZER DISPENSER	123

27	IOT BASED SMART POWER MANAGEMENT SYSTEM FOR BUILDINGS	127
28	DEEP NEURAL NETWORK BASED RECOGINITION OF PLANT DISEASES BY LEAF IMAGE CLASSIFICATION	130
29	FIRE FIGHTING DRONE (F.F.D)	133
30	SELF-DRIVING GARBAGE COLLECTING VEHICLE	137
31	POWER GENERATION USING PIEZOELECTRIC CELL FROM FOOTFALL	141
32	HYBRID INVERTER WITH SOLAR BATTERY CHARGING	146
33	VOICE CONTROLLED SELF POWERED VEHICLE FOR BORDER SECURITY	151
34	MOBILE TURRET SYSTEM	155
35	POWER QUALITY DISTURBANCE CLASSIFICATION USING LEAST SQUARE SUPPORT VECTOR MACHINE WHILE DISTRIBUTION GENERATOR INTERFACING IN GRID	159
36	PORTABLE SMART ELECTRIC SCOOTER	169
37	DESIGN OF PORTABLE CNC MACHINE FOR PCB MILLING	173
38	SIMULATION OF ON BOARD ELECTRIC VEHICLE CHARGER USING MATLAB	178
39	IMPLEMENTATION OF MULTI WAY POINT NAVIGATION USING UNMANNED AUTOMATED VEHICLES	181
40	SMART MOBILE CHARGER	187
41	A DESIGN OVERVIEW ON FACE RECOGNITION SECURITY SYSTEM	192
42	A DESIGN OVERVIEW ON HOSPITAL BED MANAGEMENT DURING PANDEMICS AND PATIENT HEALTH MONITORING SYSTEM	195
43	SMART TROLLEY USING ARDUINO AND RFID	199
44	DESIGN OF SURFACE PLASMON RESONANCE IN GAP WAVEGUIDES	207
45	UVC DEVELOPMENT FOR I2C MASTER AND SLAVE USING SYSTEM VERILOG AND UVM	210
46	PLANT LEAF DISEASE PREDICTION USING IMAGE PRE-PROCESSING AND DYNAMIC FEATURE SCALING FOR NAIVE BAYES CLASSIFIER	217
47	DESIGN OF PHOTONIC CRYSTAL FIBER (PCF) BIOSENSOR IN TETRAHERTZ SPECTRUM	223
48	IOT BASED AIR QUALITY MONITORING SYSTEM	232
49	FACIAL AND VOICE RECOGNITION BASED SECURITY SYSTEM TO DOOR	236
50	PROVIDING KNEE MOVEMENT ASSISTANCE USING ANDROID AND IOT	240
51	DESIGN AND IMPLEMENTATION OF AI TREE	245
52	FLOWER CLASSIFICATION USING DEEP NEURAL NETWORK	251

53	CLASSIFICATION AND SEGMENTATION OF PADDY SEEDS	255
54	AGRICULTURE MARKETING USING WEB BASED TECHNOLOGY	260
55	DESIGN OF LOW POWER FULL ADDER WITH MINIMUM NUMBER OF TRANSISTOR FOR APPLICATIONS	266
56	DESIGN AND IMPLEMENTATION OF SMART AQUA MACHINE (SAM) USING NODEMCU AND ANDROID APPLICATION	272
57	DESIGN AND CONTROL OF AGRICULTURE ROBOT USING LORA	276
58	TRANSPARENT WAY OF DAIRY MILK FARMING	279
59	PROVIDING KNEE MOVEMENT ASSISTANCE USING ANDROID AND IOT	282
60	INTERACTIVE VOICE RESPONSE SYSTEM FOR CROP MANAGEMENT IN KANNADA LANGUAGE	287
61	BABY MONITORING SYSTEM	292
62	IMPLEMENTATION OF REVERSIBLE 24-BIT MULTIPLIER USING OPERAND DECOMPOSITION TECHNIQUE	296
63	PLANT DISEASE DIAGNOSIS USING MACHINE LEARNING	300
64	THE ROUTER MODULE INTEGRATION AND SIMULATION RESULTS	306
65	FACIAL AND VOICE RECOGNITION BASED SECURITY SYSTEM TO DOOR	311
66	WASTE WATER TREATMENT FOR AGRICULTURE PURPOSE	315
67	INFANT MONITORING THROUGH SMART CRADLE	322
68	AN APPROACH TOWARDS REDUCED SWITCH 7-LEVEL MULTILEVEL INVERTER BY PWM METHOD	326
69	ECO-FRIENDLY HYBRID ELECTRIC VEHICLE	335
70	IMPLEMENTATION OF AUTOMATIC CHOCOLATE VENDING MACHINE USING IOT	338
71	SMART SOLAR LAWN MOWER	342
72	ATTENDANCE MONITORING USING REAL TIME FACE RECOGNITION IN IMAGE PROCESSING	346
73	DESIGN AND IMPLEMENTATION OF FPGA BASED VENDING MACHINE FOR INTEGRATED CIRCUITS(IC'S)	351
74	INTELLIGENT CAR PARKING AND MANAGEMENT SYSTEM	356
75	SMART HOME USING SMART MIRROR	360
76	8-BIT, 16-BIT AND 32-BIT MULTIPLICATION USING VEDIC MATHEMATICS	364
77	A NOVEL SECURED ELECTRONIC VOTING MACHINE	368
78	SMART ROAD DIVIDER FOR TRAFFIC CONTROL	374
79	FINGERPRINT ATTENDANCE SYSTEM USING IOT	379
80	ATTENDANCE MONITORING USING REAL TIME FACE RECOGNITION IN IMAGE PROCESSING	385
81	CHILD RESCUE SYSTEM IN OPEN BOREWELLS	390

82	REAL TIME OBJECT RECOGNITION USING CNN	394
83	APPLICATION OF DEEP LEARNING TECHNIQUES FOR THE STUDY AND ANALYSIS OF CARDIOVASCULAR DISEASES	398
84	ULTRA-VIOLET STERILIZATION ROBOT FOR DISINFECTION	406
85	DESIGN AND IMPLEMENTATION OF HIGH SPEED MULTIPLIER BASED ON SYMMETRIC STACKING COUNTER	410
86	SMART NOTICE BOARD FOR COLLEGES USING STM32 MICROCONTROLLER	415
87	NOVEL METHOD OF FAST CHARGING OF ELECTRIC VEHICLES USING VIEENA RECTIFIER	419
88	DESIGN OF LOW NOISE CMOS DIFFERENTIAL AMPLIFIER USING 90NM TECHNOLOGY	424
89	DESIGN OF HIGH GAIN CMOS OPERATIONAL AMPLIFIER USING 90NM TECHNOLOGY FOR BIOMEDICAL MONITORING APPLICATION	432

Simulation of Virtual Power Plant

Raghava Ram Bharadwaj Vemparala
Dept. of EEE
RV College of Engineering®
Bangalore, India
raghavarbv.ee17@rvce.edu.in

Sai Vamsi Uppalapati
Dept. of EEE
RV College of Engineering®
Bangalore, India
saivamsiu.ee17@rvce.edu.in

K Uma Rao
Dept. of EEE
RV College of Engineering®
Bangalore, India
umaraok@rvce.edu.in

***Abstract*—Virtual Power Plant is a collection of distributed energy sources like solar plant, small hydro plant, wind plant etc. that are coordinated and controlled by virtual power plant(VPP) control unit. The major problem of these distributed energy sources is the availability and variability of their weather dependent primary energy sources. There is an increase in number of distributed energy resources. This paper presents a simulation model of VPP. It consists of three distributed energy resources, one of them is solar. The simulation is carried out according to the real history data of irradiance located in external database.**

***Index Terms*—distributed energy resources, virtual power plant, irradiance**

I. Introduction

Renewable Energy Sources (RES) increases the scope of generation nearer to the consumer. In near future, a major portion of the power will be generated from Distributed Generation (DG). The introduction of DG into traditional distribution networks increases the challenges in the distribution networks [1]. The main idea of DG is production of energy nearer to the customers. It may include generation from RES like solar, wind, biomass and biogas and also from cogeneration units.

DG is characterized by some features which are not present in traditional centralized systems: the power generated is relatively small and has variations depending on the availability and variability of primary energy source. The power flow is bidirectional,in comparison with the central generation system where the power flow is unidirectional. The DG can play an important role in: reducing the transmission losses, improving the power quality, improving the reliability of the grid, providing better voltage support, reducing greenhouse emissions. The specific focus is on Virtual Power Plant (VPP) concept, that involves an idea of collection of Distributed Energy Resources (DERs) that can serve as equivalent of a traditional power plant [2]–[4].

VPP is a cloud-based data control center that collects production data from various distributed energy resources. VPP uses various communication technologies and the internet of things to gather data, which allows an operator to monitor and control the production of each plant. By integrating several types of power sources such as solar, wind, small hydro, and batteries, virtual power plants enable a reliable power supply. It also allows utilities to generate electricity using renewable energy sources, store it in battery banks, and then supply it to customers [5]–[8].

II. Simulation Model

A. Simulink

Simulink, developed by Math Works, is a data flow graphical programming language tool for modeling, simulating, and analyzing multi-domain dynamic systems. Its primary interface is a graphical block diagramming tool and a customizable set of block libraries. It offers tight integration with the MATLAB environment and can either drive MATLAB or be scripted from it. Simulink is widely used in control theory and digital signal processing for multidomain simulation and Model-Based Design.

1) PV Array: Fig. 1 represents PV array block. It implements an array of photovoltaic modules. The array is built of strings of modules connected in parallel, each string consisting of modules connected in series. Ir is the control signal that defines the irradiance applied to solar cells specified in W/m^2 and T is the control signal that defines temperature of the cells in degree Celsius.



Fig. 1. PV Array

The specifications of PV array are as shown in table I.

TABLE I
PV Array Parameters

Parameter	Specification
Module	SunPower SPR-415E-WHT-D
Parallel strings	88
Series connected modules per string	7
Maximum power	250kW
Open Circuit Voltage	597V
Voltage at max power	510.3V
Current at max power	500.72A

ISBN: 979-85-27243-61-1

2) Three Phase Programmable Voltage Source Block: Fig. 2 repersents the Three-Phase Programmable Voltage Source Block. It implements three-phase voltage source with programmable time variation of amplitude, phase, frequency, and harmonics. Three of these blocks are used in the simulation. One block represents the utility and the other two are DERs.

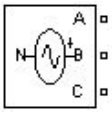


Fig. 2. Three Phase Programmable Voltage Source

B. Simulation of VPP

Fig. 3 is the single line diagram of the simulation model. Model consists of utility, three distributed generation units (one of them is solar). The three units together constitute VPP and are connected to the utility. Each DG unit supplies its own load and is monitored by the VPP control unit. The control unit then produces a signal to the circuit breaker based on the conditions required. Fig. 4 represents the simulink model of VPP.

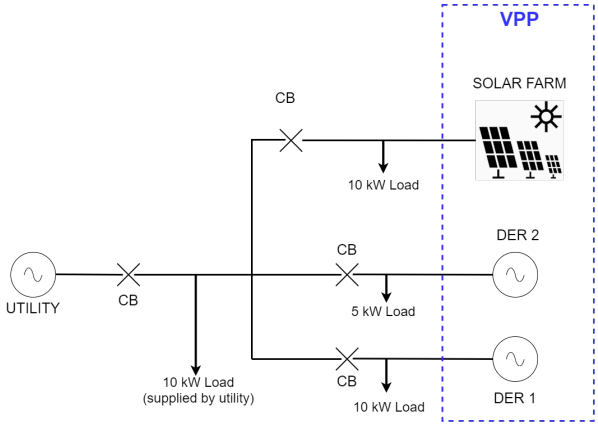


Fig. 3. Single Line Diagram of VPP

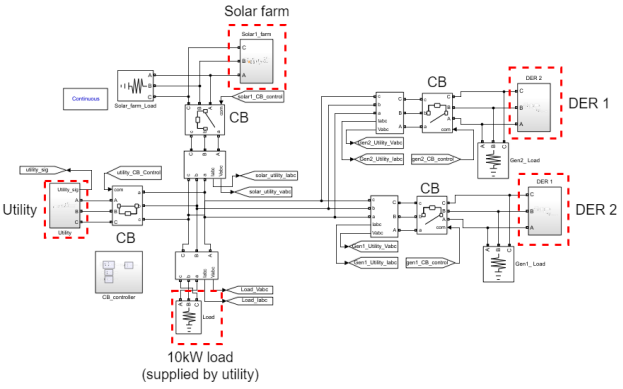


Fig. 4. Simulink Model of VPP

1) Utility: The utility subsystem consists of three phase programmable voltage source (Fig. 5). Its phase to phase voltage is 415V rms and frequency is 50Hz. A 10kW fixed load is connected to the utility. Three phase voltage measurement block is used to measure the generated voltage.

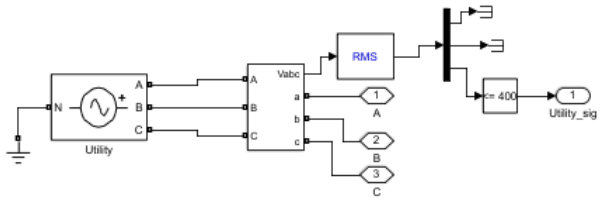


Fig. 5. Utility

C. DER 1 and DER 2

The DER 1 and 2 consists of three phase programmable voltage source. The three phase voltage sources present in DER 1 and DER 2 represent the DG sets. The rms phase-to-phase voltage of both the DERs is 415V and the frequency is 50Hz. Each DER is connected to a fixed load of 10kW and 5kW respectively. These DERs are connected to the grid through the circuit breakers which in turn are controlled by the VPP control unit. Fig. 5 represents the DER 1. Both the generators have same characteristics.

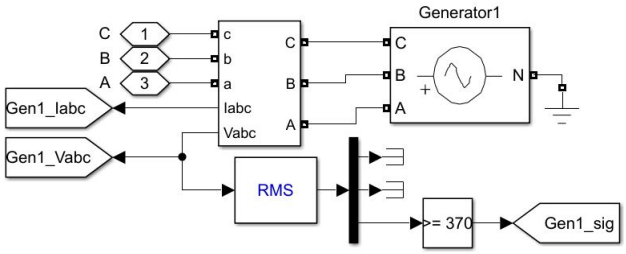


Fig. 6. DER 1

D. Solar

The Solar farm subsystem consists of PV array is connected to capacitors of 0.1F. These capacitors are connected to three level bridge which has forced commutated power electronic devices is used to convert the DC voltage to three phase AC by using gate signals. Gate signals are given from 3 Level PWM generator. This generated AC voltage is stepped up using three phase transformer. Fig. 7 represents the solar farm.

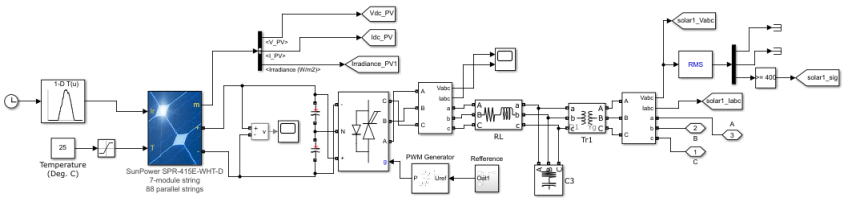


Fig. 7. Solar

Solar irradiance data and temperature data is given to the PV array for the generation of voltage. The irradiance data used for the simulation is obtained from Bagalkot solar power plant, Karnataka. The data is shown in Table II

TABLE II
SOLAR IRRADIANCE DATA

hh	mm	Data 1	Data 2	hh	mm	Data 1	Data 2
0	00	0	0	12	0	1035	853
0	30	0	0	12	30	1045	849
1	00	0	0	13	00	1036	843
1	30	0	0	13	30	1010	751
2	00	0	0	14	0	969	765
2	30	0	0	14	30	910	703
3	00	0	0	15	00	836	607
3	30	0	0	15	30	751	538
4	00	0	0	16	0	656	439
4	30	0	0	16	30	552	333
5	00	0	0	17	0	441	224
5	30	0	0	17	30	328	119
6	00	24	0	18	0	216	33
6	30	103	6	18	30	112	0
7	00	111	67	19	0	30	0
7	30	158	165	19	30	0	0
8	0	338	247	20	0	0	0
8	30	409	354	20	30	0	0
9	0	629	388	21	0	0	0
9	30	733	448	21	30	0	0
10	0	834	604	22	0	0	0
10	30	907	637	22	30	0	0
11	00	965	773	23	0	0	0
11	30	1007	831	23	30	0	0

E. VPP Control Unit

Each circuit breaker connected to the DER is controlled by the VPP control unit. The VPP control unit gathers information from DERs solar farm and utility and operates the circuit breaker accordingly. Fig. 8 represents the VPP control unit.

1) Utility circuit breaker controller: The utility circuit breaker controller(Fig. 8) takes the utility signal. This utility signal is generated by measuring the rms value of utility generated voltage and measured rms value is compared to a set value using comparator block. If the comparator output is 1 the circuit breaker will be opened and if the output is 0 the circuit breaker will be closed.

2) DER 1 and 2 Circuit Breaker Controller : As mentioned in Section II-C DER1 and DER2 consists of programmable voltage source which produces three phase AC voltage. Generated voltage is measured using V-I measurement block and rms value is taken using rms block in Simulink. The rms value measured is compared to a set value using comparator block. The comparator output is given to generator 1 circuit breaker controller and generator 2 circuit breaker controller respectively where logical AND operation is performed with the utility signal(Fig. 8). The output signal from the AND operation is given to the circuit breaker connected to DER 1 and DER 2 respectively.

3) Solar Circuit Breaker Controller: The three phase AC voltage obtained from transformer is measured using the V-I measurement block and rms value is taken using rms block in Simulink. The rms value measured is compared to a set value using comparator block. Logical AND operation is performed between comparator output and utility signal(Fig. 8). The output signal from AND operation is given to the circuit breaker connected to the solar farm.

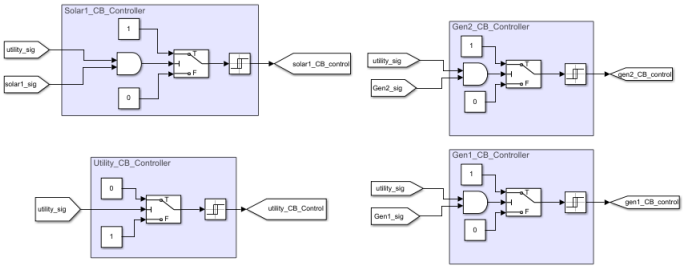


Fig. 8. VPP Control Unit

III. RESULTS

VPP operates in No Power Exchange mode if the generation from the utility is assumed to be constant i.e, VPP supplies the load demand and losses within the VPP and if the grid is unstable due to insufficient generation or to decrease the load on the grid during peak demand, VPP operates in Grid Export mode i.e, VPP generates the demand and losses within the VPP and also supplies power to the grid [4].

The data is of 24hours taken from the solar plant of two days for different seasons. From the simulation, solar irradiance, solar DC voltage and power supplied by DERs are observed.

A. VPP Simulation for Data1

The irradiance data from Data1 is given to the PV array. The DC voltage and irradiance waveform obtained is shown in Fig. 9.

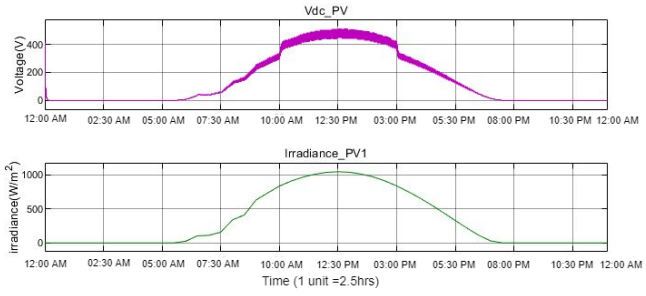


Fig. 9. Irradiance and Vdc Obtained from Data1

Initially, the utility supplies power to the load. At 01:30 AM the utility voltage drops to 0.8pu. The VPP control unit monitors DER 1, DER 2, solar farm, and utility status. Based on the availability of energy DER 1, DER 2, and solar farm are switched accordingly to supply the load constantly. DER enters the power exchange mode.

DER 1 and DER 2 will supply the load from 01:30 AM. From 05:00 AM-10:00 AM DER 1 alone supplies the load. Between 10:00 AM and 03:00 PM, the power generated by

solar is shared by the grid and the load at the solar farm. From 03:00 PM-04:00 PM, DER 1 alone supply the load. DER 1 and DER 2 supply the load between 04:00 PM and 08:00 PM. From 08:00 PM the utility supply the load and VPP enters back to no power exchange mode. The waveforms of power supplied to the grid are shown in Fig. 10. Table III (obtained

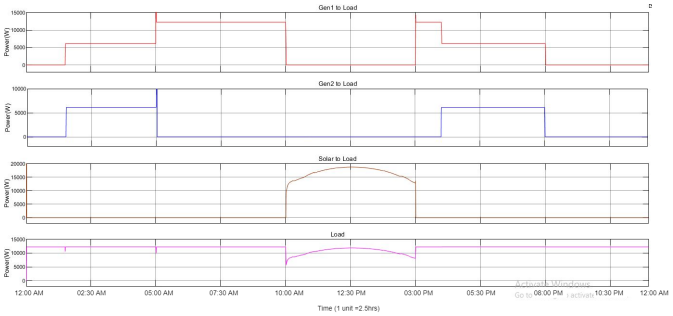


Fig. 10. Power Supplied to Grid from DERs(Data1)

from simulation results) represents the time intervals at which the utility and DERs supplies the load.

TABLE III
OPERATION TIME OF DERS AND UTILITY(DATA1)

Time interval	Utility	DER 1	DER 2	Solar farm
12:00 AM-01:30 AM	ON	OFF	OFF	OFF
01:30 AM-05:00 AM	OFF	ON	ON	OFF
05:00 AM-10:00 AM	OFF	ON	OFF	OFF
10:00 AM-03:00 PM	OFF	OFF	OFF	ON
03:00 PM-04:00 PM	OFF	ON	OFF	OFF
04:00 PM-08:00 PM	OFF	ON	OFF	OFF
08:00 PM-12:00 AM	ON	OFF	OFF	OFF

B. VPP Simulation for Data2

The irradiance data from Data4 is given to the PV array. The DC voltage and irradiance waveform obtained is shown in Fig. 11.

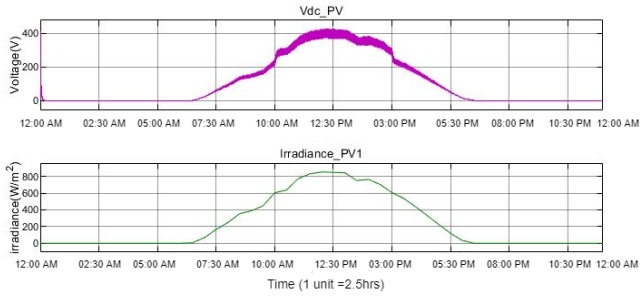


Fig. 11. Irradiance and Vdc Obtained from Data2

The utility supplies the load till 01:30 AM where VPP operates in no power exchange mode. At 01:30 AM the utility voltage drops to 0.8pu. So, VPP enters power exchange mode where DER 1 and DER 2 together supply the load between 01:30 AM and 5:00 AM. DER 1 alone supplies the load between 5:00 AM and 08:30 AM.

Both DER 1 and solar together supply the load between 08:30 AM and 04:00 PM. From 04:00 PM-05:30 PM both the DERs and solar together supply the load. DER 1 and DER 2 supply the load between 05:30 PM and 08:00 PM. From 08:00 PM the utility supply the load and VPP enters back to no power exchange mode. The waveforms of power supplied to the grid are shown in Fig. 12.

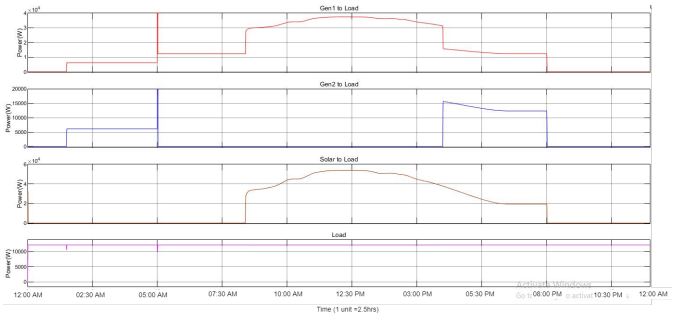


Fig. 12. Power Supplied to Grid from DERs(Data2)

The total power supplied to grid from VPP for data 2 is shown in Fig. 13.

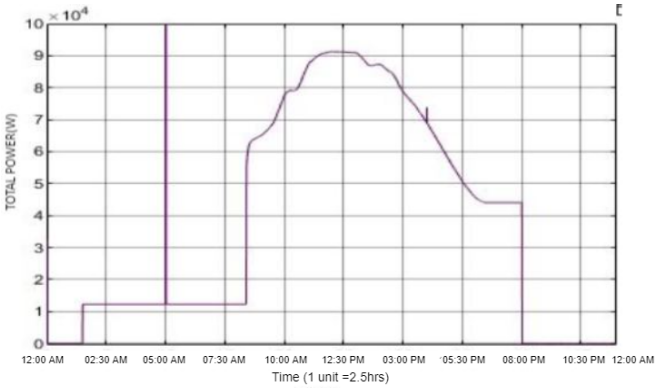


Fig. 13. Power Supplied to Grid from VPP(Data2)

Table IV (obtained from simulation results) represents the time intervals at which the utility and DERs supplies the load.

TABLE IV
OPERATION TIME OF DERS AND UTILITY(DATA2)

Time interval	Utility	DER 1	DER 2	Solar farm
12:00 AM-01:30 AM	ON	OFF	OFF	OFF
01:30 AM-05:00 AM	OFF	ON	ON	OFF
05:00 AM-08:30 AM	OFF	ON	OFF	OFF
08:30 AM-04:00 PM	OFF	ON	OFF	ON
04:00 PM-05:30 PM	OFF	ON	ON	ON
05:30 PM-08:00 PM	OFF	ON	ON	OFF
08:00 PM-12:00 AM	ON	OFF	OFF	OFF

IV. CONCLUSION

Renewable energy industry has evolved and is evolving now around the world due to its low pollution and availability

ISBN: 979-85-27243-61-1

of resources. Due to which there is increase in number of DERs. DERs reduces the transmission losses and the electricity scarcity. Earlier most of the generation was done by the conventional generation but now there is increase in number of DERs they can be combined to support the grid and participate in the market. In order to do so the concept of VPP is introduced it is based on the distributed generators which are connected, controlled and visualized as a single entity to the main grid. The VPP will not only circulate better renewable energy but also lead to a reduction in grid consumption and cost. In this paper a simple VPP model of 3 DERs with variable generation is modeled. The VPP control unit controls the DERs to operate in different conditions. If the generation from the utility is assumed to be constant, VPP operates in No Power Exchange mode and if the grid is unstable due to insufficient generation or to decrease the load on the grid during peak demand, VPP operates in Grid Export mode. VPP provide provision for voltage stability, frequency control and system security. A proper control algorithm for VPP helps in smooth operation and load management.

REFERENCES

[1] Lucian Ioan Dulau, Mihail Abrudean, and Dorin Bica. "Distributed Generation and Virtual Power Plants," *in 2014 49th International Universities Power Engineering Conference (UPEC),* IEEE, Sept. 2014.

[2] Xuanyuan Wang, Zhen Liu, Hao Zhang, Yunhao Zhao, Jianlei Shi, and Huajie Ding, "A Review on Virtual Power Plant Concept, Application and Challenges,"*in 2019 IEEE Innovative Smart Grid Technologies - Asia (ISGT Asia)*, IEEE, May 2019.

[3] Shi You. "Developing Virtual Power Plant for Optimized Distributed Energy Resources Operationand Integration," *Phd Thesis, Technical University of Denmark, Denmark*, Mar. 2010. [Online]. Available: https://backend.orbit.dtu.dk/ws/portalfiles/portal/54331357/thesis_VPP.pdf

[4] P M Naina, Haile-Selassie Rajamani, and K. S. Swarup. "Modeling and Simulation of Virtual Power Plant in Energy Management System Applications,"*in 2017 7th International Conference on PowerSystems (ICPS),* IEEE, Dec. 2017.

[5] Oliver Nwauka, "Virtual Power Plant Basic Requirements for Integration of Distributed EnergyResources , Driven by Industry 4.0,"*proceedings of the International Conference on Industrial Engineering and Operations Management Paris, France*, Jul. 2018.

[6] Gurpreet Chugh, Pramod Kumar Singh, Shivali Dwivedi, Reinhard Mackensen, Sven Liebehentze, "Opportunities for Virtual Power Plants in India,"*in Indo – German Energy Programme – GreenEnergy Corridors*, 2019.

[7] Poushali Pal, A.K. Parvathy, and K.R. Devabalaji, "A broad review on optimal operation of Virtual power plant," *in 2019 2nd International Conference on Power and Embedded Drive Control(ICPEDC),* IEEE, Aug. 2019.

[8] Runze Liu, Yu Liu, and Zhaoxia Jing, "Impact of Industrial Virtual Power Plant on Renewable energy integration," *in Global Energy Interconnection3.6* (Dec. 2020), pp. 545–552.

REAL TIME EXPERT SYSTEM FOR TRANSMISSION LINE FAULT DETECTION IN UNDERGROUND CABLES USING IOT

Unnikuttan B
PG Scholar
ECE Department.
Kottayam Institute of Technology,
Kottayam, Kerala

Geevarghese Mathew Kurian
Research Scholar
EEE Department
Kalasalingam University
Tamil Nadu, India

P.G Anilkumar
Research Scholar
EEE Department
Kalasalingam University
Tamil Nadu, India

Anishamol Abraham
Assistant Professor
CSE Department
Amaljyothi College of Engineering
Kerala

Abstract : The objective of this paper is to determine the location of the fault in underground cable lines from the source station to the exact location of the fault in kilometers by using a manipulator robot . Whenever a fault occurs in the underground cable line for some reason, the repairing process relating to that faulted cable becomes difficult owing to the lack of a proper system for tracking the exact fault location and the type of fault that occurred in the cable.. Here in this paper single line to ground, double line to ground & three-phase faults have been considered. Therefore, the basic concept of EM wave is found suitable in principle to develop a fault location tracking system. The robot is moved over the conductor wire with the help of roller wheel mechanism.If any fault occurs on thetransmission line the change in the magnetic field strength is detected by the hall effect sensor. If there is any tendency for fire and obstacle occurs the corresponding change is detected by temperature sensor and infrared sensor. Thus the proposed system finds the exact location of the fault.,the fault occurring distance, phase(R,Y&B), and time. IoT is used to control the robot and display the information over the Internet using the Wi-Fi module ESP8266.

Keywords- Underground cable system, fault detection circuit, location method ,Hall sensor, Arduino, , IoT WiFi module

I . INTRODUCTION

Transmission lines plays a vital role in power systems.it has run over hundreds of kilometers powersupply to the consumers.When a fault occurs in transmission line unless it is severe it is unseen. But these minor fault can leads to damage of the underlying equipment's connected and turn out to be a treat to human around.In recent years we donot have real time system once a fault occurs,this leads to damage of transformer and can turn havoc to human life. It may also initiate fire.To overcome such incidents to maximum extend, contineous moinitoring of transmission lines is carried out on a frequent basis.this leads to increased human power.The real intention of this is not met as many a times fault occures may due to flooding, faults at the power generating station, and parts of distribution subsystem.

Various faults in cables

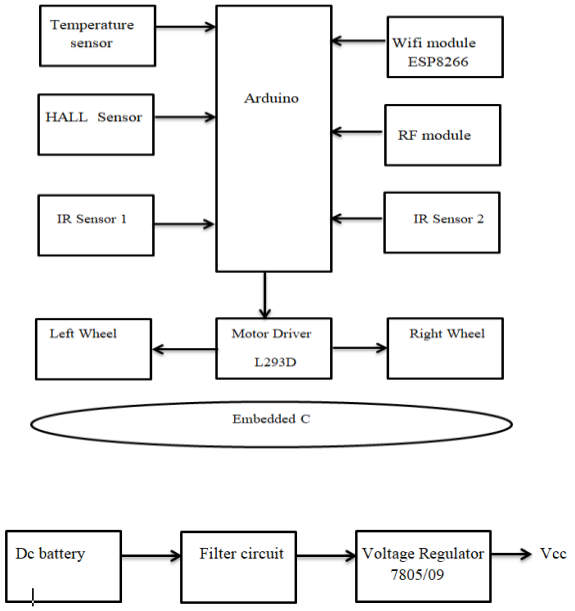
- *Single line to ground fault (SLG)* :This type of fault occurs when one conductor falls to ground or contacts the neutral wire.
- *Line to line fault (LL)* :This type of fault occurs when two conductors being short circuited.
- *Double line to ground fault (DLG)* :This type of fault occurs when two conductors falls to ground.
- *Balanced three phase fault*: The least occurring type of fault is the balanced three phase fault which can occur by a contact between the three power lines in many different forms.

The development of autonomous robot for monitoring and detecting the fault location is becoming feesible for a broad range of industrial and scientific applications.The depoloyment of robots can bring such advantages over traditional monitoring reduces cost for maintanence increasing the reliability as well as human safety and reduces man power.To achieve the continuous

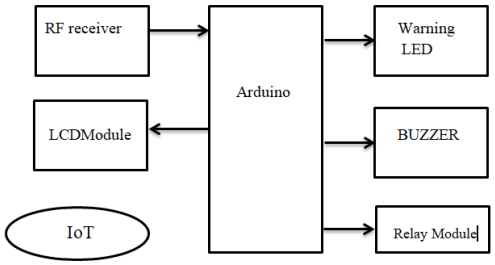
monitoring of the real time condition and giving the high output voltage with high efficiency by reducing the loses and faulty condition of the transmission line is done with robot technology.To continuously observe the running condition and find out the faulty and destructive location of the power system is the main purpose of the robot.locating the faulty points in an underground cable helps to facilitate quicker repair,improve the system reliability and reduced outageperiod.

II. BLOCK DIAGRAM

Robot section



Controlling Station



The proposed system is an IoT enabled underground cable fault detection system. It is a combination of electrical, robotics, electronics and full duplex communication. When current is passed through the underground cable there is an electromagnetic wave generated. when current increases the intensity of the electromagnetic wave will also increases. If there is any fault occurs in the cable the current leaks out the cable and the generated waves will leak out. So for finding the fault detection in the underground cable we have to develop a manipulator robot with hall sensor. This robot detects the faulty condition in the cable and the message is passes the base station and server. Moreover the device is how much km far from the starting point is displayed.warning alarm and led indication is also provided with system. A ralay circuit is included in the monitoring station to isolate the power supply if the fault is uncontrollable.

There is a ESP8266 wifi module is attached to the robotic circuit,which recieves controlling signals from the IoT server and control the direction of robot. The rotation of wheels of the robot is controlled by the dual H-bridge with this input and continuous movement of the vehicle in the path is maintained. LM35 sensor is kept on the vehicle and it continuously measures the temperature of the surrounding. Infrared sensor is kept on the vehicle and it continuously measures the obstacles of the surrounding. Hall effect sensor is kept on the vehicle and it continuously measures the fault occurs on the transmission line.

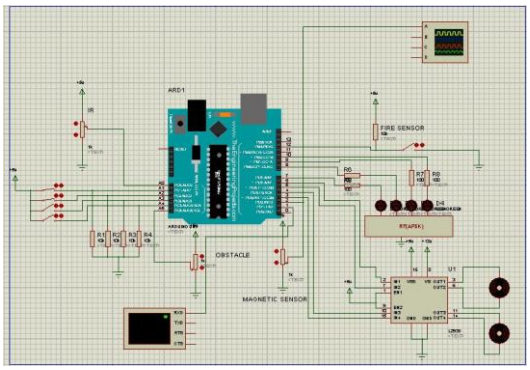
If there is any chance of fault occurs, LCD display messages includes exact location of the fault.,the fault occurring distance, phase(R,Y&B), and time etc in the control room wirelessly through RF technology and the server page through IoT . Also how much km far from the starting point is displayed in the control room.This is the working of the system.

III. Proteus circuit description

Various components used in the system are basically a Arduino, Wi-Fi modem, different sensor modules. The Hall sensor is used for detecting em wave cocentration throgh electro magnetic induction. Here we have used Arduino. Atmega328 will receive the input from the hall sensor and according to it, the controller circuit will perform some set operations like sending of data through RF encoder which is interfaced with it or serially communicating the realtime data through Tx pin of the microcontroller. Wi-Fi module acts as a medium that connects any of the physically assembled systems with the internet and transmits the data in the server. The wiFi module which is usually interfaced with Arduino is ESP8266. Now coming to its pin configurations, it consists of 8 pins but the pins which are actually used are Tx pin, Rx pin, CHPD pin, Vcc, Gnd. CHPD is the enable pin which is an active-high pin and by giving input HIGH it enables Wi-Fi and connects the system with the internet and any of the sensed values can be serially transmitted to the server. At last when the code was implemented in

Arduino then the real-time data was serially communicated in the server and the information from the server can be retrieved in mobile or laptop through IoT.

Fig: no : 3 robotic section



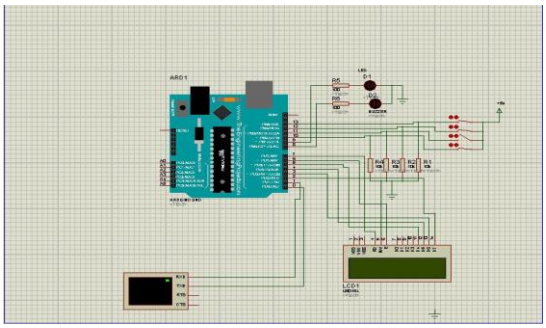


Fig:no: 4 controlling station

III. CONCLUSION

Manipulator robot for high voltage transmission line fault detection system is a reliable technique for monitoring and controlling the electric distribution system. It is a reliable and robust one. Any kind of fault occurring in the distribution system results the RF module and IoT module to send instant messages automatically to the nearest server. This system provides accurate fault location information and will serve as a reliable, And cost effective solution for monitoring and controlling the electric distribution system.

IV. REFERENCES

1. Apostolos N. Milioudis (2015), Detection and Location of High Impedance Faults in Multiconductor Overhead Distribution Lines Using Power Line Communication Device,*IEEE transactions on smart grid*, vol. 6, no. 2.

2. **Megahed, A.I., Monem Moussa, A. and Bayoumy, A.E.** (2006) , Usage of wavelet transform in the protection of series-compensated transmission lines , *Power Delivery, IEEE Transactions on,* vol. 21, no. 3, pp. 1213-1221.

3. Pandya, V. J. and Kanitkar, S.A. (2007) , A novel unit protection scheme for protection of series compensated transmission line using wavelet transform , *Power Engineering Conference*.

4.Jena, P. and Pradhan, A.K. (2010), A Positive-Sequence Directional Relaying Algorithm for Series Compensated Line, *Power Delivery, IEEE Transactions* on, vol.25,no.4, pp.2288-2298.

5.Shaaban, S.A. and Hiyama, T. (2010) , Transmission Line Faults Classification Using Wavelet Transform, *14th International Middle East Power Systems Conference*, Cairo University, Egypt, pp. 532-537.

6.Izykowski, J., Rosolowski, E., Balcerek, P.,(2011) , Fault Location on Double-Circuit Series Compensated Lines Using Two-End Unsynchronized Measurements, *Power Delivery, IEEE Transactions*, vol. 26, no.4, pp.2072-2080.

7. Pierz, P., Balcerek P. and Saha,(2013), A Method for Internal and External Fault Discrimination for Protection of Series Compensated Double-Circuit Line, *Power Tech, IEEE Grenoble*, pp. 1-6.

8. Geevarghese Mathew Kurian, P. A. Jeyanthy, D. Devaraj, and P. G. Anilkumar, "RTC Based Solar Power Multi-Level Inverter," in *2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, 2018, pp. 1875-1880.

9.Sharma, R., Ahmad,A. and Shailendra, K. S.(2013),Protection of Transmission Linesusing Discrete Wavelet Transform, *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, vol. 3, Issue-1,

10.Osman, A.H. and Malik, O.P., (2004),Protection of Parallel Transmission Lines Using Wavelet Transform, *IEEE Transactions on power delivery*, vol. 19, no.

11.Ashok, V., Bangarraju, K. G. V. S. and Murthy (2013), Identification and Classification of Transmission Line Faults Using Wavelet Analysis, *ITSI Transactions on Electrical and Electronics Engineering*, vol. 1, no. 1, pp. 117-122.

TRANSMISSION LINE FAULT DETECTION, MONITORING AND DATA ANALYSIS USING IOT

Nithin .S
PG Scholar
ECE Department.
Kottayam Institute of Technology,Kottayam Kerala)

Anishamol Abraham
Assistant Professor
Computer Science and Engineering
Amaljyothi College of Engineering
Kerala

Geevarghese Mathew Kurian
Research Scholar
EEE Department
Kalasalingam University
Tamil Nadu, India

Prof. P. Aruna Jeyanthy
Professor
EEE Department
Kalasalingam University
Tamil Nadu, India

ABSTRACT

The exact location of fault detection and monitoring of transmission lines is a major goal in power system engineers in transmission system. Fast fault detection and monitoring helps to protect the appliances and equipment's by disconnecting the faulted lines as soon as possible. The accurate fault location detection helps the utility personnel to resolve the current fault fastly and can locate the areas where the fault regularly occur, thereby reducing the occurrence of fault in a particular area. IoT is integrated along with the fault detection to display and monitor the type of fault details, zone details and occurrence of fire in a transmission line. Many methods are used for fault detection and monitoring which require current and voltage transformers. These transformers are little bit expensive and require physical contact with the monitored high voltage equipment.

Keywords- IoT, Arduino, Relay, GSM

I.INTRODUCTION

A fault in electrical equipment is defined as a defect in its electrical circuit due to which the current is diverted from the actual path. Faults are generally caused by mechanical failure, accidents, excessive internal and external stresses etc. During the faults the power flow is diverted towards the fault and supply to neighboring zone is affected. Also faults in distribution lines have resulted in damage to human and animals over the years. Besides faults need to be rectified or preventive measures need to be taken as soon as possible to avoid large scale damages for this, the faults need to be detected as quickly as possible and the information of where the fault has occurred need to conveyed to the authorities as quickly as possible.

Various methodologies are available in the transmission system for the above mentioned problem. But due to economic constraints, these cannot be implemented in the distribution system effectively. Therefore, this paper has concentrated only on the distribution system and monitoring using IoT.In this paper, the Arduino detects any fault that has occurred in the distribution system and cause the tripping of relays thus isolating the faulty area. Use of Arduino and IOT enables to introduce a display mechanism to help display the kind of fault that has occurred and can be monitored from anywhere by the help of internet.

Once the faulty area is isolated, there exists a problem of lag in reporting of the fault so that necessary actions cannot be taken immediately to ensure continuity of supply. So a system has been created that will automatically report that a fault has occurred at the precise location using GSM. This helps fault rectification as soon as possible.

It is necessary to detect the fault as early as possible. That is why a product was made using Arduino, GSM and IOT to make the system faster. Two points have to be taken into

consideration. First of all, Arduino cannot handle higher voltages directly and therefore, the actual voltage need to be scaled down to the required range (5v). Secondly, an important to note that the Arduino board itself convert analog signals to digital signals so there is no need of analog to digital converts needed separately is not required. The Arduino is so programmed to compare the input signal, which may be voltage or current fluctuations, with a given range of value. If the input is above or below the range of set value, the microcontroller will send a signal to the relay to trip the circuit and also send a parallel signal to the LCD to display the type of fault that has occurred. Thus we finally obtain the tripping as well as display of the fault at same time.

Another important addition to the product is the immediate reporting of the fault. Ones the relay is tripped, the Arduino simultaneously sends message to the authorities about the fault using a GSM module. The message includes the following key problems, sag, swell, interruptions, temperature and presence of fire in the faulty area. The message sent also includes details about where the fault has occurred. The distribution system was divided into zones, each zone consisting of fixed number of poles. The paper created is able to exactly inform the zone where the fault has occurred and it can be monitored with the help of IoT and the higher officials who are in charge of that zone can view the status of his zone when he is not in the controlling station can take remedial action quickly. In normal condition when a fault had occurred in a pole, the entire zone area is isolated from the supply but in this paper by using proper tapping connection in supply line(from one pole to another) we can isolate the single pole from the zone where fault had occurred without affecting the other pole region from the supply

The entire paper therefore provides an efficient system for fault detection and location in the distribution network where no such system prevails presently. This in turn can reduce precious time and difficulties faced in the present day. It can also help restore continuity of supply as quickly as possible ones the fault is cleared.

II. BLOCK DIAGRAM AND CIRCUIT DIAGRAM

In order to get a better and efficient system in fault detection and monitoring, paper was divided into two segments. The first segment (zone region controller) is the fault detection and sensing (fire) is done with the help of Arduino and data is sent to controlling station with help of GSM transmitter. The type of fault and the area where the fault had occurred were detected precisely and the circuit was disconnected in case of overcurrent faults with the help of relays.

The Arduino continuously receives the measured value of current and voltage and compares it with a predefine set of values. Arduino had inbuilt ADC. In case of voltage fluctuations, sag or swell, a voltage divider circuit was used to facilitate the stepping down action. The voltage was then compared to a threshold value and accordingly sag or swell was detected based on whether the measured voltage was lesser than or greater than the predetermined value.

Overcurrent faults are sensed with the help of current transformers. The measured value was compared with threshold value and if found exceeding the specified limit, the circuit was disconnected to avoid any damage in that pole region only without disturbing the power supply in the other poles of the same zone by tapping.

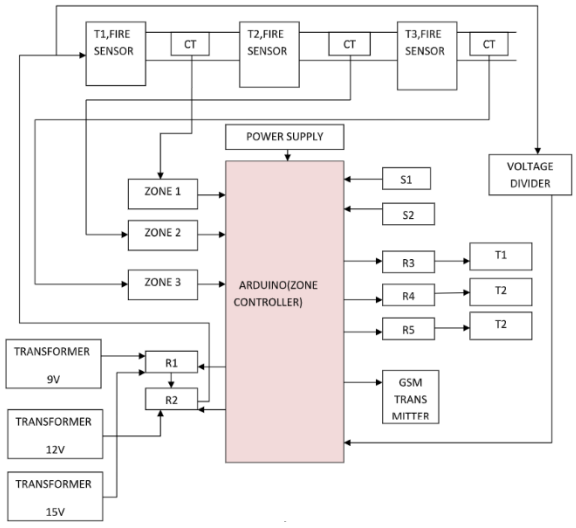


Figure 1. Block diagram of zone controller

The block diagram consist of the following parts. A power supply without which the heart of the paper, the arduino, cannot operate. The distribution network model was represented by the towers T1, T2, T3 and was divided into three zones, namely ZONE1, ZONE2 and ZONE3 respectively. Each zone was assumed to consist of about five to ten support structure. Current transformers were provided to continuously monitor the current in each zone. Switches S1 and S2 were provided for the purpose of selection of the voltage level of the distribution system (9V, 12V or 15V) with the help of relays R1 and R2. A voltage divider circuit was used to scale down the incoming voltage and measured value was provided as input to AVR. Relays R3, R4 and R5 were used to isolate the faulty part of the circuit. Fire sensors is also connected with each towers to detect the presence of fire in the transmitting line and it also sends the data to the arduino. The GSM module was used to send information regarding the type of fault and its location to the authorities.

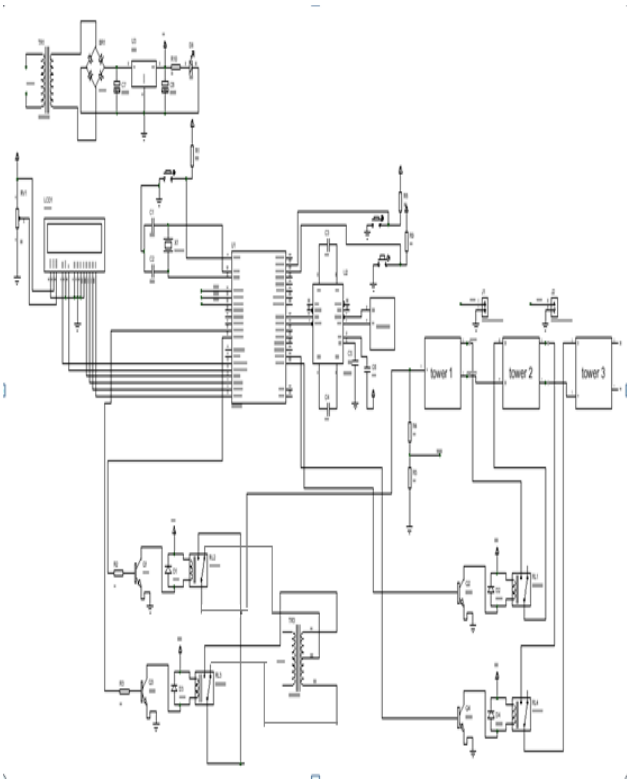
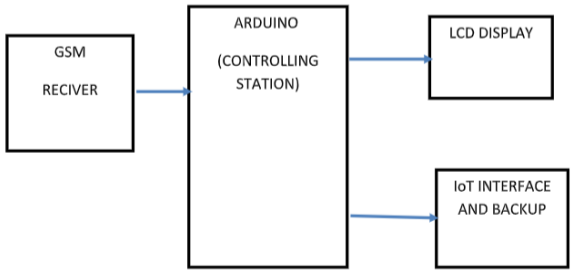


Figure 2. Circuit diagram of zone controller

III. CONTROLLING STATION BLOCK DIAGRAM



The second segment-controlling station was focused on receiving the information about the fault and its location from the zone control section using GSM receiver and it transfer the message to the arduino in the controlling station. A LCD is connected with the arduino which will continuously display the current status of each zone .By using IoT integrated with arduino the authorities can monitor the station status without sitting in the console and take remedial actions quickly. By collecting and storing the data with help of IoT, we can analyze and find the continuously fault occurring region very easily

IV. FAULT INDUCING CIRCUIT

The circuit for the creation of over voltage and under voltage are as shown in figure 3.10. The switches shown in figure below are pressed to induce the faults. If the first switch alone is pressed, the result was voltage sag and if both switches were pressed, the result was voltage swell. If neither is pressed, the circuit is assumed to be operating under normal operation. It is so designed that when one switch is pressed, the relay R2 is turned ON and 9V (sag) appear as output of the net system. When both switches are turned on, the microcontroller is so designed that both R1 and R2 are turned ON producing an output of 15V (swell). If both switches are not pressed, then output is 12 volts which is considered to be normal voltage

S1	S2	Result
OFF	**OFF**	NORMAL VOLTAGE(12V)
ON	**OFF**	SAG (9V)
OFF	**ON**	NOT DEFINED
ON	**ON**	SWELL (15V)

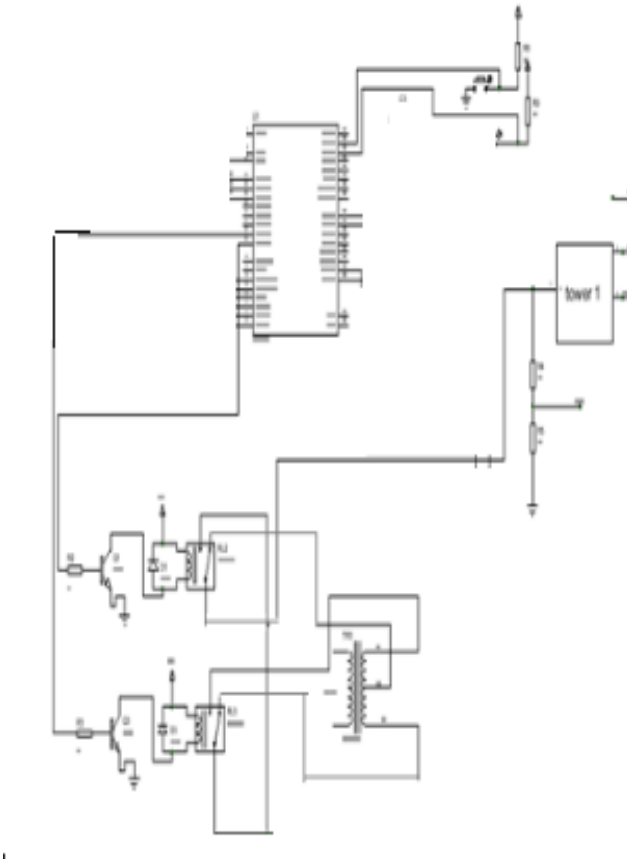


Figure 3. Fault inducing circuit

The working of the circuit can be clearly explained as follows. The three terminals of relays R1 and R2 are as shown in figure. When both the switches are not pressed, both the relays remain in normally closed (NC) position. Thus 12V appear across tower T1.

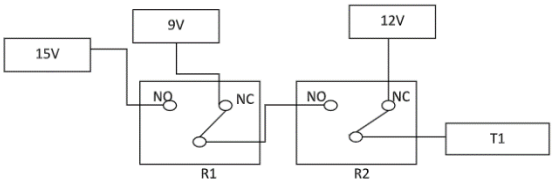


Figure 4. Relay operation

Now, when only one switch is pressed, R2 goes to normally open position and at this point, it is clear that 9V appear across the NC of R2 and 9Volts appear across T1. Finally, if both the switches were pressed, both the relay contact goes to normally open position. It is clear from the figure that in this position, 15V appear across T1. Thus different voltage levels are given to the system.

Table denoting state of S1 and S2 and its condition

i) Detection of Sag and Swell

Detection of sag and swell is done by using a voltage divider circuit. The voltage divider is designed such that 15V is taken as the maximum value of voltage that can exist and thus 15V is considered equivalent to 5V, which is the maximum voltage the controller can withstand. Thus a voltage divider of the ration 1:3 is chosen. Therefore, 15V correspond to 5V, 12V correspond to 4V and 9V correspond to 3V respectively.

If the signal from the voltage divider was 5V the system identified it as a voltage swell and the message was printed. Similarly, if it was 4V it was identified as Normal condition. 3V was identified as a sag in voltage. In each case message was sent to a predefined number with the help of GSM.

ii) Inducing Short Circuit Faults

The short circuit faults are induced by simply short circuiting the phase and neutral of the system. The hardware was so designed as to induce faults in any one of the three zones. The fault is detected by using a current transformer. The CT measures the value of current and converts it into ranges the controller can handle. If the measured value was found greater than the predefined value,

the relay of corresponding zone is triggered and the faulty section was isolated. In order to identify which section of circuit is isolated, LEDs were provided. The glowing of LED in each zone indicates the presents of the supply.

The isolation of the faulty section is done as follows. Zone 1 is considered the nearest zone to the substation followed by zone2 and zone 3. If there exists a fault in zone 3, all the CTs of zone1, zone2 and zone3 will read a high value of current. Thus to protect the circuit, zone 3 is isolated using the corresponding relay ensuring continuity of supply in zones 1 and 2. Similarly if a fault occurs in zone2, CTs of zone1 and zone2 will show a high current reading and zone2 is isolated**.** Isolation of zone2 results in supply termination in zone 3 as well. However zone1 continue to operate without any problem.

Finally, is a short circuit occurs in zone1, only the CT of zone1 will show a larger current. Thus zone 1 is isolated. Isolation of zone1 causes the entire supply to be terminated as it is the closest to the substation. Here, zone1 is the region between T1 and T2, Zone2 is the region between T2 and T3 and Zone3 is the region beyond T3. Ones again, in each case message is sent via GSM regarding in which zone the fault has occurred and also displayed on the LCD.

V .CONCLUSION

Fault detection and location in the distribution system one of the major problem that we are faced with in the present day. It is often a difficult task to locate the area where fault has occurred and also time consuming. This paper provides a solution to this problem.

Following things were done to make the system effective in detection and location of fault. The entire distribution network was divided into various zones, each zone consisting of about five to ten support structures. Current transformers were provided to continuously monitor the current in each zone and also the voltage of the system was measured. An LCD display was provided to display the kind of faults and location of fault and a GSM module to send messages simultaneously to the authorities about the same. Voltage fluctuations were induced using switches S1 and S2 and relays R1 and R2 (9V, 12V or 15V were generated, 12V being regarded as equivalent to normal voltage). A voltage divider circuit was used to scale down the incoming voltage and measured value was provided as input to AVR.

Relays R3, R4 and R5 were used to isolate the faulty part of the circuit when a short circuit fault was generated. Corresponding zone of fault occurrence was located and isolated.

VI .FUTURE SCOPE

One of the major problem that KSEB is facing nowadays is the electricity theft. This paper provides a solution to this problem. In many cases, we come across situations where people tap electrical energy directly from the lines. This results in a lot of unmonitored power being drawn from the system. Power theft is accompanies by greater amount of current drawn from the system (greater than the normal current that the system on record carries). Here comes the use of the product that was created as part of the project. The excess current drawn appears as an excess current measured by the CT. Thus the arduino input from CT will exceed the set threshold level. Thus KSEB can easily locate those unauthorized consumers and can take necessary action.

Another problem in the present system is that the load used by the consumer may not be the same as that which was shown as the total connected load at the time of acquiring an authorized connection. Many a times the consume show the maximum connected load in such a manner as to acquire single phase connection even when the loads demand the need for a three phase connection. Thus by monitoring the current drawn by the consumers, ones again the product designed can see whether the current drawn is greater than that required by the maximum single phase rating and take necessary actions.

One other major advantage of the designed system lies in the case of fault due to lightning strokes. When lightning strikes on the distribution system, especially in remote areas, it is very difficult to locate the exact region where it has occurred. It is a common practice for the authorities to go in person and inspect each and every point of the network. It often takes hours to simply spot the location, let alone the repair work. This is where the

ISBN: 979-85-27243-61-1

product crested comes to use. This system can tell exactly the region of occurrence of any abnormalities and thus reduces the search time.

REFERENCES

1. The combined study of transmission line fault detection and technique, by Rucha V Deshmukh and Prof.M.R.Salodkar.

2. Fault detection and classification in power transmission lines based on transient signal analysis: A reviewof different methodologies by Ravi V. Ghodchar and Dr. R.G.Karandikar

3. On-line monitoring analysis of fault in transmission and distribution line using GSM technique by Prof. M. S. Sujatha and Dr. M Vijay Kumar

4. Automatic reclosing of distribution and transmission line circuit breakers by L. E. Goff.

5. Analysis of fault location methods on transmission lines by SushmaGhimire

6. A Dependable Microcontroller based Embedded System by Amir Rajabzadeh and Mahdi Vosoughifar.

7. Develpoment of Microcontroller-based Electric power distribution automation systembyI.A.Adejumobi,I.G.Adebayo and A.J.Olanipekun.

8. Design,analysis and fabrication of a transmission fault detector,a new approach by M.K.Das , K.Rout and J.K.Moharana.

9. High impedance fault detection on distribution system by Craig G Wester.

10. Online monitoring of transmission line by HitendraThakre,SwapnilAgarwal.

[11] Geevarghese Mathew Kurian, P. A. Jeyanthy, D. Devaraj, and P. G. Anilkumar, "RTC Based Solar Power Multi-Level Inverter," in *2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, 2018, pp. 1875-1880.

ANALYSIS AND REDUCTION OF HARMONIC DISTORTIONS USING FILTERS IN A TYPICAL POWER SYSTEM

Preetha NP[1] , Akshay Kumar D[2] ,Harshitha MR[3]

[1]Assiatant Professor, EEE Department, Sapthagiri College of Engineering, Bangalore-560057
[2]Assiatant Professor, EEE Department, Sapthagiri College of Engineering, Bangalore-560057
[3]Assiatant Professor, EEE Department, Sapthagiri College of Engineering, Bangalore-560057

ABSTRACT: Non-sinusoidal loads in power plants lead to power quality complications due to harmonic distortion. Hence, a study is proposed in the present task to inspect the harmonics by taking a typical power system which has a crucial nonlinear load of eight induction furnaces and various small loads. Harmonic analysis is carried out on gathered harmonic injection data. Present and future operating requisites are considered for the study. The total voltage distortion and the specific voltage distortion are compared with IEEE STD 519–1992. Hence a study is proposed by using single tuned passive filters to improve power quality.

Index Terms— Nonlinear loads, power quality, harmonics, harmonic injection, induction furnaces, voltage distortion, Single tuned passive filters

INTRODUCTION

Widening diversion in the harmonic (voltage or current distortion) problem surges from the increasing numbers and power ratings of the severely non-linear loads in an industrial system. These nonlinear loads are some sources of harmonics. Projects predominantly use induction furnaces for the production of steel since they are more economical.

The trouble with this kind of furnace is the creation of harmonic distortion. The cause of the distortion is within the induction furnace system. An induction stove works by melting the scrap using a medium frequency magnetic field set up by a coil. This created distortion is very high and affects the voltage transferred by the distribution network. It is highly achievable that other loads supplied from the same network will be influenced. The loads drive non-sinusoidal currents from the supply and lead to voltage fluctuation.

The fluctuation of a sine wave can be portrayed by harmonic components considering a frequency that is an integral multiple of the fundamental frequency.Harmonics in power systems minimizes the equipment's age and can inhibit communication lines and sensitive equipment. Effects of presence in harmonics in the distribution systems can reinforce the risk of wiring failure, transformer Overheating, low power factor, blackout in the system and an excessive neutral return current in the neutral current conductor. Therefore, suppression of harmonics is turning out as a necessary topic among electric power engineers.

Examined Industrial System

Electric utilities in India are facing the pressure of reducing costs and improving the quality and reliability of supply. Reforming the performance of distribution systems to meet required objectives is a matter of selecting the most worthwhile technologies and operating methods.

Overview of the typical power system

In industrial system taken it consists of a grid rating 75MW. It supplies to two inter connected transformers namely ICT-1 and ICT-2 through ACSR MOOSE transmission line. ICT-1 is in service and ICT-2 is put into service when ICT-1 is under maintainence.ICT-1 and ICT-2 are three winding transformer having primary, secondary and tertiary MVA rating of 220/220/75 and voltage rating of 220/33/33 kV respectively.Plant consists of eight induction furnaces, four each on panel-1 and panel-2. Furnace 2 operates for a peak load of 15MW and 14.11 MVAR. The remaining 7 furnaces operate for a peak

load of 16 MW and 12.97 MVAR. There are 6 distribution transformers (DTR), three each on panel-1 and panel-2, having MVA rating of 2.5 and 33/.0433 kV DTR-1 on panel-1 and DTR-4 on panel-2 operates for peak load of 0.91MW and 0.49 MVAR. DTR-2 on panel-1 and DTR-5 on panel-2 operates for peak load of 0.87MW 0.47 MVAR. DTR-3 on panel-1 and DTR-6 on panel-2 operates for peak load of10.55MW and 0.84 MVAR.Capacitor banks are connected at each panel, which are 75 MVAR each on panel-1 and panel-2 and to correct any substantial customer-generated harmonics.

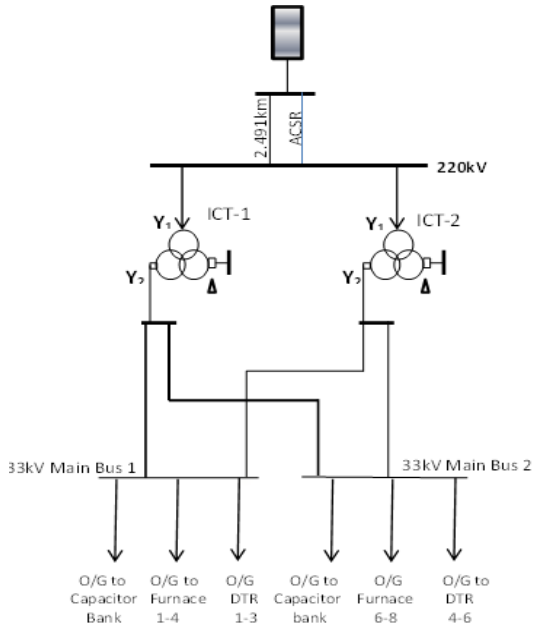


Figure 1: Industrial system

Harmonic Analysis And Calculations

It is not always efficient and normally not needed to wipe out harmonics. Since the utility company is expected to supply clean power to all of its customers, this point is chosen in part so that each customer is responsible for reducing their own harmonics to a level that will not adversely affect other users. It is also proposed to prevent the utility company from having to purchase and install expensive harmonic mitigating equipment

STAGE 1- Present Load Condition

Case 1: Without filter

Plant Operating conditions:

Inter linked transformer-1(ICT-1) is in function and Inter connected transformer-2 (ICT-2) is out of function. Three induction furnaces, two in panel 1 and one in panel 2 are in operation. Out of these furnaces, furnace 1 and furnace 7 are Ferro silica and furnace 2 is Ferro manganese with a net load of around 37.5 MW and 36.5 MVAR. Total of 40 MVAR with two capacitors each of 20MVAR is considered in panel 1 and total of 20 MVAR with one capacitor is considered in panel 2. An approximate of 1.1 MW of load is in service at auxiliary transformer, near distribution transformer (DTR) at panel 1. The overall plant load is around 50 MVA.

Determination of total harmonic distortion

Harmonic analysis is carried out for present conditions without filters. Total Voltage Harmonic Distortion (VTHD) is found at the buses where harmonics are injected. A graph of buses versus the percentage distortion is obtained as a result of simulation which gives the VTHD at different buses.

Simulation results:

VTHD at grid (bus 2) is found to be around 1.523%. VTHD at capacitor bank (bus 11) and furnace 2 (bus 28) is around 2.42%. VTHD at furnace 7 (bus 57) is around 2.415%. VTHD at distribution transformer i.e. DTR (bus 82) is found to be around 2.42%.

Determination of individual total harmonic distortion

Individual voltage harmonic distortion for present conditions without filter is determined. Individual harmonic distortion is found at the grid (bus 2). A graph of harmonics versus the percentage distortion is obtained as a result of simulation which gives the individual harmonic levels at grid.

Simulation results:

5^{th} harmonic distortion which is around 1.4% was dominating over all other harmonics which are less than 0.4%.7^{th} and 13^{th} harmonics are around 0.2%. Rest all harmonics are comparatively negligible which are less than 0.2%.

Observations

When comparisons are made between the obtained harmonic analysis results, it is found that VTHD at the buses is approximately equal or under the limits. ITHD for the grid at the buses is under restrictions but the 5th harmonic value has overtaken the IEEE STD 519-1992 value 1.0. Thus, separately tuned passive filter is formed to reduce the 5th individual voltage harmonic distortion.

CASE 2: With Filter

Plant Operating Conditions

Inter linked transformer-1(ICT-1) is in duty and Inter associated transformer-2 (ICT-2) out of service. Three induction furnaces, two in panel 1 and one in panel 2 are in operation. Out of these furnaces, furnace 1 and furnace 7 are Ferro silica and furnace 2 is Ferro manganese with a net load of around 37.5 MW and 36.5 MVAR. Total of 40 MVAR with two capacitors each of 20MVAR is considered in panel 1 and total of 20 MVAR with one capacitor is considered in panel 2. An approximate of 1.1 MW of load is in service at auxiliary transformer panel 1. The overall plant load is around 50 MVA. A sole tuned passive filter is designed and placed at 33 kV bus in panel 1.

Determination of total harmonic distortion

Harmonic analysis is carried out for present conditions with single tuned passive filter placed at 33kV furnace bank in panel 1. Total Voltage Harmonic Distortion (VTHD) is found at the buses where harmonics are injected. A graph of buses verses the percentage distortion was obtained as a result of simulation which gives the VTHD at different buses.

Simulation results:

VTHD at grid (bus 2) is found to be around 0.455%. VTHD at capacitor bank (bus 11) is found to be around 0.732%. VTHD at furnace 1 (bus 22) and furnace 2 (bus 28) is around 0.727%. VTHD at distribution transformer i.e. DTR (bus 82) is found to be around 0.668%.

Determination of individual total harmonic distortion

Individual voltage harmonic distortion for present conditions without filters is determined. Individual voltage harmonic distortion is found at the grid (bus 2). A graph of harmonics versus the percentage distortion is obtained as a result of simulation which gives the individual harmonic levels at grid.

Simulation results:

5^{th} harmonic distortion is found to be around 0.25%. 7^{th} and 13^{th} harmonics are less than 0.2%. Rest all harmonics are comparatively negligible which are too less.

Observations:

After the design and employment of tuned filter at 33kV furnace bank in panel1 total VTHD which was 1.523% across the grid is brought to 0.455% less than 1.5% according to IEEE STD 519-1992. 5th individual voltage harmonic distortion is reduced from 1.4% to 0.25% less than 1%. Hence, after the design and placement of filters , Total VTHD and the individual voltage distortions are reduced and they are made less than the IEEE STD 519-1992.

STAGE 2 – Future Load Condition

Case 1: without filters

Plant operating conditions

All eight induction furnaces, four each in panel 1 and panel 2 are in operation. Both the distribution transformers (DTR), one each in panel 1 and panel 2 are in operation.

Determination of total harmonic distortion

Harmonic analysis is carried out for future conditions without filter. Total Voltage Harmonic Distortion (VTHD) is found at the buses where harmonics are injected. A graph of buses versus the percentage distortion is obtained as a result of simulation which gives the VTHD at different buses.

Simulation results:

VTHD at grid (bus 2) is found to be around 2.091%. VTHD at capacitor bank (bus 11), furnace 1 (bus 22) and furnace 2 (bus 28) is around 3.336%. VTHD at distribution transformer i.e. DTR (bus 82) is found to be around 3.327%.

ISBN: 979-85-27243-61-1

Determination of individual total harmonic distortion

Individual voltage harmonic distortion for future conditions without filters is determined. Individual voltage harmonic distortion is found at the grid (bus 2). A graph of harmonics versus the percentage distortion is obtained as a result of simulation which gives the individual harmonic levels at grid.

Simulation results:

5^{th} harmonic distortion which is found to be around 1.8% was dominating. 7^{th}, 13^{th} and 25^{th} harmonics are around 0.2%. Rest all harmonics are comparatively negligible which are less than 0.2%.

Observations:

It is found that VTHD across the grid is 2.093% which is more than IEEE STD 519-1992 value 1.5%. 5th individual voltage harmonic distortion is 1.80 which is more than 1.0 across the grid (according to IEEE STD 519-1992). Single tuned passive filter is to be designed to reduce the 5th individual voltage harmonic distortion and total VTHD.

Case 2: With filter placed at 0.433kV bus

Plant operating conditions

Inter connected transformer-1(ICT-1) is in service and Inter connected transformer-2 (ICT-2) is out of service. All eight induction furnaces, four each in panel 1 and panel 2 are in operation. Both the distribution transformers (DTR) are in operation. Single tuned passive filter is designed to reduce the individual voltage distortion and total VTHD across the grid.5^{th} harmonic filter and 7^{th} harmonic filter is designed and placed at the 0.433kv bus, at the distribution transformer in panel 2 to reduce the harmonics at the grid.

Determination of Total Harmonic Distortion

Harmonic analysis is carried out for future conditions with single tuned passive filter for 5^{th} and 7^{th} harmonics placed at 0.433kV bus. Total Voltage Harmonic Distortion (VTHD) is found at the buses where harmonics are injected. A graph of buses verses the percentage distortion is obtained as a result of simulation which gives the VTHD at different buses.

Simulation results:

VTHD at grid (bus 2) is found to be around 1.982%. VTHD at capacitor bank (bus 11) is found to be around 3.164%. VTHD at furnace 1 (bus 22) and furnace 2 (bus 28) is around 3.155%. VTHD at distribution transformer i.e. DTR (bus 82) is found to be around 0.664%.

Determination of individual total Harmonic Distortion

Individual voltage harmonic distortion for present conditions with filters determined. Individual voltage harmonic distortion is found at the grid (bus 2). A graph of harmonics versus the percentage distortion is obtained as a result of simulation which gives the individual harmonic levels at grid.

Simulation results:

5^{th} harmonic distortion which is found to be around 1.7% which is dominating. 7^{th}, 13^{th} and 25^{th} harmonics are around 0.3%. Rest all harmonics are comparatively negligible which are around 0.2% and less than that.

Observations

VTHD is found to be around 1.98% which is still more than IEEE STD 519-1992 value 1.5%. 5th individual voltage harmonic distortion is 1.7 which is still more than 1.0 (acc. IEEE STD 519-1992) across the grid. Filter is to be designed and placed in such a way to reduce the 5^{th} individual voltage harmonic distortion and VTHD.

Case 3: With Filter placed at 33kV bus

Plant operating conditions

Inter connected transformer-1(ICT-1) is in service and Inter connected transformer-2 (ICT-2) is out of service. All eight induction furnaces, four each in panel 1 and panel 2 are in operation. Both the distribution transformers (DTR), one each in panel 1 and panel 2 are in operation. Single tuned passive filter is designed to reduce the individual voltage distortion and total VTHD across the grid. 5^{th} harmonic filter is designed and placed at the 33kv bus to reduce the harmonics at the grid.

Determination of Total Harmonic Distortion

Harmonic analysis is carried out for future conditions with single tuned passive filter for 5^{th} and 7^{th} harmonics placed at 0.433kV bus. Total Voltage Harmonic Distortion (VTHD) is found at the buses where harmonics are injected. A graph of buses verses the percentage distortion was obtained as a result of simulation which gives the VTHD at different buses.

Simulation results:

VTHD at grid (bus 2) is found to be around 0.003%. VTHD at capacitor bank (bus 11) is found to be around 0.005%. VTHD at furnace 1 (bus 22) and furnace 2 (bus 28) is around 0.004%. VTHD at distribution transformer i.e. DTR (bus 82) is found to be around 0.003%.

Determination of Individual voltage harmonic distortion

Individual voltage harmonic distortion for present conditions without filters is determined. Individual voltage harmonic distortion is found at the grid (bus 2). A graph of harmonics versus the percentage distortion is obtained as a result of simulation which gives the individual harmonic levels at grid.

Simulation results:

5^{th} harmonic distortion is found to be zero. Rest all individual harmonics are comparatively negligible which are less than 0.004%.

Observations:

It is found that VTHD is reduced from 1.982% to 0.003% which is less than the IEEE STD 519-1992 value 1.5%. All the individual voltage harmonic distortion is almost reduced to zero. VTHD and the individual voltage distortions are less than the IEEE STD 519-1992.

CONCLUSIONS

Harmonic distortion is a form of pollution in electric plant that can cause problems if the sum of the harmonic currents increases above the standard limits. Harmonic analysis of a typical industrial system is performed for the two cases 1) present condition and 2) future load condition. VTHD and individual voltage harmonic distortions are determined for both the conditions. For mitigating harmonics passive filtering is the most conventional solution. Hence single tuned passive filters are designed wherever VTHD and individual harmonic distortions have exceeded the IEEE 519-1992 specified limits. The proposed single tuned filter reduces the VTHD and individual voltage harmonic distortion to a good level of expectation. These results meet the IEEE 519 recommended harmonic standards.

REFERENCES

[1] IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems. IEEE STD 519-1992**,** (Revision of IEEE STD 519-1981)

[2] Walter A. Malsowski, Allen Bradley, "Harmonics in Power Systems," Electrical Electronics Insulation Conf., 18-21 Sept. 1995, pp. 37 – 44.

[3] J.A. Ghijselen, W.A. Ryckaert and J.A. Melkebeek, "Influence of Distribution Feeder Design on Resonances, "Proceedings of the 2003 Annual Meeting of the IEEE Power Engineering Society (PES2003), Toronto, Canada, 13-17 July 2003, IEEE, New York.

[4] J.A. Ghijselen, W.A. Ryckaert and J.A. Melkebeek, "Distribution system parameters and their influence on harmonic propagation, "Proceedings of the 17th International Conference on Electricity Distribution (CIRED2003), Barcelona, Spain, 12-15 May 2003.

[5] "Harmonic Analysis for Industrial Power Systems Computation Techniques and Filtering". Ali Moshref Shoaib Khan, St. Bruno.

[6] "Understanding Power System Harmonics"; IEEE Power Engineering Review, November 2001 W.Mack Grady, Surya Santoso.

[7] Minnesota Power Electronics, "Power Electronic Computer Simulation, Analysis and Education Using Evaluation Version of PSpice".

SELF TARGETING AUTONOMOUS TURRET SYSTEM (S.T.A.T.S)

[1]BHARATH B N, [2]Muralikrishna K, [3] Dr.Raghavendra G

[1] Assistant Professor, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
bharathbn@sapthagiri.edu.in

[2]Assistant Professor, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
muralikrishna@sapthagiri.edu.in

[3]Associate Professor, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
raghavendrag@sapthagiri.edu.in

Abstract **- Nowadays, many expenses are made in the field of defense in adopting primitive security measures to protect the border from the trespassers and also protect lives of military personnel's in warzone areas. Some military organizations take the help of robot in the risk prone areas which are not that effective when done by army men. These Army robots are confining with the omnidirectional wheels, camera, sensors, artificial intelligence and visual recognition. Not only for military applications, but autonomous turrets can also be utilized for the home and aid in keeping intruders from important possessions and family. The main objective of our system is to get real time data processed by the camera sensor to trace the intruders. It will encompass a combination of hardware and software to match a mounted airsoft weapon's point of aim to the located target in the camera's view. Different from most turrets out there, this will all be controlled from a portable device the user can move around wirelessly. The proposed system as autonomous mode of operation, in which the system tracks and engages targets without any human intervention.**

Keywords – Wireless Secure Shell, Omnidirectional, Computer Vision, Human Intervention, Mecanum Wheel, Autonomous.

I. INTRODUCTION

The motivation of the project is to strive for an autonomous system that can mark and has the ability to neutralize an intruder. The trend towards autonomous systems in the field of armed weapons has been due to the emphasis on reducing human casualties during conflicts. The self-targeting autonomous turret system (STATS), is a camera-based weapon system that uses software to locate and attack a moving target. It will encompass a combination of hardware and software to match a mounted airsoft/nerf weapon's point of aim to the located target in the camera's view. The sentry gun which will have the ability to scan its field of view and user will be able to see the field of view. This Army robot is more efficient compared to the soldiers. Excellency of this robot is in being operated wireless from re-mote which offers no risk to the soldier lives. Robots are enhanced to be robust and sturdier giving the guarantee of success in the risk prone environment. The main aim of the project is to implement a Camouflaged technology based Wireless multifunctional Robot which can be controlled through smart devices. Having locomotion and navigates around the risk prone areas and tries to identify the intruder.

II. MATERIALS & COMPONENTS USED

A. Micro-controller

Heart of the robot is a raspberry pi. Raspberry pi is a series of small single-board computers (SBCs) used for controlling all the operation done by the devices which are interfaced to it. Raspberry Pi is popularly used for real time Image/Video Processing, IoT based applications and Robotics applications. Raspberry Pi is slower than laptop or desktop but is still a computer which can provide all the expected features or abilities, at a low power consumption. Raspberry Pi is more than computer as it provides access to the on-chip hardware i.e. GPIOs for developing an application. It has ARM based Broadcom Processor SoC along with on-chip GPU (Graphics Processing Unit).

STM32F103RCT6 ARM microcontroller-MCU is another board used in this system both raspberry-pi and this chip works simultaneously reducing the load on both, this communicate via serial transmission. This ARM based chip controls Drivers, Sensors, Motors and other electrical and electronics components, where

ISBN: 979-85-27243-61-1

raspberry-pi controls the software and computer vision loads of the system.

B. *Power supply circuit and unit*

The power supply circuit is the important part of any electronics system. Power supply unit is used to power to the Microcontrollers, camera, sensors/driver Module and Motors. Where power circuits maintain and control that power with respect to the individual electronic components. The system as lithium-ion battery which is charged by conventional method charger and solar based charger which is integrated in the system itself.

C. *DC Geared Encoder Motor and Servo Motor*

A motor encoder is a rotary encoder mounted to an electric motor that provides closed loop feedback signal by tracking the speed and/or position of motor shaft. The DC motor encoder provides a mechanism to measure the speed of the rotor and provide closed feedback to the drive for precise speed control.

A servomotor is a linear actuator or rotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

D. *Camera*

Camera installed is being used for the real time data interpretation and video/image capturing, this project use 1080p HD camera with IR and LED installation port and uses OV270 cam module as its camera sensor.

E. Other Integrated circuits and converters

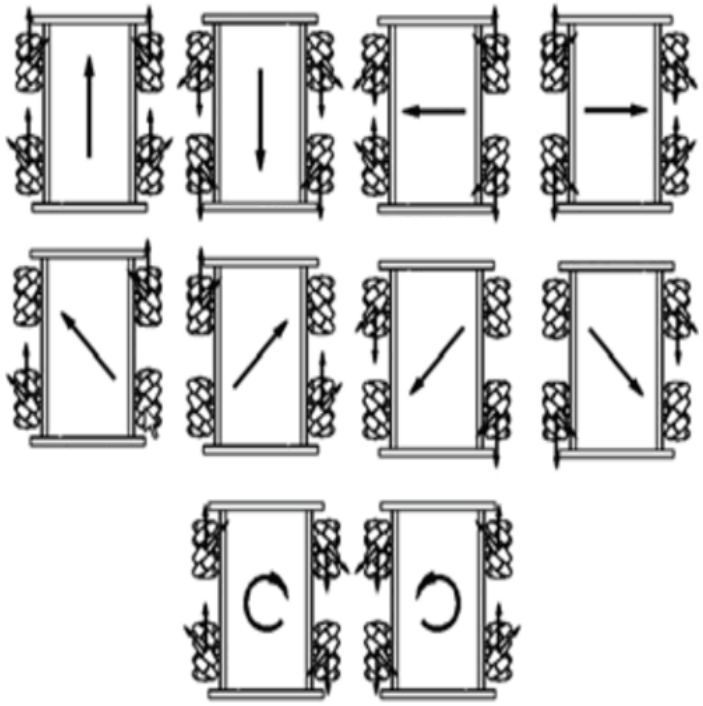
AM8257 driver IC: For the powering and control of the encoder motor, we needed a good motor driver as the requirements to drive the Mecanum wheel is high and specific. As this supports good range of voltage and max current output with low standby current for dual bridge control. Other features are low quiescent current, High temperature protection, Motor stall protection and precise speed control.

XL4005-E1 DC/DC Converter: As the system is powered battery supply which is charged by both solar and a recharger the power circuit requires good converters. This converter is capable of driving 5A load with 32V supply, with low drop out voltage, excellent power conversion efficiency, TTL shutdown capability, enable hysteresis function and good temperature hold.

MPU6050 Sensor: The MPU-6050 devices combine a 3-axis gyroscope and a 3-axis accelerometer on the same silicon chip, together with an onboard Digital Motion Processor, which processes complex 6-axis Motion-Fusion algorithms. This along with encoder gives closed loop feedback for speed control.

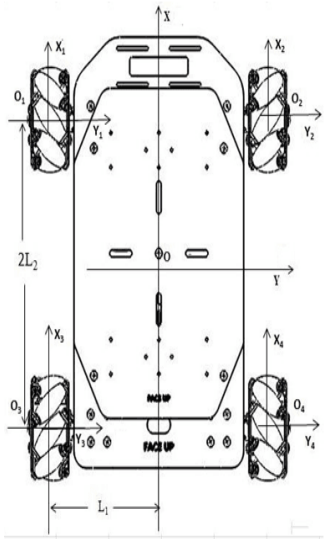
F. *Mecanum Wheels*

The Mecanum wheel is based on a tireless wheel, with a series of rubberized external rollers obliquely attached to the whole circumference of its rim. These rollers typically each have an axis of rotation at 45° to the wheel plane and at 45° to the axle line. Each Mecanum wheel is an independent non-steering drive wheel with its own powertrain, and when spinning generates a propelling force perpendicular to the roller axle, which can be vectored into a longitudinal and a transverse component in relation to the vehicle. A system consists of 4 wheels each can rotate clock wise or anti-clockwise or stopped, based on the combination of this wheels the direction of the motor will take. The

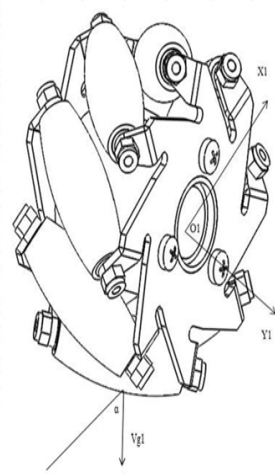


Mecanum Wheel Working Principle (Simplified)

robot can be moved by 16 possible ways.



Global Coordinate System

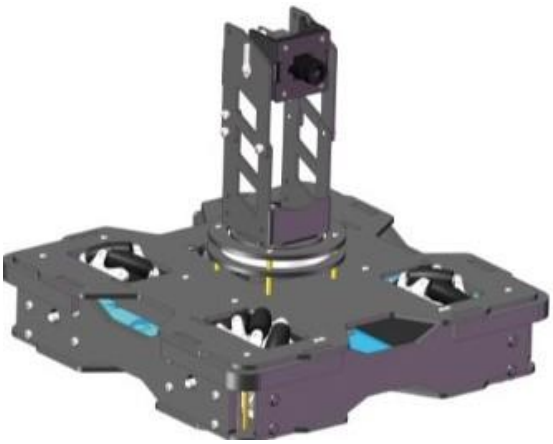


Local Coordinate System

III. METHODOLOGY:

The project includes two units, a Mobile unit, and turret unit, to ease the transport and usage, which are mounted and can be detached based on working purposes.

- The mobile unit comprises a Raspberry-pi, PCB Board, CPU, IC's, Servo/Motor drive board with a motor installed on the Chassis for the movement of the system. The motor powers the Mecanum wheel which enables the robot in omni direction (16 direction). This is powered by an independent battery and controlled via serial communication from the raspberry-pi unit.
- Turret unit comprises Nerf gun, Tilt and Pan setup with HQ camera, tilt and pan setup controlled by two servo motor with servo drive board driven by MCU, solar panel with voltage adapter is placed as a continuous power source for a long run of the system



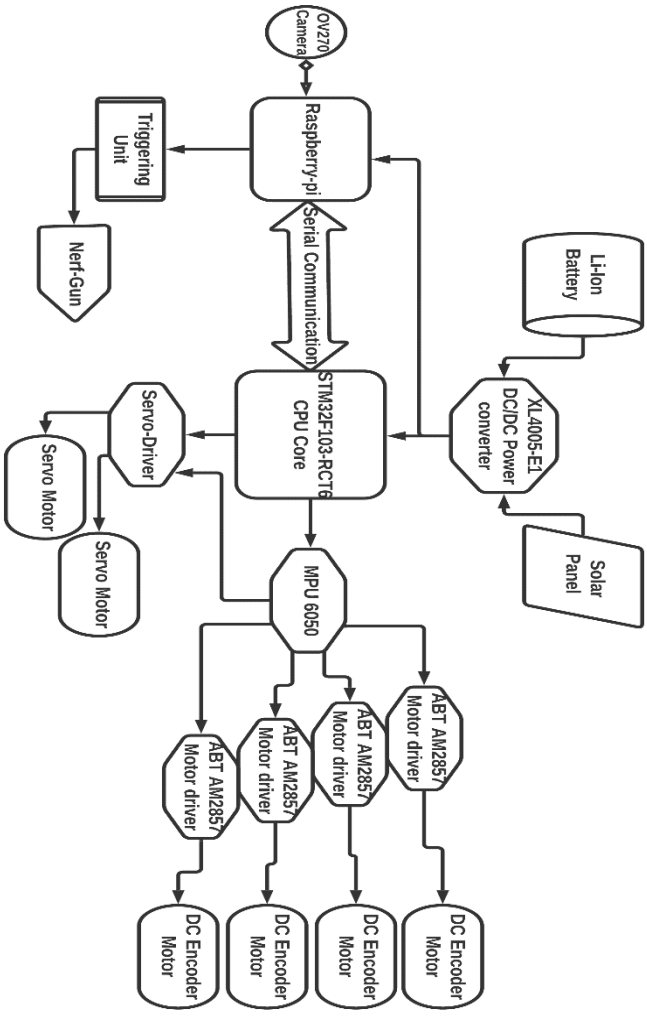


Figure 2. Block Diagram

The system is controlled over a wireless secure shell (SSH) which provides cryptographic network protocol for operating services securely, the turret will be self-driven on movement in the camera's field of view and neutralize the target. The system movement is manually

controlled, achieved by serial communication established between raspberry-Pi and MCU. The camera is used for surveillance, detecting, and recognizing. The target is analysed using computer vision which is captured by infrared-pi-camera and processed by raspberry-pi, based on this data, the turret will be operated.

Figure 3. Final Render of Mobile Unit

Image Processing

Camera vision is a must for spotting things for human movement. With better machine vision, the robot will be able to identify everything it see and navigate through stairs accordingly. Python 3.5.3 is used as programming language for its simplicity in computer vision eco system. Also, OpenCV (Open Computer Vision) 3.4.1 is going to be used to process the input images to detect staircase as well as for finding out any kind of guns and motion. Additionally, numpy-1.14.5 and matplotlib-2.2.2 are used to do transformations and rendering of image data. The process starts with reading frames with decent FPS. For detecting and tracking the image Custom Haar Cascades are created using OpenCV. Classifier tries to create most optimized target values for detecting and tracking by the changing the sizes of the features Right after image sampling, camera starts capturing images for processing. The first step of image processing is motion detection. In order to identify if this object is a human or not, we first measure its size and introduce a threshold in order to categorise it. If the size of the object exceeds this threshold, the face detection starts in order to determine whether it is human or not.

IV. RESULTS & DISCUSSIONS

The system is controlled via wireless communication and with analog communication and worked with various circumstances and scenarios. The performance of the system is satisfied as proposed project along with various features of the systems like, long run of the system and self-gyro stabilization of the project. The designed and developed system can be used as portable robot for security and defence system, in addition to following objectives:

- To provide support for military operations.
- To aid the ground unit with effective intel and real-time monitoring.
- Providing security over no-man zone without human intervention.
- Seamless surveillance and protection over border security.
- To neutralize Trespassers by maintaining the stealth using camouflage skin.
- To navigate and process in the night using IR night vision.

Overall the system performed better than expected. It had a lot to do with the area we chose to setup and the teamwork toward the end for the final push to demonstration. The tracking algorithm was on target keeping the target on point. It performed well on slowly moving targets as well. Unfortunately, it did not work too well with faster moving targets, but that was to be expected without the addition of some sort of tracking prediction algorithm being performed. This integrated system is an economical, reliable defensive embedded system solution. Its characteristics can categorise our system to ubiquitous computing. Our aim was to develop innovative techniques and give a different perspective into obsolete electronic security systems of the past by enhancing them with automation and tele-control. While we successfully met the goal of developing a robotic sentry gun, there are a number of ways that the proposed setup can be improved.

V. CONCLUSIONS

1. It is possible to develop an economical and portable yet reliable system for defence and security in terms of ease of navigation.
2. Easy to assemble and dismember the system units based on the circumstances.
3. Long duration surveillance can be committed where human can't be dispatched.
4. Can be hovered over borders without any human casualties.
5. Can be effectively implemented without any human intervention.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department, faculties of Electrical and Electronics department for their encouragement and support, and also like to thank our Guide for his timely advice, constructive suggestions and regular assistance in the seminar work.

REFERENCES

[1] Eki Ahmad Zaki Hamidi, Mufid Ridlo Effendi, Hasbi Ash Shiddiq "Design and Implementation Supervisory Control and Data Acquisition (SCADA)" 4th International Conference on Wireless and Telematics (ICWT), 2018.

[2] U. A. Nnolim, "An adaptive RGB colour enhancement formulation for logarithmic image

processing-based algorithms," Optik (Stuttg)., vol. 154, 2018.

[3] H. Kato and M. Billinghurst, "Marker Tracking and HMD Calibration for a Video-based Augmented Reality Conferencing System," IWAR'99 Proc. 2nd IEEE ACM Int. Work. Augment. Real., 1999..

[4] M. Daud bin Isa, A. Rakimi bin Mohammad, and M. Zubir Bin Mohd Hanifah, "VISION MOBILE ROBOT SYSTEM WITH COLOR OPTICAL SENSOR," vol. 12, no. 4, 2017.

[5] Campion, G. Bastin, and B. D'Andréa-Novel, "Structural properties and classification of kinematic and dynamic models of wheeled mobile robots," IEEE Transactions on Robotics and Automation, vol. 12, 1996. Google Scholar

[6] M. Wada and S. Mori, "Holonomic and omnidirectional vehicle with conventional tires," in Proceedings of the 13th IEEE International Conference on Robotics and Automation, pp. 3671–3676, IEEE, Minneapolis, Minn, USA, April 1996.View at: Google Scholar

[7] G. Pin and S. M. Killough, "A new family of omnidirectional and holonomic wheeled platforms for mobile robots," IEEE Transactions on Robotics and Automation, vol. 10, no. 4, pp. 480–489, 1994.View at: Publisher Site | Google Scholar.

[8] Sam Shue, Dr. Claude Hargrove, Dr. James Conrad, "Low cost semi-autonomous sentry robot," Southeastcon, 2012 Proceedings of IEEE, Orlando FL, 15-18 March 2012.

[9] Jian Yao and Jean-Marc Odobez, "Multi-layer background subtraction based on color and texture," IEEE, CVPR Visual Surveillance workshop, Minneapolis, June 2007.

[10] Adam Schmidt and Andrzej Kasinski, "The performance of the haar cascade classifiers applied to the face and eyes detection," in Computer Recognition Systems2, Springer Berlin Heidelberg.

ANALYSIS OF TRANSMISSION AND DISTRIBUTION INTEGRATED SYSTEM USING UNBALANCED NETWORK MODELS

V.Karthikeyan

Department of EEE

Adhiyamaan College of Engineering

Hosur 635 109

Tamilnadu, India

Email: karthi2eee@gmail.com

Dr.T.Menakadevi

Department of EEE

Adhiyamaan College of Engineering

Hosur 635 109

Tamilnadu, India

Email: drmenakadevit@gmail.com

***Abstract* – Distribution systems are naturally unbalanced as a consequence of unbalanced loads and the electrical network. Transmission and Distribution systems have traditionally been studied separately, but this approach is becoming increasingly inadequate for various reasons. This paper then proposes a methodology that integrates Transmission and Distribution systems into a common electrical model. In this paper the use of fact device to reduce the losses in the unbalanced network.**

***Index Terms* - distribution systems, network equivalents, power system analysis, transmission systems.**

I.INTRODUCTION

In recent times, the distributed generation (DG) has risen up to change the whole scene of distributing generation. The integrated analysis of transmission and distribution system has become familiar now a days to reduce the cost of power and to reduce the losses in technical and economic view points. In past, modelling of either one of the systems such as transmission or distribution has been discussed in various papers. It is very difficult to carry out a generation, transmission and distribution system in to integrated network. Because designing of such systems has to be carried out with a big network of analysis. Integration has to be carried out specifically for each and every component carefully. Distribution networks can be of various types, such as overhead, underground, radial, meshed, etc., which further complicates the analysis. The main goal of this paper is to design the whole system in terms of its network equivalents.

The linear equivalents has been established as in [1] which is suitable only for only the linear circuits and for nonlinear outputs this proposed method is not suitable.

For non-linear dynamic systems based on its performance simulation results are provided in [2]. Numerical results for the determination of modal generators related to the external are dynamic equivalent are provided in this paper. But the results are provided only for the separate systems such as either transmission or distribution systems.

An external network model to be used in Electromagnetic Transients Programs (EMTPs) is developed based on techniques directly applicable in the time domain. This is in contrast to the currently available models which are derived based on the frequency domain methods as in [3]. But the drawback in this paper is that it concentrated only on the transients programs.

This dynamic reduction to large power system models for stability studies is discussed in [4]. The main factors that affect the quality of the reduced models are discussed. The quality of reduced models and the benefits of dynamic reductions are demonstrated for three large interconnected power systems**.** This concentrates only with the stability studies. In this they are not discussed about the modeling of the power system. So it is difficult to model the whole power system using this paper.

The three-phase power-flow problem using sequence components is discussed in [5]. An improved sequence component transformer model and a decoupled sequence line model were used. The sequence power-flow algorithm has been formulated such that the single-phase power-flow programs can be called as routines for solving the positive sequence network. The computational efficiency is high.

A method is given for computing matrix reductions for power flow equivalents that is many times faster than presently used methods and produces extremely sparse equivalents as in [6].

The frequency spectrum of an external system used in the simulation of electromagnetic transients shows many peaks due to resonance effects of the leading transmission lines as in [7].

The above drawbacks are overcomes in this paper. The modeling of whole power systems such as generation, transmission and distribution system is made in this paper. The losses in the system are reduced by using the facts devices which is connected in the transmission line both in the balanced and the unbalanced conditions.

II. PROPOSED METHOD

While there are several methods for modeling of power systems. This method is the simplest method to reduce the losses both in balanced and unbalanced conditions. Fact device used here is Unified Power Quality Conditioner (UPQC) this is the recently used advanced device to reduce the losses both in the leading and lagging power conditions. Leading power can be compensated by using the inductor and the lagging power is compensated by using the capacitor banks. The Figure 1 shows the basic block diagram for the balanced power system.

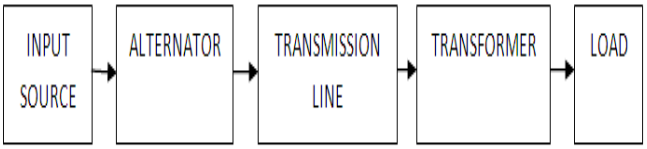


Fig1. Block Diagram of Balanced Transmission Line

In the balanced network the ac supply from the alternator is given to the transmission line. The transformer transfers the electrical signal from one circuit to the other. From the transformer the supply is given to the load. In this generation, transmission and distribution circuit by integrating together there is large amount of losses. By using FACT devices the losses can be reduced for the balanced electrical network the power can be managed. There will not be large amount of losses in the balanced network. So in this paper mostly concentrated on the unbalanced network.

The Figure 2 shows the block diagram of the unbalanced transmission line.

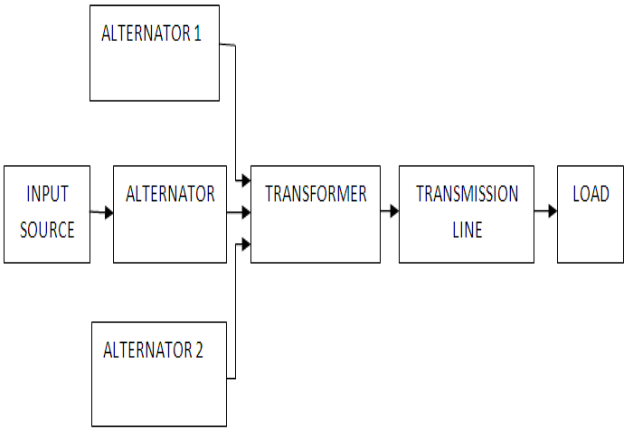


Fig2. Block Diagram of the Unbalanced Transmission Line

By connecting various generators the numbers of nodes are increased. If the nodes are increased the system become complex. An unbalanced condition occurs there will be a large amount of losses. So it is difficult to manage the power in unbalanced network. To reduce the cost of the systems & to increase the efficiency it is necessary to model the power system in both balanced and unbalanced conditions.This project is to manage the power in both the balanced and unbalanced conditions.

So inorder to reduce the losses the fact device is connected in between the transmission line. Here the fact device used is UPQC. The main difference between the UPFC and UPQC is that UPQC is connected only to the end of the transmission system that is near to that of the distribution system.

The device used as fact device consist of two converters which is in series and parallel conditions i.e., series and shunt converters connected by a dc link.

III. SIMULATION DIAGRAM

The Figure 3 shows the simulation diagram of the power system in unbalanced condition. In this the load which is connected consists of resistor, inductor and capacitor in parallel condition. So the condition of unbalanced occurs. The supply which is given is three phase. The transformer is connected in the transmission line to take 15000V to the load directly. Due to losses the power gets reduces. So inorder to compensate the losses the 3 phase line is connected to the series converter which converts AC to DC. The DC link which interconnects series converter to the shunt converter the losses is compensated using DC supply. By using shunt converter the DC supply is again converted to AC then the power is given back to the transmission line in which the power is compensated. The pulse to the converter is given by using the series and the shunt converter carrier. The power

given to the transmission line is step down by using the step down transformer and the power is given to the load i.e., consumers.

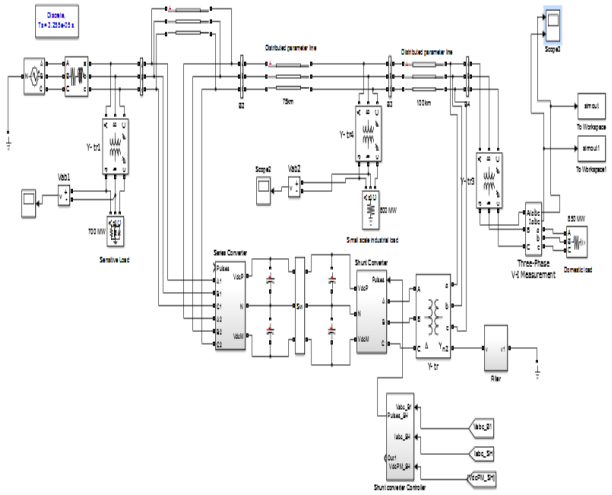


Fig3. Simulation Diagram for the Unbalanced Network

IV. SIMULATION RESULT

The Figure 4 shows the simulation results for the unbalanced network power is compensated by using the UPQC. Here the waveform is provided for the voltage and the current. The product of the voltage and the current gives the power which is shown as given below in equation 1.

$$P = VI \qquad \ldots\ldots (1)$$

When the losses occurs the original waveform of the voltage and the current gets deteriorated. When the power is compensated by using the UPQC device the original waveform of the voltage and the current is restored. So the loss gets reduced. This is the suitable way for reducing the losses in the unbalanced conditions.

The waveform gives the voltage and the current. From the product the original power is thus obtained by using the UPQC.

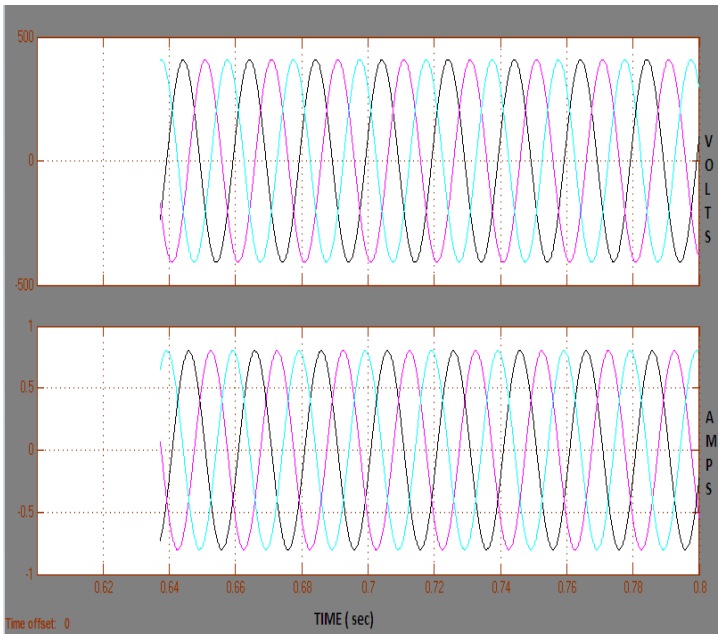


Fig4. Voltage and Current Waveform

VII. CONCLUSION

In this paper, the modelling of the power system is made with generation, transmission and the distribution system. Hence the three are connected together there will be a large amount of losses. So in order to reduce the losses the fact device UPQC is connected across the transmission line near to distribution side in the unbalanced network. By connecting UPQC across the network the losses gets reduced in the transmission line. The power is supplied from the UPQC to the distribution side so the original power is regained.

REFERENCES

[1] S. E. M. de Oliveira and A. G. Massaud, "Modal dynamic equivalent for electric power systems. II: Stability simulation tests," *IEEE Trans. Power Syst.*, vol. 3, no. 4, pp. 1731–1737, Nov. 1988.

[2] A. Abur and H. Singh, "Time domain modelling of external systems for electromagnetic transient programs," *IEEE Trans. Power Syst.*, vol. 8, no. 2, pp. 671–679, May 1993.

[3] J. P. Yang, G. H. Cheng, and Z. Xu, "Dynamic reduction of large power systems in PSS/E," in *Proc. 2005 IEEE/PES Transmission and Distribution Conf. Exhib.: Asia and Pacific*, Delian, China, 2005, pp. 1–4.

[4] M. Abdel-Rahman, A. Semlyen, and M. Reza Iravani, "Two-layer network equivalent for electromagnetic transients," *IEEE Trans. Power Del.*, vol. 18, no. 4, pp. 1328–1335, Oct. 2003.

[5] W. F. Tinney and J. M. Bright, "Adaptive reductions for power flow equivalents," *IEEE Trans. Power Syst.*, vol. 2, no. 2, pp. 351–359, May 1987.

[6] M. Abdel-Akher, K. M. Nor, and A. H. A. Rashid, "Improved threephase power-flow methods using sequence components," *IEEE Trans. Power Syst.*, vol. 20, no. 3, pp. 1389–1397, Aug. 2005.

DEVELOPMENT OF VALIDATION SYSTEM FOR 2 WHEELER ELECTRICAL VEHICLES

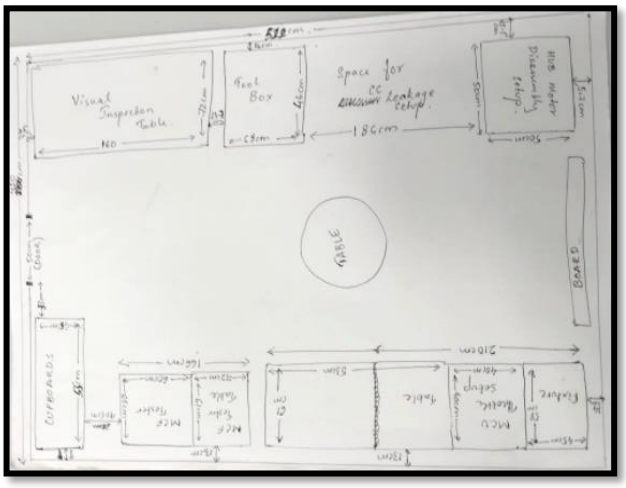
Sreelakshmi Manoj, Sonshi Mishra, Shraddha Gosh, Rahul Kumar
Guide: Dr. A M Nagaraj (Asso. Professor)
Dayananda Sargar College of Engineering
Electrical and Electronics Engineering

ABSTRACT.
Electric cars are going to be effective in the marketplace within side the area of transportation technology. They can or have the capability to revolutionize how power is used, created and redirected. Electric cars are one of the answers to the poor environmental effect as a result of the traditional cars. Electric cars (EV) are seventy five percentage green, at turning enter power into transferring power (kinetic power). On the opposite hand, gasoline powered cars with inner combustion engines (ICE) are hardly 25 percentage green. Electric cars, have fewer elements to funnel power through, and go through much less power conversion. These effects in much less power loss as compared to gasoline-powered engines. A decrease in air pollutant because of the removal of the exhaust pipe in electric powered cars promotes sustainable mobility. This significantly reduces the poor effect of pollution in the atmosphere. Electric automobile vehicles have a strength output variety just like what we're used to with combustion engines. Overall, electric powered cars are extensively and more secure for the surroundings than conventional gasoline cars.

KEY WORDS.
Hub Motor, Battery, MCF Tester

1 EV Lab Setup

As Electric Vehicles are increasing, there were lots of fault complaints coming to The company as it manufactures many parts like Batteries, Hub motors, 2W motors, Motor Control Units (MCUs), etc. At Company, we were responsible for setting up a lab where analysis of Faulty motors and other equipments can be done. The dimensions of the lab, storage room and a conference room were decided and approval was taken from The company. We learnt how to setup a lab and what are the things to be considered for designing it.



EV Lab Layout

After getting the approval, our team was responsible for placing the equipments at a specific place, such that it does not interfere with the safety of the personnel inside and also by considering the look and feel of the lab. It took about 7-10 days to setup the lab and all the safety precautions were checked again.

Setting-up the Lab

This is how our lab looked initially. All the things and equipments were kept at appropriate places.

2 NO-LOAD TEST SETUP: HUBMOTOR

The **hub motor** which is additionally called as wheel **motor**, wheel **hub** drive, **and hub motor** or in-wheel **motor** is an electrical **motor** that's incorporated into the **hub** of a wheel and drives it directly. Wheel motors are applied in industry, e.g., driving wheels that are part of assembly lines. Tire makers and component producers have developed them and therefore the first production car to use them was the Luka EV by MW Motors. Hub motors can also be found on buses.

The stationary windings of the motor are supplied by the electromagnetic fields of the hub motor. The outer part of the motor is designed in such a way that it follows those fields, turning the attached wheel. Energy is transferred by brushes which are in designed in a way for interacting the rotating shaft of the motor in a brushed motor. In a brushed motor. But the energy transfer in a brushless motor is carried out in a different way. The transfer of energy in a brushless motor is carried out electronically, which eliminates the physical contact between the parts in motion and in rest. Although in terms of cost, brushless motor technology is more costly, but when compared to brushed motor systems they are more efficient and last longer.

A in wheel motor is designed in one of these configurations. The axial-flux motor is considered as the least practical. In axial-flux motor, the stator windings are sandwiched between pairs of magnets. The other two configurations are both radial designs with the motor magnets bonded to the rotor; in one, the inner rotation motor, the rotor sits inside the stator, as in a conventional motor.

In the other, the outer-rotation motor, the rotor sits outside the stator and rotates around it. The application of hub motors in vehicular uses is still under research and there has been no standard configuration that has been accepted yet.



ISBN: 978-85-07018-61-1

Hub motor

Electric motors have their maximum torque at during the starting which makes them ideal for vehicles as vehicles require the maximum torque during the starting phase. Another advantage is the idea of "revving up" in internal combustion engines which is very common gets eliminated if we consider electric motors. The electric motors do not require a transmission as the maximum torque occurs when the rotor begins the rotate just at the starting., There is no shifting needed for electric vehicles like it is in a combustion engine where a transmission is normally paired. A gear-down arrangement may be needed though but not necessary.

Wheel hub motors are nowadays more in demand as electric vehicles are being accepted worldwide especially electric bikes and scooters.

1) Steps involved in the NO LOAD HUB MOTOR TEST.



1.Placing the Motor on the frame.

1. **Connecting the MCU.**
2. Giving the supply.
3. Monitoring the parameters via BUSMASTER application.

1. Placing the Motor on the frame. A strong working knowledge of installation techniques is significant to the effective operation and maintenance of motors.

a) Today's modern motors require your consideration of all aspects of selection, application, and maintenance as well as details of assembly,

b) hardware, and the interrelationship of components and materials. As a result, installation of those motors is more important than ever before.

c) The proper motor installation is considered to be one of the important steps in gaining a high standard operation, efficient performance, and maximum reliability for a good performance. No matter if you're an engineer or a daily mechanic; there should be proper communication and co- ordination with the other team-mates and disciplines.

d) **Receiving and handling**: When receiving a motor, one should thoroughly check and inspect it for signs of damage like dents before the motor is getting transferred from the provider. Also, one needs to examine all the information provided with the machine that is being received. The tags should not be removed with regard to assembling and storage. Also, for lubrication and operation the tags need to be safely maintained for future purposes. The nameplate should be properly checked for proper voltage, current, power supply, frequency, etc.

e) **Safety procedures**: Handling of large, heavy motors should be supervised by experienced and qualified personnel. Safety of workers and avoidance of injury to the motor are primary considerations.

f) Safety is of paramount importance during the installation, start-up, and operation of a motor, and begins with the proper design, application, and selection of the motor and associated components. Be sure that the motor has been compatible to handle the sort of load to bedriven.

g) All personnel involved with the installation should be equipped with **safety shoes** and **safety gloves**. It should be ensured that the vehicle is not in ignition state. Proper checking for pin damage or mechanical damage should be carried out. (If any damage is identified, authorized personnel should be informed.) Also, we need to make sure the laptop has the updated version of the software.

h) **Location:** Always try to locate the motor in the best possible environment: A clean, dry, cool location. The type of environment during which the motor will operate determines the sort of enclosure.

h). **Placing the motor involves the following steps.**

Mounting: A motor are often mounted in some ways, depending upon its size, weight, and use. Small motors may incorporate a rigid mount, with the frame welded on to a plate formed to match the form of the frame and incorporating mounting holes.

Foundations: For minimum vibration and proper alignment between motor and load, a rigid foundation is essential. Concrete, reinforced as needed makes the simplest foundation which is best for giant motors and driven loads. In sufficient mass, it provides rigid support that minimizes deflection and vibration.

The foundation may be located on soil, structural steel, or building floors, provided the total weight (motor, driven unit, and foundation) doesn't exceed the allowable bearing load of the support. Allowable bearing a lot of steel and floors are often obtained from engineering handbooks.

We need to be certain that the enclosure is suited to the surrounding environment and that there is adequate ventilation to assure operation at or below motor design temperature.

1. **Connecting the MCU.**

During vehicle braking, DC power can be regenerated back to battery pack for charging. Efficient cooling system enables its high-power density and performance. Protection includes against over current, over voltage and over temperature. Various electrical and environmental tests are passed to satisfy international standards.

ISBN: 979-85-27243-61-1

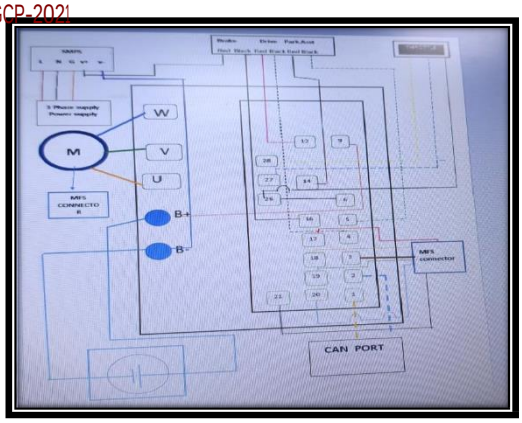


Fig: Connection Diagram for MCU

MCU is the Motor Control Unit MCU which converts Direct Current to Alternating Current to drive propulsion motor. The motor speed and torque after receiving comments from VCU (vehicle control unit) via CAN-bus communication is configured by the MCU.

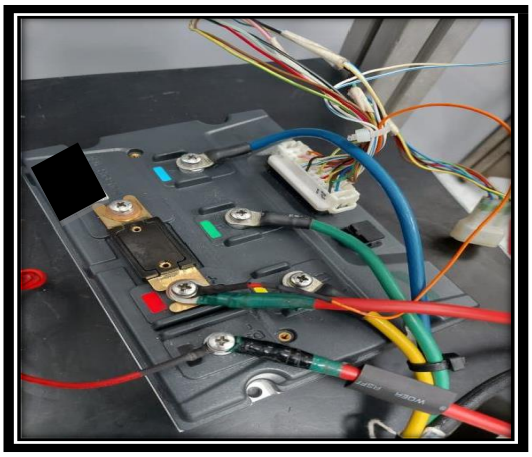


Fig: Connecting the MCU terminals(I)

3 MOTOR DISASSEMBLING SETUP

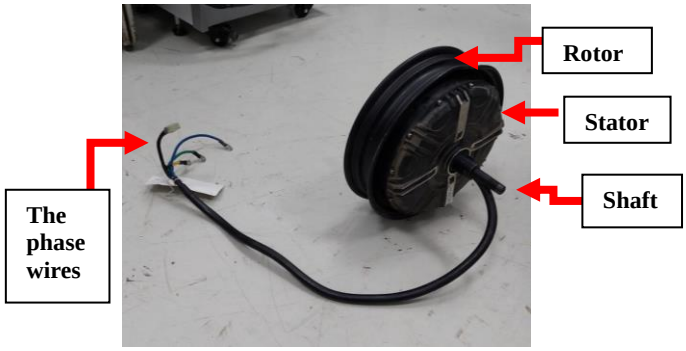
Hub motors are typically brushless motors“also known asbrushlessdirect current motors or BLDCs”, whichwillreplace the commutator and brushes with many separate coils andmanyan electronic circuit. The hub motor like any other ismade up of 2 main parts. The first part is theaxle surrounded by a fixed ringof copper coils, called the “stator”. The second part is the housinginto which the axleisseated, and where it is allowed to rotate freely. This “housing”, whichis thepart of the rear wheel, is surrounded by a ring of strong magnets that surrounds the ring of coils connected to the axle.



Majorityof thecustomers are using these electric bikesfor daily uselike commuting, riding on roads weremaintaining a steady speed regardless of the hill grade is important, thus: They provide independentpropulsion. It also has the ability to use internal gear hubs. There is less stress and wear on drive chain with a hub motorelectric bike. They provide with higher peak power capability as well.

The rider can usually leave the bike in a highergear and use the hub motor to get up to a speed fast so there is no need to go through thedownshifting and upshiftingat each stop andride.The hub motors are used in many electric bikes like the Bajaj Chetak, TVS iQube and many more.





TVS iQube Faulty hub motor

The rider can usually leave the bike in a higher gear and use the hub motor to get up to a speed fast so there is no need to go through thedownshifting and upshiftingat each stop andride. The hub motors are used in many electric bikes like the Bajaj Chetak, TVS iQube and many more. The phase wires that give power to the motor andthe cable that is insulated runsthrough a hole in the axle to the inside of the stator. To get access to the workings of the motor you need to remover separatethe stator from the rear wheel, and if necessary,remove the cover plate so that the coil inside can be inspected.

Motor disassembly using Pneumatic

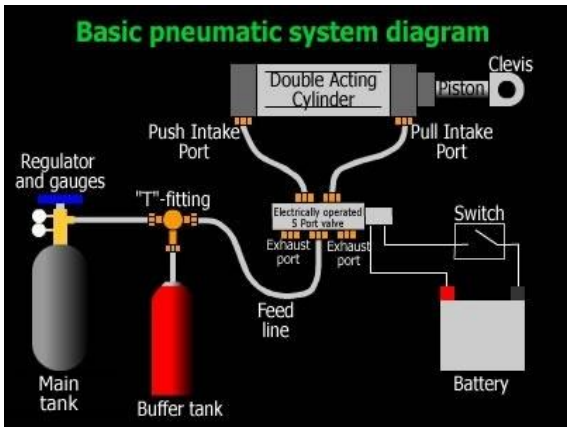
We built this setup because, the company receives complaints on the hub motors of the electric bikes, and thus these motors must be analyzedand validated. In the process of validation, there might be a necessity where we have to dismantle the hub motor for further interior inspections.In this setup we use the principle of pneumatics to separate the rotor and the stator of the hub motor.Pneumatics is a branch of engineering that deals withgas or pressurized air. Pneumatic systems used in industry are commonly powered by compressed air or compressed inert gases.The two types of gases are used in pneumatic systems such as compressed air and Nitrogen. Compressed air is a mixof all the gases in the atmosphere. The surplus quantity of air and the ease of compression makes the compressed air the most widely used fluid forthepneumatic systems.Properties of Air

- Compressibility
- Higher Pressure = Higher Friction
- Ideal Gas Lawstates:

$$PV = nRT$$

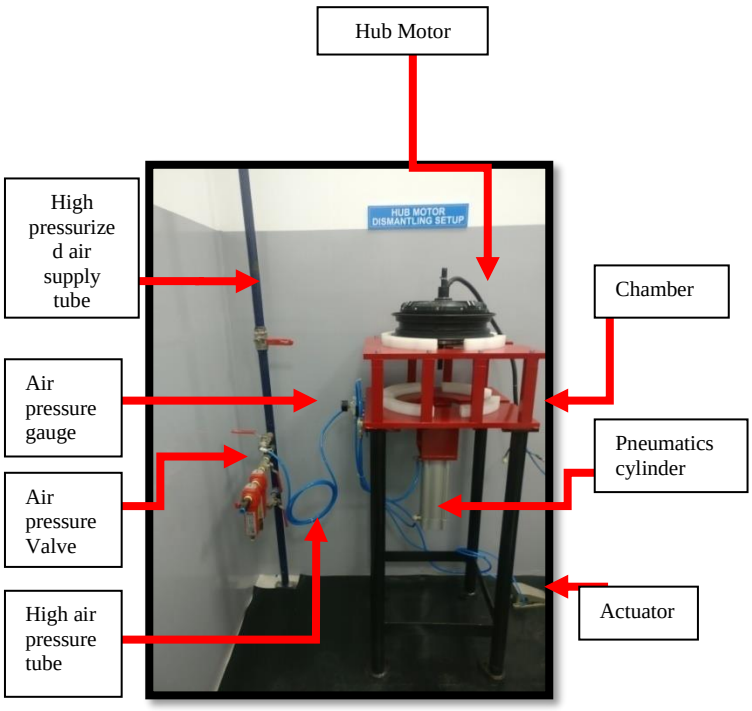
Pressure is directlyproportional to Temperature.
Pressure is indirectly proportional toVolume.

Pneumatic Energy Capacity = Pressurized Air



Pneumatics helps to overcome the strong magnetic attraction between the stator and the rotor, and thus they get separated.

Hub Motor Disassembly Setup



Working Procedure:

Step 1: Place the motor on the top plate of the setup, with the wiring side facing up as shown above.
Step2: Remove all the screws on the non-brakeside of the motor (wiringside cover). Caution: Ensure all the screws are removed before proceeding the next step.
Step 3: Lift the motor and place between the top and bottom plates(chamber)of the setup such that the wiring harness side face upwards.
Step 4: Gently hold the shaft on the wiring harness side of the motor.
Step 5: Press the actuator (placed onthe ground) gently with your foot.
Step 6: The motor's stator and rotorwillget separatedwith the stator in our hand and rotor remains in the chamber.
Step 7: Further inspection ofthe motor interior canbe done now.



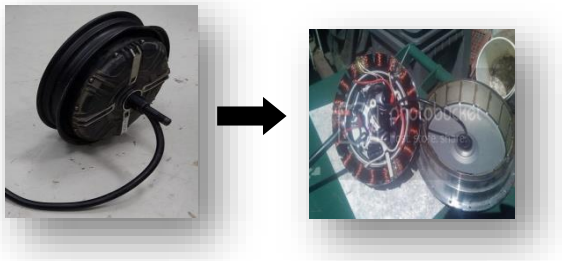
Air pressure gauge

Check the air pressure of the system. (It should be in the range of 4-5 bars).

If the pressure exceeds this range (4-5 bars), it will damage the motor.

If the pressure is lower than (4-5 bars) is will overcome the magnetic forces to separate the stator and the rotor.

Result of the motor disassembling setup:



Hub Motor **Motor after disassembling**

Safety precautions:

•Check all the connections of the setup.

•Check the air pressure of the system. (It should be in the range of 4-5 bars).

•During the disassembling operation, make sure not to insert your hand in the chamber.

•Maintain safe distance from the setup.

•Ensure to wearsafety gloves, safety goggles and safety shoes.

•If any hissing sound(air leakage) is heard, stop the operation and inform the lab in charge.

MCF TESTER

The MCF tester setup was setup in the lab by us to test the MCU and the C-Box.MCF Tester stands for MCU and C box Field failure tester.There are two types of failure/complains:

1.Zero-kilometercomplaint

2.Field complaint

Zero-kilometer complaint: Registration of the compliant prior to the usage of the component by the consumer.

Field complaint: Registration of the compliant after to the usage of the component by the consumer



MCFTester

5 MCU-Motor Control Unit (MCU):

Motor Control Unit(MCU) is an electronic motor control unit and protection devices that have a field bus interface. MCUcontrols the drive motor on electric vehicle. Typically,MCU is located in the motor starter, where its main operationis protection, control and monitoring of a 3-phase or 1-phase AC motor and motor starter equipment. MCU is connected tothe other starter equipment through digitaland analog input/output and to other MCU and control systems through afield bus interface.The MCU hastwo variations of devices:

•MCU1 is a basic low end motor controller devicethat protects,controlsandmonitors themotor and starter.

•MCU2 is a high-endmotor controller device based on the MCU1. MCU2 gives more advancedset of motor and starter equipment protection, control and monitoring functions. Some process control related functions are alsoincluded.MCU consists of four main components:

• Baseplate

• Main Unit

• Current Measurement Unit

•Voltage

Unit Baseplate: “Baseplate” is a unit that is mechanically fixed to the drawer mounting rail. All the outgoing/incoming wires of the MCU are connected to Baseplate. Main Unit and Current Measurement Unit are connected to Baseplate.Main Unit: “MainUnit”is a unit that has all the electronics of the motor control unit. Main unit is connected to the Baseplate. Current Measurement Unit: “Current Measurement Unit“has the current measurement transformers. It is connected to the Baseplate and additionally fixed by the Main Unit. Theprimary ranges are availablebetween: 0.1....3.2 Aand 2.0....63 A.

Voltage Unit (option for MCU2 only): "Voltage Unit"hasthree phase voltage measurement transformers and electronics for auxiliary power supply 2 (UAUX2). It is plugged to the Baseplate with flat cable andfixedside by side to drawer mounting rail with MCU main unit. Voltage unit detection is done with automaticfunction by the use of internal code signaling.



MCU-Motor Control Unit (MCU)

C-box -Connectivity box

Connectivity box, hascapabilitieswith telematics data sharing in a single device. It communicates with vehicle to other vehicles, the infrastructure (e.g., traffic signals), and the cloud.TheConnectionBoxis used to communicate with various external devices, such asstart sensors, wind gauges, or photo eyes,to theEther Lynxcameras. The newer ConnectivityBoxhasall of the form and functionality of the original C-Box, while adding a second photo eyeinput for use with multiple photo eyeconfigurations.

Repeatability test

MCF tester is used to do the Repeatability test on the MCU or the C-box. Repeatability or test–retest reliability is the closeness of the agreement between the results of successive measurements of the same measure, when carried out under the same conditions.Performing a repeatability test is an important part of estimating uncertainty in measurement. It is the most common experiment done to collect Type A Uncertainty data.Type A evaluation: It is the evaluationandmeasurement of a component'suncertaintyby staticalanalysis of measured quantity values obtained under defined measurement conditions.A repeatability test is attest performed to evaluate how repeatable the resultsare under similar conditions.When performing a repeatability test, itshould be performed with:

1.Same method,

2. Same operator,

3. Same equipment,

4. Same environmental conditions,

5.Same location, and

6.Same item or unit under test.

Using the same MCF tester, we can perform the repeatability test on either the MCU or the C-Box individually.

Each test takes about 3-5 minutes, and the report will be auto saved in a designated folder. About 3-4 tests are conducted for every component and all reports are later checked to identify any fault.

Working Procedure:

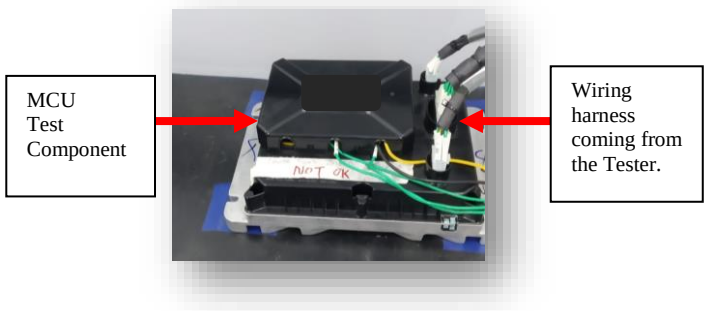
•First connect` the MCF tester to the test component (MCU or C-box).

•Switch on the supplyof the tester.

•Enter the dataregarding the test (Date, name, etc.) and then choose the test component to be tested.

•Start the test, and the resultwill be auto saved in a folder.

•The test is done repeatedlya number of times (usually 2-3 times) and the report will be compared each time.



Safety precautions:

•Check all the connections of the setup.

•Maintain safe distance from the setup.

•Wear safety equipments (e.g., Safety shoos and gloves).

•Do not touch the components when the power is turned on

Work Instructions and Release of The Lab

• These instructions are prepared under the guidance of Procedure and Safety Experts.

• Inputs were taken from them regarding the procedure to prepare work instructions.

• The company follows very high standards of safety so each and every step, every point was chosen and made carefully.

Work Instructions

Importance

- These instructions are prepared assuming that the person using these machines have bare minimum knowledge.
- This is helpful in developing high standards of safety as words chosen are very crisp and clear.

Points accounted while considering safety

- Availability of fire extinguishers at easily accessible location at placing safety equipment cabinet at the entrance of the hallway.
- Making clear warning and caution signs. Also marking the exit routes with exit boards while being in an emergency.
- Post warning signs when unusual hazards, hazardous materials, hazardous equipment, or other special conditions are present.
- Long hair and loose clothing must be pulled back and secured from entanglement or potential capture.
- Access to laboratories and support areas such as stockrooms, specialized laboratories, etc. should be limited to approved personnel only.
- Lab has an abundant number of electrical supply outlets to eliminate the need for extension cords and multi-plug adapters.

7 Battery Scanning and Documentation

These batteries are equipped with a bar code that has all the information stored in it about the battery, such as manufacturing plant and date, warranty information, operating and usage range. Also, if a fault occurs and batteries are returned to The company, the fault information is also stored in the barcode. Then the faults are analysed and then rectified. The points are noted for future reference and improvement.

Batteries

These batteries were used in Bajaj Chetak Electric Scooter but were returned to the company as they were faulty. Their faults were studied and analyzed and also changes..

.

INTERFACING CAN WITH MICROCONTROLLER

Controller Area Network

The Controller Area Network (CAN) is a serial communications protocol best suited for networking sensors, actuators, and other nodes in real-time systems. Developed by Robert The company, CAN or controller area network is protocol which is mainly used in automobiles for communication between an electronic control unit and its components.

Features Of CAN

• Designed by Robert The company in 1986.

• Initially, electronic devices in vehicles used point-to-point wiring systems.

• Increasing usage of electronics in EV/HEV. • CAN replaced wiring complexity.

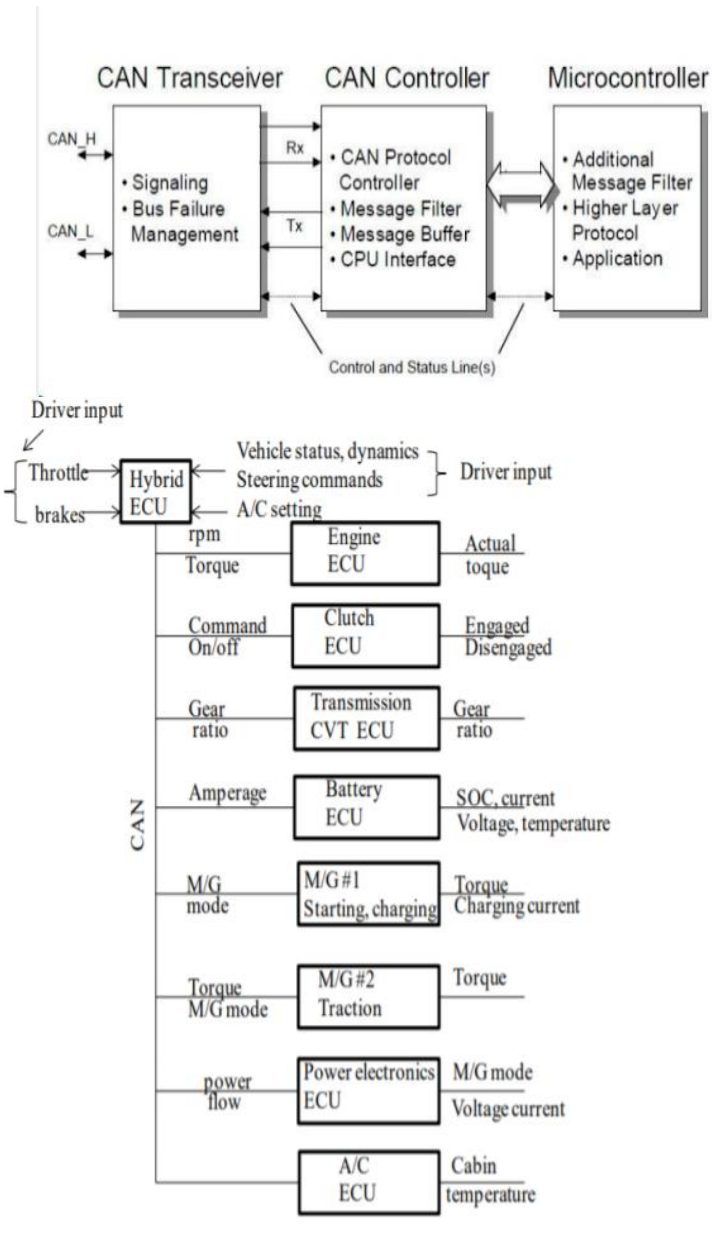
• It is a serial communications protocol.

• Microcontrollers and related devices can communicate. • It has Bitrates up to 1 Mbit/s.

• Heavily involved in the EVs application.

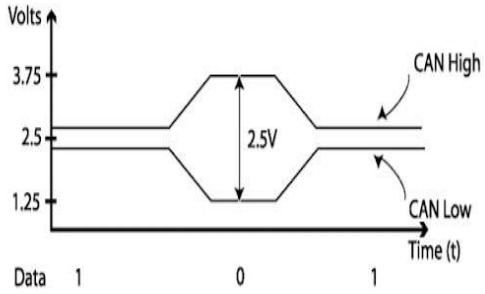
• Most EVs rely on CAN bus to link their batteries, energy management and electric drivetrain.

The given figure explains how the different control units of an EV/HEV communicate through CAN.



How CAN bus communicates?

1CAN bus uses two dedicated wires for communication-CAN high and CAN low. When the CAN bus is in idle mode, both lines carry 2.5V.When data is being transmitted, the CAN high line goes to 3.75V, the CAN low drops to 1.25V.Thereby a 2.5 volts differential between the lines. As it relies on a voltage differential between the two bus lines, the CAN bus is NOT sensitive to electrical fields or other noise.



Need for electric vehicle monitoring

- To monitor the state of charge (SOC)
- To monitor the state of health (SOH)
- Assessing the energy consumption since starting the car
- To control their EVs by the remote application

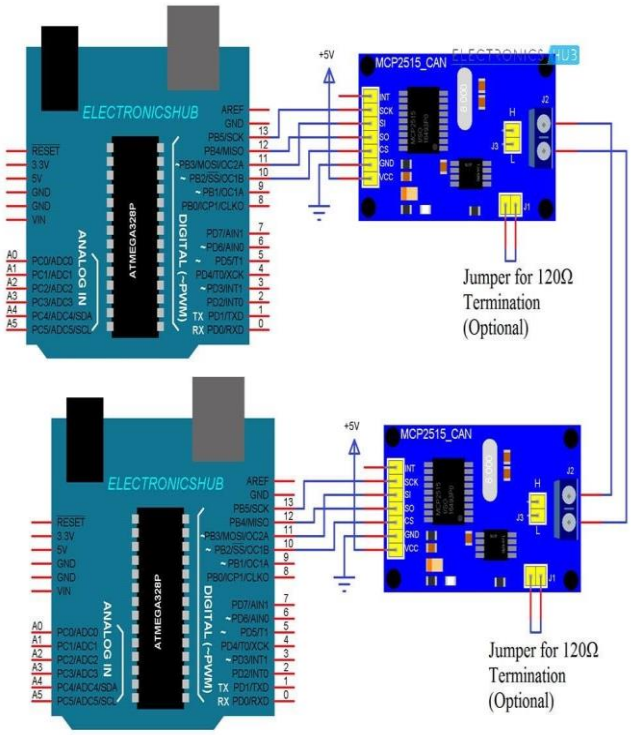
BLOCK DIAGRAM REPRESENTING INTERFACE BETWEEN CAN AND MICROCONTROLLER.

The CAN module should consist of 2 ICs, one the controller IC, and the other should be the Transceiver IC. The controller IC is mainly responsible for interfacing CAN module to the microcontroller and establish serial peripheral interface between them. The transceiver IC should be responsible in establishing connection between users CAN module and the CAN bus of the external vehicle, with the help of CAN high and CAN low which help in transmitting and receiving of messages. 38 CAN BUS MODULE MCP2515

- The MCP2515 CAN Bus Module is a Module which supports CAN Protocol
- This module consists of MCP2515 CAN Controller IC and TJA1050 CAN Transceiver IC.
- The MCP2515 IC is standalone CAN Controller.
- It has integrated SPI Interface for communication with microcontrollers.
- TJA1050 IC will act as an interface between the MCP2515 CAN Controller IC and the Physical CAN Bus.
- MCP2515 IC is the main controller and it internally consists of three main subcomponents: The CAN Module, the Control Logic and the SPI Block.
- CAN Module is responsible for transmitting and receiving messages on the CAN Bus.

In the real scenario, the can module MCP2515 enables us to communicate with the vehicle CAN via the DB9 to OBD2 connector. The OBD port of the vehicle has dedicated pins for can high and can low. However, we have 39 demonstrated the communication happening via CAN bus with the help of 2 CAN modules, one acting as the MASTER and the other one acting as the Slave.

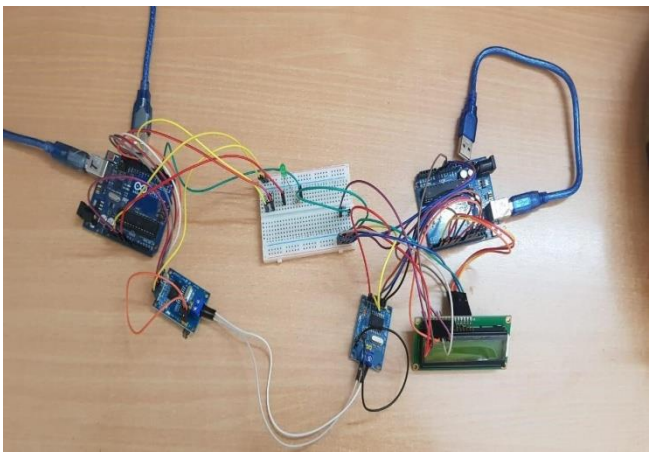
CIRCUIT DIAGRAM



WORKING

Communication is established between the master (transceiver module) and slave (receiver module) with the help of the CAN bus. Our set up consists of 2 Arduino uno boards, 2 MCP2515 CAN modules, 1 LCD, 1 LED, 2 bread boards, a switch and connecting wires. In the master circuit, we have a CAN module interfaced with Arduino. A LED with a switch is also connected to the Arduino board in this master side. On the slave circuit we again have a CAN module with Arduino board along with LCD

screen for displaying results. When the LED on the master side is switched on or off, the communication is made via the CAN bus between the master and the slave, and the LCD on the slave side displays appropriate message. The transmitter sends a message which is transmitted over CAN Bus and the receiver receives this message and is displayed on its serial monitor. The 0th and 4th bit i.e., 1 and 0 in the above sequence are extracted separately by the receiver and turns ON and OFF the LED connected to Pin 2 of Arduino.



As the topic “Electric vehicles” is going to be a major part of our life, and also this is the most trending and developing topic, we choose this as our final year project topic. We established the lab to test the Hub Motors of the 2 wheeler electric vehicles with no load, disassembling the motor for further interior inspection. Test and flash the Motor control units and c-box. We also worked with the CAN communications of the vehicle, and made prototype of the CAN communication using Arduino. We were also introduced to many topics in the industry like analyzing the fault on the fuel level sensors and Oxygen sensors etc. In the year 2008, Ferdinand Dudenhoeffer, ‘head of the Centre of Automotive analysis’ at the Gelsenkirchen University of Applied Sciences (Germany), had foreseen that "by 2025, all traveller cars sold in Europe are electrical or hybrid electric". The COVID-19 pandemic gave birth to proposals for radical amendment within the organization of the city, corresponding to the pronunciamento for the Reorganization of the town once COVID19, revealed in Barcelona and signed by one hundred sixty teachers and three hundred architects, extremely vital towards a transportation supported the non-public electric vehicle thought of as a false solution. Most major current automotive corporations are sure a really bumpy decade or two as electrics flood the market from upstarts, desperate secondary brands that figure it out, and probably one or two of legacy vendors who commit strongly, appreciate Volkswagen and Nisan. We have successfully completed the establishment of the Lab/Validation setup in The company for analyzing and testing two wheeler electric vehicle components**.**

References

[1] "Abraham Ganz at the Hindukush". Poemas del Rio Wang. Studiolum. Archived from the original on 11 February 2016. Retrieved 30 September 2015.

[2]Fritzsche, A (2017). "Corporate Foresight in Open Laboratories - A Translational Approach". Technology Analysis & Strategic Management. 30 (6): 646–657.

[3]Shi, Z., Sun, X., Lei, G., Yang, Z., Guo, Y., & Zhu, J. (2020). Analysis and Optimization of Radial Force of Permanent Magnet Synchronous Hub Motors. IEEE Transactions on Magnetics, 1–1. doi:10.1109/tmag.2019.2953731.

[4] Yamamoto, S., Morita, R., & Oike, M. (2018). Transmission-equipped Wheel HubMotor for Passenger Cars. ATZ Worldwide, 120(3), 28–33. Doi:10.1007/s38311-017-0181-2 .

[5] Ringing Mitigation Schemes for Controller Area Network ,2018 IEEE Vehicular Networking Conference. Umehara, D., & Shishido, T. (2018). . doi:10.1109/vnc.2018.8628443

[6] Millikin, Mike (20 May 2016). "Worldwide sales of Toyota hybrids surpass 9 million units; Prius family accounts for 63%". Green Car Congress. Retrieved 22 May 2016.

Performance Evaluation of Optimization Techniques in DG Placement in a Standard Bus System

SHUBA A*[1], SANGEETHA S M*[2], JAYASHREE B*[3],CHAITRA A S*
Department of Electrical & ElEctronics Engineering, Sri Krishna Institute of Technology
#29, Hesaraghatta main road,Chimney hills, Chikkabanavara post, Bangalore- 560090
shubaashwath@gmail.com , smsangeetha20@gmail.com , jayashreenukky@gmail.com,chaitraas.skitblr@gmail.com

***Abstract* - Distributed generation is the technique where establishment of the power system as nearer as possible to the consumers and then compare it with the centralized power plants. In this project optimal placement and sizing of DG is done with Hybrid algorithm. .The Hybrid PSOGSA is implemented to deduce the optimal sitting and sizing of DG from the elected buses. The proposed scheme has been applied on 33-bus and 69-bus IEEE standard radial distribution systems.And then it is compared with the standard PSO alogrithm**

I. INTRODUCTION

The demand of electrical power is greater than the generation. The growth of demand triggers a need of more power generation. The demand of power is escalating in the world of electricity. The centralized power generating units use the conventional resources for generation purpose such as thermal, hydro power and nuclear system for electrical power generation. The distribution of electricity is the final stage in the delivery of electrical power to end users. An approach that employee ' s of small scale power generation technologies that provides electric power at a site near to customers than the central generating stations is Distributed Generation.

DG is known as distribution generation which is placed near to the costumers to reduce the demand of electricity apart from the central generating stations. DG allows collection of energy from many sources which is naturally available and may cause less environmental impacts and improved the security of supply. The concept of DG has led to new considerations concerning the distribution network which have created a challenge and an opportunity for developing various novel technologies in power generation.

Concatenation of DG systems for the existing power systems influence Power Quality (PQ), Degrade system, Reliability and cause overvoltage and safety issues. Power Quality is defined as any deviation in an electrical power such as (voltage, current and frequency) that impacts the normal operation of electrical equipment ' s. PQ disturbance arisen either from the source side or the load side may lead to various operational issues such as malfunctions, failure of electrical equipment instability and so on. Power quality (PQ) events such as swag, swell, transient, harmonics, notch, fluctuation and flicker are the most common types of disturbances that occurring a power line degrade.

DG was previously used as an active power source but today with technological advancement it is available in many forms such as an active power source of supply and reactive power supply.In the first stage the loss sensitivity factor(LSF) was satisfied for determining the optimal placement of DG units to reduce the search space of optimization algorithm and then simulation annealing algorithm (SA) was proposed for optimal sizing. Many researchers concentrated on decreasing the system losses without taking in their considerations the cost of losses and DG's units installations with their maintenance.

Although some researchers took these costs in their accounts but they worked on improving the voltage profile only without reducing system losses and costs insufficiently.

II. PROBLEM STATEMENT

In our daily life the electricity is needed for wide purpose and we can find power reliability in it and generation of power from the sources like coal power generating and other generating stations which may affect the man kind and transmitting this power to consumers with help of transmission line for long and short ranges based on consumers rating, to build the generating station required vast site and huge man power to construct the stations there should be continuous power supply from the stations and initial investment is high , if the consumer's rating couldn't be generated from the stations few industry prepare their own sources to run the industry. Failures of

ISBN: 979-85-27243-61-1

components can be seen and replacements is done wherever it is occurred.

To overcome the problem of power reliability we use the following algorithms like PSO, GSA etc.,

III. METHODOLOGY

The PSO Algorithm is used to solve the problem. The Particle Swarm Optimisation(PSO) is a computational method that optimises a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. The Gravitational search algorithm (GSA) is a kind of swarm intelligence optimization algorithm based on gravitation.

Steps for Methodology

- Literature survey: To study on various methods to improve the power quality and reliability on power system has been surveyed by referring various papers.
- Netwon Raphson method is used for load flow analysis.
- Praticle swarm Optimization(PSO) method is used for determination of sizing and sitting of DG plant, tested on 33 and 69 bus system.
- GSA method is used for updating the particle position.
- Then the combination of both PSOGSA used for determination of sizing and sitting of DG plant, tested on 33 and 69 bus system.

- Consider f(x)=-x^2+2x+11 where x ranges from -2 to +2 On substitution from -2,-1,0,1,2 then f(x) will be 11,12,11,14,11

Step 1:- Assuming n=4

Step 2:- x1= -1.5 , f(-1.5)= 5.75
x2=0 , f(0)= 11
x3=0.5 , f(0.5)=11.75
x4= 1.25 , f(1.25)=11.9375 (best value)

Step 3:- considering v1(0)=v2(0)=v3(0)=v4(0)=0

Step 4:- P-best of 1 particle = -1.25
P-best of 2 particle = 0
P-best of 3 particle = 0.5
P-best of 4 particle = 1.25

- VELOCITY

Vj(i)=Vj(i-1)+r1[Pbest(j)-xj(i-1)]+r2[Gbest-xj(i-1)]
j=1,2,3,4 and i= iteration count and G best =1.25 and P-best will be -1.5 and r1and r2 will be taken from 0-1.r1=0.3294 and r2=0.9342.

1st particle velocity = 2.6241
2nd particle velocity = 1.1927
3rd particle velocity = 0.7156
4th particle velocity = 0

- Then x1(1)= -1.5+ calculated velocity say 2.6241 then x1(1)= 1.1241,x2(1)=1.1927 , x3(1)=1.2156 & x4(1)=1.25

- substituting new x values for the fitness function then f(x1)=11.98 , f(x2)=11.9621 , f(x3)=11.9535 , f(x4)=11.9375

- The best fitness value is f(x1) and P-best will be 1.124.



ISBN: 979-85-27243-61-1

IV. OPTIMIZATION TECHNIQUE

a. PSO ALGORITHM

PSO is a robust stochastic optimization technique based on the movement and intelligence of swarms. PSO applies the concept of social interaction to problem solving. It was developed in 1995 by James Kennedy (social-psychologist) and Russell Eberhart (electrical engineer). It uses a number of agents (particles) that constitute a swarm moving around in the search space looking for the best solution. Each particle is treated as a point in a N-dimensional space which adjusts its "flying" according to its own flying experience as well as the flying experience of other particles.

STANDARD ALOGRITHM

The basic PSO algorithm can be described in vector notation as follows:

$$V_{k+1}=a \otimes V_K+b_1 \otimes r_1 \otimes (p_1-x_k)+b_2 \otimes r_2 \otimes (p_2-x_k)$$

$$X_{k+1}=c \otimes x_k+d \otimes V_{k+1}$$

The symbol $\otimes$ denotes element-by-element vector multiplication. At iteration k, the velocity V_k is updated based on its current value affected by a momentum factor 'a' and on a term which attracts the particle towards previously found best positions: its own previous best position 'p_1' and globally best position in the whole swarm 'p_2'. The strength of attraction is given by the coefficients 'b1' and 'b_2' . The particle position x_k is updated using its current value and the newly computed velocity v_{k+1} , affected by coefficients c and d, respectively. It is shown later that c and d can be set to unity without loss of generality. Randomness useful for good state space exploration is introduced via the vectors of random numbers r_1 and r_2 . They are usually selected as uniform random numbers in the range [0, 1]: $r_1, r_2 \in$ Uniform [0, 1].

It appears from equations that each dimension is updated independently from the others. The only link between the dimensions of the problem space is introduced via the objective function, i.e., through the locations of the best positions found so far p_1 and p_2. Thus, without loss of generality, the algorithm description can be reduced for analysis purposes to the one-dimensional case:

$$V_{k+1}=aV_k+b_1r_1(p_1-x_k)+b_2r_2(p_2-x_k)$$
$$x_{k+1}=cx_k+dv_{k+1}$$

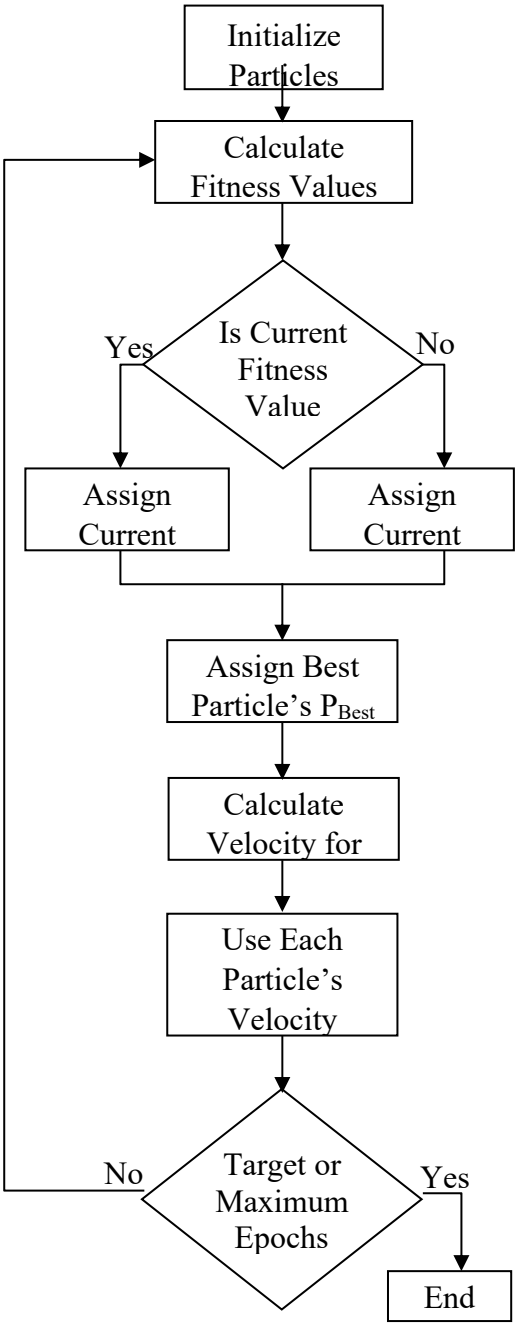


Figure 1. Flowchart of PSO

ISBN: 979-85-27243-61-1

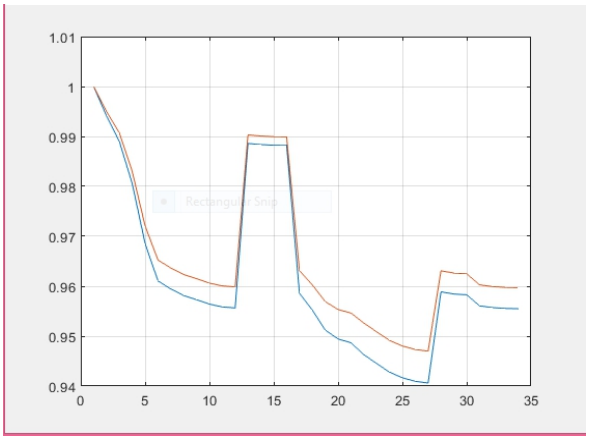


Figure 2. Result of PSO

b. PSOGSA TECHNIQUE

Hybrid PSOGSA approach is structured with the incorporation of PSO and GSA [9]. In PSO, Kennedy and Eberhart [10-11] produced PSO that is deemed as an evolutionary technique. The PSO was derived from social behavior of bird flocking. It employs a number of particles as candidate solutions that fly around in the search space to evaluate the best solution. To modify and update the position of each particle in PSO have to consider the current velocity and position, the distances of *pbest* and *gbest*. The mathematical model of PSO can be derived as follows [3]:

$$v_{it1+t} = w * v_{itt} + c1 * r1[\, pbest_{itt} - x_{itt}\,] + c2 * r2[\, gbest_{itt} - x_{itt}\,] \quad (22)$$

Positive constants c_1 and c_2 are the weighting factors, which are the acceleration constants responsible for varying the particle speed towards *pbest* and *gbest*, respectively. Variables r_1 and r_2 are two random numbers generated in the range [0, 1]. Eq. (23) provides the position update, depending on its previous position and its velocity, considering ¨t=1. In Eq. (22) consists of three parts, first part introduces exploration ability of PSO. Second and third parts are considered as private thinking and cooperation of particles respectively [9]. In (22), after calculating the velocities, the position of masses can be evaluated in (23). The iteration of process will continue updating the particles' position until achieving the PSO target.

In GSA, E. Rashedi et al. [12] implemented GSA as a novel heuristic optimization tool. Theory of this technique is deduced from Newton's gravitational force behaves is called ''action at a distance" [9, 12].

GSA can be considered as a combination of agents "elected solutions" whose have masses proportional to their value of fitness function. These masses are attracted between each other during generations. During the masses processes, the heavier masses that have a huge attraction force are possibly near the global optimum attract the other masses proportional to their distances.

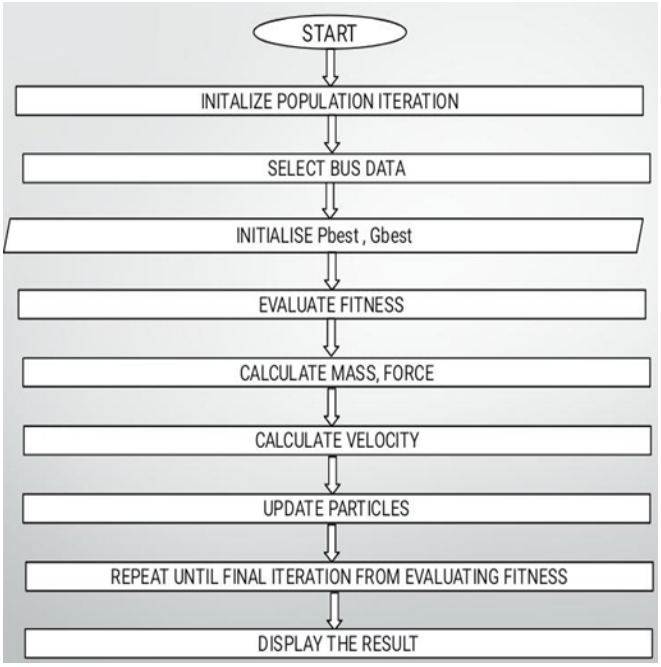


Figure 3. Flowchart of PSOGSA

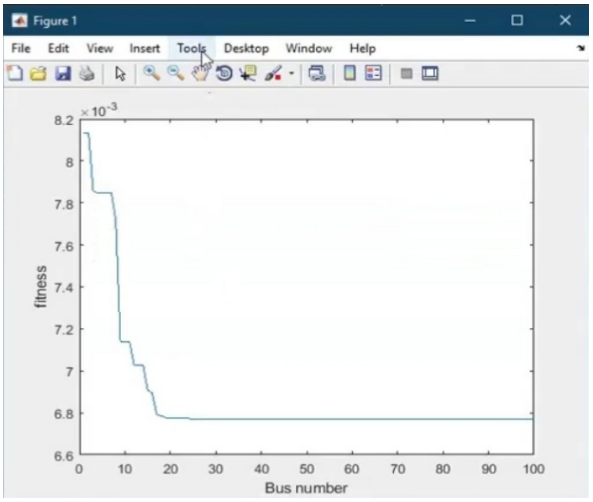


Figure 4 . Graphical Results obtained when DG placed on 33 bus system

ISBN: 979-85-27243-61-1

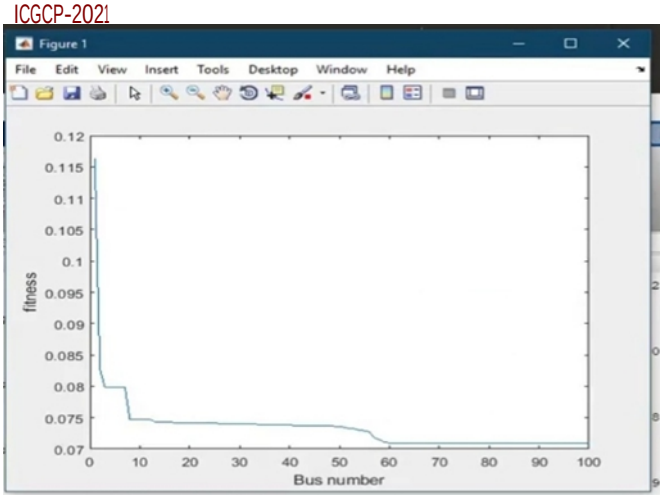


Figure 5. Graphical Result obtained when DG placed on 69 bus system

	Before Optimization	Proposed PSOGSA
Total Losses in KW	210.98	67.70
Optimal location & Size of DG's in MW	-	(24)1.0762MW (14)0.7432MW (30)1.044MW
Vworst(pu) bus	0.9038	0.99693(24,14,30)

Table 1. The Results of 39 bus system

	Before Optimization	Proposed PSOGSA
Total Losses in KW	224.98	70.95
Optimal Location & Size of DG's in MW	-	(49)0.82008MW (17)0.53091MW (61)1.7811MW
Vworst(pu) bus	0.9092	0.98817(49,17,61)

Table 2. The Results of 69 bus system

V.

VI. CONCLUSION

A novel strategy based on hybrid PSOGSA algorithm is proposed in this paper to find the optimal allocation and sizing of DGs in the radial distribution networks. The sensitivity factors are produced to reduce the search space of PSOGSA algorithm by estimating the most candidate buses for DG units' sitting. For power flow determinations, the Netwon raphson method is implemented. The proposed scheme PSOGSA has been tested on 33-bus and 69bus radial distribution systems. The results of the proposed algorithm have been compared with the PSO method to make sure the validation of the proposed approach.In PSOGSA will have the loses of 0.067 in 33 bus system and 0.0709 in 69 bus system. In PSOGSA the voltage will in between 1 pu to 0.98pu and in PSO the voltage lies between 1pu to 0.953 pu. The results illustrate that the proposed approach has a high accuracy and performance solution. It was clear that, the proposed scheme is capable of improving the voltage stability; minimizing the system losses and it says that PSOGSA is better than PSO.

ACKNOLEDEMENT

We would like to express our sincere gratitude to the management, Principal of Sri Krishna Institute of technology, Bengaluru for the facilities provided and their support . Also we would like to thank Head of Department of Electrical and Electronics Engineering and faculties for their encouragement and support.

VII. REFERNCES

1) P. Chiradeja P, and R. Ramkumar, "An Approach to Quantify the Technical Benefits of Distribute Generation", IEEE Trans Energy Convers, 2004.

2) Vladimir N. Tulsky, Artem S. Vanin, Mohamed A.Tolba, and Ahmed A. Zaki Diab, "Measurement and Analysis of Radial Distribution System with Reactive Power Compensation-Case Study: Moscow Region", IEEE NW, Russia Young Researchers in Electrical and10.1109/EIConRusNW.2016.7448281, pp. 710 – 716, 2016.

3) S. K. Injeti, and N. P. Kumar, "A Novel Approach to Identify Optimal Access Point and Capacity of Multiple DGs in a Amall, Medium and Large Scale

ISBN: 979-85-27243-61-1

Radial Distribution Systems", Elsevier, Science Direct, Electr. Power Energy Syst., pp. 142-151, 2013.

4) Mohamed Imran A., and Kowsalya M., "Optimal size and siting of multiple distribution generators in distribution system using bacterial foraging optimization ", Elsevier, Science Direct, Swarm and Evolut. Comput., 15, pp. 58-65, 2014.

5) D. Shirmohammadi, H. W. Hong, A. Semlyen, and G. X. Lou, "A compensation-Based Power Flow Method for Weakly Meshed Distribution and Transmission Networks", IEEE Transaction on Power Systems, Vol. 3, No.2 May, 1988.

6) S. K. Injeti, V. K. Thunuguntla, and M. Shareef, " Optimal allocation of capacitor banks in radial distribution systems for minimization of real power loss and maximization of network savings using bio-inspired optimization algorithms " , Elsevier Ltd, Electrical Power and Energy Systems 69, pp. 441–455, 2015.

ISBN: 979-85-27243-61-1

Allocation of DG's Integrated with Distribution Network Reconfiguration for Power Quality Enhancement

VARUN GAIKWAD S[1], NITIN D SALUNKE[2], UPENDER PRASAD YADAV[3], CHANDAN K[4], CHAITRA A S*, HOD of Electrical Department

Department of Electrical & Electronics Engineering, Sri Krishna Institute of Technology
#29, Hessarghatta main road, Chimney Hills, Chikkabanavara Post, Bnagalore-560090

[1]gaikwadvarun07@gmail.com[1] [2]nitinsalunke747@gmail.com[2] [3]upendra88610@gmail.com[3]
[4]chandan.eee@skit.org.in[4] *chaitraas.skitblr@gmail.com*

Abstract- The network reconfiguration is required in case of fault in feeders. In faulty conditions it is required to meet the load demand of consumers. To achieve this additional capacitor banks or distribution generators are attached to feeder which are used to minimize the power losses due to fault and to gain maximum voltage profile. A set of switches are opened and closed to optimally reduce the losses. The new structure thus formed should also maintain the radial structure of feeder. This opening and closing of switches is the task with many nonlinear constraints and nonlinear equations .To get an optimal set of switches to be closed, we used PSO optimization algorithm and simulation is done in MATLAB.

1. INTRODUCTION

The distribution system is an important part of an electric power system. As stated in [1], the capital investment in the distribution system constitutes a significant portion of the total amount spent in the entire power system. Due to the recent market deregulation, this portion may become even larger. Furthermore, since the distribution systems operate at the low voltage levels, the losses are usually higher compared to those in other parts of the system. Thus, the distribution system rates high in economic importance, which makes careful planning and design most worthwhile. DG placement in distribution system network can diminish numerous problems to a great degree like reduction in power loss, improvement in voltage profile, drop in power demand, power supply to the consumer with improved quality, cost minimization at peak operation, enhanced safety and reliability, reduced greenhouse gas emission, grid strengthening and so on. In [1] by using mixed integer nonlinear programming (MINLP) based optimization method, the optimal planning of DGs are found and sited in the 33 and 69-bus distribution system network to decrease the losses and improved the voltage profile. Teng et al. [3] and Díaz at el. [4] presented load flow analysis which is used in the presented work. Many researchers have stated that different optimizing techniques [5-11] are available for the determination of optimal planning of renewable DGs which can maintain the performance, operational, economical and reliability issues.

The Genetic Algorithm optimization technique is given in [5-7], while the particle swarm optimization technique is given in [8-10] are used for distribution system planning. In [11] it is discussed that what kind of commonly used technologies are available to harvest the energy by using DGs near to the consumption place and their different type of module size. Prakash et al. [12] presented a comparable study for the optimal placement of DG in IEEE 69-bus Radial Distribution System (RDS) between PSO and bat algorithm (BA). Sedighiz deh et al. [13] presented a work based on reconfiguration with the objective of loss and reliability indices minimization. In [14] depending on the injected power DGs are characterized as four types . Reddy at el. [17] proposed a work namely reconfiguration of IEEE 33 and 69bus RDS using PSO. The DG planning with reconfiguration is a complex target to achieve with a fitness function which is having multi objective function constitutes non-linear constraints. In the presented work, the PSO technique is used in order to evaluate the optimal planning of multi renewable distributed generator with reconfiguration.

In the used methodology, the radial property of the distribution system network is always maintained for load flow study (LFS). Newton-Raphson method is used for load flow study, which is more superior to basic load flow method for radial systems.

The proposed work is organized in different sections as follows: The Section-1 contains Introduction, Methodology is given in Section-2, In Section-3 Optimization Technique is explained, Section-4 is about Result and Discussion, and Section-5 is about Conclusion. The different cases of proposed work are as follows:

Cases-1: Base Case system

Cases-2: System with reconfiguration

Cases-3: System with single DG

Cases-4: System with multi DG

Cases-5: System with reconfiguration and single DG.

Cases-6: System with reconfiguration and multi DG

2. METHODOLOGY BASED ON MOFF

Multi Objective Based Fitness Function Formulation In this section advanced multi objective fitness function (MOFF) is introduced, which consists of distinct system performance and reliability assessment parameter. This novel fitness function based problem is utilized for the optimal planning of multi renewable DG with reconfiguration by using PSO technique for different cases.

MOFF = c_1*APLI + c_2*VolDI + c_3*RPLI + c_4*RLI

Where, c1, c2, c3, and c4, having the values 0.40, 0.20, 0.25 and 0.15 respectively are weight factors which define how much weight we have given to each variable system indices based on priority

APLI- Active Power Loss Index
VolDI- Voltage Deviation Index

RPLI- Reactive Power Loss Index

RL- Reliability Index

basis [10]. APLI, VolDI, RPLI and RLI are active power loss index, voltage deviation index, reactive power loss index, and reliability index respectively.
In the fitness function we have given priorities to all the important factors that will make our distribution system more efficient and reliable. In the said work with the proposed methodology, active power loss (APL), reactive power loss (RPL) of the system is reduced as shown in table I while the voltage profile and reliability of the system has improved as presented in table-2.

Let us assume that an *n*-bus power system contains a total number of n_p P-Q buses while the number of P-V (generator) buses be n_g such that $n = n_p + n_g + 1$. Bus-1 is assumed to be the slack bus. The approach to Newton-Raphson load flow is similar to that of solving a system of nonlinear equations using the Newton-Raphson method: at each iteration we have to form a Jacobian matrix and solve for the corrections from an equation of the type given. For the load flow problem, this equation is of the form

$$J\begin{bmatrix} \Delta\delta_2 \\ \vdots \\ \Delta\delta_n \\ \dfrac{\Delta|V_2|}{|V_2|} \\ \vdots \\ \dfrac{\Delta|V_{1+n_p}|}{|V_{1+n_p}|} \end{bmatrix} = \begin{bmatrix} \Delta P_2 \\ \vdots \\ \Delta P_n \\ \Delta Q_2 \\ \vdots \\ \Delta Q_{1+n_p} \end{bmatrix}$$

where the Jacobian matrix is divided into submatrices as

$$J = \begin{bmatrix} J_{11} & J_{12} \\ J_{21} & J_{22} \end{bmatrix}$$

It can be seen that the size of the Jacobian matrix is $(n + n_p - 1) \times (n + n_p - 1)$.

J_{11}: $(n - 1) \times (n - 1)$, J_{12}: $(n - 1) \times n_p$, J_{21}: $n_p \times (n - 1)$ and J_{22}: $n_p \times n_p$

The submatrices are:-

$$J_{11}=\begin{bmatrix} \frac{\partial P_2}{\partial \delta_2} & \cdots & \frac{\partial P_2}{\partial \delta_n} \\ \vdots & \ddots & \vdots \\ \frac{\partial P_n}{\partial \delta_2} & \cdots & \frac{\partial P_n}{\partial \delta_n} \end{bmatrix}$$

$$J_{12}=\begin{bmatrix} |V_2|\frac{\partial P_2}{\partial |V_2|} & \cdots & |V_{1+n_g}|\frac{\partial P_2}{\partial |V_{1+n_g}|} \\ \vdots & \ddots & \vdots \\ |V_2|\frac{\partial P_n}{\partial |V_2|} & \cdots & |V_{1+n_g}|\frac{\partial P_n}{\partial |V_{1+n_g}|} \end{bmatrix}$$

$$J_{21}=\begin{bmatrix} \frac{\partial Q_2}{\partial \delta_2} & \cdots & \frac{\partial Q_2}{\partial \delta_n} \\ \vdots & \ddots & \vdots \\ \frac{\partial Q_{1+n_p}}{\partial \delta_2} & \cdots & \frac{\partial Q_{1+n_p}}{\partial \delta_n} \end{bmatrix}$$

$$J_{22}=\begin{bmatrix} |V_2|\frac{\partial Q_2}{\partial |V_2|} & \cdots & |V_{1+n_p}|\frac{\partial Q_2}{\partial |V_{1+n_p}|} \\ \vdots & \ddots & \vdots \\ |V_2|\frac{\partial Q_{1+n_p}}{\partial |V_2|} & \cdots & |V_{1+n_p}|\frac{\partial Q_{1+n_p}}{\partial |V_{1+n_p}|} \end{bmatrix}$$

Step-1: Choose the initial values of the voltage magnitudes $|V|^{(0)}$ of all n_p load buses and n - 1 angles $d^{(0)}$ of the voltages of all the buses except the slack bus.

Step-2: Use the estimated $|V|^{(0)}$ and $\delta^{(0)}$ to calculate a total $n-1$ number of injected real power $P_{calc}^{(0)}$ and equal number of real power mismatch $\Delta P^{(0)}$.

Step-3: Use the estimated $|V|^{(0)}$ and $\delta^{(0)}$ to calculate a total n_p number of injected reactive power $Q_{calc}^{(0)}$ and equal number of reactive power mismatch $\Delta Q^{(0)}$.

Step-4: Use the estimated $|V|^{(0)}$ and $\delta^{(0)}$ to formulate the Jacobian matrix $J^{(0)}$.

Step-5: Solve for $\Delta\delta^{(0)}$ and $\Delta|V|^{(0)} \div |V|^{(0)}$.

Step-6: Obtain the updates from

$$\delta^{(1)}=\delta^{(0)}+\Delta\delta^{(0)}$$

$$|V|^{(1)}=|V|^{(0)}\left[1+\frac{\Delta|V|^{(0)}}{|V|^{(0)}}\right]$$

Step-7: Check if all the mismatches are below a small number. Terminate the process if yes. Otherwise go back to step-1 to start the next iteration with the updates given.

3. OPTIMIZATION TECHNIQUE

The first ever PSO technique was stated by Kennedy and Eberhart in 1995 [9]. PSO is a population based optimization technique [8, 9]. In PSO, in its search area every swarm follows a stated inertia and velocity by associated iterations. Based on the swarm last local best understanding and the past best understanding in its neighborhood the speed and way of the velocity are in tune. The characteristics of the swarm are to fly towards a promising area in the search area. PSO counts each individuals movement in the complete search area with a specific stated velocity which is updated according to its local movement understanding and its colleagues movement understanding [8–10]. In Fig. 1 the PSO technique algorithm flowchart has shown. In PSO the population of particles are initializes randomly and the corresponding updates in the particles position is totally based upon the local best and neighbor best experience [10].

At every iteration updated new values of the velocity are the deciding factor for updated new value of the population. Swarm updated population is the sum of population of previous iteration and the velocity of current iteration in the next iteration.

Suppose total population is P and respective velocity is v. The velocity and population for i^{th} iteration is v (i+1) and X (i+1) respectively, similarly v and X are the velocity and population for previous iteration. These two equations are given in order to update the values of velocity and population for i^{th} iteration are given as [6,8].

$$\mathbf{V(i+1)=w(i)*v(i)+ c_1*rand*(X_{local\ best}-X)+ c_2*rand*((X_{gbest}-X))}$$

$$\mathbf{X\ (i+1\ ) = X(i) + v(i+1)}$$

Where P (i=1, 2, 3….P) is number of population; $X_{local\ best}$ and X_{gbest} are the local and global best populations respectively.

v = Velocity, X= Swarm population for PSO

i = i^{th} iteration, w = inertia, rand = random number between 0 and 1 respectively and c1, c2 are the constriction factor these are positive constant numbers [6-8].

The flowchart to determine optimal planning with reconfiguration in IEEE 33-bus RDS is presented in Fig. 1. Five switches (TS1, TS2, TS3, TS4, TS5,) three DG locations (Loc1, Loc2, Loc3) and sizing of DGs are considered in the flowchart; these are converted and represented as swarm or (particle).

ISBN: 979-85-27243-61-1

4. RESULTS AND DISCUSSION



Fig-1. Flowchart for optimal planning of DG with Reconfiguration using PSO.

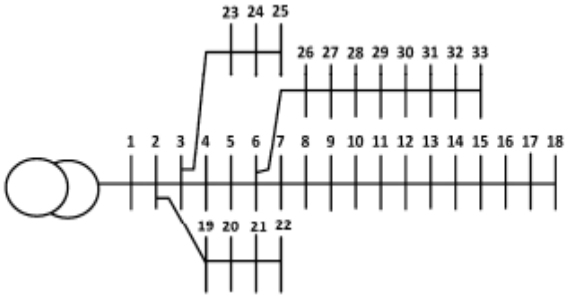


Fig-2. Standard IEEE 33 Bus RDS

In case-1, base case is considered without reconfiguration and DG, and obtained results are active power loss (APL) as 0.2027 p.u., reactive power loss (RPL) as 0.1351 p.u. and maximum voltage deviation (VolD) of the system as 0.0869 p.u. with respect to reference voltage. While in case-2, the standard IEEE 33 bus RDS with only reconfiguration is considered by maintaining the radiality of the system, the observed results are APL as 0.102006672 p.u., RPL as 0.065954684 p.u. and maximum VolD of system as 0.040345 p.u. respectively with respect to base case as shown in table-1 & 2. In the same fashion when we have implemented single DG by using PSO technique in Case-3, APL, RPL, and VolD is reduced by 48.69 %, 44.60 % and 44.48% respectively as shown in below three table with respect to Case-1. In Case-4 we have considered multi DG by using PSO technique where we got APL reduction 59.71 %, RPL reduction 58.62%, VolD decrease by 69.96%, and hence the reliability is increased to 96.39% as shown in table-2.

CASES	P loss	Q loss	S loss
Case-1	0.2027	0.1351	0.2435
Case-2	0.102006672	0.065954	0.12147
Case-3	0.103985761	0.074844	0.1277
Case-4	0.08165251	0.05589624	0.09896
Case-5	0.0575685	0.0419187	0.07126
Case-6	0.043364024	0.031123	0.05339

TABLE-1:- LOSSES OF THE 33BUS FOR ALL CASES

CASES	APLI	VolDI	RPLI	RL in %	FITNESS FUNCTION
Case-1	1	0.0869	1	95.92	0.81738
Case-2	0.5032	0.04035	0.48844	96.25	0.469239
Case-3	0.51306	0.04841	0.55382	96.18	0.469239
Case-4	0.40287	0.03131	0.41364	96.39	0.408789
Case-5	0.28404	0.02281	0.31018	96.6	0.328123
Case-6	0.21395	0.01539	0.23030	96.65	0.277607

TABLE-2:- FITNESS FUNCTION OF IEEE 33 BUS RDS FOR ALL CASES

Thereafter, we have implemented reconfiguration with DGs placement then better reduction in all indices has noticed, therefore two more cases namely Case-5 & 6 are considered. In Case-5 reconfiguration with single DG by using PSO technique is implemented then the APL reduced by 71.59 %, RPL reduced by 68.97%, and VolD also decrease by 73.36% when it is compared with Case-1. Multi DG with reconfiguration by using PSO technique has implemented in case-6 and considerable reduction is observed in the multi objective function where APL reduced by 78.60 %, RPL reduced by 76.96 %, and VolD decrease by 82.28% hence the reliability is increased upto 96.65 % as given in table-2.

Case-1-Blue Graph

Case-2- Red Graph

Case-3, 4- Yellow Graph

Case-5, 6- Purple Graph

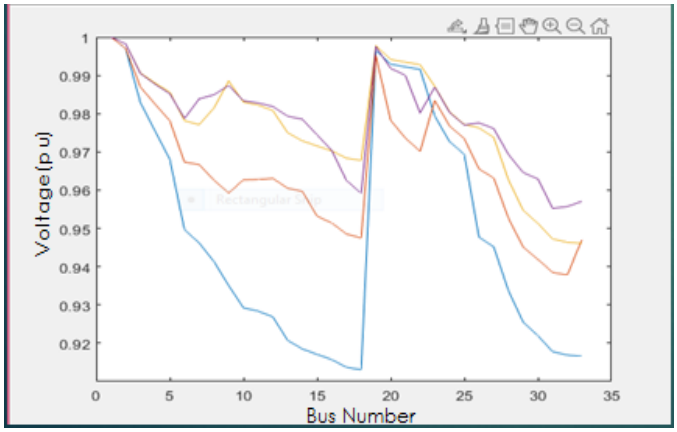


Fig-3:- Improved Volatge profile of 33 Bus RDS for 1,2,3,5 cases.

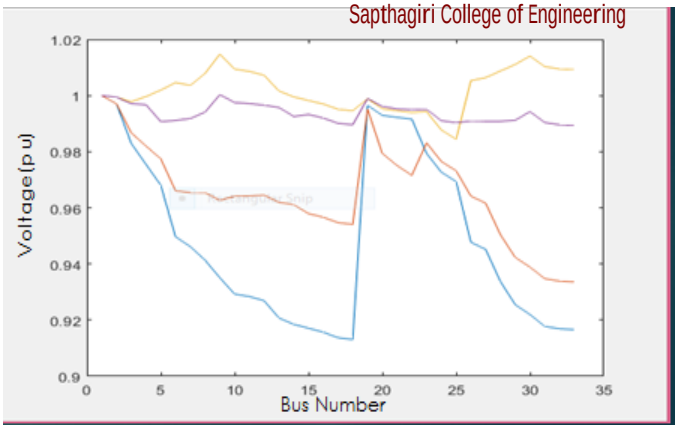


Fig-4:- Improved Voltage Profile for 33 Bus with 1,2,4,6 cases.

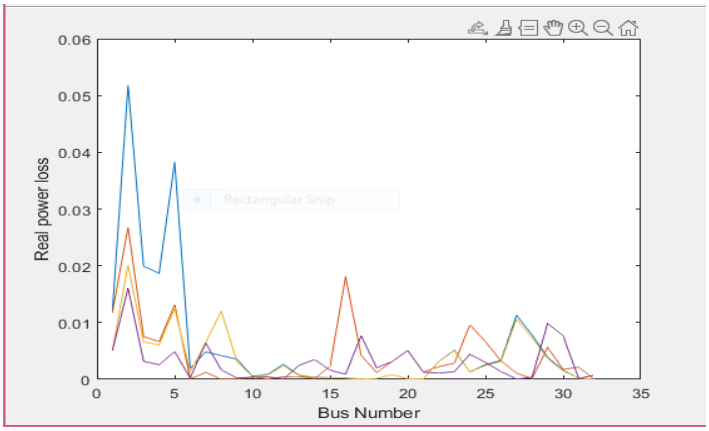


Fig-5:- IEEE 33 Bus RDS Active Power Loss with 1,2,3,5 cases.

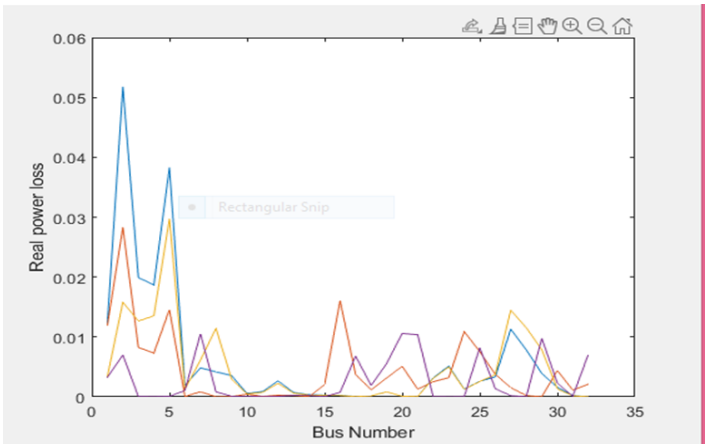


Fig-6:- IEEE 33 Bus RDS Active Power Loss with 1,2,4,6 cases.

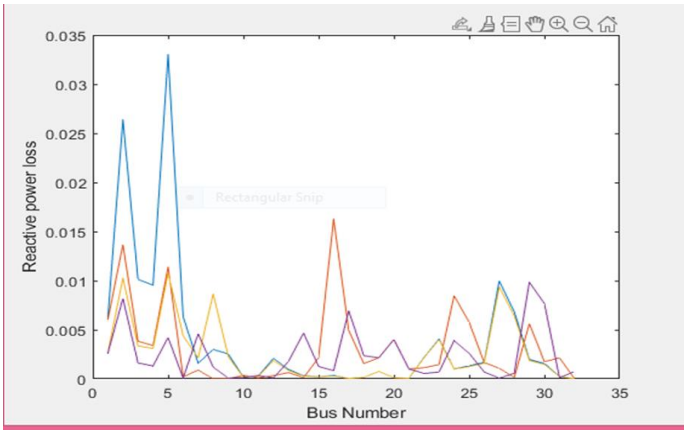


Fig-7:- System Reactive Power Loss for 1,2,3,5 cases.

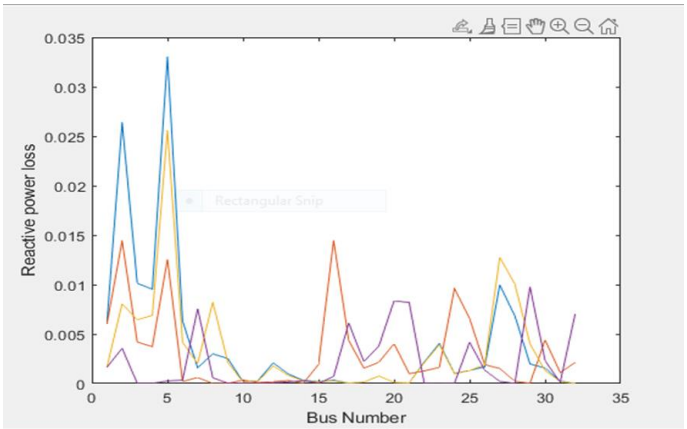


Fig-8:- System Reactive Power Loss for 1,2,4,6 cases.

After analyzing the obtained result it can be concluded that the Optimal planning of multi Renewable Distributed Generator with Reconfiguration using PSO Technique is an effective approach to minimize the multi objective based fitness function.

Through this proposed work we achieved our target with 78.60 % APL reduction and improved reliability of 96.65 % along with better-quality voltage profile as shown in table-1 & 2 and all graphs.

TABLE-3:- COMPARATIVE ANALYSIS OF 33 BUS RDS EXISTING WORK WITH PROPOSED WORK

Existing/Proposed Work	Optimization Technique	Power Loss (kW)	Voltage Deviation
Alam *et al.* [1]	MINLP	72.95	----
Prakash *et al.* [14]	PSO	74.09	----
Reddy *et al.* [17]	PSO	148.30	0.1605
Proposed Work	PSO	43.36	0.0869

In the comparison table, literature [1] and [14] presented optimal DG placement using MINLP Technique and PSO Technique of the IEEE 33-bus RDS respectively, whereas in [17] reconfiguration using PSO for the same has been carried.

For the said cases in table-3 the reduced active power losses are 72.95 kW, 74.09 KW and 148.30 kW but in the proposed work of this paper the active power loss is reduced to 43.36 kW also the voltage profile is improved with reference to the base case as given in table I.

5. CONCLUSION

The optimal planning of DG with reconfiguration based on a multi-objective fitness function, which includes several system parameters using PSO is evaluated on IEEE 33-bus RDS. Finally, network reconfiguration with multi DG is implemented using PSO technique with MOFF. In the observed outcomes, APL, RPL, & VolD are decreased by 78.60 %, 76.96 %, and 82.28% as shown in table-1. Correspondingly the overall reliability is enhanced up to 96.65% along with improved voltage profile as illustrated in result analysis with respect to the first case i.e., with the base case. The outcomes are analyzed for different cases and also compared the results of finally implemented case i.e., reconfiguration with multi DG (Case-6) with the existing work as illustrated in table-3. It is concluded that the presented approach is effective for the decrease in apparent power. Therefore, the power losses (active & reactive) and the voltage deviation reduce significantly. Moreover, the system reliability and voltage profile of the system is enhanced.

ACKNOLEDGEMENT

We would like to express our sincere gratitude to the Management, Principal of Sri Krishna Institute of Technology, Bengaluru for the facilities provided and their support. Also we would like to thank the Head of department of Electrical & Electronics Engineering and faculties for their encouragement and support.

6. REFERENCES

[1] Alam, Afroz, Abhishek Gupta, Parth Bindal, Aiman Siddiqui, Mohammad Zaid. "Power loss minimization in a radial distribution system with distributed generation." IEEE International Conference on Power, Energy, Control and Transmission Systems (ICPECTS)., pp 2125, 2018.

[2] Ackermann, Thomas, Göran Andersson, and Lennart Söder. "Distributed generation: a definition." Electric power systems research, vol. no. 57(3), pp. 195-204, 2001.

[3] Teng, Jen-Hao. "A direct approach for distribution system load flow solutions." IEEE Transactions on power delivery, vol no. 18(3), pp. 882887, 2003.

[4] Díaz, Guzmán, Javier Gómez-Aleixandre, and José Coto. "Direct backward/forward sweep algorithm for solving load power flows in AC droop-regulated microgrids." IEEE Transactions on Smart Grid, vol. no. 7(5), pp. 2208-2217, 2015.

[5] Holland, John H. "Adaptation in natural and artificial systems." The University of Michigan Press, pp. 275, 1975.

[6] Goldberg, D. E. "Genetic Algorithms in Search. Optimization and Machine Learning. Addism1—Wesley." Reading, MA, 1989.

[7] Haupt, Randy L., and Sue Ellen Haupt. "Practical genetic algorithms." A John wiley & sons, Inc., Publication, 2004.

[8] Kennedy, J., and R. Eberhart. "Particle swarm optimization (PSO)." Proc. IEEE International Conference on Neural Networks, Perth, Australia. pp.1-6, 1995.

[9] Eberhart, Russell, and James Kennedy. "A new optimizer using particle swarm theory." MHS'95. Proceedings of the Sixth IEEE International Symposium on Micro Machine and Human Science, pp. 1-6, 1995.

[10] Bohre, Aashish Kumar, Ganga Agnihotri, and Manisha Dubey. "Optimal sizing and sitting of DG with load models using soft computing techniques in practical distribution system." IET generation, transmission & distribution, vol. no. 10 (11), pp. 2606-2621, 2016.

[11] Dulău, Lucian Ioan, Mihail Abrudean, and Dorin Bică. "Distributed generation technologies and optimization." Procedia Technology, vol. no. 12, pp. 687-692, 2014.

[12] Prakash, Ram, and B. C. Sujatha. "Optimal placement and sizing of DG for power loss minimization and VSI improvement using bat algorithm." IEEE National Power Systems Conference (NPSC)., pp. 1-6,2016

[13] Sedighizadeh, M., M. Esmaili, and M. M. Mahmoodi. "Reconfiguration of distribution systems to improve reliability and reduce power losses using Imperialist Competitive Algorithm." Iranian Journal of Electrical and Electronic Engineering, vol. no. 13(3), pp. 287-302, 2017).

[14] Prakash, D. B., and C. Lakshminarayana. "Multiple DG placements in distribution system for power loss reduction using PSO Algorithm." Procedia Technology, vol. no. 25 (2016), pp. 785-792, 2016.

[15] Zimmerman, R.D., Murillo-Sanchez, C.E.: 'Matpower4.1', December 2011. Available at: http://www.pserc.cornell.edu//matpower/

[16] Swarnkar, Anil, Nikhil Gupta, and K. R. Niazi. "A novel codification for meta-heuristic techniques used in distribution network reconfiguration." Electric Power Systems Research, vol. no. 81(7) , pp. 1619-1626, 2011.

[17] Reddy, AV Sudhakara, and M. Damodar Reddy. "Optimization of network reconfiguration by using particle swarm optimization." IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES), pp.1-6, 2016.

"SMART UG CABLE FAULT DETECTION SYSTEM BASED ON IOT"

[1]Arpitha J N, [2]Dhananjaya MK, [3]Dilip Kumar C, [4]Manoj V, [5]Ganesha G C

[1]8TH sem DSCE Student, Bangalore
arpitha.naduvinamath@gmail.com

[2]8TH sem DSCE Student, Bangalore
dhanuramachari1@gmail.com

[3]8TH sem DSCE Student, Bangalore
dilipkumar3479@gmail.com

[4]8TH sem DSCE Student, Bangalore
hemanthmanoj1111@gmail.com

[5]Asst Prof DSCE, Bangalore
Ganesh.anpurna@gmail.com

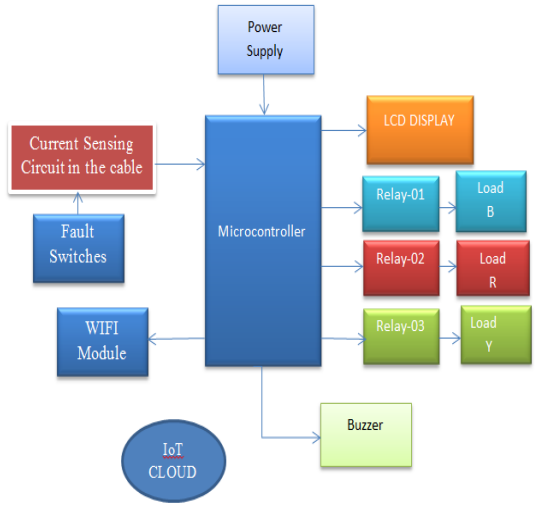
Abstract-Our main Aim is meant to observe the situation of fault in various underground cable lines from the bottom station to precise location in kilometers using an Arduino Microcontroller kit. within the urban areas, the transmission line runs in undergrounds rather than overhead lines. Whenever the fault occurs in underground cable it's tough to observe the precise location of the fault for method of repairing that individual cable. The planned system finds the precise location of the fault. this method uses an Arduino mega microcontroller kit and a corrected power supply. Here this sensing circuits created with a mix of resistors can be interfaced to Arduino Micro controller kit to assist of the inner ADC device for providing digital information to the microcontroller representing the line unit in kilometers. The fault creation is created by the set of switches. The relays can be controlled by the relay driver. A 16x2 liquid crystal display |LCD| digital show [alphanumeric display] display connected to the microcontroller to display the fault location. just in case of fault the voltage across series resistors changes consequently, that is then fed to AN ADC to develop precise digital information to a programmed Arduino Micro controller kit that additional display's precise fault location from base station in kilometers. Whenever a fault happens in an exceedingly cable the buzzer manufacture the alarm to alert and to require an instantaneous action by field employees.

INTRODUCTION

Our main Aim is to seek out, precise fault location of ug cable problem from the starting of the station to finishing of the line in meters. Typically by using an Arduino board, we tend to use OH lines. We are going to simply determine the fault however in a hurried or acquainted places or cities we tend to could not use OH lines. So, we tend to maneuver UG cables. UG cables used mostly in geographical region instead of OH lines we simply can't determine the fault within the UG cables. This project deals with Arduino microcontroller, buzzer and liquid crystal display. We use Internet of things technology that grant the authorities or any officials to look at and check information regarding faults over web. The method we use greatly decreases the time as well as operates effectively. The UG cabling system may well be typical follow several urban areas. Several time faults may occur because of constructional works and alternative reasons. At that period it's difficult to dig up cable because of unknown precise location of the cable fault the utilization of Arduino microcontroller, buzzer and liquid

display proposes that it lessens the time and

BLOCK DIAGRAM

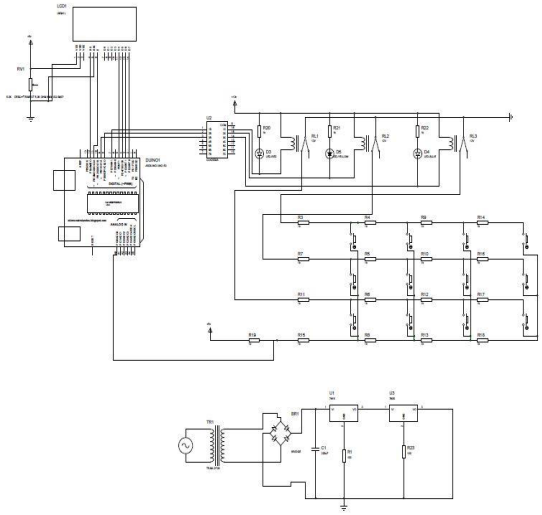


The operation of the system states that once the current flows through the fault sensing circuit module the present would vary relying upon the length of the cable from the place of fault that occurred if there's any SC fault with the one L&G, or L&L,G, or 3 section to ground problems. The voltage drops across the series resistors changes consequently so the fault signal goes to internal ADC of the microcontroller to develop digital information. Then microcontroller can convert the digital information and therefore the output is being displayed within the digital display connected to the microcontroller in kilometers and section as per the fault conditions. This Output is additionally displayed within the cloud

CIRCUIT DIAGRAM

operates efficiently.

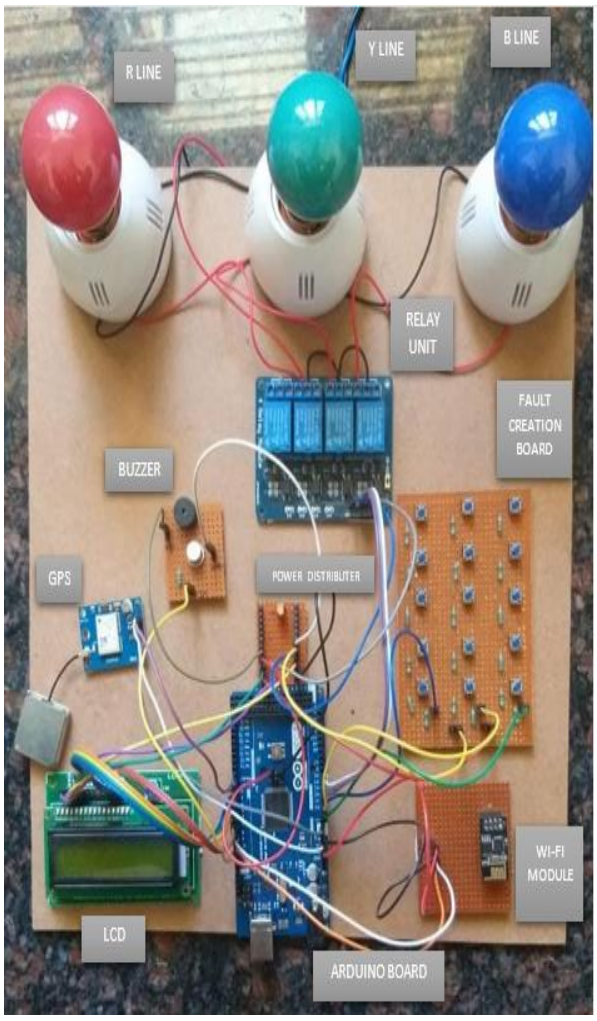
through the IoT Wi-Fi Module ESP8266 connected to the system, the power given to the system is 230V ac. This 230 V supply is fed to the 2 Adapter Modules (12 V, 2 Am ps. each). The adapter module one and a pair of converts the AC voltage to DC. The ripples in the output of adapter module one is then separated with the assistance of a one thousand microfarad capacitor. Since a relentless five volts voltage supply is wanted for this system, as a result of the ATmega328 Microcontroller, 16x2 Liquid Crystal Display(LCD), Relays and Relay Drivers, Fault Sensing Circuit Module , IoT Wi-Fi Module, etc. and also the different parts work 5V provide, thence we have a tendency using three 7805 voltage regulators. These three voltage regulator converts the filtered output to 5Volts constant provide voltage. the primary transformer (VR1) feeds the five Volts provide to the microcontroller, liquid crystal display |LCD|, and also the set of series resistors whereas the second transformer VR2 feeds the relay driver IC ULN2003A three relays. The third transformer is connected to the IoTESP8266 Wi-Fi Development Board Module which supplies five Volts DC provide to that. The hardware consists of 3 relays that ac driven by a relay driver IC ULN2003A. The relays used here switches off/on the bulb hundreds R, Y and B to point the fault being occurred in corresponding phase



The connection are as per the diagram, here we have used the resistors for the line fault. There are 3 lines present in the board namely R, Y & B.The Total length of a single line is 5 km for each 1 km we have considered the resistance value as 1ohm's,the push button are also interconnected with resistance to create the fault, when the push button are pressed the fault occurs. Now the terminals of the fault board are connected with Arduino pin numbers of A0-R, A1-Y,A3-B.The Relays are used to protect the load from the fault section, where as we have considered it to indicate the line's condition. We can say that, if lights are OFF fault as has been occurred in the system, if the lights are ON no fault occurred in the system. The Relays are connected to pin number of A4-R, A5-Y, A6-B.The Wi-Fi module is connected to the Arduino board, to pin number of 18,19 ,VCC& gnd are also connected. The piezo buzzer are used to create the sound when fault occurs, they are connected to pin number of 10, vcc & gnd are connected. The Gps are used to find the exact location of fault they are connected to the Arduino pins of 8,9 vcc & gnd are connected. The LCDs are used to display the fault line they are connected to Arduino pins of rs = 7, en = 6, d4 = 5, d5 = 4, d6 = 3, d7 = 2.The power adapter is used to boost the voltage of the various boards because many component are used so that Arduino can't satisfy the load

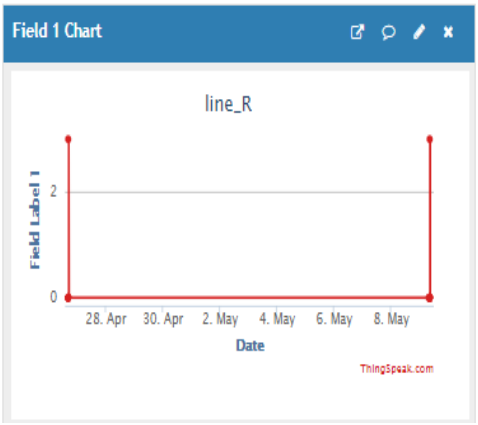
RESULTS

The figure shown below is the model of our project. We can observe the various components that we have used.





The fig shown above is the fault occurred in the R line at 3 km, when the push button of R line is pressed



From the fig above is the information of fault has occurred in the line which is displayed in the ThingSpeak web and from this data we can also find the exact location of fault. The data of fault can be also downloaded from this web. isolate the healthy part from the faulty part of the line. The technology, which we used for our project is IOT & same data is displayed in LCD. From thing speak we can download the data, we can rectify the faults and it can be monitored and check the inform

CONCLUSION

Our main Aim is meant to locate the precise fault location in ug cable from the base station to end station in kilometer through the use of an Mega Arduino board. The board operates on the basis of the cable fault, it

REFERENCE

[1] Gilbert Cheung, Yuan Tian, Tobias Neier, Technics of Locating Underground Cable Faults inside conduits, International Conference on Condition Monitoring and Diagnosis IEEE (CMD 2016)

[2] Nikhil Kumar Sain, Rajesh Kajla, and Mr.Vikas Kumar, Underground Cable Fault Distance Conveyed Over GSM, International Organization of Scientific Research Journal of Electrical and Electronics Engineering, Volume 11, Issue 2, Mar-April 2016.

[3] Pooja P.S and Lekshmi M(2015) Fault Detection Technique to pinpoint Incipient Fault for Underground Cables‘-International Journal of

Engineering Research and General Science Volume 3, Issue 3, May-June, 2015.

[4] DhivyaDharani. A, Sowmya. T 'Development of a Prototype Underground Cable Fault Detector', 2347-2820, Volume -2, Issue-7, 2014.

[5] A.Ngaopitakkul, C.Pothisarn, M.Leelajindakrairerk, 'Study of Characteristics for Simultaneous Faults in Distribution Underground Cable using DWT', 2011 IEEE.

[6] C.Bharatiraja, S.Jeevananthan, J.L. Munda, A Timing Correction Algorihm based extended SVM for three level Neutral point clamped MLI in Over Modulation Zone IEEE Journal of Emerging and Selected topics in Power Electronics.

DESIGN OF A CONTROLLER FOR CASCADED H BRIDGE MULTILEVEL INVERTER SYSTEM FOR REDUCED TOTAL HARMONIC DISTORTION AND IMPROVED PERFORMANCE

Dr A M Nagaraj
Electrical and Electronics engineering
Dayananda Sagar College of Engineering
Bangalore,India
amnrajp@gmail.com

Sahana M B
Electrical and Electronics Engineering
Dayananda Sagar College of Engineering
Bangalore,India
sahanabasavaraj85@gmail.com

Abstract— **Multi-level inverter have huge advantages than the conventional inverter. This paper proposes 27 level cascaded multi-level inverter with minimum number of semiconductor switches and DC sources. A new controller is designed to trigger the switches of semiconductor devices to obtained the required output. To control the switching sequence of the metal oxide semiconductor field effect transistor (MOSFET) an embedded code is developed. 3- level, 5 -level ,17 -level and 27 -level cascaded H Bridge multi-level inverters are modelled on MATLAB/SIMULINK and Total Harmonic distortion(THD) of each level are compared to show the improved performance.**

Keywords — cascaded H bridge multi-level inverter, controller, total harmonic distortion

I. INTRODUCTION

Multi-level inverter has various applications in the area of power industry due to its ability to reach higher voltage with producing lower harmonic content[1].The concept of multilevel inverter came into existence because of the demand for medium voltage and high power in many applications[2].There are different topologies in multi-level inverter namely Diode clamp, flying capacitor and cascaded H bridge multi-level inverter compared to all the above choosing cascaded multi-level inverter is better because of its arrangement containing less number of semiconductor switches and also less harmonic distortion in the output[3].

The major disadvantage of cascaded H bridge multi-level inverter(CHBMLI) is it requires a separate DC source for an individual H bridge cell which in turn increases the number of semiconductor switches that leads to complexity in the circuit , higher cost and increase in size[4].To overcome this issue asymmetric arrangement of CHBMLI is used. If DC source in the H bridge cell is of same magnitude then the arrangement is called symmetrical CHBMLI. If each DC source magnitude is different in each H bridge cell it is called Asymmetric CHBMLI and this arrangement helps to increase the number of steps in the output voltage without adding more semiconductor devices[5].

A new control algorithm is used in multilevel inverter for controlling the gating signals for various switching topologies employing embedded coding[6]. According to the control algorithm CHBMLI for 3- level , 5-level ,17-level and 27- level is modelled in the MATLAB/SIMULINK and the obtained results are discussed.

Total harmonic distortion(THD) is the deviation in the desired waveform and obtained waveform due to harmonics in the signal. As the number of steps increases in the output the THD decreases and output becomes similar to sinusoidal. The THD of 3- level , 5-level ,17-level and 27-level CHBMLI is calculated and compared.

II. PROPOSED TOPOLOGY

CHBMLI consist of semiconductor switches and DC Voltage which is together called as H Bridge cell. Each H bridge cell requires four switches and an individual DC Voltage. The traditional CHBMLI requires (P-1)/2 number of H bridge cell, 2(P-1) number of switches and (P-1)/2 number of DC Voltages where P is the count of levels. There is always three output voltages for an individual H bridge cell which are ±Vdc and 0.Fig 1 shows arrangement of 3-level CHBML.

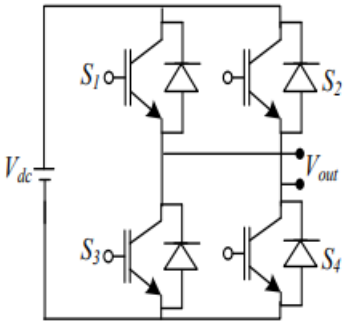


Fig 1 Arrangement of 3-level CHBMLI

3-level CHBMLI consist of four semiconductor switches and one DC source. Since it has one H bridge cell it generates 3 output voltages +Vdc , zero and –Vdc.

The switching chronology of 3-level CHBMLI is shown in Table I. To get +Vdc as output voltage switches S1 and S4 must be triggered. Switches S2 and S3 must be triggered to get –Vdc as the output voltage and to get 0 as the output voltage either (S1 , S2) or (S3 , S4) must be turned ON. This Switching Chronology gives 3 levels in the obtained output.

TABLE I
SWITCHING CHRONOLOGY FOR 3-LEVEL CHBMLI

Output Voltage level	Switches to be turned ON
$+V_{dc}$	S_1, S_4
0	S_1, S_2 or S_3, S_4
$-V_{dc}$	S_2, S_3

5-level CHBMLI consist of eight semiconductor switches and two DC voltages. Since it has two H bridge cell it produces five output voltages ±2Vdc, ±Vdc and 0 .

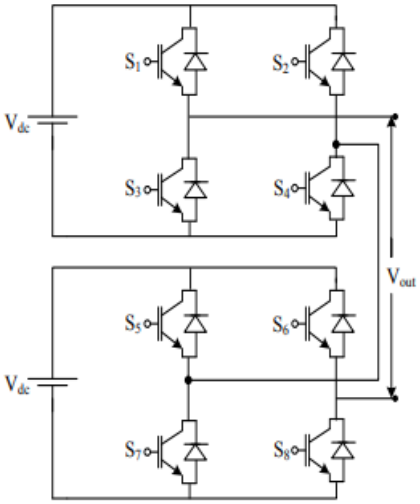


Fig 2 Arrangement of 5 level CHBMLI

The switching chronology of 5-level CHBMLI is shown in Table II .Operating gate signals of the switches according to the Switching pattern gives 5 levels in the obtained output.

TABLE II
SWITCHING CHRONOLOGY FOR 5- LEVEL CHBMLI

Output Voltage	Switches to be turned ON
$+2V_{dc}$	S_1, S_4, S_5, S_8
$+V_{dc}$	(S_1, S_4, S_5, S_6) OR (S_1, S_2, S_5, S_8)
0	(S_1, S_2, S_5, S_6) OR (S_1, S_2, S_7, S_8)
$-V_{dc}$	(S_2, S_3, S_5, S_6) OR (S_1, S_2, S_6, S_7)
$-2V_{dc}$	S_2, S_3, S_6, S_7

According to the traditional CHBMLI seventeen level cascaded H bridge multi-level inverter needs eight H bridge cells , 32 switches and 8 DC voltages of same magnitude. But in the proposed asymmetrical type of arrangement of CHBMLI 3 H bridge cells with 12 switches and 3 DC voltages of different magnitudes are needed. The three different magnitudes are Vdc, 3Vdc and 9Vdc. The arrangement of 17-level CHBMLI is shown in Fig 3.Similarly traditional 27-level CHBMLI needs 13 H bridge cells, 52 switches and 13 DC sources of same magnitude which makes the circuit topology complex and large in size. But in the proposed asymmetrical type of arrangement of CHBMLI 3 H bridge cells with 12 switches and 3 DC sources of different magnitudes are needed. The three different magnitudes are Vdc, 3Vdc and 9Vdc.The arrangement of 27-level CHBMLI is shown in Fig 4.

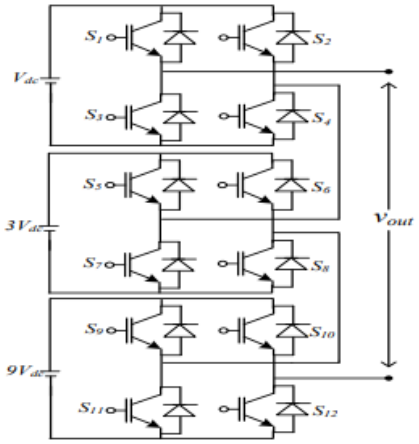


Fig 3 Arrangement of 17 level CHBMLI

.TABLE III
SWITCHING CHRONOLOGY FOR 17- LEVEL CHBMLI

Output voltage levels	Switches to be turned ON
+8 Vdc	S1, S3, S5 ,S7, S9, S11
+7 Vdc	S1, S2, S5, S7, S9, S11
+6 Vdc	S3, S4, S5, S6, S9, S11
+5 Vdc	S1, S3, S5, S6, S9, S11
+4 Vdc	S1, S2, S5, S6, S9, S11
+3 Vdc	S3, S4, S7, S8, S9, S10
+2 Vdc	S1, S3, S7, S8, S9, S10
+1 Vdc	S1, S2, S7, S8, S9, S10
0	S1, S2, S5, S6, S9, S10
- Vdc	S3, S4, S5, S7, S9, S10
-2 Vdc	S1, S2, S7, S8, S9, S10
-3 Vdc	S1, S3, S7, S8, S9, S10
-4 Vdc	S3, S4, S7, S8, S9, S10
-5 Vdc	S1, S2, S5, S6, S9, S11
-6 Vdc	S1, S3, S5, S6, S9, S11
-7 Vdc	S3, S4, S5, S6, S9, S11
-8 Vdc	S1, S2, S5, S7, S9, S11

The switching chronology of 17-level CHBMLI is shown in Table operating gate signals of the switches according to the Switching chronology gives 17 levels in the obtained output.

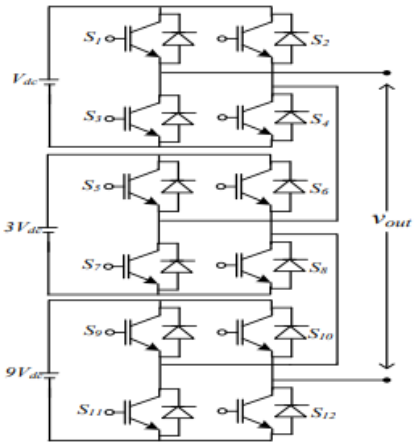


Fig 4 Arrangement of 27 level CHBMLI

TABLE IV
SWITCHING CHRONOLOGY FOR 27- LEVEL CHBMLI

Output voltage levels	Switches to be turned ON
+13 Vdc	S1, S3, S5, S7, S9, S11
+12 Vdc	S1, S2, S5, S7, S9, S11
+11 Vdc	S3, S4, S5, S6, S9, S11
+10 Vdc	S1, S3, S5, S6, S9, S11
+9 Vdc	S1, S2, S5, S6, S9, S11
+8 Vdc	S3, S4, S7, S8, S9, S10
+7 Vdc	S1, S3, S7, S8, S9, S10
+6 Vdc	S1, S2, S7, S8, S9, S10
+5 Vdc	S3, S4, S5, S7, S9, S10
+4 Vdc	S1, S3, S5, S7, S9, S10
+3 Vdc	S1, S2, S5, S7, S9, S10
+2 Vdc	S3, S4, S5, S6, S9, S10
+ Vdc	S1, S3, S5, S6, S9, S10
0	S1, S2, S5, S6, S9, S10
- Vdc	S1, S2, S5, S6, S9, S10
-2 Vdc	S1, S3, S5, S6, S9, S10
-3 Vdc	S3, S4, S5, S6, S9, S10
-4 Vdc	S1, S2, S5, S7, S9, S10
-5 Vdc	S1, S3, S5, S7, S9, S10
-6 Vdc	S3, S4, S5, S7, S9, S10
-7 Vdc	S1, S2, S7, S8, S9, S10
-8 Vdc	S1, S3, S7, S8, S9, S10
-9 Vdc	S3, S4, S7, S8, S9, S10
-10 Vdc	S1, S2, S5, S6, S9, S11
-11 Vdc	S1, S3, S5, S6, S9, S11
-12 Vdc	S3, S4, S5, S6, S9, S11
-13 Vdc	S1, S2, S5, S7, S9, S11

The switching chronology of 27-level CHBMLI is shown in Table IV .Operating gate signals of the switches according to the Switching chronology gives 27 levels in the obtained output.

III. DESIGN OF CONTROL ALGORITHM

A controller is developed using embedded function coding to generate the gating signals for different switching topologies of CHBMLI. This embedded code can be directly uploaded to any microcontroller. According to the control algorithm 3-level ,5-level ,17-level and 27- level CHBMLI is simulated in MATLAB/SIMULINK to get the desired output.

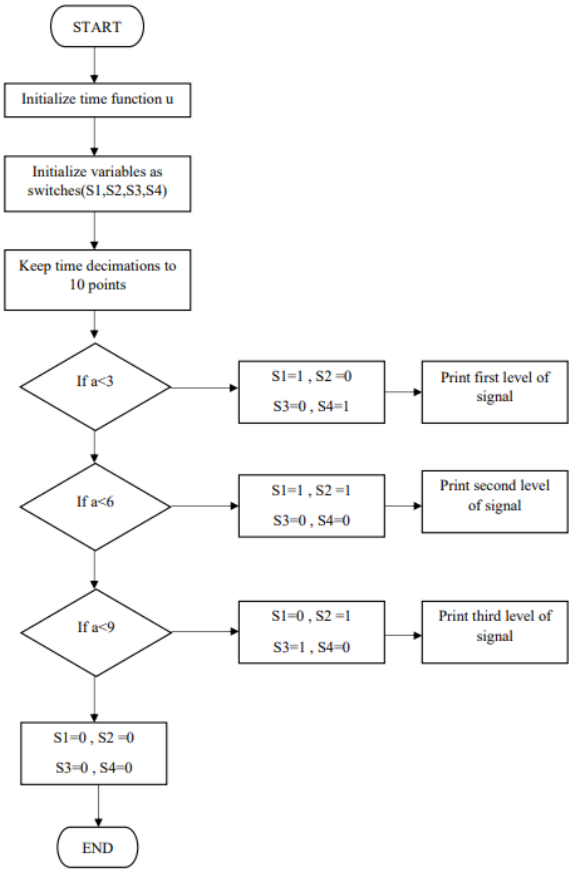


Fig. 5 Flow chart for triggering the switching pulses for 3-level CHBMLI

Flow chart for triggering the switching pulses for 3-level CHBMLI is shown in fig. 5. At first time function is initialized and then variables are initialized as switches(S1, S2, S3, S4). Time decimation is kept to 10 points.3-level CHBMLI has 3 intervals at first if the condition a<3 satisfies the switches S1 and S4 are triggered and generates first signal i.e. + Vdc next if the condition a<6 satisfies the switches S1 and S2 are triggered and generates second signal i.e. 0 similarly if the condition a<9 satisfies the switches S2 and S3 switches turns ON generating the third signal i.e. – Vdc. If no conditions are satisfied all the switches are in the OFF state. Similarly 5-level has 5 intervals, 17-level has 17 intervals and 27-level has 27 intervals and the conditions are applied according to the switching states and the signals are generated in the output .

IV. RESULTS AND DISCUSSION

CHBMLI for 3-level, 5-level 17-level and 27-level are simulated in MATLAB/SIMULINK platform. Fig 6(a), 6(b), 6(c), and 6(d) shows the Simulink model of 3-level, 5-level, 17 level and 27-level CHBMLI Respectively. Embedded function block is used for producing the switching sequence.3-level has single DC voltage of 1V , 5-level has 2 DC voltages of 1V and 3V ,17-level and 27-level has 3 DC voltages of 1V, 3V and 9V. .

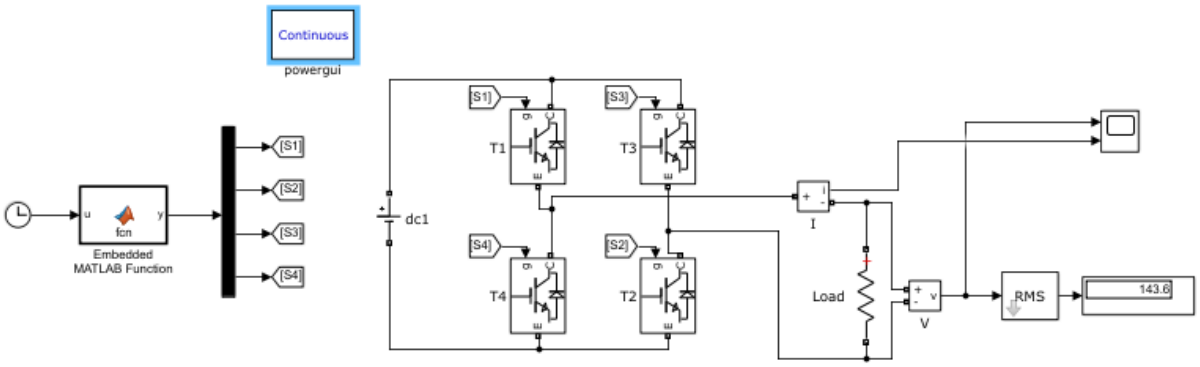


Fig 6(a)simulated model of 3-level CHBMLI

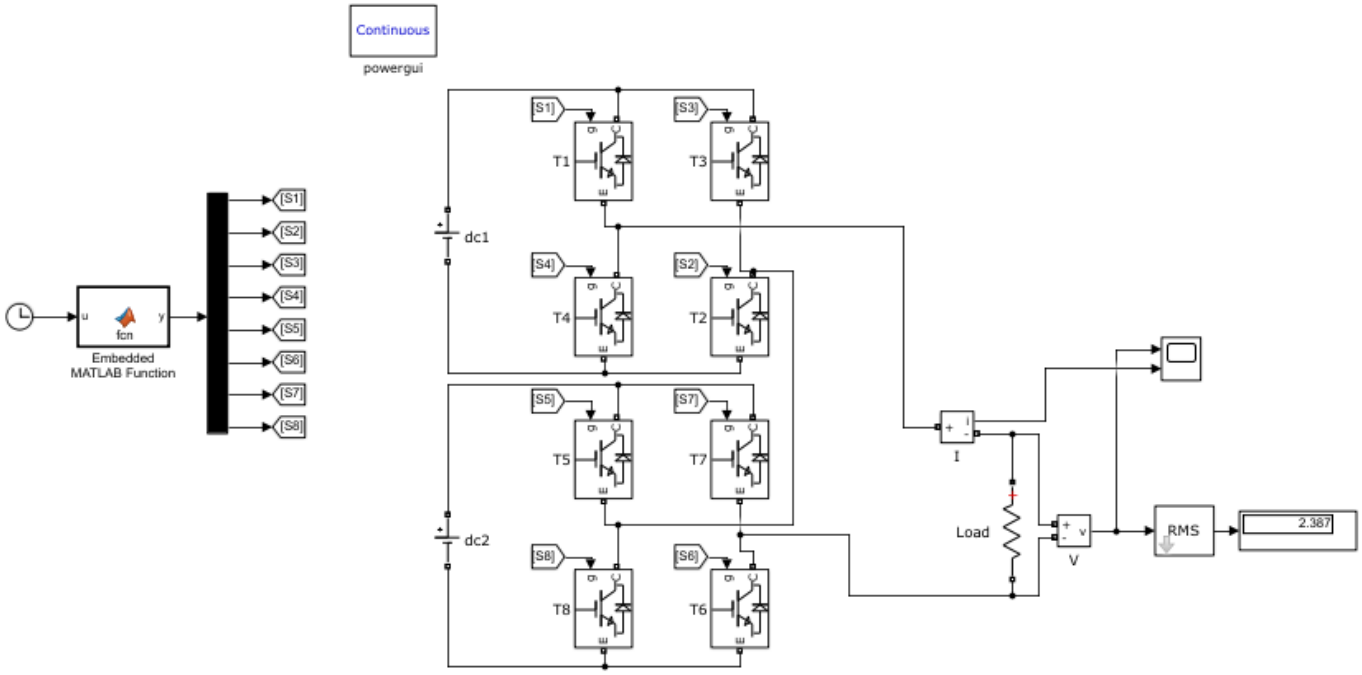


Fig 6(b) Simulated model of 5-level CHBMLI

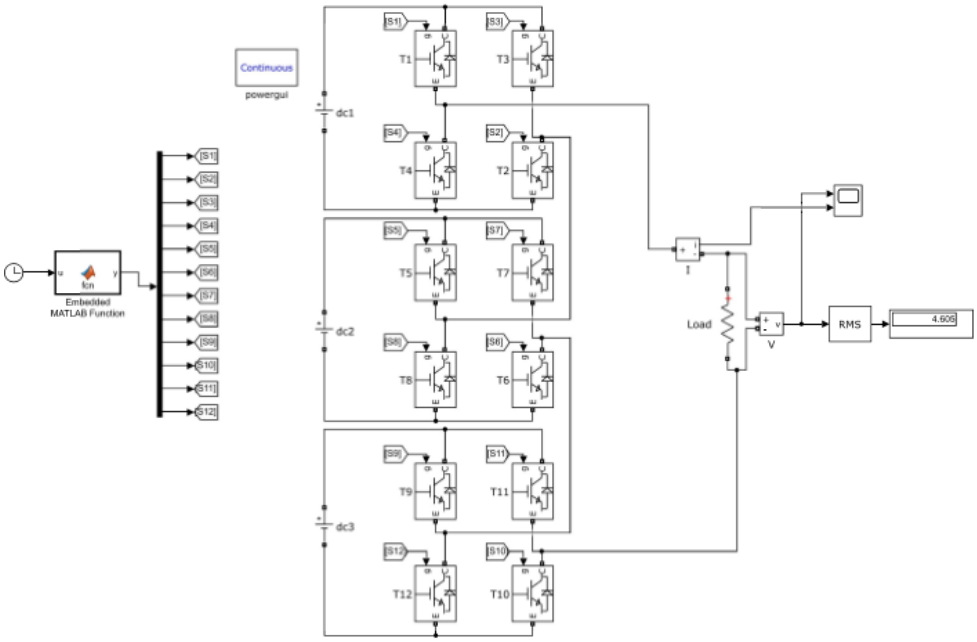


Fig 6(c) Simulated model of 17-level CHBMLI

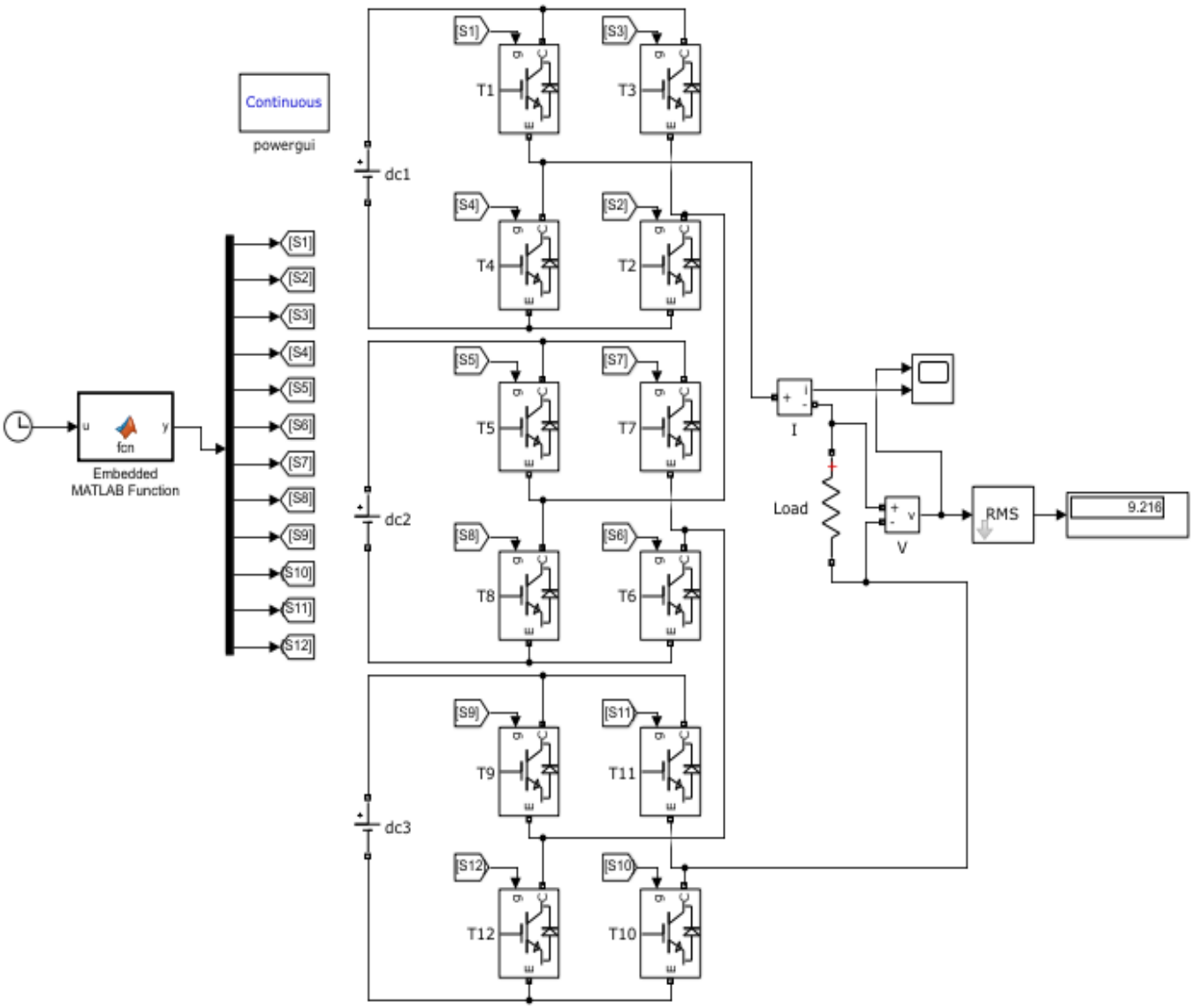
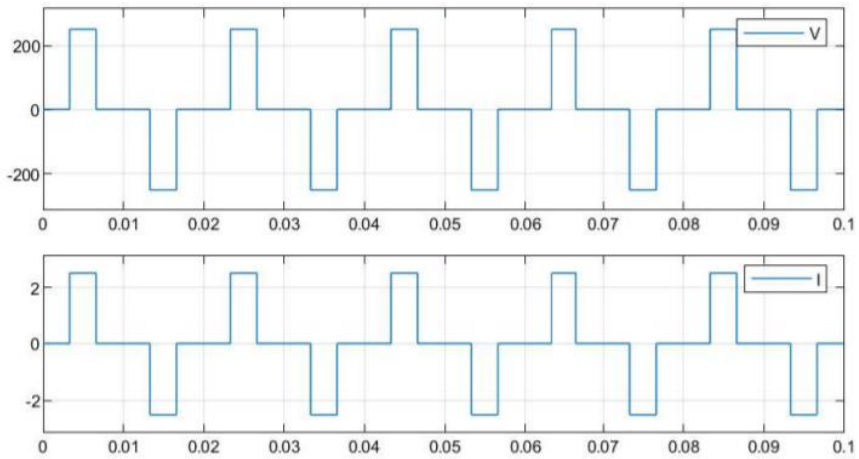


Fig 6(d) Simulated model of 27-level CHBMLI



7(a)output waveform of 3-level CHBMLI

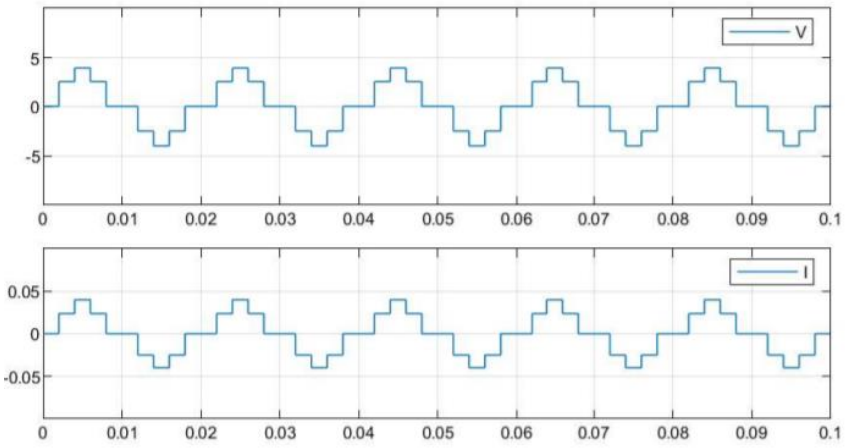


Fig 7(b)Output waveform of 5-level CHBMLI

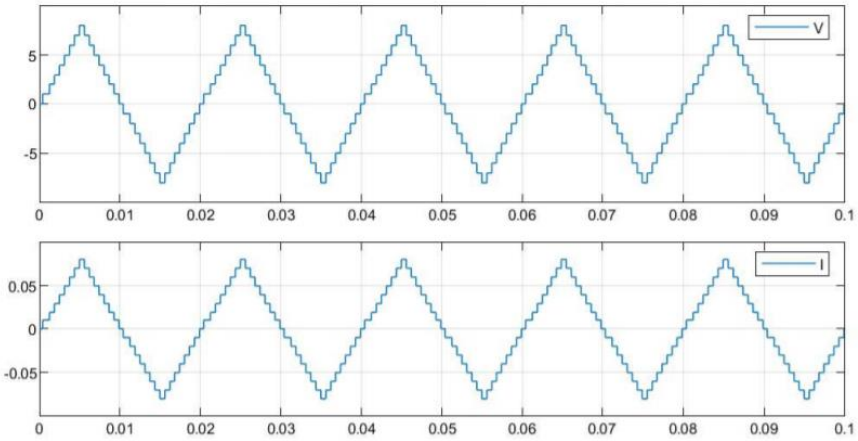


Fig 7(c)Output waveform of 17-level CHBMLI

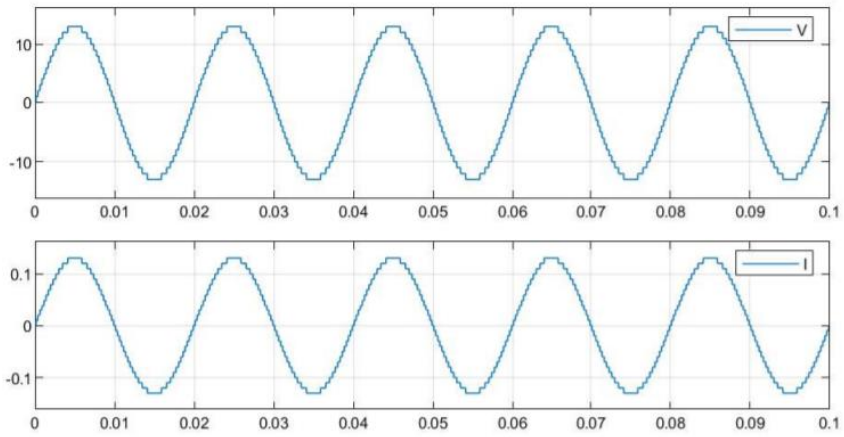
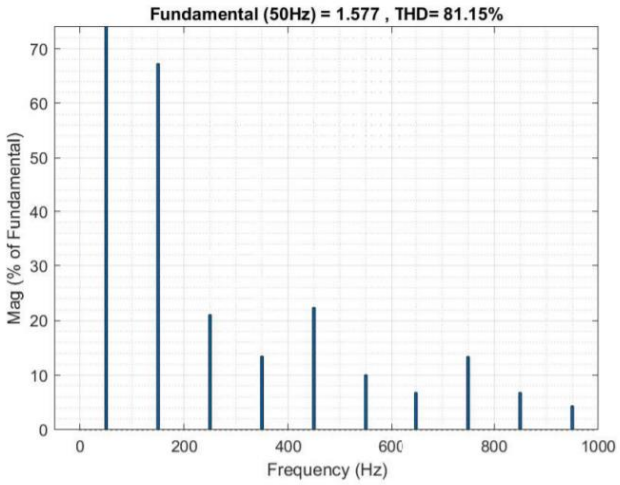
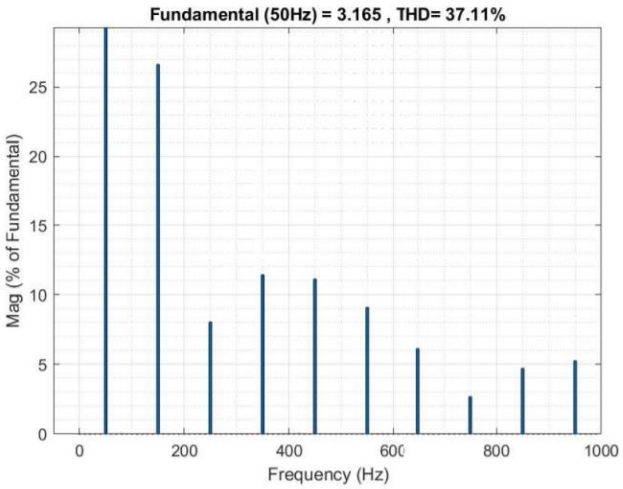


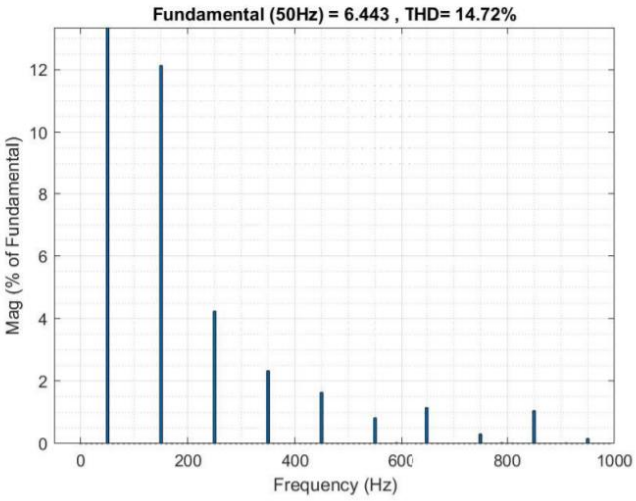
Fig 7(d)Output waveform of 27-level CHBMLI



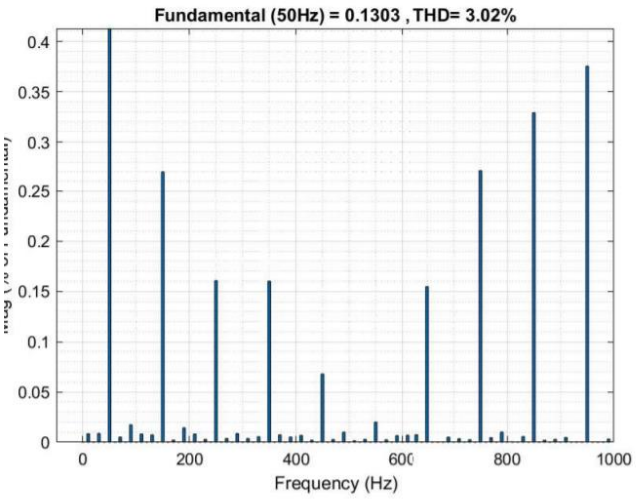
8(a) THD of 3-level CHBMLI



8(b) THD of 5- level CHBML



8(c)THD of 17-level CHBMLI



8(d) THD of 27-level CHBMLI

Fig 7(a), 7(b), 7(c) and 7(d) shows the output waveforms of 3-level, 5-level, 17-level and 27-level CHBMLI. It is clear from the waveforms that there is a significant change from 3-level to 27-level CHBMLI. So we can say that maximizing the number of steps in the output makes the waveforms more sinusoidal.

Fig.8(a), 8(b), 8(c) and 8(d) shows the Total harmonic distortion of 3-level, 5-level, 17-level and 27-level CHBMLI respectively. According to the IEEE Standards the Value of THD must be less than 5% for any kind of topology. From the figure we can note that the THD of 3-level is 81.15% , THD of 5-level is 37.11%, THD of 17-level is 14.72% and THD of 27-level is 3.02% and identify that the THD is much reduced from 3-level to 27-level.Greater the number of levels lesser the Total Harmonic distortion. Decrease in THD increase the power quality also improves efficiency.

V. CONCLUSION

The comparison of simulation results of different levels of CHBMLI obtained on MATLAB/SIMULINK platform shows that maximizing the levels makes the output waveform more sinusoidal. It is concluded that the proposed controller helps to minimize the total semiconductor devices which reduces cost and complexity of the circuit. From the graphs we can conclude that Total Harmonic Distortion decreases with the increase in the levels. Finally we can conclude that the execution of the designed controller increases the overall performance.

REFERENCES

[1] Espinoza. J.R., “Inverters,” Power Electr. Handlook, MH Rasid (Ed.), pp. 225-269, 2001.

[2] Mahesh kumar,”Comparision , simulation and hardware setup for single phase cascaded multilevel inverter with less switches” 2017 international conference on smart technology for smart nation,978-1-5386-0569-1$31.00©2017 IEEE.

[3] Parimal.H. Patil, Mini Rajeev “ Comparision of three different topologies of a five level multilevel inverter “ International Journal of engineering Research and technology ISSN: 2278-0181. ICNET-2015 conference proceedings.

[4] Suraj Raiyani , Ravindra Gamit , Balvant Solanki , G Pradeepa “ A Technological Review : on Cascaded H Bridge Multilevel Inverters(IJIRST / Volume 3/ Issue 12/03).

[5] Aparna Prayag , Sanjay Bodkhe, “ A comprative study of symmetrical and asymmetrical cascaded H Bridgr Multilevel Inverter Topology for Industrial Drive” (IRJET Volume: 05 Issue 02/Feb 2018.

[6] Ujwal Kumar Kalla , Avanti Verma , Bhim Singh , Keshav Joshi, “ A Controller for cascaded H Bridge Multilevel Inverter 978-1-4673-8962-4/16$31.00 ©2016 IEEE.

[7] S. Maurya, D. Mishra, K. Singh, A. K. Mishra and Y. Pandey, "An Efficient Technique to reduce Total Harmonics Distortion in Cascaded H-Bridge Multilevel Inverter," 2019 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT), Coimbatore, India, 2019, pp. 1-5, doi: 10.1109/ICECCT.2019.8869424.

[8] M. Aalami, E. Babaei and M. Sabahi, "Design of a new combined cascaded multilevel inverter based on developed H-bridge with reduced number of IGBTs and DC voltage sources," 2018 IEEE 12th International Conference on Compatibility, Power Electronics and Power Engineering (CPE-POWERENG 2018), Doha, Qatar, 2018, pp. 1-6, doi: 10.1109/CPE.2018.8372571.

[9] S. N. Dehedkar and A. G. Thosar, "Simulation of Single Phase Cascaded H-Bridge Multilevel Inverters & THD Analysis," 2018 International Conference on Emerging Trends and Innovations In Engineering And Technological Research (ICETIETR), Ernakulam, India, 2018, pp. 1-6, doi: 10.1109/ICETIETR.2018.8529116.

[10] A. Anan, T. K. Chakraborty and K. Sultan Mahmood, "A Single-Phase Cascaded H-Bridge Multilevel Inverter with Reduced Switching Devices and Harmonics," 2018 IEEE International Conference on Smart Energy Grid Engineering (SEGE), Oshawa, ON, Canada, 2018, pp. 222-225, doi: 10.1109/SEGE.2018.8499512.

[11] T. V. Kiran and N. Babji, "Design of a novel cost effective cascaded H-Bridge multilevel inverter topology," 2016 International Conference on Signal Processing, Communication, Power and Embedded System (SCOPES), Paralakhemundi, India, 2016, pp. 726-731, doi: 10.1109/SCOPES.2016.7955535.

[12] S. Mamilla, S. K. Anisetty and K. S. Gowri, "A new generalized cascaded multilevel structure for single phase H bridge inverter," 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS), Chennai, India, 2017, pp. 31-36, doi: 10.1109/ICECDS.2017.8390161.

[13] A. Anan, T. K. Chakraborty and K. Sultan Mahmood, "A Single-Phase Cascaded H-Bridge Multilevel Inverter with Reduced Switching Devices and Harmonics," 2018 IEEE International Conference on Smart Energy Grid Engineering (SEGE), Oshawa, ON, Canada, 2018, pp. 222-225, doi: 10.1109/SEGE.2018.8499512.

[14] T. V. Kiran and N. Babji, "Design of a novel cost effective cascaded H-Bridge multilevel inverter topology," 2016 International Conference on Signal Processing, Communication, Power and Embedded System (SCOPES), Paralakhemundi, India, 2016, pp. 726-731, doi: 10.1109/SCOPES.2016.7955535.

[15] S. Maurya, D. Mishra, K. Singh, A. K. Mishra and Y. Pandey, "An Efficient Technique to reduce Total Harmonics Distortion in Cascaded H-Bridge Multilevel Inverter," 2019 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT), Coimbatore, India, 2019, pp. 1-5, doi: 10.1109/ICECCT.2019.8869424.

Grain Dryer using Solar PV System

Vinayaka K S
Student
Electrical and Electronics engg.
Dayananda sagar college of engg
Banglore , India
vinayakavine03@gmail.com

Raghunath Reddy K
Asst. professor
Electrical and Electronics engg.
Dayananda sagar college of engg
Banglore , India
raghunath-eee@gmail.com

Devika p
Student
Electrical and Electronics engg
Dayananda sagar college of engg.
Banglore , India
devikasiri164@gmail.com

Shivu M S
Student
Electrical and electronics engg.
Dayananda sagar college of engg.
Banglore , India
shivums164@gmail.com

Rakesh J G
Student
Electrical and electronics engg.
Dayananda sagar college of engg.
Banglore , India
rakeshjavali.g777@gmail.com

***Abstract*: The solar grain drying system utilizes the solar energy to heat the heating coil, it consists of solar photovoltaic cells, buck converter, SPDT relay, LDR sensor, LCD display, voltage sensor, heating coil and grain cabinet. This module is more economical and efficient due to the utilization of solar energy for producing the heat. The prototype model has ability to dry the grains throughout a day by using the solar energy and also can be used utility supply. Due to the efficient way of heating the moisture gets removed from the grain chamber which results in better preservation of grains**.

Keywords: Solar panels, buck converter, battery, SPDT relay, Arduino UNO, LCD display, temperature sensor.

I. INTRODUCTION

The sun which produces the radiant light and heat which is known as solar energy, this solar energy can be used for solar heating, photovoltaic and solar thermal energy etc [1]. It is one of the most widely available renewable energy, the solar energy technologies are characterized as passive or active solar depending on their operation. The photovoltaic system, concentrated solar power and solar water heating, this system comes under the active solar techniques. The material which is favourable for thermal mass, light dispersing properties are comes under the passive solar techniques [2].

Upper atmosphere from the earth receives the 1360/W2 of solar radiation, the 30% of the incoming radiation are reflected back while at the same time remaining radiation is observed by the land, water bodies and clouds. In summer when the clear sky is present, we can achieve 800-1000 W/m2 [2][4]. The grain which are to be preserved for long time requires drying, by using the solar dryers drying can be done efficiently. In the earlier days people used the method called open sun drying in which they use the plastic or cloth mats and put the grains on it for drying, but this method has an effect like dirt, dust, insects and birds due to which results in loss of grains and quality of grains for storing [3].

The problem which are present in open sun drying can be overcome by the solar dryers, these solar dryers are more efficient than open sun drying and these dryers are better solution for the world for storing grains and foods [5][6]. As compare to open sun drying these dryers produce more temperature, low humidity and reduces spoilage of grains. The solar dryers have more temperature range than open sun drying this reduces the drying time.[7]

II. SIGNIFICANCE OF THE PROJECT

The purpose of storage is to provide the dried grain with the protection against the insects, birds and rodents and to prevent the moisture from re-entering the grains. if the drying is not done properly there will be losses.

Initially for drying crops in industries they use coal and wood has a fuel to generate the heat. This can be overcome by natural sun light drying, it is cost effective and it causes no pollution.

The natural sun light requires more time to dry the grains and it is only applicable in day time. In the worst condition like dust, water vapour etc can affect the drying. The efficiency of the open sun drying is very less, most of the farmers use open sun drying due to economic conditions. by using this prototype model grain dryer using solar PV module. In this we have a provision for day and night operation,

external power supply from mains and combined blower fan & heater (in a single module). This is automatic enough for switching between batteries for day and night operation using LDR sensor and the DC or AC supply from mains can be detected. This system can be operated at all weather conditions without disturbing the drying process

III. DESIGN OVERVIEW

The main objective of this paper is to make the work of formers and industries easy, faster and highly efficient in grain drying. The design mechanism takes less times to dry up grains using solar photovoltaic based drying as compared to traditional drying process. The components used are following: solar panel, buck converter, battery, LDR sensor, voltage sensor, NO NC relay, LCD display, temperature sensor, Arduino UNO, fan heater.

Functional block diagram:

Solar panel 1&2 which contains the solar cells those converts the solar energy from the sun into DC electricity with maximum voltage of 17V (each panel), depending on the solar radiation. The output from each solar panel varies from 0 –17V, this variable output voltage from the solar panel is given to their separate buck converter. The buck converter is a device which takes variable input voltage from solar panels and gives reduced constant output voltage 12V, the constant 12V output from the buck converter 1&2 is given to the two 7Ah 12V lead acid batteries, the batteries simultaneously get charge and gives out the 12V output. The 12V from the batteries is given to the SPDT relay1, the SPDT relay1, the SPDT relay1 switches between the two batteries depending upon the Arduino UNO signal. The Arduino UNO takes the input signal from the LDR sensor (which senses the day or night operation depending on light) and selects the battery1 or battery2 by operating the SPDT relay1. When SPDT relay1 is at NC position it selects battery1, the output from the battery1 is given to the heater and when it is at NO position the output from battery2 will give to the heater.

For alternative usage when there is no sun light available and bad climatic condition, the AC supply from the mains (230V) which can be stepdown and rectified by using stepdown transformer and rectifier. The 12V output from the rectifier is given to the voltage sensor which operates when power is not available from the panel and batteries are drained and this output from the rectifier is given to heater. The direct resistance heating method is used to supply the hot air.

The temperature inside the cabinet is sensed by the temperature sensor LM35, the output from the temperature sensor is given to the Arduino UNO and SPDT relay3. The SPDT relay3 switch OFF or ON the heater depending on the temperature inside the cabinet which is present, the variations in the temperature inside the cabinet will be displayed on the LCD. The hot air from the heater is given to the cabinet in which the grains are to be dried is placed.

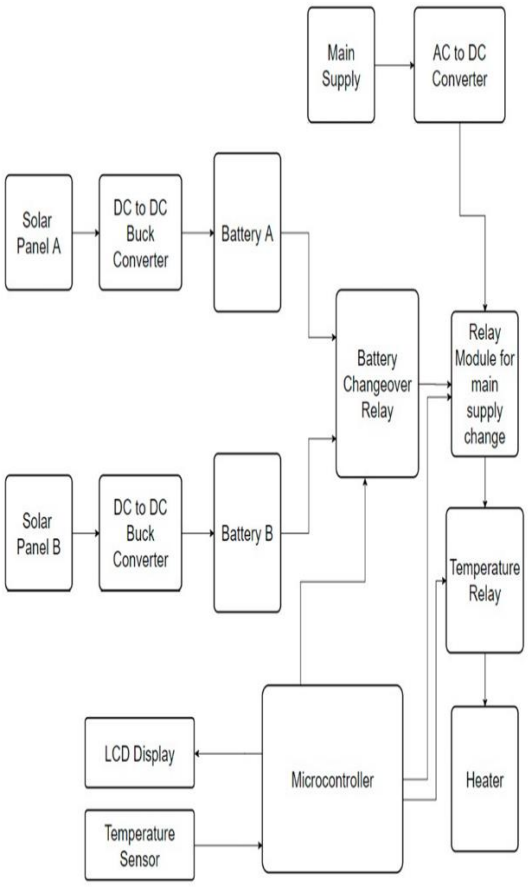


Figure 1: Functional block diagram

IV. APPLICATIONS AND ADVANTAGES

Applications

1. Agricultural applications
2. Industrial applications
3. Drying small quantity of grain in home
4. Remote places.

Advantages

1. Energy available is free and conventional.
2. Low operational cost

3. Can be used in remote areas
4. Drying is efficient with low cost of source.

V. RESULTS AND DISCUSIONS

1. For green grams: - when temperature maintained at 38° C

The below results we got for the green grams when the temperature is maintained at 38°C, this result is obtained for the temperature and time required for the green grams to dry. The total time required by the green grams for complete drying is approximately two & half hour (including heater on and off time).

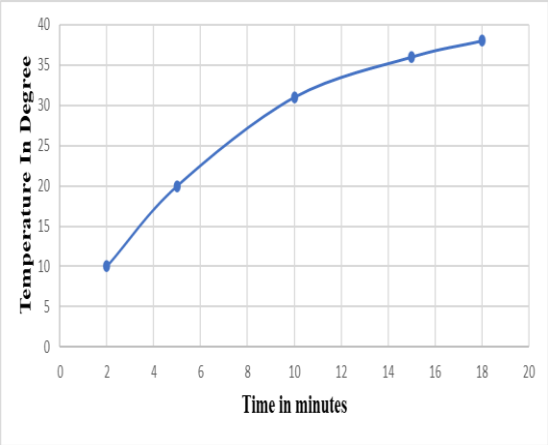


Figure 2: Green gram characteristics graph at 38°C

Tabular column 1:

SL.NO	Time in minutes	Temperature in degree
1	2	10
2	5	20
3	10	31
4	15	36
5	18	38

2. For green grams: - when temperature is maintained at 42°C

The bellow graph shows the result for the green grams which are dried at the temperature 42°C, as we observed that as the temperature increases the time required for drying decreases. For green grams to reach 42°C it requires 23 minutes and for total dying time is approximately one and half hour (including the heater on and off time). If the temperature reaches above 42°C the heater automatically gets turned off and protects the grains from over drying.

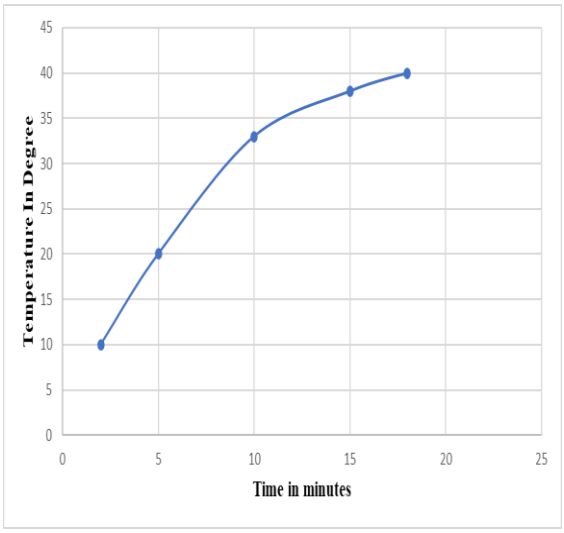


Figure 3: Green gram characteristics graph at 42°C

Tabular column 2:

SL.NO	Time in minutes	Temperature in degree
1	2	10
2	5	20
3	10	33
4	15	38
5	18	40
6	23	42

3.For hyacinth bean: - when the temperature is set for 38°C

The bellow graph is shown for the results obtained for hyacinth bean when it is maintained at the temperature of 38°C. This requires more time for reaching the 38°C as compare to the green grams. It reaches the 38°C approximately by 20-22 minutes. This hyacinth bean requires approximately three hours (includes heater on and off time) for total drying at 38°C temperature. Hence, we set the cut off temperature for this set of reading is 38°C, has the safety concern when the temperature reaches above 38°C the heater gets turned off and when it reaches below 35°C its again turned on.

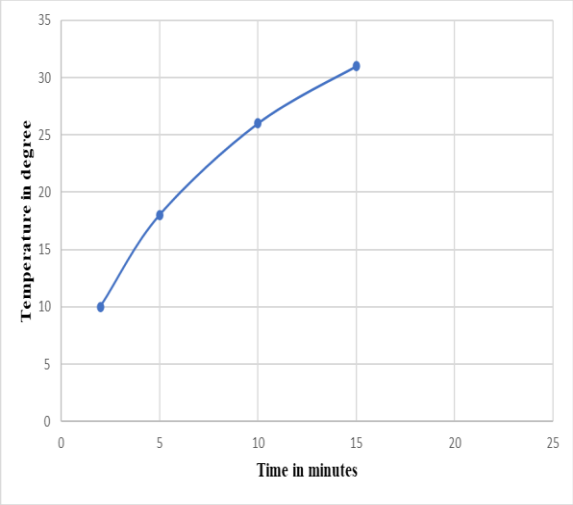


Figure 3: hyacinth bean characteristics graph at 38°C

Tabular column 3: -

SL.NO	Time in minutes	Temperature in degree
1	2	10
2	5	18
3	10	26
4	15	31
5	20	38

4.For hyacinth bean: - when temperature is maintained at 42˚C

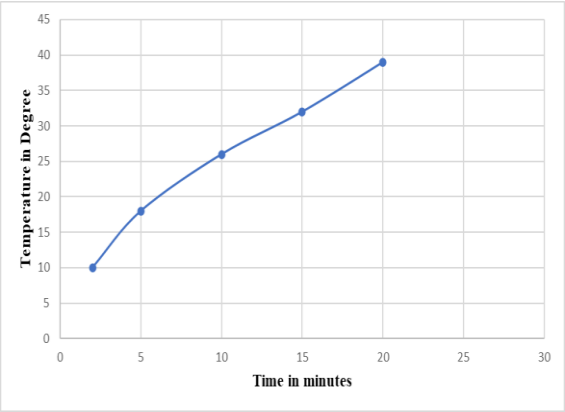


Figure 4: hyacinth bean characteristics graph at 42°C

Tabular column 4: -

SL.NO	Time in minutes	Temperature in degree
1	2	10
2	5	18
3	10	26
4	15	32
5	20	39
6	24	42

The above graph is shown for the results obtained for hyacinth bean when temperature is maintained at 42^0C. It reaches to 42^0C approximately by 24-25 minutes and this hyacinth bean requires two hours & 20 minutes for total drying which includes the heater on and off time when the temperature is set at 42^0C. The heater gets turned off when reaches above 42^0C and it automatically gets turned on when the temperature drops below 37^0C and this set up is made because to overcome the uneven drying of grains.

The results of the project which is used to determine the drying of grains with better efficiency and time are discussed in this chapter. Experimental data have been analysed based on the different set of readings we got for different temperature and different grains, for better analysis we have presented in the form of tabular column and graph. When we conduct the experiment for drying grains, we kept the temperature at constant and for different results we changed the temperature. In this condition we came to know that as we increase the temperature the time required for the operation reduces and as we reduce the temperature the drying time increases. As we came to know from the results the temperature outside the cabinet can also affect or make changes for the drying operation. Setting the temperature for different grains may result in better drying like if the grains have more moisture then they have to be dried at high temperature and if they have less moisture content, they can be dried at low temperature

V. CONCLUSION AND FUTURE WORK

The project model results in the performance of the forced air circulating solar PV dryer using solar energy are presented and explained in this project. Experimental data is analysed and presented; we can use IOT based technique for remote operation. Overall view is that we can use renewable energy as solar which as more advantages, using this solar energy all the cereal crops give more yields if they are harvested at optimum moisture content which

gives higher yields than usual storage. This minimizes the agricultural losses.

Future scope of this project:

The humidity sensor can be implemented to know the accurate amount of heat present in the cabinet along with the present temperature sensor.

The WI-FI module can interfaced with Arduino UNO for easy operation and control of the dryer module.

The conveyer belt is used for the movement of grains by using suitable motors for easy removing of grains from the cabinet.

The components ratings will be increase to implement this project model into the industrial or farmer use.

VI. ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible. I consider it as a privilege to express few words of gratitude and respect to all who guided and inspired me in the completion of the project work. I express my sincere thanks to my beloved Principal Dr. C P S Prakash for giving the valuable support and encourage for our project. We are extremely grateful to Dr. P. Usha, Head of the Department (EEE). We would like to express profound gratitude to our guide, Prof. Raghunath Reddy K, Department of Electrical and Electronics Engineering, for his valuable support, supervision and suggestions throughout the process of this project. We are also thankful to all the authors of the papers and textbooks that we have referred to complete the project.

VII. REFERENCE

[1] A review on the complementarity of renewable energy source, in solar energy 195(2020) 703-724 by J. Jurasz, F.A. Canales, A. Kies, M. Guezgouz, A. Beluco.
[2] Solar cells in research and applications, in materials science and applications, 2015, volume 6, 1145-1155.
[3] Solar drying, in solar energy volume 85(2011) 1665-1691.
[4] Photovoltaic conversion of concentrated sunlight by VM Andrew.
[5] Design and fabrication of experimental dryer for studying agricultural products, in international journal of agriculture vol.10(1), 61-65, by AR Yadollahinia, Mahmoud Omid.
[6] Improvement on the design of a cabinet grain dryer, in January 2009 by Adzimah Kwasi Stephen and Emmanuel Seckley.
[7] Design and Development of Solar Powered Automatic Grain Dryer for Storage, Conference Paper · August 2019
[8] Design and simulation of dc-dc converters, in International Research Journal of Engineering and Technology (IRJET), Volume 03, Issue January-2016 by Shafinaz A. Lopa, S. Hossain, M.K. Hasan, T.K. Chakraborty.
[9] Analysis and design of dynamic buck converter with change in value of load impedance, in procedia engineering volume 170 (2017) 398- 403 By Cristri, A.W, Iskandar. R.F.
[10] Performance analysis of dc-dc buck converter for renewable energy applications, in International Conference on Green and Sustainable Computing (ICOGES) 1019 (2018) by N.H. Baharudin, T M N T Mansur, F A Hamid, R Ali.
[11] Design and implementation of lead acid battery state of charge, state of health and state of charge measurement, published by IEEE in 2017 by Gabriel L. Bressanini, Tiago D.C Busarello.
[12] The charging- discharging behaviour of the lead acid cell with electrodes based on carbon matrix, in Journal of Solid-State Electrochemistry (2018) volume 22, 703- 2714, by Andrzej Czerwinski, Justyna Wrobel.
[13] Light dependent resistance as a sensor in spectroscopy setups using pulsed light, in sensors article (2006) volume 6, 514-525, by Deric Felix da Silva and Daniel Acosta-Avalos.
[14] Working principle of Arduino and using it as a tool for study and research, in international journal of control, automation, communication and systems (IJCACS), volume1, no2, April-2016, by Leo Louis.
[15] Analysis of controlled single-phase full wave rectifier with RL load, in European journal of engineering research and science (EJERS) volume3, no12, December 2018 by Onah Aniagboso John.

DESIGN AND IMPLEMENTATION OF MODERN AGRICULTURAL TECHNIQUES FOR CROP PROTECTION USING IOT

LAKSHMI K[*1] , GEETHA K S[2] , PRAMILA[3] , VINUTHA S[4]

Department of Electrical and Electronics Engineering , Sri Krishna Institute of Technology
No.29,chimney hills, hessarghatta main road, post, chikkabanavara, bengaluru, 560090 India
[1]llakshmik8@gmail.com [2]geethagowda008@gmail.com [3]pammipramilla17@gmail.com
[4]Vinuthaeee@skit.org.in

Abstract **-This project presents a collaborative system made up of a Wireless Sensor Network (WSN) using temperature and air or dust sensor. In this project depending on nature variation, sensor detects the value and takes the decision to protect the crop by opening and closing the sheet or panel through dc motor. And also send the alerts to user through IOT. Our project deals with agriculture. this problem has captured farmer's interest to implement agro-environmental remote monitoring method in their agriculture industries. Our main aim is to directly interact with the farmers and to make their work easy. This is done by intimating the farmers using mobile phones about soil moisture, temperature, weather condition and also about the motor level condition. We will send an alert message to farmers as text so that they can maintain their land properly Using IOT, the farmer will be able to monitor whenever he is unavailable to maintain his land. The farmers can access their land from anywhere. He will be asked to monitor using IOT. this project presents a system for detection and controlling of diseases on leaf along with soil quality monitoring through Matlab.**

Keywords – Wireless Sensor Network, Sensors, IOT, Matlab.

I. INTRODUCTION

Plant protection is a mandatory thing in agriculture in order to intimate the farmers about their crops, the farmers should login to the website using particular username and password so that he can see the details that include date, time and data when is sent by the Arduino from which they can monitor their lands in a easy way. In this project we are proposing the system which prevents the spoilage of crops due to heavy rains and sun rays. This is achieved with embedded system design using IOT technology. The actual concept of this project is protecting the crops from heavy rainfall and sun rays by covering the field automatically and also to save the collected rain water. In order to achieve this, in this system we use IOT, sensor and soil moisture sensor.

II. LITERATURE REVIEW

Sensors are used to monitor different conditions of environment like water level, humidity, temperature etc., The processors ATMEGA8535 and ICS8817 BS, analog to digital conversion and wireless sensor nodes with wireless transceiver module based on Zig bee protocol are used in the designing the system. Database and web application is used to retrieve and store data. In this experiment the sensor node failure and energy efficiency are managed [1].

The system performs data acquisition, processing, transmission and reception functions. The aim of their experiments is to realize greenhouse environment system, where the of system efficiency to manage the environment area and reduce the money and farming cost and also save energy. IOT technology here is based on the B-S structure and cc2530 used like processing chip to work for wireless sensor node and coordinator. The gateway has Linux operating system and cortex A8 processor act as core. Overall the design realizes remote intelligent monitoring and control of greenhouse and also replaces the traditional wired technology to wireless, also reduces manpower cost.[2].

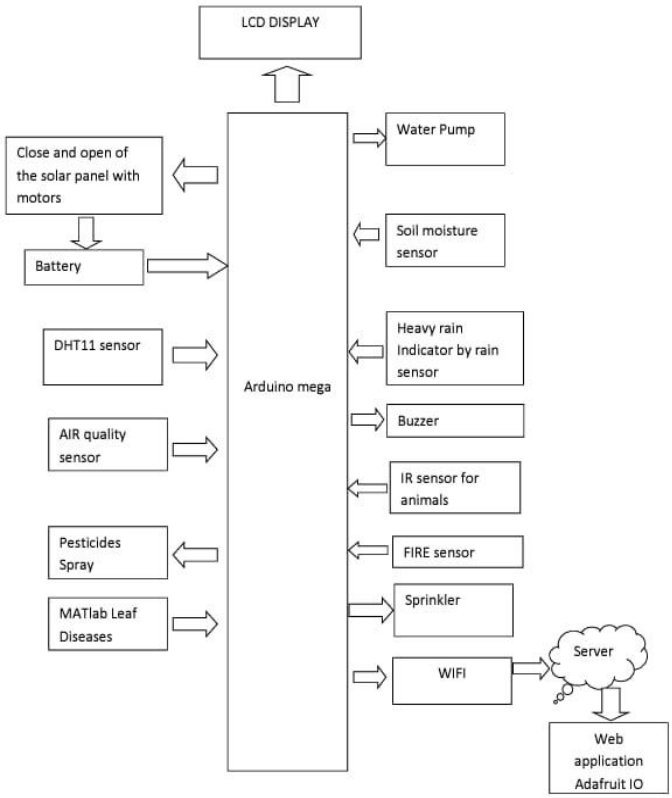
This system uses the integration of the both wired and wireless techniques and ARM controller to have regular

monitoring on the environmental conditions of farm and also provides the necessary precautions to be taken for yield to increase for modern agriculture [3].

The object is to focuses on a method for developing a smart environment to monitor the irrigational parameter in the entire field. The system also aims on reducing the energy consumption and the cost of communication[4]

The design and the implementation of a Wireless Sensor Network that monitors the air temperature, humidity and ambient light intensity in a crop field and from remote places[5].

III. PROPOSED SYSTEM



Block diagram

IV. HARDWARE USED

Arduino Mega 2560

Itis a microcontroller board based on the ATmega2560 (datasheet).It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analoginputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, apower jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-DC ACto-DC adapter or battery to get started.

NodeMCU v2 WIFI MODULE

The NodeMcu is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines

Soil moisture sensor

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors.This Soil Moisture Sensor can be used to detect the moisture of soil or judge if there is water around the sensor, let the plants in your garden reach out for human help. Insert this module into the soil and then adjust the on-board potentiometer to adjust the sensitivity. The sensor would outputs logic HIGH/LOW when the moisture is higher/lower than the threshold set by the potentiometer. With help of this sensor, it will be realizable to make the plant remind you : Hey, I am thirsty now, please give me some water.

Waterpump 5VoltswaterPumpMotor

MQ135 Gas sensor

array (Sno2type) detects aroma which is emitted from the fruits in the different ripening stages of the fruits. The typical gases emitted from the fruits ex; alcohol, methane, carbon dioxide, ammonia and carbon monoxide, have been detected by the sensor array.

DHT11 Humidity &Temperature Sensor

DHT11 Temperature & Humidity Sensor features a temperature & humidity sensorcomplex with a calibrated digital signal output. By using the exclusive digital-signal-acquisitiontechnique and temperature & humidity sensing technology, it ensures high reliability andexcellent long-term stability. This sensor includes a resistive-type humidity measurementcomponent and an NTC temperature measurement component, and connects to a highperformance8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

Obstacle sensor

Ranging sensors include sensors that require no physical contact with the object being detected. They allow a robot to see an obstacle without actually having to come into contact with it. This can prevent possible entanglement, allow for better obstacle avoidance (over

touch-feedback methods), and possibly allow software to distinguish between obstacles of different shapes and sizes. There are several methods used to allow a sensor to detect obstacles from a distance.

Fire sensor

The Fire sensor is used to detect fire flames. The module makes use of Fire sensor and comparator to detect fire up to arrange of 1 meters.

Buzzer

It is an electrical device which makes sound. In this project when fruit is artificially or natural in detected buzzer will turn on. The volume of the Buzzer container will be manually adjusted so that you can create the correct volume for the area. This ensures so as to the proper volume level is achieved for a particular area.

Sprinkler

It is a device used to irrigate agricultural crops, lawns, landscapes, golf courses, and other areas. They are also used for cooling and for the control of airborne dust. Sprinkler irrigation is the method of applying water in a controlled manner in way similar to rainfall. The water is distributed through a network that may consist of pumps, valves, pipes, and sprinklers.

Battery

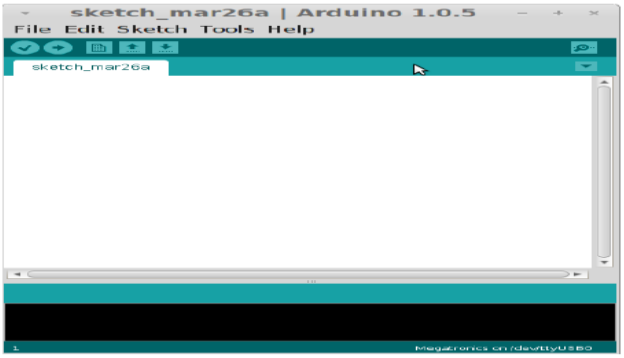
The power source consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy.

V. SOFTWARE USED

Arduino IDE

Arduino is an open-source project, enabling hobbyists to easily take advantage of the powerful Atmega chips. The Arduino IDE is the software where you can write code and upload it to the Atmega chip. The code is then executed on the chip.

Most 3D-printer electronics are Arduino-compatible, they use the Atmega chip and enable the user to upload their code using Arduino. This includes Megatronics, Minitronics and RAMPS



Before you can start using the electronics you need software 'firmware', that translates machine instructions (gcode) into actual movements. There are a few options here, including Marlin and Sprinter and Repetier. The actual firmware is not discussed in this document. You can use Arduino to upload this firmware onto your electronics. This document will guide you in the steps you need to take.

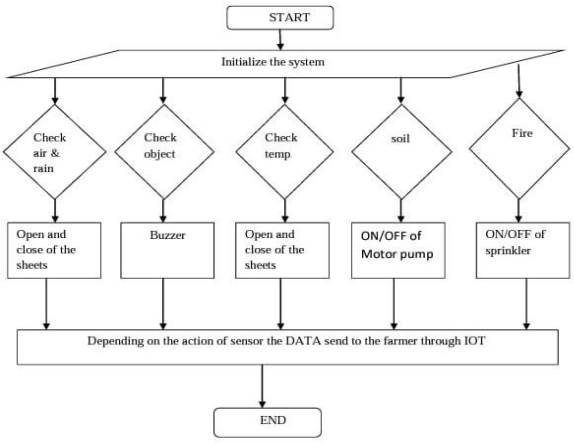
Adafruit IO

It is a system that makes data useful. Our focus is on ease of use, and allowing simple data connections with little programming required.

IO includes client libraries that wrap our REST and MQTT APIs. IO is built on Ruby on Rails, and Node.js. Adafruit IO is currently in beta. If you would like to join the beta, head over toadafruit.com to sign up (http://adafru.it/eZ8).

Please keep in mind that Adafruit IO is still in the beta testing stage.

VI. METHODOLOGY

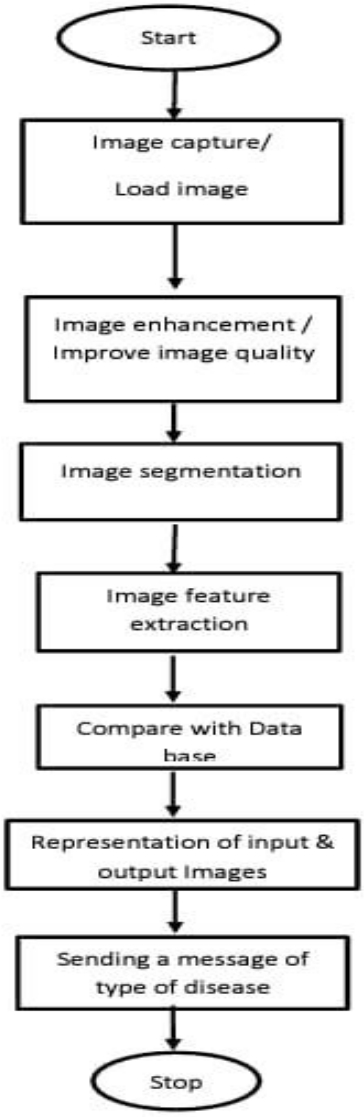


VII. MAT LAB

It is a high-performance language for technical computing. It integrates computation, visualization, and programming environment. Furthermore, MATLAB is a modern programming language environment it has sophisticated data structures, contains built-in editing and debugging tools, and supports object-oriented programming. These factors make MATLAB an excellent tool for teaching and research.

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning.

VIII. FLOW CHART OF LEAF DISEASE



IX. Experimental results



Fire sensor output



Temperature sensor output



Leaf Diseases

X. CONCLUSION

1. This IOT based agriculture monitoring system serves as a reliable and efficient system for monitoring agricultural parameters.
2. The corrective action can be taken and reduce the human power, but it also allows user to see accurate changes in it.
3. It is cheaper in cost and consumes less power. The GDP per capita in agro sector can be increased.

XI. FUTURE SCOPE

• Detection of soil moisture level can be added to the system.

• Control of water usage by using temperature level and humidity level.

• This can be extended for cattle monitoring.

XII. REFERENCES

[1] Balaji Banu, G Naveen Balaji, V Nandhini, S.Mithra, N. Priya, IEEE vol- issue-1,2018 "Designed a Wireless Sensor Networks To Observe The Conditions Of The Farming And Increasing The Crop Yield And Quality"

[2] Liu Dan,Joseph Haule, Kisangiri Michael and Wang Weihong, Cao Shuntian -"Intelligent Agriculture Green House Monitoring System Based On ZigBee Technology".

[3] Prabha and her group members published on Real-Time Atomization Of Agricultural Environment For Social Modernization Of Indian Agricultural System Using Arm 7.

[4] Angel C and her teammate Asha S published a research on developing a smart environment in agricultural irrigation technique.

[5] M.Munnira Sulthana, E.Ramakalaivani and A.V.S. Elavarasi presented "Wireless Sensor Network For Remote Monitoring Of Crop Field".

[6] Y. Erdem, L. Arin, T. Erdem, S. Polat, M. Deveci, H. Okursoy and H. T. Gültas, Crop water stress index for assessing irrigation scheduling of drip irrigated broccoli (Brassica oleracea L. var. italica), Agriculture. Water Manage., vol. 98, no. 1, Dec. 2010, pp. 148–156.

[7] S.L Davis and M. D. Dukes, Irrigation scheduling performance by evapotranspiration- based controllers, Agriculture. Water Manage., vol. 98, no. 1, Dec. 2010, pp. 19–28.

[8] X. Wang, W. Yang, A. Wheaton, N. Cooley and B. Moran, Efficient registration of optical and IR images for automatic plant water stress assessment, Computer. Electron. Agriculture., vol. 74, no. 2, Nov. 2010, pp. 230–237.

[9] K.W Migliaccio, B. Schaffer, J. H. Crane and F. S. Davies, Plant response to evapotranspiration and soil water sensor irrigation scheduling methods for papaya production in south Florida, Agriculture. Water Manage., vol. 97, no. 10, Oct. 2010, pp. 1452–1460.

[10] A.S O'Shaughnessy and S. R. Evett, Canopy temperature based system effectively schedules and controls center pivot irrigation of cotton, Agriculture. Water Manage., vol. 97, no. 9, Apr. 2010, pp. 1310–1316.

ARTIFICIAL EYE FOR BLIND ULTRASONIC VIBRATOR GLOVE

AISHWARYA GUPTA[1], AKSHATA SHENOY K[2], BHOOMIKA M C[3], CHAITANYA D R[4], ASHWINI C*[5], Dr. K N RAVI*[6]
*8TH Semester, Professor**
Department of EEE, Sapthagiri College of Engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India
[1]aishwaryagupta565@gmail.com
[2]akshatashenoyk@gmail.com
[3]bhoomi12031999@gmail.com
[4]chaichaitanyachaitu@gmail.com
[5]ashwinic@sapthagiri.edu.in
ravi.ushi@gmail.com

Abstract: **According to WHO 49 million people are estimated as blinds worldwide. They suffer a lot of hardships in their daily life. It is difficult for them to do their work, to walk and also due to this they suffer with many different problems. Due to lack of visual sense a lot of people to be a victim of road accidents. Well governments are working hard to decrease the number of blind pedestrian accidents. Many projects have already been made to help blind people like white cranes, trained dogs etc. The affected ones have been using these traditional white canes and other invented devices for many years which although being effective, but still has a lot of disadvantages. With the help of the multi-discipline subjects like computer science, electronics engineering and health science here we are proposing "Artificial Eye for Blind-Ultrasonic Vibrator Glove" which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles. This project is designed to help the blind to overcome the lack of visual sense, by using other senses like sound and touch. In the system we have used the devices which aid in calculation of the distance between the obstacle and the device; then alerts the person by its audio and vibration quality. Thus this device will be of a great use for the blinds and help them travel different places.**

Keywords: Arduino UNO, ultrasonic, buzzer, vibration.

I. INTRODUCTION

For blind people to walk freely is not less than a challenge due to lack of information about obstacles. They always need an external assistance like a person or trained dog with them who can help them to navigate their way. Eyes are the prime sense of organ in perceiving the outside environment; dis-function of such prime sense organ severely affects people. The main problem of blind people is how to navigate their way to wherever they want to go. Blind people mostly use cranes but unfortunately it is also limited resource and cannot provide proper navigation. Also, the use of cranes, dogs or external assistance are very costly that a normal person cannot afford.

This project is to design a product which is very useful, effective and efficient for blind people who often have to rely on others. 'Artificial Eye for Blind' project is an innovation which helps blind people to move around and go from one place to another with speed and confidence by knowing the nearby obstacles. For sensing the distance the system uses a HC-SR04, an Ultrasonic Range Finder Distance Sensor Module. The sensor module is designed to measure the distance using the principle of SONAR or RADAR, of using ultrasonic wave to determine the distance of an object. The system also consist a buzzer to generate an alarm sound and a motor to generate vibration signals to notify user about obstacles through buzz sound and vibrations. Thus it allows the user to walk freely by detecting the obstacles. They only need to wear this device as a band or cloth on their body. Even though there are so many technologies, things and smart devices for blind people for the navigation in current world, they are not affordable, need a lot of training and efforts to use. This is a wearable device and affordable by everyone is the main purpose of this innovation. With the use of this improvised device in a large scale, it will drastically benefit the community of the blind people.

II. EXISTING SYSTEM

Till the last few years, there are many new technologies have been developed for visually challenged people in order to detect the obstacles and warn or alert them at

danger places or the obstacles. But, there are a lot of limitations and restrictions on those new inventions.
Shoval*et al*. in [1]developed a Navbelt, an obstacle avoidance wearable portable computer which is only for indoor navigation. Navbelt was equipped with two modes, in the first one the system information was translated to audio in different sounds. One sound for free for travel direction and other for blocked, it was difficult for the person to differentiate the sounds. Other problem was the system would not know the user momentary position.

Yuan [2] introduced concept of active triangulation that was used in his proposed device. It will detect the object. The main disadvantage of this work is, it can only detects the object at the rate of 15 measurement/ second and also faces a surface discontinuities.

Benjamin *et al*. in [3]introduce a laser cane with three photo diodes and three laser diodes function as receiver making an optical triangulation. The direction is 45 degrees over and parallel to the ground and with sharp deepness The laser cane has no data or technology or we can say system for determining the location and the position of the obstacle, rather it is just like a hit and trial method.

Pooja Sharma [4] created a device for blind people. In that case the object has been detected but within a certain range. Only within that range the object can be identified. This was the major limitation in this paper.

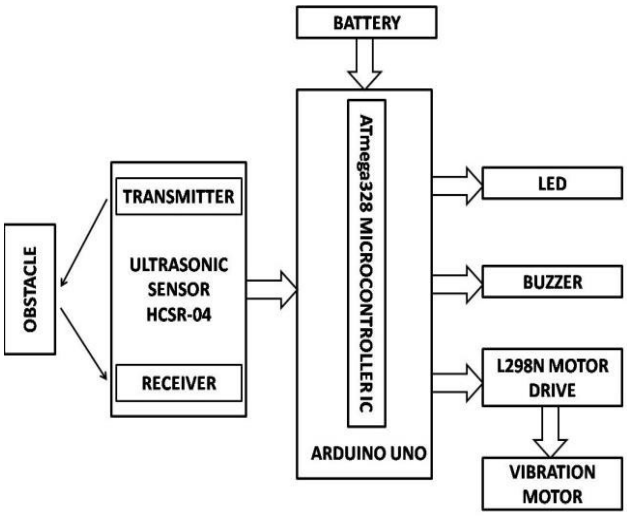
All the above existing system cannot satisfy the exact needs of the blind peoples. They use a white cane the smart cane [5], and the laser cane [6]. The cost of the trained dogs is also very high and is not affordable option [7]. A survey found [8] that the remote guidance system is very difficult to carry and thus the wearable band will be more optimized version.

To overcome those limitations this project will help. Nowadays there is a lot of technologies available for the visually challenged but our project is cheaper among them.

III. PROPOSED SYSTEM

The proposed system deals with the cheaper and effective obstacle detection with a wide range of coverage. It allows the user those who are visually impaired to walk freely by detecting the obstacles. As the distance between glove and obstacle decreases, frequency of both audio and vibration signals increases.

1. BLOCK DIAGRAM



2. BLOCK DIAGRAM DISCRIPTION

A. Arduino Uno

Atmega 328p microcontroller is used. It is a 28 pin IC and an 8 bit microcontroller. It consists of A0 to A5 analog pins and 14 digital I/O pins. It has an operating voltage of 5V. It is externally connected to input and output devices through wires. In this c programming is used to run the device. These microcontroller devices help in sensing and controlling the objects in the real-time situations and environment.



Fig. 1 Arduino Uno

B. L298N Motor Driver Module

The motor driver model L298N 2A and the driver chip Double H Bridge L298N is used. L298N Based Motor Driver Module is a high power motor driverperfect for driving DC Motors and Stepper Motors. It uses the

popular L298 motor driver IC and has the onboard 5V regulator which it can supply to an external circuit. It can control up to 4 DC motors, or 2 DC motors with directional and speed control.

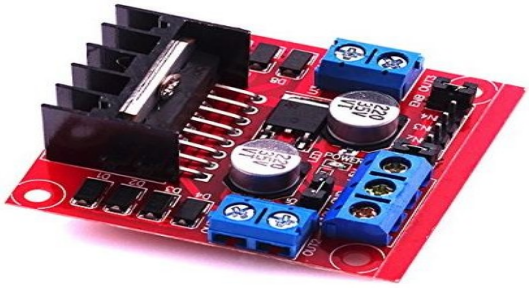


Fig. 2 L298N Motor drive module

C. *Ultrasonic Sensor HC-SR04*

It is used to sense the obstacle using ultrasonic waves and convert it in 0's and 1's and then send it to the Arduino uno for further process. It consists of two main parts transmitter and receiver. The transmitter converts electrical signal into sound waves. The receiver converts the soundwaves into electrical signal again. The ultrasonic sensor measures distance using sonar, an ultrasonic pulse is transmitted from the unit and distance-to-target is determined by measuring the time required for the echo return.

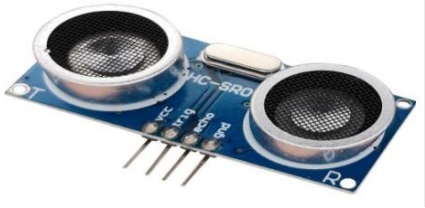


Fig. 3 Ultrasonic Sensor HC-SR04

D. *Buzzer*

In project we are using *piezo buzzer*. A buzzer is in the lower portion of the audible frequency range of 20 Hz to 20 kHz. This is accomplished by converting an electric or digital signal to oscillating signal in the audible range. If the obstacle is at certain distance to the device, then microcontroller sends a signal to sound a buzzer.



Fig. 4 Piezo electric Buzzer

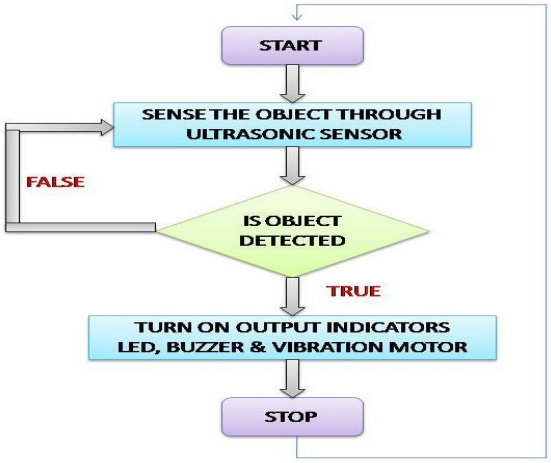
E. *Motor*:

Vibrator motor is used here. A vibrator motor is included to enhance the overall feedback for the person who receives the warning of obstacles in different forms of vibrations. This device is used to make the person feel and let him know about the obstacle.



Fig. 5 Vibration motor

3. FLOW CHART



4. WORKING

As the blind person needs to know that there is an obstacle in front of him, an Ultrasonic sensor module is used to detect the obstacles. The sensor module is designed to measure the distance using the principle of SONAR or RADAR, of using ultrasonic wave to determine the distance of an object. It transmits high frequency sound wave signal for every 10µs. This sound signal hits the obstacle and gets reflected which is called as an echo.

Based on the distance, we could see the output. The system consist a buzzer to generate an alarm sound and a motor to generate vibration signals to notify user. This entire processing is done by the microcontroller used here. As the distance between glove and obstacle

decreases, frequency of both audio and vibration signals increases.

The Ultrasonic sensor here used as a transceiver. The ultrasonic waves are emitted by the transmitter when the objects are detected. Both the transmitter and receiver are present inside the ultrasonic sensor. We calculate the time interval between the transmitted and received signal. The distance between the object and sensor is calculated using this.

The ultrasonic sensor converts the signal to binary number (0, 1). This is then detected by Arduino uno. The Arduino program compiler. In the program the baud rate is set to be 9600 bits/sec. The distance is calculated by the formula: Distance = Duration * 0.034 / 2.

The Arduino checks the distance and compare with the set distance (here 80 cm), if distance is less than 80 cm the loop stops and the output devices (led, buzzer and motor) starts. So, with the vibration and beeping sound the person gets alert about the upcoming obstacles and moves to a safe place. If the distance is more than 80 the loop continues.

IV. RESULT

Ultrasonic Vibrator Glove for Blind is developed using Arduino UNO with removable ATmega328p microcontroller, Ultrasonic Sensor module (HC SR04), LED, resistors, capacitors, Buzzer, Vibrator motor and motor driver. After all the necessary connections are made, the output is being observed while moving our module towards an obstacle. Ultrasonic sensor module detects the obstacle. So as the person moves forwards, it is pointed towards the obstacle and it sends the ultrasonic waves towards the direction it is pointed to.

The Ultrasonic module calculated the distance of the obstacle from the person and when obstacle is not detected, that is, when it is not in the range of the distance as used in the program code, the person can't feel any of the outputs.

When the module is in the range, so that the obstacle could be detected, the LED glows, vibrator motor vibrates and the buzzer buzzes. As the distance between glove and obstacle decreases, frequency of both audio and vibration signals increases. That is, the buzzer buzzes, motor vibrates and LED glows more rapidly when we move closer to the obstacle.

V. CONCLUSION

The 'Artificial Eye for Blind Ultrasonic vibrator Glove' is a device helpful for the blind to do their work independently. A combination of a microcontroller Atmega 328P and an Ultrasonic sensor HC-SR04 are used as inputs to calculate the distance of the obstacle from the blind person and another combination of vibrator motor and buzzer are used to notify about the obstacle. This system offers low power consumption and robust solution for navigation with obvious short response time. Thus, this project Arduino based obstacle detector for blind people is a new method to resolve their problems. They only need to wear this device as a band or cloth on their body. A less complex portable, cost efficient, easy to manage an effective system with many more amazing properties and advantages are proposed to provide support for the blind. It allows the user those who are visually impaired to walk freely by detecting the obstacles. Without the help of others the blind person can move from one place to other and lead their regular lives independently.

VI. REFERENCES

1. Shraga Shovel, Iwan Ulrich, Johann Borenstien. Nav Belt and the Guide Cane, IEEE Transactions on Robotics & Automation. 2003; 10(1):9-20.
2. Yuan D, Manduchi R. Dynamic Environment Exploration Using a Virtual White Cane, Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), University of California, Santa Cruz, 2005, 1-7.
3. Benjamin JM, Ali NA, Schepis AF. A laser cane for the blind", Proceedings of San Diego Medical Symposium, 1973, 443-450.
4. Pooja Sharma, Shimi SL, Chatterji S. A Review on Obstacle Detection and Vision, International Journal of Science and Research Technology. 2015.
5. Niitsu Y, Taniguchi T, Kawashima K (2014) Detection and notification of dangerous obstacles and places for visually impaired person using a smart cane. ICMU, Singapore, pp 68–69
6. Bolgiano D, Meeks Jr E. A laser cane for the blind, IEEE Journal of Quantum Electronics. View at Google Scholar. 1967; 3(6):268.
7. Przemyslaw Baranski, Maciej Polanczyk, Pawel Strumillo. A Remote Guidanc System for the Blind, IEEEd. Transactions on Remote Guidance, 2010, pp. 386390.

UNDERGROUND CABLE FAULT DETECTION USING IOT

RAKSHITHA M, SHANI PRADEEP, SPOORTHY D K

GUIDED BY: Mrs Rekha S N

Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering

#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

1. rakshitha.m349@gmail.com

2. shanipradeep66@gmail.com

3. spoorthydk16@gmail.com

Abstract –The project is intended to detect the location of fault in underground cable lines from the base station to exact location in kilometres using an Arduino microcontroller kit. In the urban areas, the electrical cable runs in undergrounds instead of overhead lines. Whenever the fault occurs in underground cable it is difficult to detect the exact location of the fault for process of repairing that particular cable. The proposed system finds the exact location of the fault. This system uses an Arduino microcontroller kit and a rectified power supply. Here the current sensing circuits made with a combination of resistors are interfaced to Arduino microcontroller kit to help of the internal ADC device for providing digital data to the microcontroller representing the cable length in kilometres. The fault creation is made by the set of switches. The relays are controlled by the relay driver. A 16x2 LCD display connected to the microcontroller to display the information. In case of short circuit, the voltage across series resistors changes accordingly, which is then fed to an ADC to develop precise digital data to a programmed Arduino micro controller kit that further displays exact fault location from base station in kilometres. Whenever a fault occurs in a cable the buzzer produces the alarm to alert and to take an immediate action by field workers.

INTRODUCTION

Till last decades, a million miles of cables were threaded in the air across the country. But currently most of the cables are laid underground. Because, underground cables are not affected by any adverse weather condition like pollution, heavy rainfall, snow and storm, etc. But, when any problem occurs in cable, it is very difficult to find the exact location of the fault due to not knowing the exact location of the cable. Day by day, the world is becoming digitalized so, this project is proposed to find the location of fault by using IoT technology. When the fault occurs, the process of repairing related to that particular cable is very difficult. The fault of the cable mainly occurs due to many reasons like weakness of the cable, insulation failure and breaking of the conductor etc. To overcome this problem, here is a project namely underground cable fault distance locator, used to find the location of the fault for underground cable.

Underground cables are used largely in urban area instead of overhead lines. Many time faults occur due to construction works and other reasons. At that time, it is difficult to dig out cable due to not knowing the exact location of the cable fault. We use IOT technology that allows the authorities to monitor and check faults over internet. This process greatly reduces the time and operates effectively. Here the current sensing circuits made with a combination of resistors are interfaced to Arduino micro controller kit to help of the internal ADC device for providing digital data to the microcontroller representing the cable length in kilometers. The fault creation is made by the set of switches. The relays are controlled by the relay driver. A 16x2 LCD display connected to the microcontroller to display the information. In case of short circuit, the voltage across series resistors changes accordingly, which is then fed to an ADC to develop precise digital data to a programmed Arduino microcontroller kit that further displays exact fault location from base station in kilometers.

ISBN: 979-85-27243-61-1

METHODOLOGY & WORKING

The operation of the system states that when the current flows through the fault sensing circuit module the current would vary depending upon the length of the cable from the place of fault that occurred if there is any short circuit fault with the Single Line to ground fault, or double line to ground fault, or three phase to ground fault. The voltage drops across the series resistors changes accordingly and then the fault signal goes to internal ADC of the microcontroller to develop digital data. Then microcontroller will process the digital data and the output is being displayed in the LCD connected to the microcontroller in kilometres and phase as per the fault conditions. This Output is also displayed in the cloud through the IoT Wi-Fi Module ESP8266 connected to the system

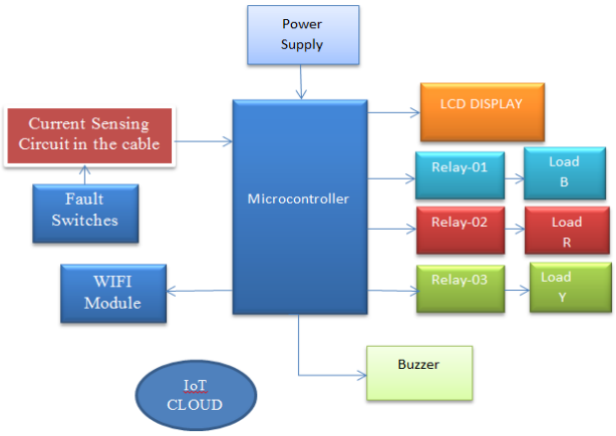


Fig.1 Block Diagram

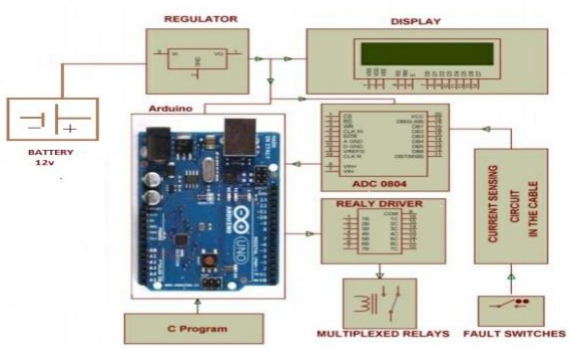


Fig.2 Circuit Diagram

The power supply given to the system is 230V ac supply. This 230 V supply is fed to the two Adapter Modules (12 V, 2 Amps. each). The adaptor module 1 and 2 converts the AC voltage to DC. The ripple in output of adaptor module 1 is then removed with the help of a 1000 microfarad electrolytic capacitor. Since a constant 5 V voltage source is desired for our system, because the Microcontroller (ATmega328), 16x2 LCD (Liquid Crystal Display), Relay Drivers and Relays, Fault Sensing Circuit Module, IoT Wi-Fi Module, etc. and the other components work at 5V supply, hence we are using three voltage regulators (7805). These voltage regulators convert the filtered output to 5V constant supply voltage. The first voltage regulator (VR1) feeds the 5 Volts supply to the microcontroller, LCD display, and the set of series resistors while the second voltage regulator VR2 feeds the relay driver IC ULN2003A and 3 three relays. The third Voltage regulator is connected to the IoT ESP8266 Wi-Fi Development Board Module which gives 5 Volts DC supply to it. Each series resistors represents the resistance of the underground cable for a specific distance using four such resistors of about 2Km,4Km,6Km,8Km.The hardware consists of three relays which are driven by a relay driver IC ULN2003A. The relays used here switches off/on the bulb loads R, Y and B to indicate the fault being occurred in corresponding phases. The fault occurring at a particular distance and the respective phase is displayed on a LCD interfaced to the Arduino board. Whenever a fault occurs in a cable the buzzer produce the alarm to alert and take action.

RESULT & DISCUSSION

In this project we detect the exact location of short circuit fault in the underground cable from feeder end in Km by using microcontroller ATmega328p (Arduino) and through IOT technology. For this we use simple concept of OHM's law so fault can be easily detected and repaired.



Case 1 (If there is no fault in R,Y,B phase)

ISBN: 979-85-27243-61-1



Case 2 (if there is a fault at R phase within 2 km)



Case 3 (if there is fault at all three cable within 2km)

CONCLUSION

This work is intended to detect the exact location of circuit fault in the underground cables from the feeder end in km by using an arduino microcontroller. The arduino microcontroller works based on output of the cable resistance. Relay helps to separate the faulty line from healthy line. We use IOT technology that allows the authorities to monitor and check faults over internet.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Mechanical Engineering and faculties for their encouragement and support.

REFERENCES

[1]. Underground Cable Fault Location, B. Clegg. New York: McGraw- Hill, 2000

[2]. A. N Gaopitakkul, C. Pothisarn, M. Leela jindakrairerk, ―Study of Characteristics for Simultaneous Faults in Distribution Underground Cable using DWT‖, 2011 IEEE

[3]. “Microcontroller based Fault Detector” International Journal of Advancements in Research & Technology, Volume 1, Issue 5, October-2012 1 ISSN 2278-7763.

[4]. “Underground Cable Fault Distance Locator” NOVATEUR PUBLICATIONS INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT] ISSN: 2394-3696 VOLUME 2, ISSUE 4APR.-2015

SPWM drive for Single Phase Induction Motor

JHANSI K
Assistant professor, department of EEE,
Sapthagiri college of engineering,
Bangalore
jhansik@sapthagiri.edu.in

SWETHA G
Assistant professor, department of EEE,
Sapthagiri college of engineering,
Bangalore
swethag@sapthagiri.edu.in

CHIDANANDA C
student, department of EEE,
Sapthagiri college of engineering
Bangalore
Chidu0701@gmail.com

***Abstract*— Transportation systems, textile mills, fans, pumps, and other industrial and home uses all require motion control. "Drives" are the systems that are used to control motion. Typical electric drive systems are becoming more compact, efficient, cheaper, and adaptable as power electronics, microprocessors, and digital electronics progress.**

The "ARDUINO" is used to create SPWM signals as a control unit. Arduino software is used to create a code for the SPWM signal. The output of an ARDUINO is fed to H-Bridge through gate drive, The H-Bridge provide SPWM pulses of high voltages when these signal pass through a low-pass filter we get an output waveform which is nearly a sin wave, similarly we will generate an another sin wave which is 90 degree out of phase compare to previously generated waveform. These two sine waves are fed to main winding and auxiliary windings of single phase induction motor respectively [1].

Keywords*— *H-Bridge, ARDUINO, SPWM.

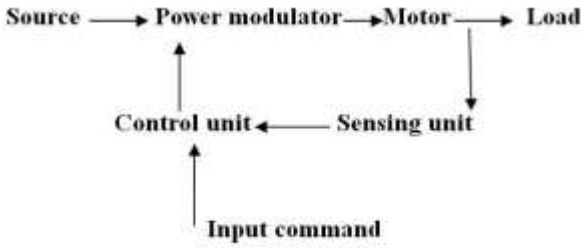
I. INTRODUCTION

We have a propensity to believe that the rotational speed of these machines is totally controlled by the source voltage and frequency of the source current, regardless of whether the word electric motor or generator is used. The rotational speed of an electrical machine, on the other hand, may be decisively controlled by realising the concept of drive. The main attraction of this concept is that it efficiently streamlines movement control with the help of drive. Electrical drives, in a nutshell, are systems that control the movement of electrical machinery.

An electric motor (or several) and a complicated control framework that controls the pivot of the motor shaft make up a standard driving system. With the use of programming, this control is currently achievable. As a result, the controlling becomes more precise, and the drive concept also provides usability. This drive system is commonly used in a wide range of industrial and household applications, including processing facilities, transportation systems, material manufacturers, fans, pumps, engines, and robotics, among others. Diesel or gasoline engines, gas or steam turbines, pressure driven motors, and electric motors all use drives as prime movers.

The following is a simplified block diagram of an electric drive. The load in the diagram depicts a variety of electric-motor-driven equipment, such as fans, pumps, and washing machines.

Forced-commutated electronic switches such as IGBTs, MOSFETs, and GTOs are used in the variable-speed control of AC electrical equipment. Asynchronous machines powered by voltage supplied converters (VSC) fed by pulse width modulation (PWM) are gradually displacing DC motors and thyristor bridges. It can provide the same flexibility in speed and torque control as DC machines by combining PWM with modern control approaches such as field-oriented control or direct torque control.



Block diagram of an electrical drive

fig. 1: **Electrical Drive**

II. BLOCK DIAGRAM

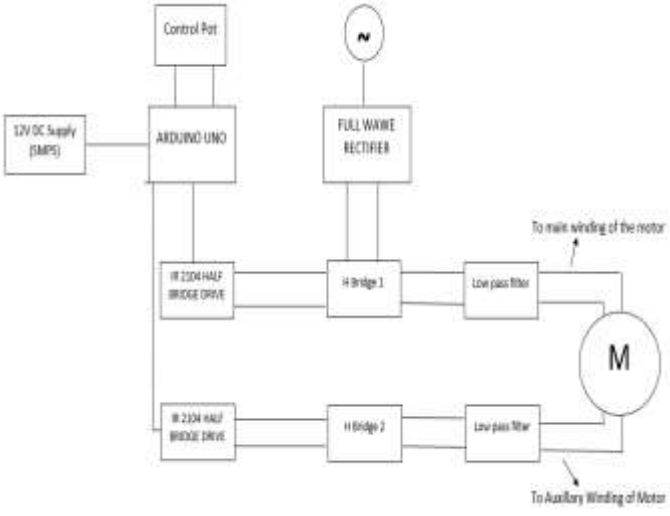


Fig. 2 **Block Diagram**

III. METHODOLOGY

The following programmes are built based on the SPWM generation principals and the mentioned mathematical model of the SPWM generation. In this method, digital pin 13 is used to generate output.

After that, a sine wave lookup table is employed. (I used the DDS approach for this.) In this instance, we'll modify the duty cycle of the Arduino Uno's default pwm signal. The duty cycle of our SPWM is directly proportional to the sine wave values at any moment time t, as we know theoretically.

We can't compare the "sine wave" and the "carrier wave" (triangular wave) with Arduino since the microcontroller doesn't have a negative axis. Unless there are zeros, it always takes positive values. As a response, we vary the duty cycle by setting Delay according to the lookup table. We can alter the sample frequency of the SPWM as much as we like with this method because we can measure and generate waves in MHZ. Also, because this is on-board programming, it can run for an extended period of time, making it suitable for real-time applications.

We utilise 50 Hz supplies in our daily lives and home appliances, and most industrial applications do as well. In this project, we'll use a standard half HP single phase induction motor, therefore we'll develop a software to have the Arduino generate two sine waves at 50 Hz.

The time taken to complete one cycle of waveform in 50Hz frequency is 0.02sec.

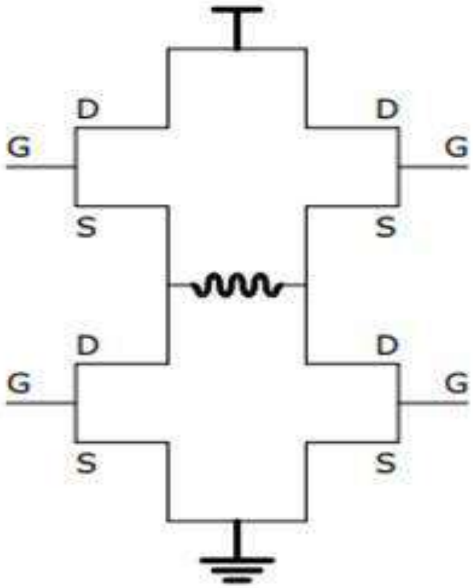


Fig 3: **The H-Bridge Motor Driver Circuit**

This circuit is called H-bridge because the MOSFETs form the two vertical strokes and the motor forms the horizontal stroke of the alphabet 'H'. It is the simple and elegant solution to all motor driving problems. The direction can be changed easily and the speed can be controlled.

In an H-bridge configuration, only the diagonally opposite pairs of MOSFETs are activated to control the direction, like shown in the below figure:

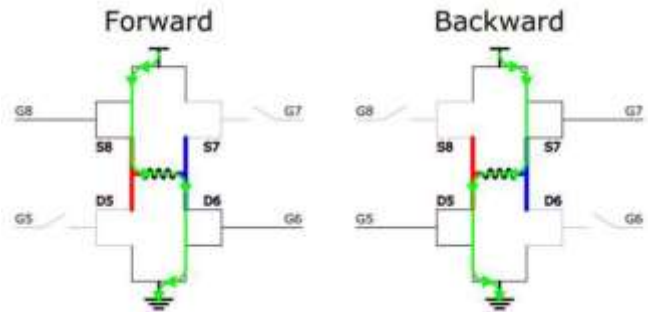


Fig 4: **The H-Bridge Motor Driver configuration**

When activating one pair of (diagonally opposite) MOSFETs, the motor sees current flow in one direction and when the other pair is activated, the current through the motor reverses direction.

The MOSFETs can be left on for maximum power, or they can be SPWM-ed for power regulation, or they can be switched off to allow the motor to stop. The motor is slowed by activating both the bottom and top MOSFETs (but never both at the same time).
The top point of the H-Bridge in our project is connected to the output of the SMPS, which produces DC output. H-Bridge receives roughly 315V in DC power.

This is the component of the circuit that controls the motor that actually works. The pulldown resistor generally pulls the MOSFET gates low. Both P-channel MOSFETs switch on as a result, but this isn't a problem because no current can pass. The N and P-channel MOSFETs are turned on and off alternately when the PWM signal is supplied to the gates of one leg, regulating the power[2].

This alternative output is necessary because we need an AC power to drive the induction motor.

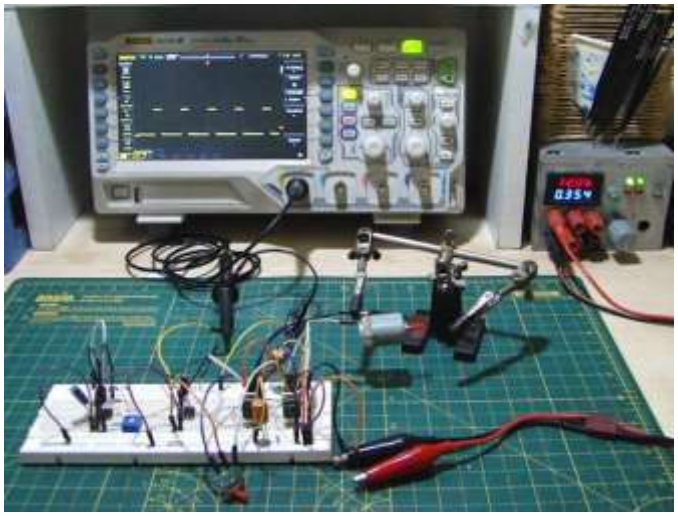


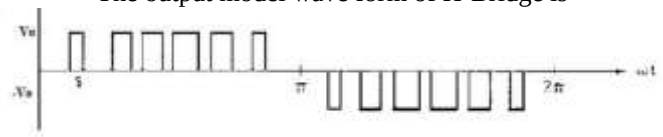
Fig 5: **Connection Diagram**

IV. RESULTS AND DISCUSSION

Many motor driving challenges, such as bidirectional, power management, and efficiency, can be solved with an H-Bridge circuit.

The output of the H-Bridge, which is a high voltage rectangular SPWM signal, is fed into a low-pass filter to produce a sine wave-like output waveform.

The output model wave form of H-Bridge is



To decrease harmonics created by the pulsating modulation waveform, a low pass LC filter at the H Bridge's output terminal is necessary The cut-off frequency of the L-C filter is chosen so that most of the low-order harmonics are eliminated. As a result, the capacitance value should be maximised and the inductance value should be minimised at the low-pass filter's selected cut-off frequency. Because the reactive power of L and C determines the cost of an LC filter and it is chosen to minimise the cost, it is typical for the filter components to be decided at the set of a small capacitance and a high inductance, resulting in a high output impedance of the inverter Depending on the type of load, such as linear or nonlinear, the load current flows in different ways. The system with two inputs of inverter output voltage and load current can be represented.

The output of a Full Wave Bridge Inverter with SPWM signal will yield a wave that is almost equal to a sine wave after passing through an LC filter.

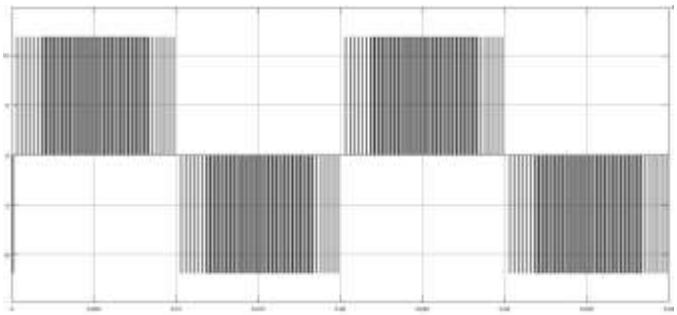


Fig 6: **output from H-Bridge or also we can say as it is an input to low-pass filter.**

Fig 7: **output from low-pass filter.**

V. CONCLUSION

When power is provided to the model, it is noted that the power flow from the source to the motor is modulated using various techniques and programming in such a way that the single phase induction motor becomes self-starting and so functions efficiently.

VI. ACKNOWLEDGEMENT

The authors would like to thank Dr. K N Ravi, HOD of EEE, and Mrs. Rekha S N Assosciate Professor at Sapthagiri College of Engineering, for their support and advice.

VII. REFERENCES

1. Pallavi Patel ,'Generation of Sinusoidal Pulse Width Modulated Signal using Arduino Microcontroller', http://ethesis.nitrkl.ac.in/,june 2016.
2. Santhosh S, Manan patel, Rakshitha.p, K.MD.Zaki.Ahmed, Ashhar aziz, 'Implementation of Bi Directional Rotation of Single Phase Induction Motor without Run Capacitor', (IJAREST),e-ISSN: 2393-9877, p-ISSN: 2394-2444, Volume 4, Issue 7, July-2017
3. A book written by - Simon Monk Book name - Programming Arduino™ Getting Started with Sketches.

SELF TARGETING AUTONOMOUS/ SEMI-AUTO TURRET SYSTEM (S.T.A.T.S)

[1]BHARATH B N, [2*]UDAY J, [3]R LOKESH, [4]VIKAS L, [5]YESHWANTH S

[1] Assistant Professor, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
[1]bharathbn@sapthagiri.edu.in

[2,3,4,5] Students, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
[2]udayjgowda7@gmail.com
[3]rajaloki15@gmail.com
[4]vikasgowa@gmail.com
[5]yeswanthshankar27@gmail.com

Abstract **- Nowadays, many expenses are made in the field of defense in adopting primitive security measures to protect the border from the trespassers and also protect lives of military personnel's in warzone areas. Some military organizations take the help of robot in the risk prone areas which are not that effective when done by army men. These Army robots are confining with the omnidirectional wheels, camera, sensors, artificial intelligence and visual recognition. Not only for military applications, but autonomous turrets can also be utilized for the home and aid in keeping intruders from important possessions and family. The main objective of our system is to get real time data processed by the camera sensor to trace the intruders. It will encompass a combination of hardware and software to match a mounted airsoft weapon's point of aim to the located target in the camera's view. Different from most turrets out there, this will all be controlled from a portable device the user can move around wirelessly.**

Keywords – Wireless Secure Shell, Omnidirectional, Computer Vision, Human Intervention, Mecanum Wheel, Autonomous.

A. INTRODUCTION

The self-targeting auto/semi-auto turret system (STATS), is a camera-based weapon system that uses software to locate and attack a moving target. It will encompass a combination of hardware and software to match a mounted airsoft weapon's point of aim to the located target in the camera's view. The sentry gun which will have the ability to scan its field of view and user will be able to see the field of view. This Army robot is more efficient compared to the soldiers. Excellency of this robot is in being operated wireless from re-mote which offers no risk to the soldier lives. Robots are enhanced to be robust and sturdier giving the guarantee of success in the risk prone environment. The main aim of the paper is to implement a Camouflaged technology based Wireless multifunctional Army Robot which can be controlled through smart phone using IOT Module having locomotion and navigates around the risk prone areas and tries to identify the intruders, in addition to this Army Robot is built with some artificial intelligence for its safety.

B. MATERIALS & COMPONENTS USED

A. Micro-controller

Heart of the robot is a raspberry pi. Raspberry pi is a series of small single-board computers (SBCs) used for controlling all the operation done by the devices which are interfaced to it. Raspberry Pi is popularly used for real time Image/Video Processing, IoT based applications and Robotics applications. Raspberry Pi is slower than laptop or desktop but is still a computer which can provide all the expected features or abilities, at a low power consumption. Raspberry Pi is more than computer as it provides access to the on-chip hardware i.e. GPIOs for developing an application. It has ARM based Broadcom Processor SoC along with on-chip GPU (Graphics Processing Unit).

STM32F103RCT6 ARM microcontroller-MCU is another board used in this system both raspberry-pi and this chip works simultaneously reducing the load on both, this communicate via serial transmission. This ARM based chip controls Drivers, Sensors, Motors and other electrical and electronics components, where raspberry-pi controls the software and computer vision loads of the system.

ISBN: 979-85-27243-61-1

B. *Power supply circuit and unit*

The power supply circuit is the important part of any electronics system. Power supply unit is used to power to the Microcontrollers, camera, sensors/driver Module and Motors. Where power circuits maintain and control that power with respect to the individual electronic components. The system as lithium-ion battery which is charged by conventional method charger and solar based charger which is integrated in the system itself.

C. *DC Geared Encoder Motor and Servo Motor*

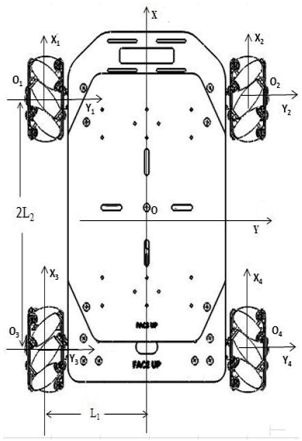
A motor encoder is a rotary encoder mounted to an electric motor that provides closed loop feedback signal by tracking the speed and/or position of motor shaft. The DC motor encoder provides a mechanism to measure the speed of the rotor and provide closed feedback to the drive for precise speed control.
A servomotor is a linear actuator or rotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

D. *Camera*

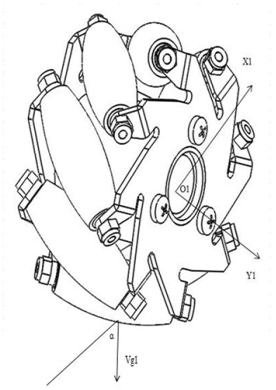
Camera installed is being used for the real time data interpretation and video/image capturing, this project use 1080p HD camera with IR installation port and uses OV270 cam module as its camera sensor.

E. *Mecanum Wheels*

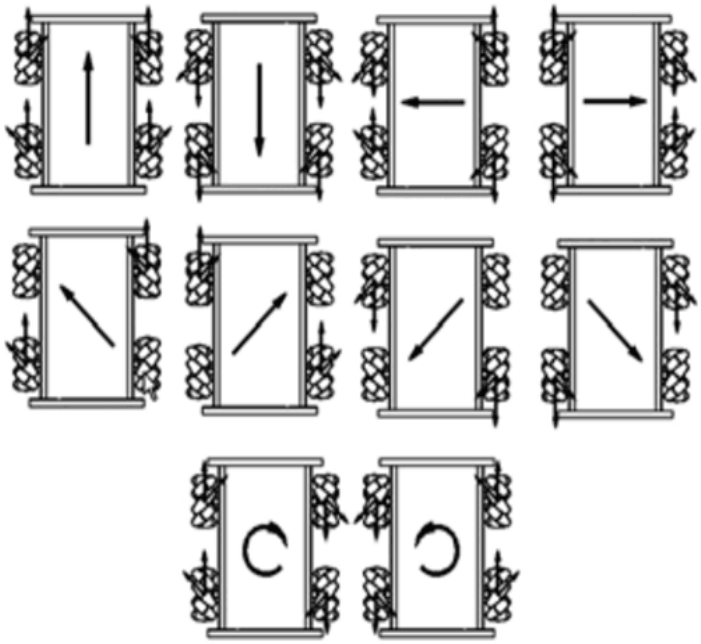
The Mecanum wheel is based on a tireless wheel, with a series of rubberized external rollers obliquely attached to the whole circumference of its rim. These rollers typically each have an axis of rotation at 45° to the wheel plane and at 45° to the axle line. Each Mecanum wheel is an independent non-steering drive wheel with its own powertrain, and when spinning generates a propelling force perpendicular to the roller axle, which can be vectored into a longitudinal and a transverse component in relation to the vehicle. A system consists of 4 wheels each can rotate clock wise or anti-clockwise or stopped, based on the combination of this wheels the direction of the motor will take. The robot can be moved by 16 possible ways.



Global Coordinate System



Local Coordinate System



Mecanum Wheel Working Principle (Simplified)

III. METHODOLOGY:

The project includes two units, a Mobile unit, and turret unit, to ease the transport and usage, which are mounted and can be detached based on working purposes.

- The mobile unit comprises a Raspberry-pi, PCB Board, CPU, IC's, Servo/Motor drive board with a motor installed on the Chassis for the movement of the system. The motor powers the Mecanum wheel which enables the robot in omni direction (16 direction). This is powered by an independent battery and controlled via serial communication from the raspberry-pi unit.
- Turret unit comprises Nerf gun, Tilt and Pan setup with HQ camera, tilt and pan setup controlled by two servo motor with servo drive board driven by MCU,

ISBN: 979-85-27243-61-1

solar panel with voltage adapter is placed as a continuous power source for a long run of the system

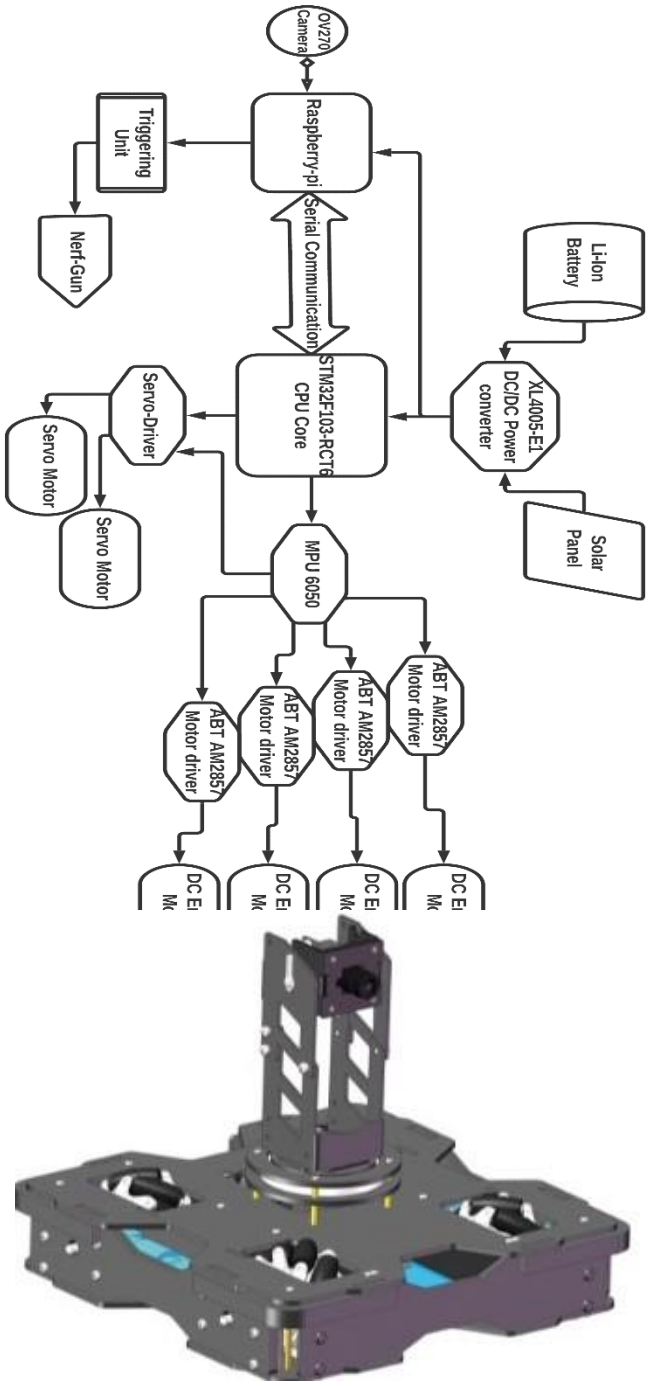


Figure 2. Block Diagram

The system is controlled over a wireless secure shell (SSH) which provides cryptographic network protocol for operating services securely. The system will execute by three means: Autonomous Mode, Interactive Mode, and Safe Mode.

- In Autonomous mode, the turret will be self-driven on movement in the camera's field of view and neutralize the target.
- In Interactive mode, the turret and movement are controlled manually by users.
- In Safe mode system falls to power saving mode and used just for surveillance.

The system movement is manually controlled, achieved by serial communication established between raspberry-Pi and MCU. The camera is used for surveillance, detecting, and recognizing. The target is analysed using computer vision which is captured by infrared-pi-camera and processed by raspberry-pi, based on this data, the turret will be operated.

Figure 10. Final Render of Mobile Unit

IV. RESULTS & DISCUSSIONS

The system is controlled via wireless communication and with analog communication and worked with various circumstances and scenarios. The performance of the system is satisfied as proposed project along with various features of the systems like, long run of the system and self-gyro stabilization of the project. The designed and developed system can be used as portable robot for security and defence system, in addition to following objectives:

- To provide support for military operations.
- To aid the ground unit with effective intel and real-time monitoring.
- Providing security over no-man zone without human intervention.
- Seamless surveillance and protection over border security.
- To neutralize Trespassers by maintaining the stealth using camouflage skin.
- To navigate and process in the night using IR night vision.

Overall the system performed better than expected. It had a lot to do with the area we chose to setup and the teamwork toward the end for the final push to demonstration. The tracking algorithm was on target keeping the target on point. It performed well on slowly moving targets as well. Unfortunately, it did not work too well with faster moving targets, but that was to be expected without the addition of some sort of tracking prediction algorithm being performed.

ISBN: 979-85-27243-61-1

V. CONCLUSIONS

1. It is possible to develop a portable system for defence for ease of navigation.
2. Easy to assemble and dismember the system units based on the circumstances.
3. Long duration surveillance can be committed where human can't be dispatched.
4. Can be hovered over borders without any human casualties.
5. Can be effectively implemented without any human intervention.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department, faculties of Electrical and Electronics department for their encouragement and support, and also like to thank our Guide for his timely advice, constructive suggestions and regular assistance in the seminar work.

REFERENCES

[1] Eki Ahmad Zaki Hamidi, Mufid Ridlo Effendi, Hasbi Ash Shiddiq "Design and Implementation Supervisory Control and Data Acquisition (SCADA)" 4th International Conference on Wireless and Telematics (ICWT), 2018.

[2] U. A. Nnolim, "An adaptive RGB colour enhancement formulation for logarithmic image processing-based algorithms," Optik (Stuttg)., vol. 154, pp. 192–215, 2018.

[3] H. Kato and M. Billinghurst, "Marker Tracking and HMD Calibration for a Video-based Augmented Reality Conferencing System," IWAR'99 Proc. 2nd IEEE ACM Int. Work. Augment. Real., 1999..

[4] M. Daud bin Isa, A. Rakimi bin Mohammad, and M. Zubir Bin Mohd Hanifah, "VISION MOBILE ROBOT SYSTEM WITH COLOR OPTICAL SENSOR," vol. 12, no. 4, 2017.

[5] Campion, G. Bastin, and B. D'Andréa-Novel, "Structural properties and classification of kinematic and dynamic models of wheeled mobile robots," IEEE Transactions on Robotics and Automation, vol. 12, no. 1, pp. 47–62, 1996.View at: Publisher Site | Google Scholar

[6] M. Wada and S. Mori, "Holonomic and omnidirectional vehicle with conventional tires," in Proceedings of the 13th IEEE International Conference on Robotics and Automation, pp. 3671–3676, IEEE, Minneapolis, Minn, USA, April 1996.View at: Google Scholar

[7] G. Pin and S. M. Killough, "A new family of omnidirectional and holonomic wheeled platforms for mobile robots," IEEE Transactions on Robotics and Automation, vol. 10, no. 4, pp. 480–489, 1994.View at: Publisher Site | Google Scholar

ANYTIME MEDICINE USING VENDING MACHINE

1. Neha.S
Student, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
nehashivaram.99@gmail.com

2. Neha.T.R
Student, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
trneha1999@gmail.com

3. Shilpa.S
Student, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
s.shilpadefence1999@gmail.com

4. Mr. Yousuf Madar
Assistant Professor, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
yousufmadar @sapthagiri.edu.in

***Abstract*—An anytime medicine vending machine with a self-contained on-site pill dispensing mechanism and a storage facility for the plurality of pills that can be dispensed based on the user requirement .Major components of the machine are, a scanner to take the input from user, a system that includes dc motors for dispensing the medication, large storage for space to store pills, inventory monitoring system to keep track of the storage. The inventory monitoring system also keeps the track to send alerts to refill the storage when pills are run out. All these systems are monitored by a central microprocessor, which is programmed to receive input from the user via card and to actuate and control all the necessary components required to dispense the medication requested by the user. The machine can be viewed as an automated pharmacy placed on a commercial scale so that an infinite number of users will be able to access it anytime.**

I. INTRODUCTION

Degrees of social status are closely linked to health inequalities. Those with poor health tend to fall into poverty and the poor tend to have poor health. According to the World Health Organization, within countries those of lower socioeconomic strata have the worst health outcomes. Health also appears to have a strong social component linking it to education and access to information. Intelligent pillbox is an automatic medicine vending machine.

A vending machine is a machine which dispenses items such as snacks, beverages, alcohol, cigarettes, lottery tickets, cologne, consumer products and even gold and gems to customers automatically, after the customer inserts currency or credit into the machine. The Medicine Vending Machine as the name suggests is a vending machine that will dispense the required medicine as per the user's choice. It provides an all- encompassing solution to an individual looking for immediate symptomatic relief for trivial health problems**.** It can also decrease the current costs of open medicine cabinets. By having an over-the-counter vending machine in the workplace, worksites without clinics or pharmacies can benefit from increased work efficiency and avoid underperformance of ill employees. Moreover, it prevents hours wasted waiting in queues at clinics for trivial problems like colds and headaches. This situation gets especially magnified when a location is suffering from a localized epidemic or pandemic.

II. PROBLEM STATEMENT

A. Objectives:

The main objective of the project is to develop a system to deliver medicine 24x7.The system will dispense the medicines as per the prescription. Diagnosis is always a concern for the people living in rural areas. In the same way, the availability of medicine all the time is more important. The main aim of this prototype is to give relief to the people a better chance for resisting health by making them easily accessible to medicines. Major advantage of this project is that, people would be able to access the drugs via patient kiosks in public places such as medical stores , malls , bus , railway station, on highways ,and etc, by using the health card, where medical stores are limited and in some of the rural areas and also the places where medical stores is not nearby.
In those cases the people will not be able to get the medicine on time for their requirement.

XXX-X-XXXX-XXXX-X/XX/$XX.00 ©20XX IEEE
ISBN: 979-85-27243-61-1

This machine helps them get medicine on time , based on their requirements.

B. The Main Stages of Project are:

- First, the national health card needs to be scanned.
- Then it will ask the user to enter the password.
- If the user is authorised then the system will display the prescription of that user i.e. the list of medicines.
- Users can enter the number of medicines required.
- If the medicine is greater than mentioned in the prescription then the system will ask the user to consult the doctor.
- If not, it will check for the available balance for the required number of medicines.
- If balance is available then the payment will be deduced from the card.
- It will dispense the medicine
- If the balance is not sufficient then it will display insufficient balance.
- Database will be updated.

III. METHODOLOGY

This section describes the architecture of the system as well as how it is structured and how it works These are the following steps need to be followed:

User Authentication: User authentication is a process that allows a device to verify the identity of someone who connects to a network resource. The user has to insert their card and enter a password. If the password is correct the system will accept the transaction or else, it will display the appropriate error message.

Medicine Dispensing: Once the authentication process has been carried out, the user will select the medicine and pillbox will dispense it.

Database Updating: Once the medicine has been dispensed the balance and database will be updated. User's database will be updated with the current balance and number of pills dispensed. Stock database will be updated with current stock value.

Inventory Control: Controlling the inventory of drugs is critical for functioning of the machine. If the medicine gets over, the system will send notification to refill it.

Block diagram:

A system architecture is a conceptual model that defines the structure, behavior and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

The system has a microcontroller Arduino mega which is an 8-bit RISC microcontroller board which controls the functionality of all the components in the system.

The system is connected with the hardware components like RFID module, Keypad module, LCD module, GSM module, Wi-Fi module and Dispenser. A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks.

They are heavily used in engineering in hardware design, electronic design, software design, and process flow diagrams. Block diagrams are typically used for higher level, less detailed descriptions that are intended to clarify overall concepts without concern for the details of implementation.



Figure 1: Block diagram of the device

Flow chart:

This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analysing, designing, documenting or managing a process or program in various fields.

The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows.

Firstly the health card needs to be scanned, after scanning the system will ask to enter a password, this ensures the security and allows only the authorized and registered customers to use the machine.

After the password is verified the list of medicines and doctor's name is displayed, next the system will ask the user to choose the medicines, among the listed medicines,thus ensuring to dispense only the prescribed medicines.

ISBN: 979-85-27243-61-1

After the selecting of medicines the system will ask the customer to enter the quantity required, if the entered quantity is lesser or equal to the prescribed medicine only then the system will dispense medicine, ensuring the legal way of distributions of medicines and drugs.
Each and every time, the medicines are dispensed the balance and the deducted amount is updated, along with the net quantity of the medicines available in the machine.

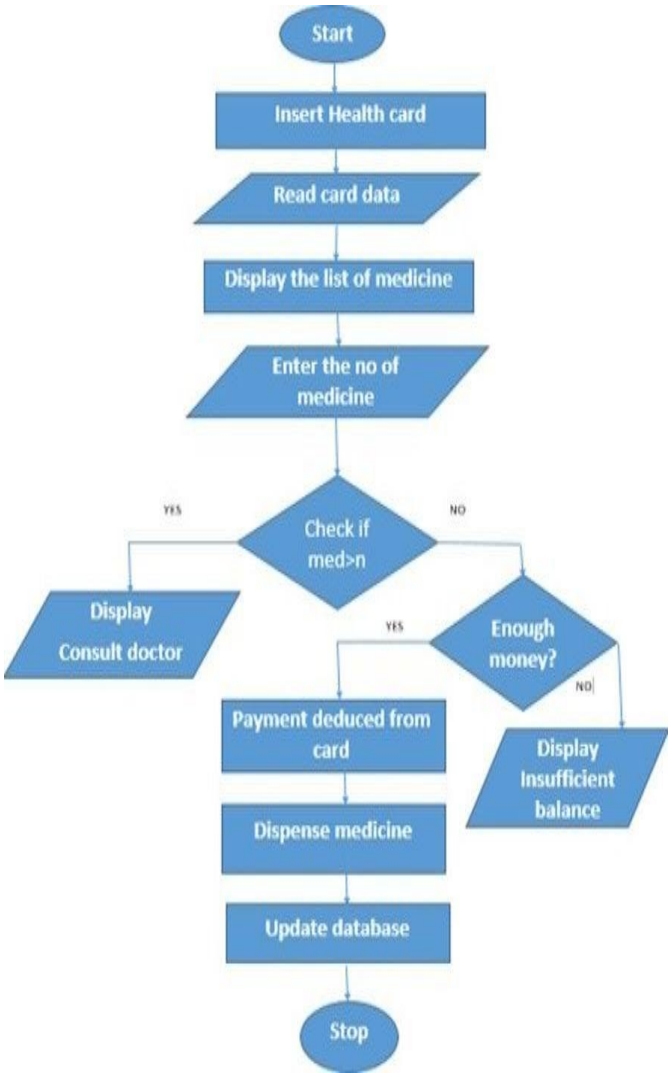


Figure 2: Flow chart depicting different steps to be followed

IV. RESULTS AND DISCUSSIONS

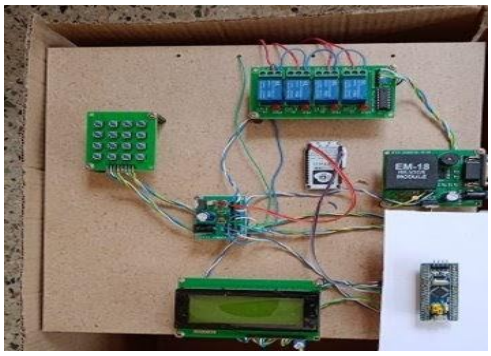


Figure 3: The top view of the model

The model works as per as the design fulfilling the main objective that is to dispense medicine 24x7.
In The top view interfacing of all the components such as 4-channel relay, STM-32microcontroller, 4*4 keypad, LCD display with the gsm and wifi module is done.

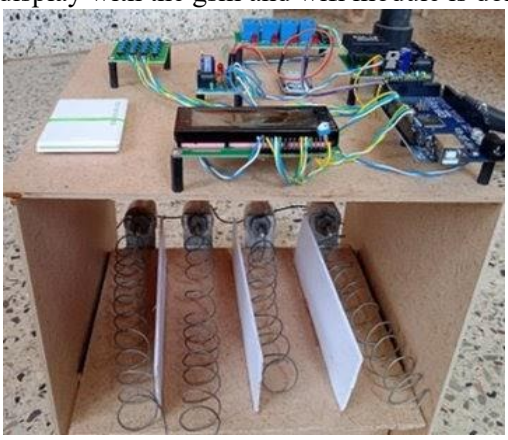


Figure 4:The side view of the model

The side view shows the dispensing components used where spring modules,relays work on dispensing of respective medicines to the consumers. System meets the desired features and works efficiently.

A. Applications

- The main application of this project is to develop a system to deliver medicine 24x7.
- The concept is very much useful in day to day life for common people.
- It can be implemented and installed everywhere such as Railway stations, remote areas, National Highways.
- Facility of measurement of various parameters.
- As all operations will be controlled through software human interfacing is minimized.

B. Advantages

- It is so portable that it can be installed in very few areas.
- No Individual person needed for maintenance.
- Easy to use and Provides 24/7 medicine facility.
- Since online transactions involved no fear of robbery.
- Since disease name and relevant medicine will be stored in the database, the user will have to mention the disease name.
- The dispenser will dispense the medicine automatically for that disease.

V. CONCLUSION

The pillbox offers a flexible and simple solution for extending basic healthcare to all places, at a very moderate cost. The machine will dispense prescribed medicine. The machine adds an intelligent medicine unit, which sends a refill notification message to the nearest pharmacy when the number of medicine strips decreases below a certain level. The intelligent pillbox is technically feasible to all people. It will be very helpful and it gives ease of access. It is a sales person-less service which will be based on RFID. It is important to consider how the technology may affect quality of medication delivery and use.

VI. FUTURE SCOPE

- In the current system only prescribed medicines are dispensed but in future users can dispense medicine which does not require prescription like medicines that relieve aches, pains, and itches and first aid.
- Block diagram should be detailed out along with legal, medical and administrative aspects for the feasibility study and further changes in design, can be done according to the area requirements.

VII. REFERENCES

[1] Bhagya Shree S R, Chandra Shekar P, 'Automated Medication Dispensing System', 2015 IEEE.

[2] Kahtan Aziz , 'Real-Time Healthcare Monitoring and Tracking System using GSM/GPS Technologies', August 2016 IEEE.

[3] Mahaveer Penna, 'Design and Implementation of Automatic Medicine Dispensing machine', May 2017 IEEE.

[4] Vishal Tank, Sushmita Warrier, 'Medicine Dispensing Machine Using Raspberry Pi and Arduino Controller ', March 2017 IEEE.

AUTOMATIC GAS CYLINDER BOOKING OVER IOT

AJAY M[1], GIRISH V[2], SINDHU S[3]

Department of Eelctrical Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India
[1]ajaynh006@gmail.com[2]
girichalappa@gmail.com[3]
Sindhus1131998@gmail.com[4]

Abstract **–LPG is widely used for cooking in many countries for economic reasons, for convenience or because it is the preferred fuel source. This paper focuses on the application of the IOT which is used for measuring and displaying the gasoline content present in household LPG cylinder and this is helpful in automatic booking of new LPG cylinder and also detect the gas leakage. Usually the capacity of LPG in cylinder is not determined, so we are going to display the level of LPG .The level of LPG is measured using load sensor the output of sensor is connected with Arduino R3. By use of GSM Module, the information is sent to user by SMS and also automatic booking number and by this we prevent pre-booking and late booking. Then by detecting the gas leakage we can prevent the LPG gas burst accidents in the home.**

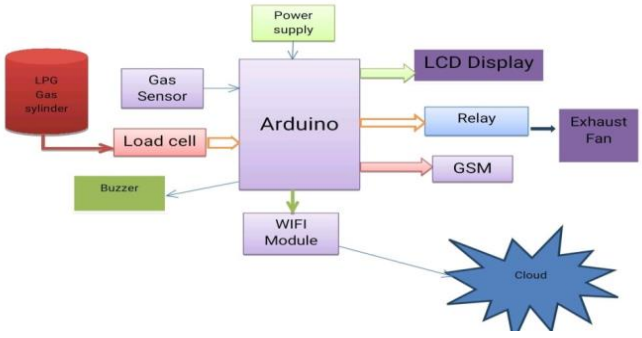
Keywords – LPG gas cylinder, IOT, GSM

I. INTRODUCTION

In our day to day life, LPG cylinder plays a major role. The main application of the LPG is that it is used in the place of chlorofluorocarbon which causes great damage to the ozone layer. Though its one in all the foremost normally used fuels, Its associate explosive vary of one 85-90% volume of gas in air. With the rising demand for LPG, users have to be compelled to pre-book their LPG cylinder a minimum of a month before the delivery of new LPG cylinder. Most of the days, users find it difficult to figure out what quantity of LPG is left at intervals the cylinder and this causes tons of bother to them. In such of affairs, associate degree efficient technique to watch the amount of LPG within the cylinder is needed, so the user are tuned into the LPG level at intervals the cylinder. This paper deals with the detection of the gas leakage of gas in the cylinder and automatic booking of new LPG cylinder. The sensor detects other gases including cigarette smoke. When the gas detects the output of sensor is send to the microcontroller and buzzer is turned on when the weight measured using load sensor becomes critically low, the alert is send to the user and the new LPG cylinder is booked. The main application of this proposed system is to overcome the shortcomings such as delay and pre-booking of LPG cylinder by the consumers. Work by [1] Mr. Akshay D. Prabhu, Mr. Ashwin D. Pathak, "Gas Leak Detector using Arduino UNO Microcontroller" International Journal for Research in Applied Science & Engineering Technology (IJRASET) ,Volume 5, July 2017 [2] Al-Karaki, J.N. and A. E. Kamal (2004). "Routing techniques in wireless sensor networks: a survey. "Wireless communications, IEEE 11(6): 6-28 [3] S. Ranjitha, T. Swapna, "Security alert system using GSM for gas leakage" International Journal of VLSI and Embedded systems IJVES [4] Ravindra R. Hiwase, Priya K. Kewate , Sushmita P. Tajane, Jitendra Waghmare "Automatic LPG Cylinder Booking and Leakage Detection using Arduino UNO" IJESC [5] Shital Imade, Priyanka Rajmane, Aishwarya Gavali, V.N. Nayak wadi "Gas leakage detection and smart alerting system using IOT" International Journal of Innovative.

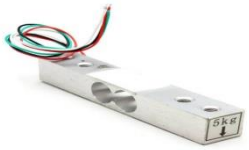
II. MATERIALS & METHODS

The following figure shows the block diagram of gas level detection and automatic gas booking using IOT and also detects gas leakage which is displayed in LCD with an IOT alert.



ISBN: 979-85-27243-61-1

Load Sensor:



A Load cell is a transducer that measures force, and outputs this force as a electrical signal. The load cells are used since it provides the accurate weight. Strain gauge is used in most of load cells for the accurate measurement.The driving voltage if the load is about 5-10V. This is used to measure the weight of cylinder. The accuracy rate is less than 0.1% of full scale.

Gas Sensor:



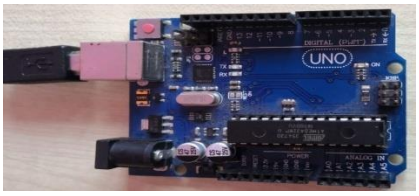
Gas Sesor (MQ-6) module is useful for gas leakage detecting. This sensitivity can be adjusted by the potentiometer. Sensitive material (MQ-6) gas sensing element is SnO2, that will lower physical phenomenon in clear air. The physical phenomenon of the sensing element is high once the flammable gas is detected. The resistanceof the sensor is changed when the gaseous element comes in contact with the sensor. This change can be read in microcontroller. There are different sensitivity values for various gaseous elements.

Relay:



A relay is programmable electrical switch which can be controlled by Arduino or any microcontroller. Its used yo programmaticaly control on/off devices, which use the high voltage and/or high current.

Arduino:

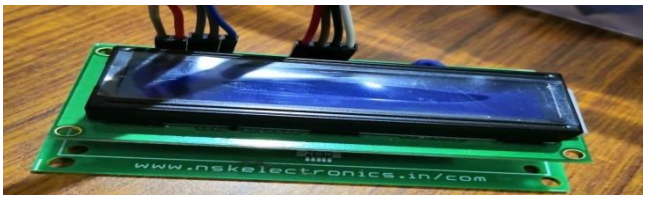


The Arduino UNO board may be microcontroller supported the ATmega328. There are 14 digits input/output pins. Among this vi pins square measure used as PMW outputs, a sixteen megacycle ceramic resonator, an ICSP header, a USB association, vi analog inputs, an influence jack and a button that contains all the desired support required for microcontroller. This can be the connected to laptop with a USB cabel or with a AC-to- DC adapter or battery to urge started

ThingSpeak:

Its an open-source Internet of things (IOT) application and API to store and retrieve data from things using the HTTP protocal over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things status updates

LCD:



LCD includes some microwatts for show compared to some milli watts. Liquid crystal display could be a combiation of 2 states of matter, the soild and therefore the liquid. Liquid is employed to provide a comprehensible imagine in liquid crystal display. The liquid crystal display works on principle of obstruction lightweight. When compered to LED and cathode ray tube, LCD is thinner. Blocking light principle is used for the working of LCD.This is used to display the weight of the gasoline content.

GSM:

GSM could be a mobile communication modern, Its stand for world system for mobile commincatio (GSM). GSM is employed for transmission mobile voice and knowledge services. They are operated at

ISBN: 979-85-27243-61-1

850MHz, 900MHz, 1800MHz and 1900MHz frequency bands that are an open and digitl cellular technology. Standing indicator can flashes unceasingly whenever the decision arrives otherwise its left ON. Network junction rectifier can blink each second that indicates that the GSM module isnt connected to mobile network. The LED blink continously for every 3 seconds, when the connections arent established.

Hardware Requirements:

- Arduino UNO
- Power Supply
- Gas Sensor
- Load CelL
- Relay
- Wi-Fi
- GSM
- Exhaust Fan
- LCD

Software Requirements:

- Arduino IDE
- Embedded C

Methodology:

- The weight of cylinder is calculated by using load cell, and then this information is given to **Arduino** microcontroller.
- The leakage in gas cylinder is detected by **Gas Sensor**.
- If there is any leakage occurs then, this information is sent from **Arduino** to **Relay** and excess of gas is exhausted through **Exhaust fan** and simultaneously **Buzzer** starts to beep to indicate that there is a gas leakage and this is displayed on **LCD Display**.
- Dry weight of gas cylinder is usually known. When it became low than the limit, the supplier gets information through **GSM** by Wi-**Fi Module** from **Cloud** and by knowing this information automatic gas booking is done.
- If there is any gas leakage or empty of LPG content than its marked limit, all of these is displayed on **LCD Display**.

III. RESULTS & DICUSSION

1. The automatic gas booking system was proposed, designed and implemented in our project was useful for home safety and industrial applications.

2. This system detects the leakage of gas and alerts the owner about leakage through SMS, by activating alarm.

3. The system continuously monitors the weight of gas cylinder and display on LCD makes efficient home security to detect the gas leaks.

4. This project is done by implementing Arduino microcontroller and information is uploaded to cloud.

IV. CONCLUSIONS

The automatic gas booking system was proposed. Designed and successfully implemented in this paper for human simplicity and gas leakage detection is useful in home safety and industrial applications. This system detects the leakage of gas and alerts the owner about the leakage of gas by SMS, while activating the alarm. The system continuously monitor the weight of gas cylinder and its display on LCD makes it an efficient home security system and also can be used in industries and other places to detect gas leaks. This project is implemented using the Arduino microcontroller and uploading data to cloud.

V. ACKNOWLEDGMENT

We would like express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also we would like to thank the Head of department Electrical Engineering and faculties for their encouragement and support.

VI. REFFERENCES

[1] Mr. Akshay D. Prabhu, Mr. Ashwin D. Pathak “Gas Leak Detector using Arduino UNO Microcontroller”,

ISBN: 979-85-27243-61-1

International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 5,July 2017

[2] Al-Karaki, J. N. and A. E. Kamal (2004). "Routing techniques in wireless sensor networks: a survey". Wireless communications, IEEE 11(6): 6-28.

[3] S. Ranjtha, T. Swapna, "Security alert system using GSM for gas leakage" International Journal of VLSI and Embedded System IJVES.

[4] Ravindra R. Hiwase, Priya K. Kewate Sushmita P. Tanjane, Jitendra Waghmare "Automatic LPG Cylinder Booking and Leakage Detection using Arduino UNO" IJESC.

[5] Shital Imade, Priyanka Rajmane, Aishwarya Gavali, V.N. Nayak Wadi "Gas leaage detection and smart alerting system using IOT" International Journal of Innovative Research & Studies.

[6] L.K.S. Rohan Chandra Pandey, Manish Verma, "Internet of things (IOT) based gas leakage monitoring and altering system with MQ-2 senor", International Journal of Engineering Development and Research, Vol. 5, 2017.

[7] Shalindra Kumar Dewangan3 Praveen Singh Rathore4 Abid Khan1, Neju K. Prince2. GSM based automatic LPG ordering system with leakage alert. IJRET: International Journal of Research in Engineering and Technology, 3(12). June 2014.

ISBN: 979-85-27243-61-1

AUTOMATIC FISHERMEN BORDER ALERT SYSTEM

1. Preksha S
Student, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
prekshasyadav9830@gmail.com

2. Swathi C
Student, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
swathi951753@gmail.com

3. Rakshitha G M
Student, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
grakshitha5@gmail.com

4. Teju M K
Student, Department of EEE, Sapthagiri College of Engineering Bengaluru, India
tejuyogitha99@gmail.com

5. Mrs. Jhansi K
Assistant Professor, Department of EEE, Sapthagiri College of Engineering, Bengaluru, India
jhansik@sapthagiri.edu.in

***Abstract*—One of the frequent and unsolved problem of Tamil Nadu is that boundary between India – Sri Lanka is not easily identifiable by fishermen so the Tamil Nadu fishermen are arrested, or shot 33by the Sri Lankan Navy and also the fishermen can't able to properly get the help at the emergency situation from Indian Navy. This project gives the solution using Lora wireless technology. It transmits and receives signals for a long range and low power consumption device. By using this we transmit signals from shore and its act as a safe zone for fishermen. If the fishermen crossing the safe zone, they get alert message through LCD and alarm through buzzer then that particular boat number is automatically passed to the Navy with the location of boat through GPS.**

In case of any emergency situation by pressing the emergency key, immediately message is sent to the control station and also alerts nearby boats using Zigbee. This system automatically monitors the weather condition using wind speed sensors.

***Keywords*— GPS, Lora Technology, Smart Tracking, Arduino UNO, Wind Speed Sensor.**

I. INTRODUCTION

In our day-to-day life we hear the news about fishermen once out on the sea the fishermen are subjected to various oceanographic and climatic conditions. Tamil Nadu has involved in conducting fishing along the India - Sri Lanka maritime border. Due to the lag of communication many fishermen are struggling a lot. On the basis of census 2018, there are 3,288 marine fishing villages in Tamil Nadu.

To develop the effective tool to provide the safe navigation system for commercial vessels through waterways is vital thing global. Safety studies have found that the majority of. A portable device will be made which gives a proper communication between one boat to another boat as well as to Indian navy by implementing our project in real time we can save fishermen life.

The people livelihood in coastal areas completely depends on Aquatic occupation in the marine. Overpass the international boundary is being treated as a serious crime. Due to unawareness about the borderline edge, the fisherman used to cross the international margins. After they cross the margin, they are arrested or killed by the pertinent navy and they are being snatched and their boats are being caught by the neighborhood nation's coastal guards. Under such condition exists of fishermen continues to be in danger. And it has become one of the major factors for loss in humans as well as their country economic. To eliminate such difficulties a system has been developed which helps the fishermen to be aware of crossing the border line.

The biggest challenge fishermen facing is to differentiate the international border. Hence, we have come up with a technology like Above Proposed System.

A. The three main features are:

- Border Determination.
- Sorrow message communication.
- Sudden weather change alerting.



Figure. 1: Fishing Boats in Rough OCEAN

XXX-X-XXXX-XXXX-X/XX/$XX.00 ©20XX IEEE
ISBN: 979-85-27243-61-1

To distinguish the border of a country at sea is impossible unlike the land. Unfortunately, many fishermen unknowingly cross the international border and get caught. Whenever the fishermen are in danger condition, just with the help of push button, he can send the signal to the port and nearby boats and also in case of any sudden changes in the weather, the fishermen will be informed to reach back to the shore immediately.

II. PROBLEM STATEMENT

A. *Objectives:*

- Design and development of the system for Fisherman Safety, Security and Tracking System.
- Design and development of the system for Fisherman Safety, Security and Tracking System.
- Use of GPS module for Determining Longitude and Latitude of the Fisherman Boat.
- To Generate the Distress Messages under Dangerous Situations.
- To send a Request Message via Lora technology to Nearby Boats regarding Dangers.
- prevent them from climatic conditions like storm, cyclone and path misleading.

B. *The Main Stages of Project are:*

- Lora wireless technology has transmitter and receiver. It transmits and receives signal for a long range. By using this we transmit the signal over 500km in the sea. It is used to alert the nearby boats during emergency situation by pressing emergency key.
- Buzzer is used for intimate the fishermen when crossing safe zone. GPS (Global Positioning System) is used to find the location of the boat. The real time location of boat is always displayed in control room.
- Wind-speed sensor sense the speed of air and it is continuously displayed in LCD.
- Control station also contains Lora for the communication between shore and boat. The boat signals are received by the Lora receiver.
- Through Arduino UNO the signals are passed to the PC. It shows current location of boat, which boat is crossed the safe zone and also display through monitor.
- All the boats are continuously display through Monitor.

III. METHODOLOGY

This section describes the architecture of the System as well as how it is structured and how it works. The System can be implemented to all most all fishermen boats. Whenever the fishermen are under distress situation, sudden weather changes and crossing the international border, we can intimate message to the nearest boats or the main boat.

A. *Description:*

- The block diagram of the SEAMAN device in the boat of the fishermen shown in Figure.2.
- The Lore Module receiver is used to receive the "sudden weather change alerts" from the Base station.
- Lore Module is used to transmit the SOS message from boat to base station and other boats.
- The latitude & longitude coordinates are obtained using the GPS receiver.
- Push button is used to activate the "distress SOS" communication.
- Both weather alert and SOS activation messages are displayed on respective 16x2 LCD modules.

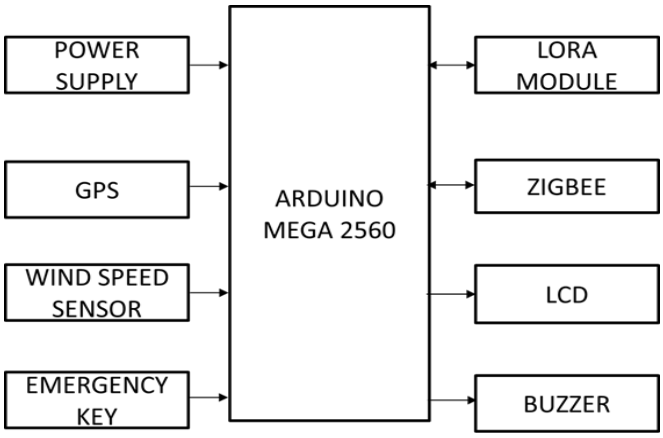


Figure. 2: Block diagram of the planned system Boat Module. Controller section (boat)

The Schematic of the Port Module implemented using Arduino UNO is shown in figure. If the Serial Message is received from the Lora the Data is processed and message is displayed on LCD.



Figure. 3: Block Diagram of the planned system Port Module. Control Room (Base Station)

IV. RESULTS AND DISCUSSIONS

A. *Boat unit of the planned system*

The boat module of the planned system including LCD, push button and GPS module. When the push button is pressed the trigger, message is displayed on the LCD Indicating Particular operation Performed. An SOS Message is sent via

Lora module along with the GPS Location of the Boat, under Danger Condition Along with the Boat Number to the Port as well as nearby boats.



Figure. 4: Controller section (boat)

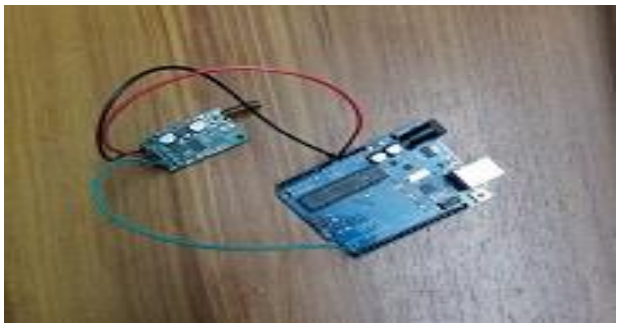


Figure. 5: Control Room (Base Station)

The Boat module decodes the Received information from the Lora and Displays the Template message on LCD as shown in the figure.4.

Longitude and Latitude Values of the Boat under Danger situation. The figure shows the Port module of the proposed system. Whenever the Port module receives the Information via the Lora Module the Command is decoded and displayed on LCD, Regarding the Problem of Boat which is under Danger. The Longitude and Latitude Reference value of the Boat which is under danger situation is displayed along with the Boat number which is decoded from the Message received from the Boat Module.







Figure. 6: Boat module indicating the Message to Fisherman that messages displayed on the LCD of Boat Module.

B. Advantages

- Can be implemented into any small fishing boats with rechargeable battery support.
- User friendly operation for illiterate fisherman due to Audio visual Indicators.
- Cost effective.
- Less maintenance is required.

C. Applications

- Used by small scale fishing industries to provide security to their employees.
- Used by marine transport industry to provide security and track their vehicles in the sea.
- Self-employed fishers can use this system to communicate with neighbor Boats in dangerous situations.
- Can be incorporated into the trespassing Police boats where high security and tracking is required.
- Boat module indicating the Message to Fisher men About Crossing Indian Border

V. CONCLUSION

In previous days fishermen cannot easily find out the border and proper information about climatic condition. With the help of this paper, we can easily identify the border and continuous monitoring of climatic condition using Lora wireless technology and wind speed sensor. And also, we can track the boat location. Thus, the fishermen can easily identify the national sea borders and therefore prevents them from entering their area. Thus, saving their lives and providing good relationship with the neighboring countries. Also, the piracy of ship can be easily brought.

VI. FUTURE SCOPE

- Marine traffic can be completely controlled and bought under control.
- We can extend the long-range wireless communication using libilium.

VII. REFERENCES

[1] M. Sivaramaganesh/International journal of innovative research in electrical, electronics, instrumentation and control engineering vol. 2, issue 3, March 2014.

[2] K. Prabhakaran, A Novel Approach of Geofencing and Geotagging System Based Sea Border Identification Using Embedded System - International Conference on Current Trends in Engineering and Technology, July 2013.

[3] K. Suresh Kumar, K. Sharath Kumar, "Design of low-cost maritime boundary identification device using GPS system", International Journal of Engineering Science and Technology, Vol. 2(9), 2010.

[4] Glanford A. McFarlane and JosephSkobla, "GPS Based Marine Communicator, Department of Physics; the University of theWestIndies", 2010IEEEAerospaceConferene Proceedings University of the West Indies", 2010 IEEE Aerospace Conference Proceedings.

[5] Design of Data Acquisition and Record System Based on Zigbee and GPS - Huali Chen & Zhifan Feng - Pacific-Asia Workshop on Computational Intelligence and Industrial Application, 2008. PACIIA '08.

[6] The System of GPS Navigation Based on ARM Processor Wang Bo &Jia-Xu Dong International Forum on Information Technology and Applications (IFITA), 2010.

[7] P. Satheesh, Maritime Border Refuge System [MBR] National Conference on Emerging Trends in Computer, Communication & Instrumentation in Strength Security.

MATEMATICAL MODELING AND SIMULATION OF SERIES DC MOTOR IN ELECTRIC CAR

1. Kousalya D
Student, Department of EEE Sapthagiri College of Engineering
Bengaluru, India
kousalyadevendran99@gmail.com

2. Kushal D
Student, Department of EEE Sapthagiri College of Engineering
Bengaluru, India
rakshitkushal0044@gmail.com

3. Manasa R
Student, Department of EEE Sapthagiri College of Engineering
Bengaluru, India
manasarajanna07@gmail.com

4. Manoj C
Student, Department of EEE Sapthagiri College of Engineering
Bengaluru, India
manojgowda1357@gmail.com

5. Mrs. Preetha N P
Assistant Professor, Department of EEE, Sapthagiri college of Engineering, Bengaluru, India,
preethanp@sapthagiri.edu.in

***Abstract*— This paper is assessing use of series DC motor in electric car with its rotation speed controller, and evaluating its performances when different running cases of electric car with different car.

Computer model of these equations was implemented using MATLAB/SIMPOWER facilities obtaining a complete model for motor and controller. Series DC motor is considered and its parameters were used for simulation. The electronic controller operates based on PWM control technique.

Simulation of series DC motor performances was conducted within presumptions of changing car load and different resistant torques.

Changing loads was realized changing number of passengers when electric car is running on normal streets, when running on streets with slope, when car accelerate to reach a stead speed and when car is changing speed rigidly and suddenly running on country road having some holes and small slopes.

Keywords—Series DC motor, Simulation, PWM inverter, Electric Car.

I. INTRODUCTION

The aim of mathematical modeling is an essential step in the analysis and design of physical systems. In this paper, the mathematical models of DC motors are obtained by applying the fundamental physical laws governing the nature of the components making these models. A electric motor is being an electromechanical system, Newton's laws are used in the mathematical modeling of mechanical systems. Similarly, Kirchhoff's laws are used in the modeling and analysis of electrical systems. In general, the mathematical model of a system is one which encompasses of algebraic and differential equations describing the steady state and dynamic behavior of the system.

The manufacturers of cars in cooperation with scientific research institutions and technical universities jointly conduct research for the development of several types of electric motors especially for use in automotive application. As a result there were several types of electric motors chosen for use in vehicles, such as DC motors, Induction motors and Variable Magnetic Resistance motors. That most commonly used and currently the most prevalent are the three-phase inductive motor followed by the series DC motor.

In this research a series DC motor used in electric traction in general and for electric cars in particular, will be considered. The operating equations of such motors and equivalent electric circuit will be modeled and simulated using MATLAB/SIMULINK. A suitable switched Electronic controller based on PWM technique is used to drive this motor and control its speed: this controller was modeled in the same complete computer model. The study of the motor performances was conducted within presumptions of changing car load from one passenger(the driver) to 6 passengers, as well as motor performance when electric car is running with different load torques on variable roads slope and when car is running on rural roads.

XXX-X-XXXX-XXXX-X/XX/$XX.00 ©20XX IEEE
ISBN: 979-85-27243-61-1

II. Mathematical Model Of Series DC Motor

DC motors are considered the best type of motor from the point of speed control and regulation its speed with high accuracy and fine increments. The advantage of using this type of motor is the possibility of changing the direction of rotation by reversing the polarity of the input voltage. This motor also has a high torque that is proportional to the Square value of the load current.

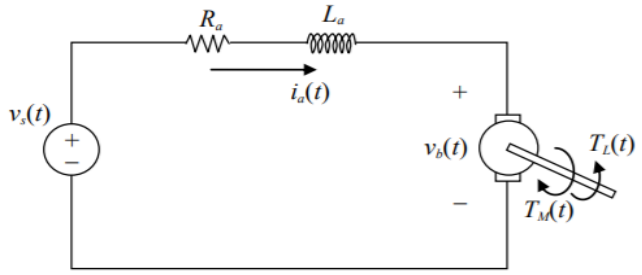


Fig:-Electric circuit of series DC motor

The system structure of a DC motor is depicted in Figure, including the armature resistance Ra and winding leakage inductance La. According to the Kirchhoff's voltage law, the electrical equation of the DC motor is described as,

$$R_a i_a(t) + L_a di_a(t)/dt + V_b(t) = V_s(t) \quad \rightarrow (1)$$

Where $i_a(t)$ = Armature Current

$V_b(t)$= Back emf voltage

$V_s(t)$=Voltage source

The back emf voltage Vb(t) is proportional to the angular velocity w(t) of the rotor in the motor expressed as,

$$V_b(t) \alpha w(t)$$

$$V_b(t) = K_b w(t) \quad \rightarrow (2)$$

Where K_b is the back emf constant.

In addition, the motor generates a torque Tm proportional to the armature current, given as,

$$T_m(t) \alpha i_a(t)$$

$$T_m(t) = K_T i_a(t) \quad \rightarrow (3)$$

Where K_T is the torque constant,

If the input voltage $V_s(t)=V_s$ is a constant, the resulted armature current ia(t)=Ia, angular velocity w(t)=Ω and torque $t_m(t)$=T are also constant in the steady state.

From equation (1) to (3), we have

$$R_a I_a + K_b \Omega = Vs \quad \rightarrow (4)$$

$$T = K_T I_a \quad \rightarrow (5)$$

Under the conservation of power, we know that the input power IaVs is equal to the external power resistance. i.e.,

$$V_s I_a = T\Omega + R_a I_a^2 \quad \rightarrow (6)$$

Substituting Vs in Equation (4) into (6) yields

$$T = K_b I_a \quad \rightarrow (7)$$

From equation (5) and (7), we know that both Kt and Kb are the same. From equation we can rewrite equation (1) and (3) as

$$R_a i_a(t) + L_a di_a(t)/dt + Kw(t) = V_s(t) \quad \rightarrow (8)$$

$$T_m(t) = Ki_a(t) \quad \rightarrow (9)$$

Where $K=K_T= K_b$.

Besides, it the DC motor is used t drive an external torque $T_L(t)$ of payload then its mechanical behaviour is described as,

$$T_m dw(t)/dt + B_m w(t) = T_m(t) - T_L(t) \quad \rightarrow (10)$$

Where T_m is the rotor moment of inertia and Bm is the frictional co-efficient.

Based on Eq(8), (9) and (10), the dynamic equation of the DC motor can be expressed as

$$L_a di_a(t)/dt + R_a ia(t) + K_w(t) = V_s(t) \quad \rightarrow (11)$$

$$J_m dw(t)/dt + B_m w(t) - Ki_a(t) = -T_L(t) \quad \rightarrow (12)$$

Note that the electrical time constant la/Ra is often neglected since it is at least one order in magnitude smaller than the mechanical time constant Jm/Bm. In other words by neglecting the term dia(t)/dt , equation (11) becomes

$$I_a(t) = V_s(t)/R_a - Kw(t)/R_a \quad \rightarrow (13)$$

Substituting it into equation (12), we have

$$J_m dw(t)/dt + B_m w(t) - K[V_s(t)/R_a - K/R_a\, w(t)] = -T_L(t)$$

$$J_m dw(t)/dt + B_m w(t) - KV_s(t)/R_a + K^2/R_a = - T_L(t)$$

$$J_m dw(t)/dt + [B_m - K^2/R_a]w(t) = - T_L(t) + KV_s(t)/R_a$$

Divide by J_m

$dw(t)/dt\ (t)+ [B_m/J_m - K^2/J_mR_a]w(t) = - T_L(t)/J_m+ KV_s(t)/R_aJ_m$ → (14)

Clearly, the motor will encounter two external sources, the input voltage $V_s(t)$ to drive the motor and the torque $T_L(t)$ reacted from the pay load.

Now,based on the above analysis, let's discuss the model of a DC motor in state-space description and input-output description.

First, let's consider the case which requires the DC motor to move in a constant speed. Then, the angular velocity is selected as the output,expressed as

$y(t)=w(t)$ → (15)

From equation (11) and (12) and choosing the state variables as $x_1(t) + L_a\dot{x}_1(t) + Kx_2(t) = V_s(t)$ → (16)

$J_m\dot{x}_2(t)= B_mx_2(t) - Kx_2(t)= - T_L(t)$ → (17)

Further rearranging equation (16) and equation (17) the state equation

$\dot{x}_1(t)= - R_a/L_ax_1(t) -K/L_ax_2(t)+ 1/L_aV_s(t)$ → (18)

$\dot{x}_2(t)= - B_mJ_mx_2(t) -K/J_mx_1(t) -T_L(t)/J_m$ → (19)

And the output equation is

$y(t) = x_2(t)$ → (20)

Hence, the state- space description is given as

state equation : $\dot{x}\ (t) = Ax(t)+ Bu(t)$ → (21)

Output equation : $y(\ t) = Cx(t)$ → (22)

Where the state vector is $x(t) =\begin{bmatrix} x1(t) \\ x2(t) \end{bmatrix}$,

The input vector is $u(t)=\begin{bmatrix} Vs(t) \\ Tl(t) \end{bmatrix}$, and the

System matrices are $A=\begin{bmatrix} -Ra/La & -K/La \\ K/Jm & -B/Jm \end{bmatrix}$, $B=\begin{bmatrix} 1/La & 0 \\ 0 & -1/Jm \end{bmatrix}$ and $C=[0 \quad 1]$

Note that the state equation (21) can be rearranged as

$\dot{x}(t)=Ax(t)+b_1u_1(t)+b_2u_2(t)$ → (23)

Where $u_1(t) =V_S(t)$, $u_2(t) =T_L(t)$, $b_1=\begin{bmatrix} 1/La \\ 0 \end{bmatrix}$ and $b_2=\begin{bmatrix} 0 \\ -1/Jm \end{bmatrix}$

If the motor is operated without any payload $T_L(t)$, i.e., $u_2(t)=T_L(t)=0$, then the state Equation(23) can be rewritten as, $\dot{x}(t)=Ax(t)+bu(t)$ → (24)

Where the input is $u(t) =V_S(t)$ and the input matrix is $b=\begin{bmatrix} 1/La \\ 0 \end{bmatrix}$

If the goal of control is o drive the DC motor to a desired angle, not a speed, then the output should be set as the angular position.

$y(t) =\theta(t)=\int_0^t w(\tau)d\tau$

To include the angular position, we often change the integral form $\theta(t)= \int_0^t w(\tau)d\tau$ into the differential form as below. $\theta(t)=\omega(t)$ → (25)

And choose the new state variable $x_3(t) = \theta(t)$. As a result, the total system is changed into the state equations,

$\dot{x}_1(t)= - R_a/L_ax_1(t) -K/L_ax_2(t)+ 1/L_aV_s(t)$ → (26)

$\dot{x}_2(t) =K/J_mx_1(t)-B_m/J_mx_2(t)-1/J_mT_L(t)$ → (27)

$\dot{x}_3(t) =x_2(t)$ → (28)

And the output equation

$y(t) =x_3(t)$ → (29)

In matrix form, we have

State equation: $\dot{x}(t)=Ax(t)+Bu(t)$ → (30)

Output equation: y(t)=cx(t) → (31)

Where x(t)=$\begin{bmatrix} x1(t) \\ x2(t) \\ x3(t) \end{bmatrix}$, u(t)=$\begin{bmatrix} Vs(t) \\ TL(t) \end{bmatrix}$

A=$\begin{bmatrix} -Ra/La & -K/La & 0 \\ K/Jm & -Bm/Jm & 0 \\ 0 & 1 & 0 \end{bmatrix}$, B=$\begin{bmatrix} 1/La & 0 \\ 0 & -1/Jm \\ 0 & 0 \end{bmatrix}$

C=[0 0 1]

Similarly, without any payload $T_L(t)$, the state equation(30) can be expressed as,

$\dot{x}(t)=Ax(t)+bu(t)$ → (32)

where the input is $u(t)=V_S(t)$ and the input matrix is $b=[1/La \quad 0 \quad 0]T$.

III. PID Controller

The control goal is to stabilize both the current and torque by minimizing the error and to achieve this stated objective a proportional-derivative controller is implement in such a way that the gain of the proportional controller, K_p, is high to produce a fast system and the derivative gain K_d, is select in a manner to decrease the oscillation. The PD controller algorithm combines the P-action and D-action to adjust the system. It is a two-term controller that is coined from the PID controller by setting the integral action to zero. The term domain expression for PD controller is given as:

$$U(t)=K_p e(t) + K_d \frac{de}{dt}$$

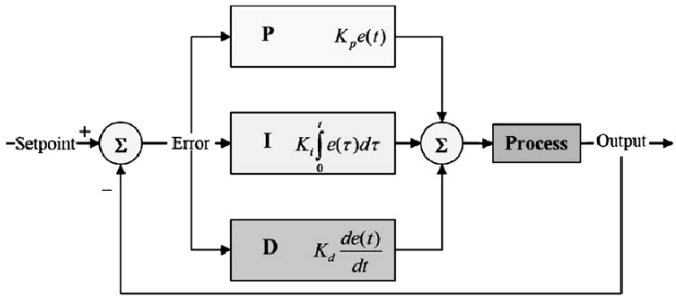


Fig:-PID Controller

Where U(t) is the control signal, The error signal e(t) is defined as e(t)=r(t)-y(t) and r(t) is the reference input signal. In the Simulink and Simelectronics models, a PD controller is implemented from the PD block in the Simulink toolbox library and converted to a physical system with Simulink-PS converter for the Simelectronics. The tuning of control parameters is done using PID tuner and the best performance of the controller parameter values are selected.

IV. SIMULATING THE SERIES DC MOTOR

According to mathematical model of dynamic state for the series DC motor mentioned above, the following model has been developed using MATLAB/SIMULINK tools and shown in fig.

The control system that was used operates in a closed loop configuration providing a stable output during changes in the operating parameters of the system. This is achieved by sampling the output of this system and comparing it will a desired values constantly giving feedback of errors in output values to PID controller for processing. The control systems used in continuous PID controllers are commonly used to address the error signal based on the desired parameters such as speed, torque, current and position to adjust the values of these parameters so as to achieve better transient response through several criteria, including the relative deviation of the output such as speed, control the speed of response, static error and the oscillating of the system.

The common way to start addressing problems related to the speed of response is therough the proportional part of the controller, while processing errors occuring in the steady-state is in the integral amplifier part; whereas the differential part has the complementary role in damping oscillations occuring in a transient state while reaching the desired state. The pedal based control used to drive a DC motor in electric car is done based on PWM (Pulse Width Modulation) technigue, which is one of the modern methods in the control of motors which offers lower power loss during control of motor.

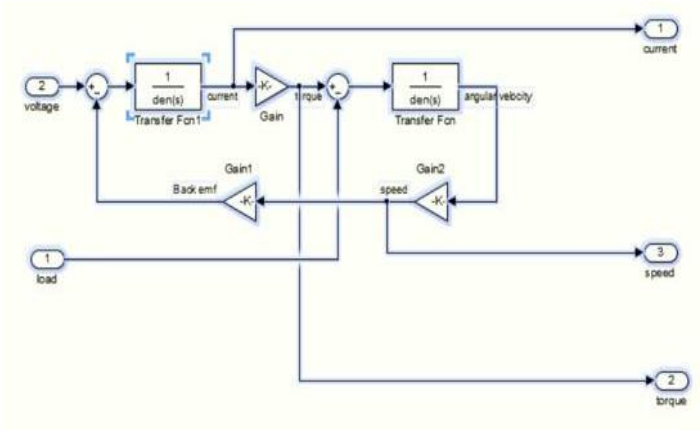


Fig:-Transfer function model of series DC motor

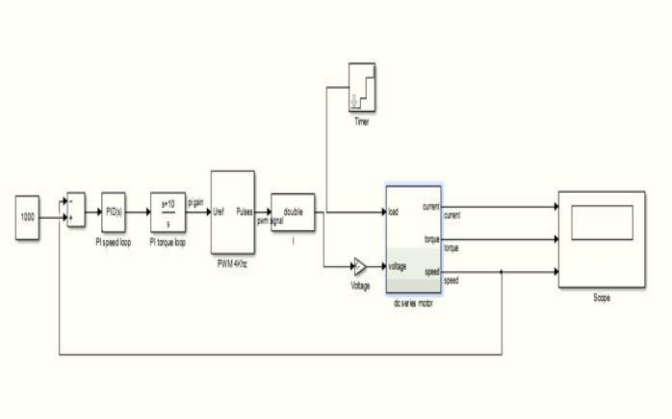


Fig:-Simulation model of series DC motor

V. SIMULATION RESULTS

The series DC motor was tested with PWM using simulation of the complete model implemented in MATLAB/SIMULINK to study its behavior if used in electric car. The cases can simulate the running with different loads on motor axis while car is moving from 0 rpm speed and accelerating till steady speed is reached and maintained for a period of time; running on streets with slope applying smooth increase to speed; running on rural roads having holes and small slopes which force the driver to break and change speed.

In simulation, the running of series DC motor applying different load torques, considering the weight of empty car is on average of 620kg, the average weight of 4 passengers is 350kg.

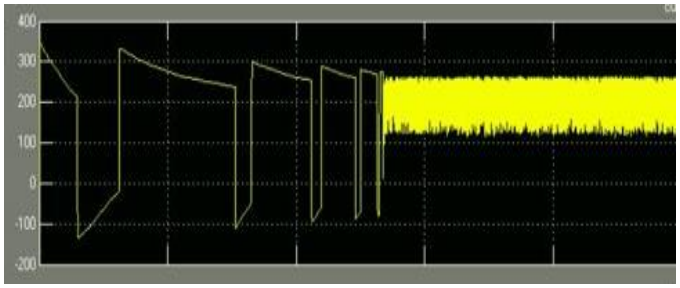


Fig:-Case(i):Current vs time

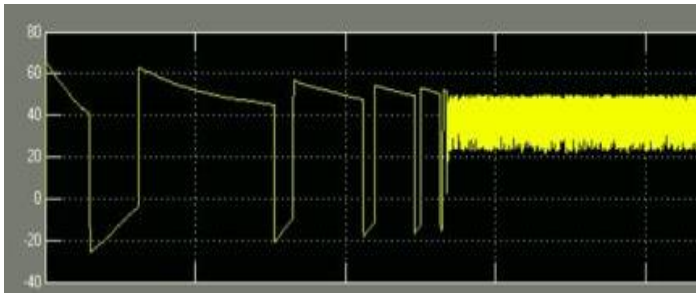


Fig:-Case(i):Torque vs Time

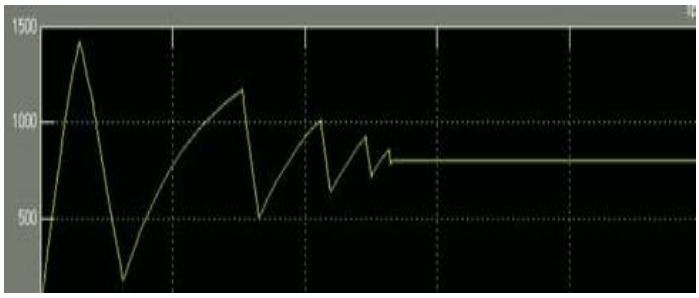


Fig:-Case(i):Speed vs time

The results are given variation in time of toque, current and rotation speed of the series of the Series DC motor when a load torque equal to 100% of the nominal torque of DC motor is applied.

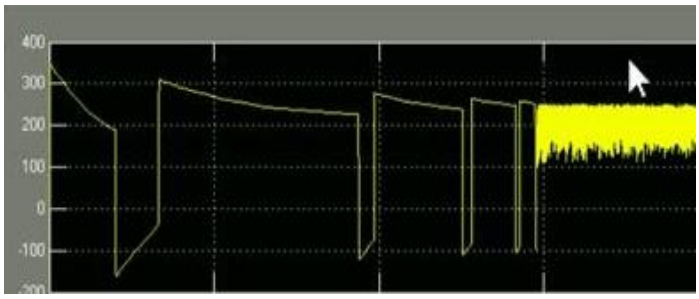


Fig:-Case(ii):Current vs time

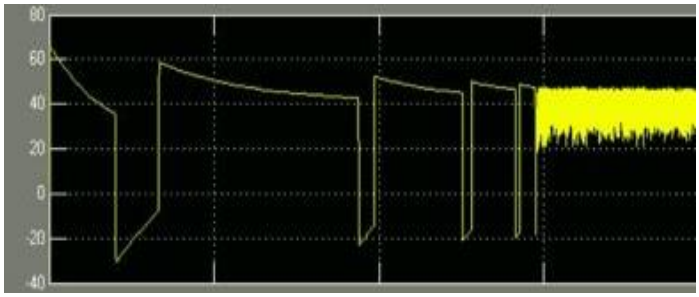
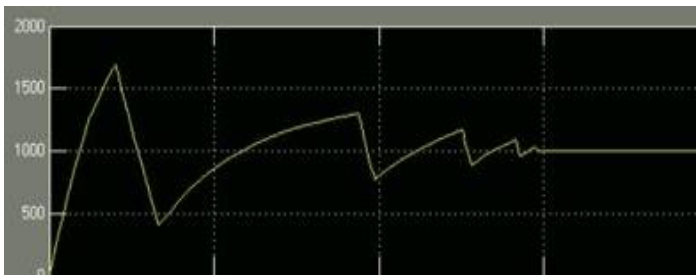


Fig:-Case(ii):Torque vs Time



Case(ii):Speed vs time

When both torque and speed are positive values the D motor is providing torque in the direction of rotation. This is normal motoring operation. When the motor torque is in the opposite direction to the speed, then the motor is being pushed and acting as a generator.

The following graphs are shown to conclude the current, torque and speed with respect to time is each graph for two different load cases.

VI. CONCLUSION

1. The Series DC motor reaches steady state having constant rotation speed after transient period not exceeding 1.5s is most loading cases of the car. This confirms that Series DC motor is suitable to be used in electric cars and generally in electric traction.
2. When load torque is increased or reduced to comply with country roads with holes and slopes, rotating speed is reduced or increased accordingly. The response of Series DC motor is satisfactory.
3. This simulation results can be used for electric vehicle applications.

VII. ACKNOWLEDGEMENT

The authors would like to thank Dr.Narayanappa HOD of EEE, and Mrs. Preetha N P, Assistant Professor at Sapthagiri College of Engineering, for their support and advice.

VIII. REFERENCES

1. Bambang K, Soebagio M, Hery P. Design and Development of Small Electric Vehicle Using MATLAB/SIMULINK. Institute of Technology, Indonesia; 2011.
2. E. Can and H. H. Sayan, “THE PERFORMANCE OF THE DC MOTOR BY THE PID CONTROLLING PWM DC-DC BOOSR CONVERTER” teach.j., vol6168, pp.182- 187,2017 BOOST CONVERTER,” Tech. J., vol. 6168.
3. Z. Bitar, S. Al, and I. Khamis, “Modeling and Simulation of Series DC Motors in Electric car” energy procedia, vol. 50, pp.460-470, 2014.
4. M. R. Khan, “Speed Control of DC Motor under Varying Load Using PID Controller,” Int. J. Eng., no. 9, pp. 38–48.
5. Richard A. Mathematical Modelling and Simulation of a PWM Inverter Controlled Brushless Motor Drive System from Physical Principles for Electric Vehicle Propulsion Applications. Cork Institute of Technology, Ireland; 2011.

SMART DIESEL GENERATOR CONTROL AND MONITORING USING ANDROID APPLICATION

Rekha S N*[1], Praveen J[2], P. Aruna Jeyanthy[3]

*1,2 *Department of Electrical and Electronics Engineering, Sapthagiri College of engineering*
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India
3 Kalasalingam academy of Research and Education

[1]rekhasn@sapthagiri.edu.in

[2]praveenjaishankar123@gmail.com

[3]p.arunajeyanthy@klu.ac.in

Abstract **-** The traditional technique of monitoring an electric generator was through regular checks on the generator's variables: oil, temperature, voltage and frequency on a daily basis. Therefore, keeping a normal cycle of performance requires hard work and is often imprecise. The paper presents the solution for the aforementioned issues and more. The idea is to initialize an application that monitors electric generators wirelessly, using the famous Smart Phone operating system Android. The implemented sensors deliver analog signals that provide real time data about the generator's status. These data are converted and programmed though the Arduino micro-controller, which outputs the results in its digital state and then transforms the output into a serial signal, transmitted to the android phone, through IOT technology. Thus, a live feedback of the state of the generator is assured. This project is the first step towards the combination of systems monitoring locally using 16X2 LCD and monitoring remotely using IOT cloud service because it revolutionizes the ideology of monitoring and displaying real time data which can be implemented in various fields depending on different needs. Such fields include electricity, mechanics, and communication. The main limitation faced was the lack of advanced electronics, and technology.

INTRODUCTION

Electric generators play an essential role in majority of today's economic fields, as they are the main element that powers up the whole system of modern life. Since the glue holds the design of the 21st century, technological dependency is extremely crucial[1], monitoring these generators is a major and important issue that factories are facing, to overcome this every factory must have a maintenance team to check up on the vitals of the generator in a daily, hourly and cyclic manner which requires a lot of hard work. [2],[3]In addition to this, inaccurate data readings become a problem due to the lack of automation. To facilitate the whole process and to resolve the aforementioned problems, the solution is presented by building an android application that can monitor the live conditions of the generator including fuel level, temperature, frequency and voltage values. This paper presents a new application in the domain of embedding various systems, aiming for the advancement and contribution to the technological world present. And finally, to provide a smart and creative solution that can help and initiate a boost to the field of wireless monitoring.

A diesel electric generator is the combination of a diesel engine with an electric generator (often an alternator) to generate electrical energy. Diesel generator sets are used in places which lack connection to the country's main power grid, [4] they are used as emergency power-supply devices if the grid fails and also used for more complex applications such as peak-lopping, grid support and export to the power grid. Sizing of a diesel generator is critical to avoid low-load or a shortage of power and is complicated by modern electronics, specifically non-linear loads". Diesel and gaseous-fueled generators each offer advantages to consider when designing a standby power solution [5]. By comparison, diesel-fueled generators provide access to backup power in remote areas that do not have a gaseous-fuel infrastructure. When applied to standby power applications, a diesel-fueled generator delivers a lower capital cost per kilowatt of electricity than a gaseous-fueled generator [6] . Attempts to lessen this disparity, such as converting industrial diesel engines to gaseous fuel, only add engineering costs to the project. As a result, diesel-fueled generators have a capital cost advantage over their spark ignited counterparts in larger standby applications, making

ISBN: 979-85-27243-61-1

them the traditional market norm. Previously it was monitored by a technician. It was not possible to cover all generator by just one technician and also all records were in register format so work needed more time. It was very difficult and hard to check all the required parameters.

PROPOSED METHODOLOGY

Condition monitoring is the process of monitoring a parameter in a machinery (fuel level, temperature etc.) in order to identify a significant change which is the indication of a developing fault. It is a major component of predictive maintenance. The use of conditional monitoring allows maintenance to be scheduled or other actions to be taken to prevent failure and avoid its consequences. Condition monitoring techniques are normally used on important equipment and other machinery (pumps, electric motors, internal combustion engines, presses). A wireless sensor network of spatially distributed autonomous sensors is used to monitor physical or environmental conditions such as temperature, frequency, fuel level, etc., and to cooperatively pass their data through the network to a main location. The more modern networks are reading various parameter using sensor activity. Today such networks are used in many industrial and consumer applications, such as power generator, industrial process monitoring and control, machine health monitoring, and so on.

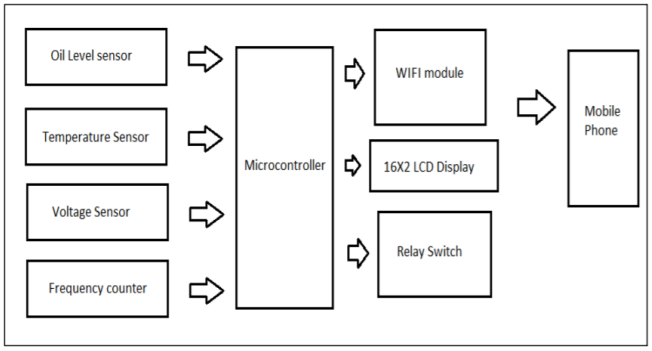
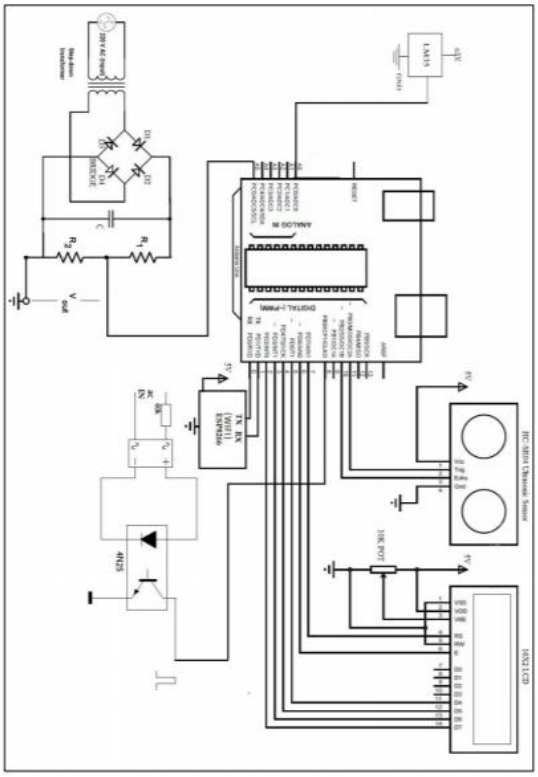


Fig.1 Block Diagram

Fig.1 represents the block diagram of the proposed methodology .The four sensors which are used for the monitoring of generator are directly connected to the Arduino microcontroller in addition to the pins from the digital side of the Arduino which are connected to the relays implemented in the generator, making it possible to initiate the generator. Once the start button is pushed, a signal will be sent from the phone to the router all the way to the Arduino's control digital pins where it will be switched from 0V to 5V which will turn ON the relay allowing the battery of the generator to close the circuit, thus turning ON the generator. After this step is complete, the 4 sensors will send real time values to the Arduino, and the latter will transmit them, after converting them into digital values, to the router which in turn will emit them through WiFi to the phone ensuring live feedback of the generator's vital signs. Moreover, if any vital sign of the generator gets out of the normal range the phone will receive a notification, warning the user to check up on the generator. Next, if the user wants to turn off the generator, all that's necessary to be done is to press the STOP button where a control signal will be transmitted from the phone to the Arduino, following the same concept as the START button and a normally closed relay will open allowing the generator to turn OFF.

HARDWARE IMPLEMENTATION



ISBN: 979-85-27243-61-1

Fig.2 Circuit Diagram

Fig.2 represents the circuit diagram of the hardware model. For this proposed real-time frame works takes a frequency sensor, voltage sensor, oil level and a LM35 temperature sensor for monitoring frequency, voltage, oil and temperature respectively, this data from the DG system can be then sent to any desired location in the world. The analog values are taken in multiplexing mode connected to a programmable microcontroller ATMEGA328. The power supply is given through a step down transformer 230V/12V, which steps down the voltage to 12V AC. This is converted to DC using a bridge rectifier and it is then regulated to +5V using a Voltage Regulator 7805 which is required for the operation of the Arduino, 3.3 Volts for the Wi-Fi unit and other components. All sensors work on 5 Volts DC. The temperature sensor and voltage sensor are giving analog output so both these sensors are connected with analog pin of microcontroller. While ultrasonic sensor and frequency sensor both are digital sensors and so these two sensors are interfaced with digital pin of microcontroller. IOT module is interfaced with digital TX and RX pins of microcontroller. LCD display is also connected with digital pins of microcontroller. Microcontroller reads the data of all the sensors one by one and after processing the data, it passes it to the LCD display for local monitoring and same data is passed to ESP8266 Wi-Fi module for remote monitoring. All these works happen in a loop and cycle repeats continuously. Fig.3 represents the hardware model.

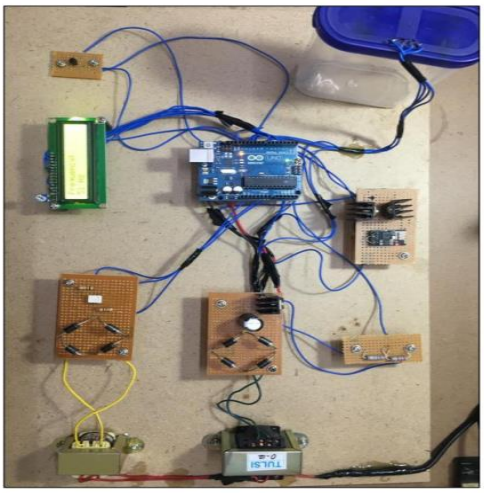


Fig.3 Hardware model

SOFTWARE IMPLEMENTATION

ESP-01 and ESP-03 were initially meant to be used as an Arduino WiFi module. In that aspect it made sense to break out CH_PD so that the user could disable the device when not in use (to save power).

ESP-01 and ESP-03 were initially meant to be used as an Arduino WiFi module. In that aspect it made sense to break out CH_PD so that the user could disable the device when not in use (to save power).

Blynk is an Internet-of-Things platform designed to make development and implementation of smart IoT devices quick and easy. It can be used to read, store, and visualize sensor data and control hardware remotely Internet of Things has been all the buzz lately and more and more devices are being talking to internet every day. With the rise of such amazing technology, the risk of security has also increased substantially. Some of the major concerns in IoT are:

♣ If IoT devices are sending your data to the internet, the communication needs to be closed and encrypted which cannot be possible without using a dedicated and closed server which is really hard to manage.

ISBN: 979-85-27243-61-1

♣ The IoT devices also need to be responsive and again, that is not possible without a server with low latency and high responsiveness.

♣ In IoT, the platform needs to be compatible with many different types of hardware architecture and devices, so that it doesn't restrict its users with single type of hardware with limited capabilities. Keeping in view the problems mentioned above, Blynk is the perfect solution for all these problems. Blynk consists of the following three major components:

Blynk App – The mobile app developed by Blynk works as a control panel for visualizing and controlling your hardware. It is available for both Android and IOTS. The app offers a very productive interface and various different widgets for different purposes. Blynk works on a currency of its own called energy. New users get 2000 amount of Blynk energy with a free Blynk account and this energy is used to buy and deploy widgets in the paper.

Blynk Server – The most amazing component of the Blynk Platform which makes it all possible is the Blynk Server. Blynk offers a secure, responsive and centralized cloud service through its server which allows all of this communication between the devices. The Blynk server is also available as open source so you can literally make your own server and make it even more secure with a little tinkering.

Blynk Library – The key feature of Blynk platform which makes it scalable and amazing, is the Blynk Library. The Blynk Library makes it possible to connect your hardware and get it up and running in a blink. The support for multiple hardware devices including Arduino, ESP8266 and Raspberry Pi is included in the library and it also makes it possible to connect with hardware through many different ways of communication like Wi-Fi, Bluetooth, BLE, USB and GSM. The fig.4 indicate the flow chart of the work.

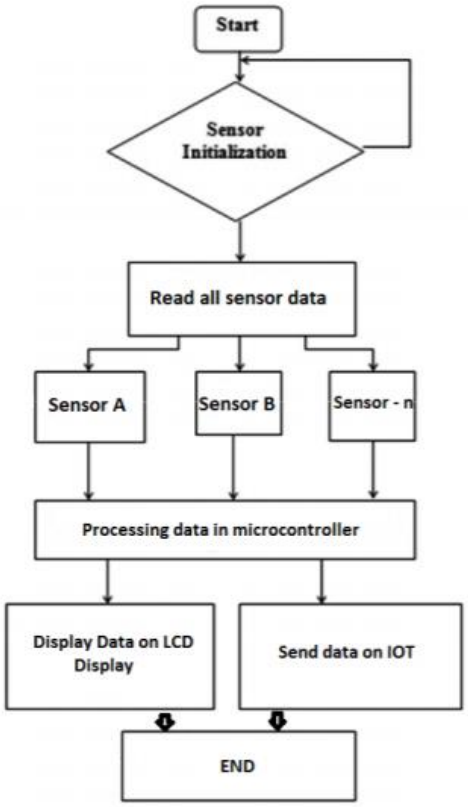


Fig.4 flow chart

In particular the suggested system will be a powerful, flexible and secure tool that will offer this service at any time, and from anywhere with the constraints of the technologies being applied. The embedded controllers are capable of sensing the various parameter of generator in normal and abnormal condition. The embedded controller offers a wide scope of application in the field of remote monitoring in the diesel generator industry. We are able to get all parameter value in real time. We tested the all senor by changing the environment and condition for sensors. As per the implementation all sensor and its parameter working perfectly.

The following images shows the readings taken by the system for various parameters

1. Oil Level

ISBN: 979-85-27243-61-1



2. Frequency measurement



3. Temperature measurement



4. Voltage measurement



This paper developed a new idea, it is simple yet advanced. It offers a mixture of formulas that finally got tested for validation. It offered us a chance to nurture our curiosity towards our courses in communication, signals, programming and electrical circuits. The major contribution of the paper to the world as an advanced monitoring system as it can be produced in other forms to reflect different needs. Developed good knowledge in all aspects related to the functioning and monitoring of an electric generator which increased our experience in the real world of technology. The paper opens up a whole new dimension related to future work in the market, especially since it is highly requested by managers in fields concerned with controlling and monitoring machines from a distance. In addition, this paper is still in need for several types of updates. The future work of this work has a wide scale because the plan on continuously advancing this work and updating it. For instance, an idea is to switch the task of monitoring electric generators to monitoring and controlling medical equipment in hospitals because the whole communications system works with the same concept.

REFERENCES

[1]. D.V. Pushpa Latha1, K.R. Sudha2 and Devabhaktuni Swati1, “Millienium3 PLC Based Temperature Control Using LM 35,” Research Journal of Engineering Sciences, vol.2, no.6, pp.30-34, June 2013.

[2] E. Baraneetharan, Dr.G.Selvakumar, “Implementation of GSM Based Automatic Change over System for Electric Generators,” International Journal of Innovative Research in Science, Engineering and Technology, vol.4, no.6, May 2015

[3] Gaby AbouHaidar, Roger Achkar, Roger Achkar, “Remote Generator Control Using Android Application,” 2014 8th Asia Modelling Symposium,I vol.978, no.1, pp.4799- 6487. 2014.

[4] H. Yamamura, M. Ogasawara, “Diesel Generating Set with Self-Diagnosis Function,” Engineering Bureau, Nippon Telegraph and Telephone Public Corporation IEEE, 1984.

[5] K. S. Ahn, “Digital Controller of a Diesel Generator using an Embedded System,” International Journal of Information Processing Systems, vol. 2, no.3, 2006.

[6] M. Sarsamba, “The Load Monitoring and Protection on Electricity Power lines using GSM Network,” International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, no. 9, 2013.

ISBN: 979-85-27243-61-1

IMPLEMENTATION OF IOT ON SPEED CONTROL OF SINGLE PHASE AC MOTOR.

[1]DIVYA N S, [2]PRAJWAL S, [3]PRASHANTH Y L, [4]SHIVARAJ N P

[1]Assistant Professor, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
[1]divyans@sapthagiri.edu.in

[2,3,4,]Students, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering,Bengaluru
[2]prajwal3579@gmail.com, [3]prashanthyl035@gmail.com, [4]shivarajshivu1811@gmail.com,

***Abstract*— Single-phase Ac motors are used widely in home appliances and Industrial control due to their cost and useful application. The Mosfet driver serves the purpose of amplify between the microcontroller circuit and the Mosfet and supplies the required gate voltage for the conduction of the power Mosfet in this section. The microcontroller consequently provides the pulse signal based on sets the frequency, which in provides the different switching frequency for the desired speed. This frequency user will pass through IOT platform. ESp8266 IOT module interfaced with microcontroller and user will able to change speed using by this frequency change The complete project is modelled and tested using hardware implementation to control the speed of a single phase motor.**

Keywords*— *Rectifier bridge section; Iot Speed control; MOSFET and Step-up transformer

I. INTRODUCTION

In previous days, various limitations for variable speed drives such as low speed, large space, efficiency poor etc. But, the invention of power electronics devices change the situation so now, variable speed drive are constructed in smaller size and high reliability.

Motors used in most industrial processes due to their reliability, rugged nature, low maintenance and reduced cost. A variable frequency also referred to as a variable speed drive is a type of system through which speed of an induction motor can be varied. A variable frequency makes use of electrical motor hence referred to as electric drives. This controls speed of electric machine by converting frequency of state supply to adjustable value on machine side hence allowing electrical motors to quickly and easily adjust its speed. To control speed using suitable speed control techniques and in this case varying the frequency using the pulse width modulation MOSFET section. Input power we can use DC source as well as single phase supply.

The Two major functions of the variable frequency are

- Provide power conversion from one frequency to another.
- To Control of output frequency.

VFD's are used in many applications ranging from smallest to largest of industrial applications. These include mining industries, compressors, and ventilation systems for large buildings, fans, pumps, conveyors and machine tools.

II. RECTIFIER BRIDGE SECTION

Rectifier Bridge using here for convert the input single phase 50Hz ac supply to DC Supply. Because we need zero hz supply

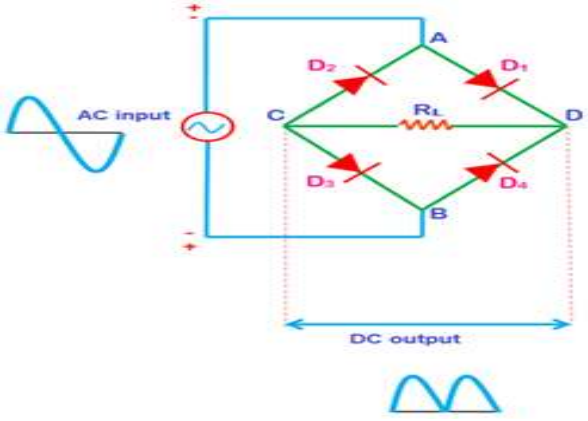


Fig: Bridge Rectifier

A bridge rectifier type of full wave rectifier which uses four or more diodes in a bridge circuit configuration to efficiently convert the Alternating Current (AC) into Direct Current (DC).

ISBN: 979-85-27243-61-1

The bridge rectifier is made up of four diodes namely D1, D2, D3, D4 and load resistor RL. The four diodes are connected in a closed loop (Bridge) configuration to efficiently convert the Alternating Current (AC) into Direct Current (DC). The main advantage of this bridge circuit configuration is that we do not require an expensive centre tapped transformer, thereby reducing its cost and size.

The input AC signal is applied across two terminals A and B and the output DC signal is obtained across the load resistor RL which is connected between the terminals C and D.

The four diodes D1, D2, D3, and D4 are arranged in series with only two diodes allowing electric current during each half cycle. For example, diodes D1 and D3 are considered as one pair which allows electric current during the positive half cycle whereas diodes D2 and D4 are considered as another pair which allows electric current during the negative half cycle of the input AC signal.

When input AC signal is applied across the bridge rectifier, during the positive half cycle diodes D1 and D3 are forward biased and allows electric current while the diodes D2 and D4 are reverse biased and blocks electric current. On the other hand, during the negative half cycle diodes D2 and D4 are forward biased and allows electric current while diodes D1 and D3 are reverse biased and blocks electric current.

During the positive half cycle, the terminal A becomes positive while the terminal B becomes negative. This causes the diodes D1 and D3 forward biased and at the same time, it causes the diodes D2 and D4 reverse biased.

The current flow direction during the positive half cycle is shown in the figure (I.e. A to D to C to B).

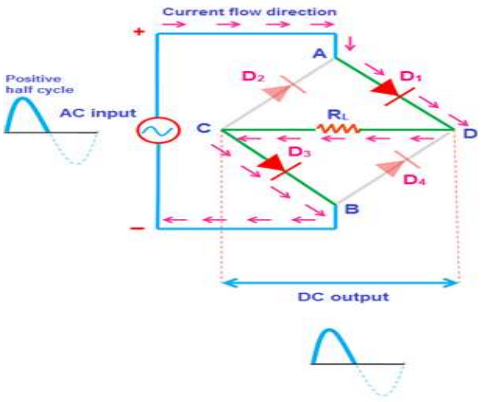


Fig: Bridge Wave Rectifier in Positive cycle

During the negative half cycle, the terminal B becomes positive while the terminal A becomes negative. This causes the diodes D2 and D4 forward biased and at the same time, it causes the diodes D1 and D3 reverse biased.

The current flow direction during negative half cycle is shown in the figure (I.e. B to D to C to A).

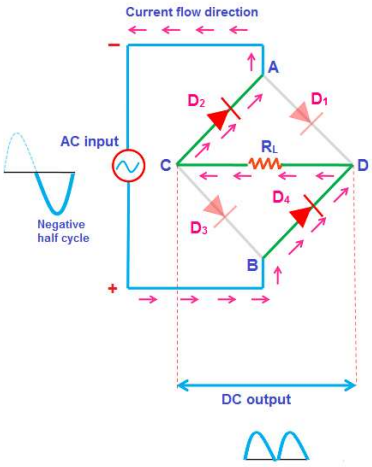
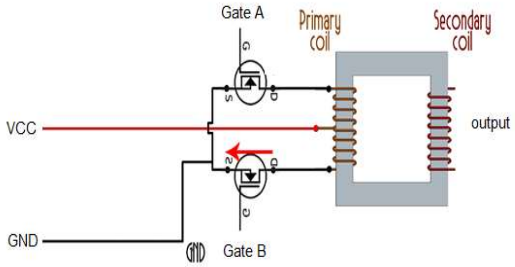


Fig: Bridge Wave Rectifier in Negative cycle

From the above two figures, we can observe that the direction of current flow across load resistor (RL) is same during the positive half cycle and negative half cycle. Therefore, the polarity of the output DC signal is same for both positive and negative half cycles. The output DC signal polarity may be either completely positive or negative. In our case, it is completely positive. If the direction of diodes is reversed then we get a complete negative DC voltage.

III. MOSFET AND STEP UP TRANSFORMER

In this circuit we are using two switches, in this case two N channel MOSFETS,



ISBN: 979-85-27243-61-1

So, we have a 12V dc voltage on one side and we want an oscillating 220 volts and also maximum 50 hertz at the output. For that we will use a transformer like the one above with one coil on the output side and another at the input, but the coil at the input is divided in half in such a way that the middle pin will be the main input and then we have two outputs.

So, let's imagine now that at each output we add a switch as a push button connected do ground and the middle pin is connected to 12V. If we close the top switch a current will pass only through the first primary coil. So, a magnetic flux is induced in one direction. The core of the transformer will pass that magnetic flux to the secondary coil and as we all know the output voltage of the transformer will be given by this formula below where N is the amount of turns of each coil.

$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$

But we also know that transformers won't work with DC voltages so a current will be induced at the output only on magnetic flux change.

A static magnetic flux like this one that we apply right now won't induce current in the coil. Only at the beginning when the button is pressed a current will be induced in the coil for a short period of time so, we will definitely have to close and open the switch in order to achieve an AC voltage at the output. So, turning this two switches on and off one inverted to the other will create a nice oscillating magnetic flux inside the transformer core. That magnetic flux will induce a current in the secondary coil as the faraday law say.

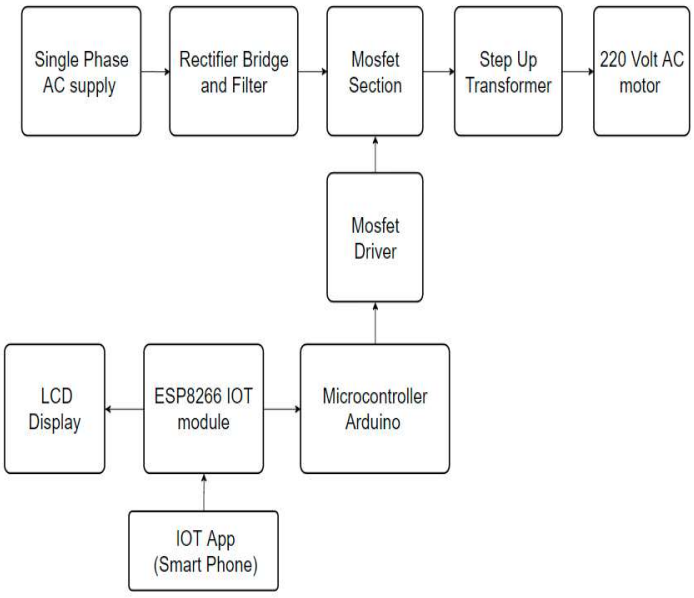
Using the formula above, we can know the amount of turns for each coil. We know that the input will be 12V from a battery and let's make the primary coil 100 turns. If we want 220 at the output we will need a secondary of 1833 turns.

IV. OBJECTIVES AND METHODOLOGY

- Simulation of circuit in Matlab Simulink
- Iot implementation for monitoring and controlling the speed of AC Motor.

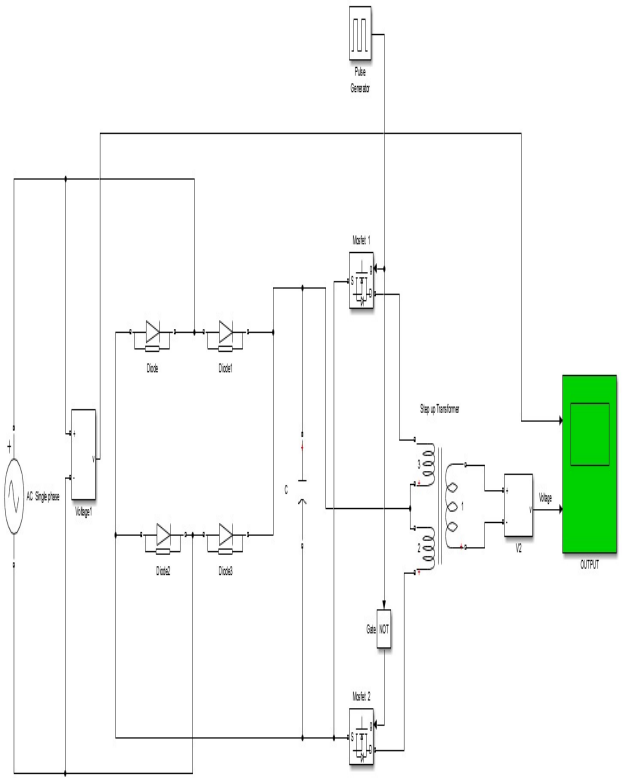
This Project involves fabrication of the speed control of single phase AC motor using IOT platform. The IOT will provide signal to main Arduino microcontroller.
The microcontroller provides the pulse signal to gate of MOSFET using MOSFET Driver.
This pulse signal is given to the MOSFET, which in turn provides the required frequency for the desired speed. This technique has been employed in this MOSFET section to supply the motor with variable frequency.
In this implementation we are using, control of speed of motor by variable frequency method using microcontroller. The speed of the motor is directly proportional to the frequency. The best way to control the speed of the motor is by varying the frequency.
With help of IOT user will able to control speed from any remote location.

V. BLOCK DIAGRAM

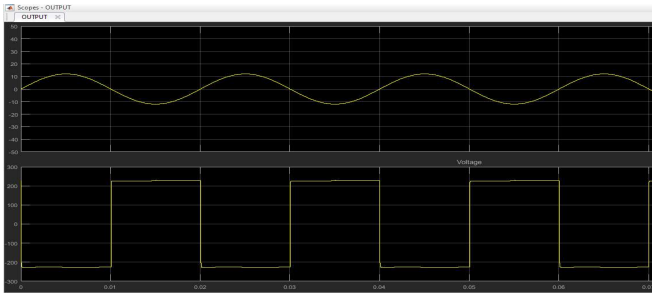


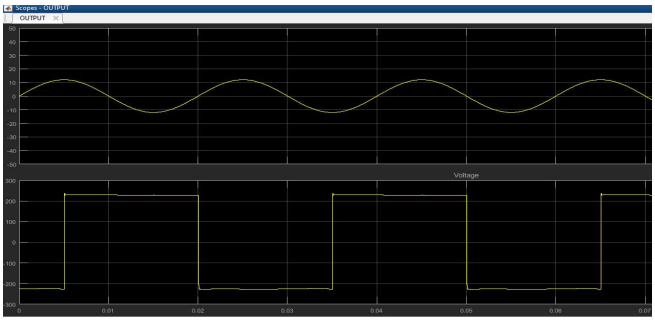
ISBN: 979-85-27243-61-1

VI. SIMULATION OF CIRCUIT

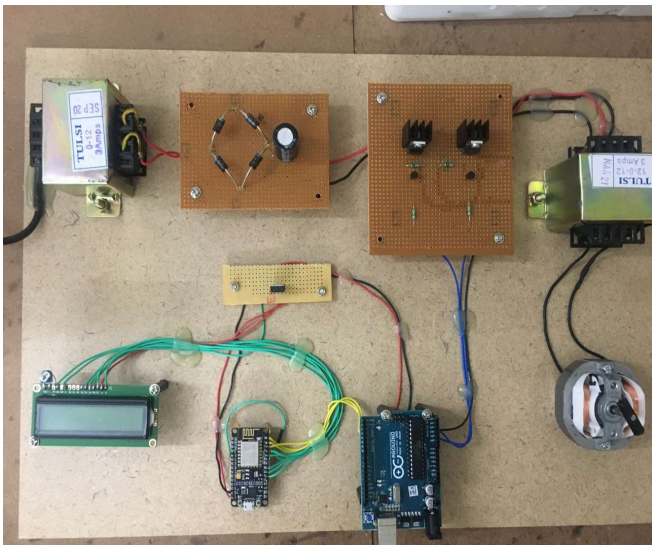


OUTPUT WAVEFORMS





VII. HARDWARE IMPLEMENTATION



This project is dependent on the frequency. So output motor speed will change as indicated by frequency. So for control the speed of motor we will change the frequency. This system utilizes two MOSFET's. These MOSFET's are connected to MOSFET driver and this MOSFET driver is connected with Arduino Uno microcontroller. This microcontroller generates the PWM cycles to trigger the MOSFET's. One MOSFET works at positive cycle and other in negative cycle.

Thus PWM cycle time and frequency we are controlling through the IoT . In this work, ESP8266 Wi-Fi module is used. This gives the commands to the microcontroller and microcontroller takes the actions accordingly whatever it receives the commands from Wi-Fi module. Where Wi-Fi module is connected to our mobile using Wi-Fi connection anywhere in the world location we can give the command.

VIII. CONCLUSION

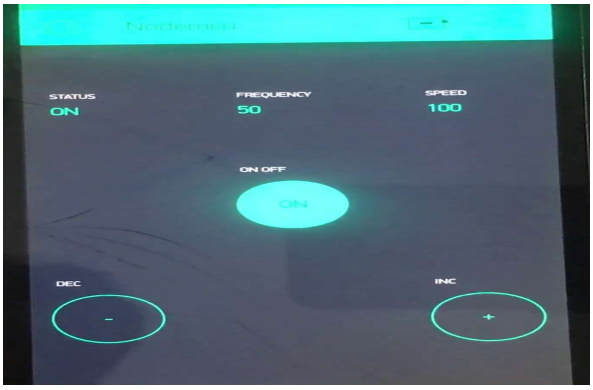
The topology of speed control of Ac motor using frequency control using microcontroller technology is successfully implemented in this work. This is the one of the method for controlling the speed, which is employed for AC motor drives. The speed control of AC motor is performed using this technology by the Atmega328 microcontroller. It has high reliability and long life at low cost and compact. The experimental results are analyzed and it is found that the speed of the motor is controlled in

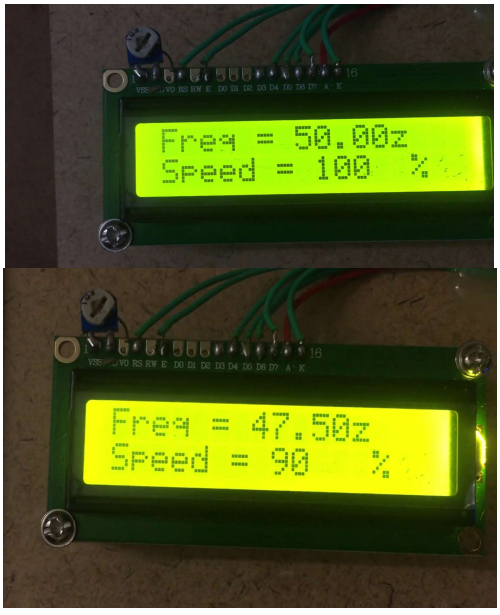
ISBN: 979-85-27243-61-1

Normal. And step up, step down speed requirement is done smoothly using this technology. User will able to control the speed from any remote locations using IOT platform.

IX. RESULT

We can control the speed of an ac motor from any remote locations. Here android application is used for controlling using Wi-Fi module connected to mobile. The Lcd will display the speed and it's corresponding frequency.
From the above discussion, Speed can be varied by using cell phone through an app. If we press incremental button, LCD will display the speed increment by 10% (i.e. percent of rated speed). Similarly we press decrement button, speed will gradually reduce by 10%.Iot is implemented for monitoring and speed control of Ac motor.





X. ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal of Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electrical and Electronics Engineering and faculties for their encouragement and support.

XI. REFERENCES

[1] OPERATION OF VARIABLE-FREQUENCY DRIVE MOTOR SYSTEMS WITH SOURCE VOLTAGE UNBALANCE
https://ieeexplore.ieee.org/document/8022992

[2] OPERATION OF VARIABLE FREQUENCY DRIVE MOTOR SYSTEMS WITH SOURCE VOLTAGE UNBALANCE
https://ieeexplore.ieee.org/document/8003869

[3] M. Hermwille. (2007, October 31). IGBT Driver Calculation (Application Note) [Online]. Available: http://www.semikron.com/skcompub/en/AN7004_IGBT_Driver_Calculation_rev00.pdf

[4] Texas Instruments. (1998, January 1). Field Orientated Control of 3-Phase AC-Motors (Application Note) [Online].Available: http://www.ti.com/general/docs/litabsmultiplefilelist.tsp?literatureNumber=bpra073

[5] Texas Instruments. (1998, March 1). Implementation of a Speed Field Orientated Control of single Phase AC Induction Motor using TMS320F240 (Application Note) [Online].Available: http://www.ti.com/sc/docs/psheets/abstract/apps/bpra076.htm

ISBN: 979-85-27243-61-1

Self-Charging Electric Vehicle

(USING GENERATOR)

SUDEEP R*[1], SIDDAIAH DC[2], YOGESH S[3], REKHA S N[4]

Department of Electrical and Electronics Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]sudeepr867@gmail.com
[2]yogeshacharya189@gmail.com
[3]siddaiahdc9164@gmail.com

[4]rekhasn@sapthagiri.edu.in

Abstract - Now days the automobile industry become more competitive the vehicles can get the energy from petrol or diesel engine for its drive .the recent years e-vehicle became more attractive and less maintenance cost. But only drawback of e-vehicle is requires frequent charging form EB supply. In this paper is based charging arrangement on the e-vehicle. The motor is use the electric energy from battery and battery can receive electric energy from dynamo .this energy is stored in battery. Market available e-vehicle batteries are designed to spent 6-8 hours/charge by using EB supply. This e-vehicle running cost is very low, when compare to other sources of energy. Today available e-vehicle are use 3-4 no' s of 12v batteries. But in this paper we use only one 12v battery, so battery cost is reduced. Then these batteries are charged by dynamo. So electric supply cost also reduced.

INTRODUCTION

There are so many types of car that came to influence in this existing world. Their operating systems are based on the fossil fuel systems. At present, the fossil fuel can exceed only for a certain period and it also becomes costlier, scares and creates environmental issues. Due to these constraints, alternate fuels and other source of energy such as solar, wind, etc., bringing the automobile industry to the next level. Hybrid vehicles are becoming more now-a-days. Their performances are more than the existing conventional vehicles. Also the electric vehicles are developing rapidly. These electric cars have both pros and cons. The main advantage is that it does not require gas, doesn't cause emissions and also more cost effective. Its disadvantages are that longer recharge time**,** battery replacement**,** recharge points are less. Due to these problems in this vehicle, we have made an attempt to design and fabricate a self-charging electric vehicle. Generally the electric motor driven vehicles draw power from a battery and will run based on the charging capacity of the battery. It have to be charged at the time only when vehicle is in stationary condition. To break through, we have designed our vehicle which will generate power by itself while the vehicle is in running condition and the battery is getting charged simultaneously. This is

ISBN: 979-85-27243-61-1

done by coupling a dynamo with motor which generate current when the vehicle is in running condition and will be stored in the battery

MATERIALS & METHODS

Battery

The purpose of the battery in a series circuit is to give the circuit a source of energy. The purpose of a switch in a series circuit is to make it easy to open or close the electrical circuit, turning the flow of electricity on or off.Specification-12v 7.5 amp ups battery

Gear

Spur gears are the most common type of gears. They have straight teeth, and are mounted on parallel shafts. Sometimes, many spur gears are used at once to create very large gear reductions. It also increases the stress on the gear teeth. Specification -The Gear has a pressure angle of 20° full depth

Dynamo

Mechanical energy is changed into electrical energy in case of dynamo. When a coil of wire is rotated in the vicinity of magnetic field then magnetic flux will be cut. This would cause an induced Emf in the coil and this phenomenon is known as electromagnetic induction.

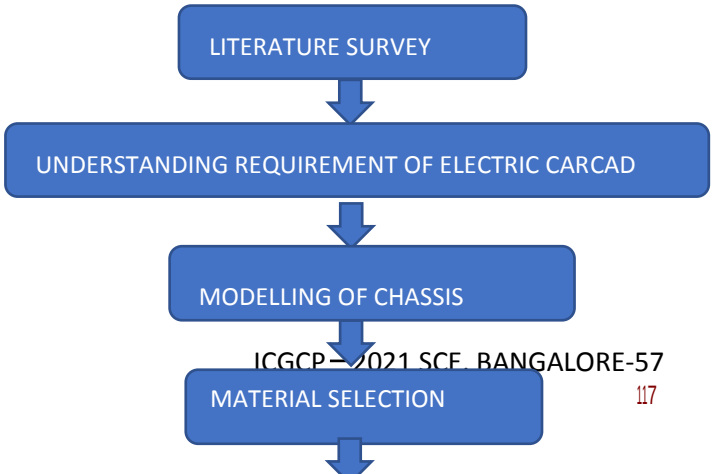
In working, Battery with capacity of 12V, 7.5Ah is connected with 12V, 65amps (at full load capacity) DC series motor through MCB (Mini circuit breaker) using 16 square mm single core copper wire, so as to withstand the load. This motor setup is connected to the crank shaft by the help of 26mm v-belt and pulley drive. Other end of this shaft is coupled with dynamo which generates 12V, 65amps.

Initially the DC series motor draws power from the battery for starting at idle speed. Once motor reaches the particular speed, the gearbox will activated based on the centrifugal force and transfer the power to the rear wheel, so as to enable the vehicle to move. Also the dynamo starts to produce current due to the rotation and it is directly coupled to the battery for charging purpose simultaneously.

The **wheel hub motor** (also called **wheel motor**, **wheel hub drive**, **hub motor** or **in-wheel motor**) is an electric motor that is incorporated into the hub of a wheel and drives it directly. In a typical DC motor, there are permanent magnets on the outside and a spinning armature on the inside. The permanent magnets are stationary, so they are called the stator. The armature rotates, so it is called the rotor.

Methodology:

The design and the fabrication work of self-charging electric vehicle starts with the collection of data regarding the need for a self-charge to be operated while car is in running condition. The flow chat depicts the actual plan of action carried out in order to design and fabricate the car from the development stage. After literature survey, brainstorming session was conducted to decide on possible features



ISBN: 979-85-27243-61-1

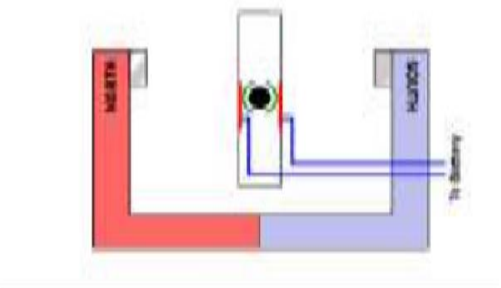


Fig.1 Working Of GENERTOR

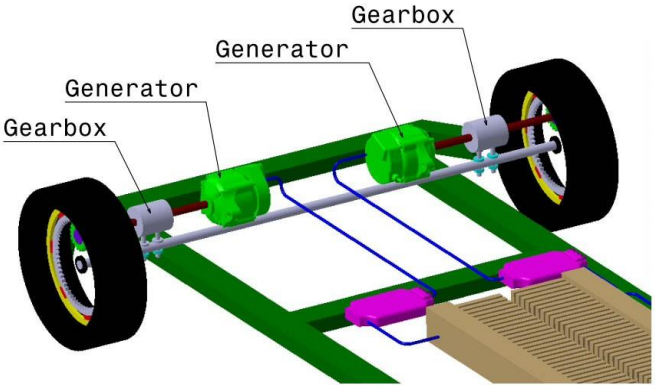


Fig.2 Design of electric vehicle

RESULTS & DISCUSSIONS

Thus the self-charging electric car was fabricated. This car is very feasible for day-to-day travel. The car is much comfortable which supports the driver for easy riding. It is very less weight compared to a small car and provides better safety. This project provides flexibility in operation and noiseless operation. The scope of this project lies in fully determining and understanding the functioning of car. This project gives solution to the old problems, where the most common problem arising from existing electric car is the recharging system. The conventional system leads to consume more conventional power and time. Hence our project reduces the problem called recharging time and makes our car the most economical one.

CONCLUSIONS

As a conclusion, comparing our project electric vehicle with the commercial electric vehicle. Our vehicle is efficient to run doubled the distance of ordinary electric vehicles. As a result, electric vehicle not only used for short range transportation, it can also be used long range transportation's too. Though our electric car is independent from external power supply it may be used for charger free transportation's and it payee's better path towards pollution free atmosphere for our nation. In the coming future, it is for thought that all the petrol car need to be replaced by the E-cars as there is fuel energy crisis and also to save our mother earth. And also it made a low cost of transportation for the human being's. This vehicle also give's safety driving for human being' s because of it' s limited speed.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also we would like to thank the Head of department electrical and electronics Engineering and faculties for their encouragement and support.

ISBN: 979-85-27243-61-1

REFERENCES

[1] "Cheap and green, Electric bikes are the range in China", by Tim Johnson. Originally Published 23 May McClatchy Newspaper.

[2] "Chi-Jen Yang (2010)." Launching strategy for electric vehicles: Lessons from China and Taiwan" . Technological Forecasting and Social Change (77): 831-834

[3] "Wheel Motors to Drive Dutch Buses". Technology Review.23 March 2009.Retrieved 23 November 2009.

[4] "Peugeot Shows Two Hybrid Concept, New BBI EV Concept at Frankfurt" . Green Car Congress. 15 September 2009.Retrived 31 May 2010.

[5]Battery Types and Characteristics for HEV Thermo Analytics, Inc., 2007. Retrieved 11 June 2010.

ISBN: 979-85-27243-61-1

An Ultra-violet sterilization robot for disinfection

Akshatha B Kulkarni Archana D Divyalakshmi P Krithi Biddappa K
Mrs. Rekha S.N

Department of Electrical Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

archana6104@gmail.com
bvkakshata@gmail.com
divyaprasad1703@gmail.com
krithibiddappa1999@gmail.com
rekhasn@sapthagiri.edu.in

***Abstract*—Ultraviolet (UV) sterilization technology is used to aid in reduction of microorganisms that may remain on the surfaces after a standard cleaning to the minimum number. In these difficult times, it is an extreme need to save ourselves from various harmful bacteria and viruses that threaten mankind. Due to this COVID-19 situation people have become more aware of the importance of cleanliness & hygiene and have started giving importance to personal and environmental sanitation. In this study, we have adopted the physical disinfection method by using UVC light as an agent. The UV bot has three 19.3- watt of UV lamps mounted on top of the UV bot platform.**

***Keywords*— Ultra-violet Sterilization, Robot, Disinfection, Covid-19**

I. INTRODUCTION

The goal of environmental control in a room is to keep microorganisms including drug-resistant bacteria to a minimum to provide a safe environment for the patient and healthcare worker. At present, there are as many as 14-17% of infections in operating, and 38% of hospital infections occur in patients who have surgery [1]. Therefore, both daily perioperative and terminal cleaning of the OR environment is one of the most effective infection control methods used to minimize the number of microorganisms, dust, and organic debris present in the environment.

However, a standard cleaning procedure via cleaning solutions by human alone cannot reduce the number of these microorganisms as there are many blind spots or unreachable areas such as walls and ceiling. Recently, a type of ultra-violet inpatient (UV) could aid hospitals in ongoing battle to keep microorganisms from lingering in the patient rooms and causing new infections [2]. That particular wavelength range that can eradicate microorganisms is 200-280 nm, also known as the C band of UV light (UV-C). This wavelength range is effective in inhibiting bacteria, viruses, and fungi. In addition, it can be used to sterilize in air, in water, on the surface, and very effective when using disinfection in the OR.

Currently, fixed UV sterilization systems have many limitations in use. For instance, UV exposure is harmful to users if they are exposed for a long time or in a very large quantity. Furthermore, it cannot be used to disinfect in some areas hidden under the shadow of the object.

A UV robot or UV bot is designed that can be manually navigated around a room enabling it to thoroughly sterilize the entire OR with or without human intervention.

II. BACKGROUND

A. *Ultraviolet disinfection*

Light wavelength for germicidal irradiation is a technology that utilizes a UV light in the range between 100
- 400 nanometers. UV-C radiation (200 – 280 nm), which is considered the most germicidal wavelength range due to the fact that UV-C can inactivate microorganisms.

The light is absorbed by the DNA and RNA of microorganisms resulting in the dimerization of adjacent molecules (particularly thymine). This occurrence in the DNA and RNA of viruses and bacteria makes it impossible for the microorganisms to replicate and infect.

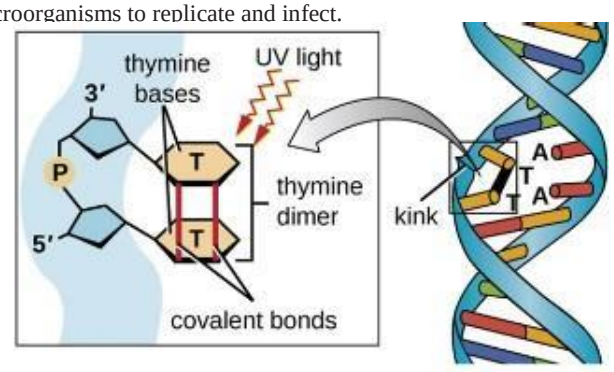


Fig. 1 Thymine dimer phenomenon

B. Surgical site infections

Surgical site infections (SSIs) remain one of the most common causes of serious surgical complications. they account for 14 - 17% of all hospital-acquired infections and 38% of nosocomial infections in surgical patients. Approximately 20 - 30% of surgical-site infections are caused by *Staphylococcus aureus* (*S. aureus*).

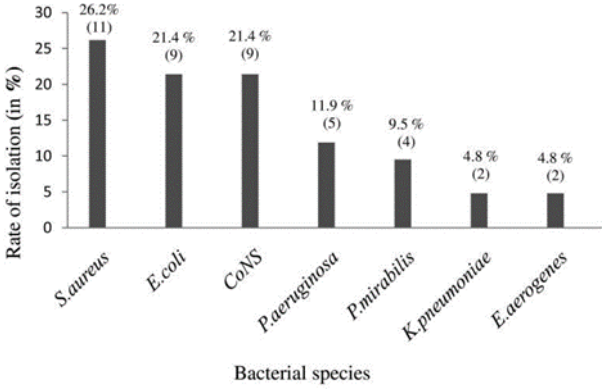


Fig. 2 Bacteria that cause infection in the operating room.

III. COMPONENTS

ARDUINO board: The ARDUINO uno is an open-source microcontroller board based on a module microchip ATmega328P microcontroller.



Fig.3 Arduino board

2-channel relay: The relay module is an electrically operated switch that allows you to turn on or off a circuit using voltage and/or current much higher than a microcontroller could handle. Each channel in the module has three connections named NC (normally close), COM (common), and NO (normally open).

In this 2-channel relay one is used for the sprayer and the other for a UV bulb.

Specifications:

- On-board 5V, 10A / 250VAC, 10A / 30VDC relays
- The module can be directly and MCU I/O link, with the output signal indicator
- PCB Size: 45.8mm x 32.4m
- Operating voltage: 5V
- Input: Digital

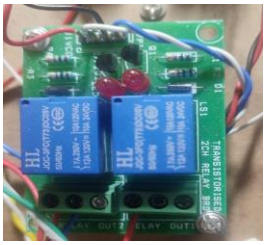


Fig.4 2-channel Relay

Wi-Fi module: The ESP8266 Wi-Fi Module is a self-contained

SoC with integrated TCP/IP. It is the low power consumption of the

UART-Wi-Fi module and ultra-low power consumption technology, designed especially for mobile devices and IoT applications, a user's physical device can be connected to a Wi-Fi wireless network.

Specifications:

- Integrated low power 32bit MCU
- Integrated TCP/IP protocol stack
- Frequency range: 2.4GHz - 2.5GHZ
- Operating voltage: 3.0v~3.6v
- Operating current: Average value 80mA
- Wi-Fi 2.4 GHz, support WPA/WPA2 Security

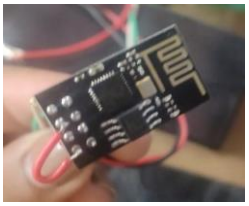


Fig.5 Wi-Fi module

H-bridge: The L293D is designed to provide bidirectional drive currents of up to 600-mA. It is used to run the robot forward
or backward direction / right or left.

Specifications:

- Can be used to run Two DC motors with the same IC.
- Speed and Direction control is possible
- Motor voltage Vcc2 (Vs): 4.5V to 36V
- Maximum Peak motor current: 1.2A
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to Vcc1(Vss): 4.5V to 7V
- Transition time: 300ns (at 5Vand 24V)

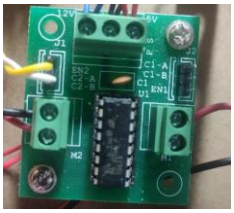


Fig.6 H-bridge

UV bulb: UVC light emits very short wavelengths to kill microorganisms. UVC Germicidal Lamp consists of UVC light which is used for killing bacteria, viruses, and micro-organisms. This lamp is used for disinfection purposes for example product disinfection, surface disinfection, room disinfection as well as air disinfection.

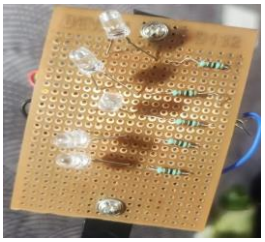


Fig.7 UV bulb

IV. METHOD

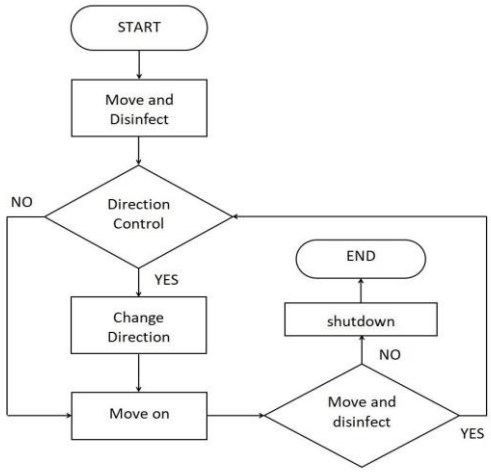


Fig.8 Flowchart

Key designs for our UV bot are in both a small form factor and free of electrical control wires (battery operated) in aiding navigation around the room. Essential components of our UV bot are 1) a robot platform or frame 2) UV bulb 3) microcontroller 4) a power source equipped with 12 volts battery (5) controlled wheels and (6) freewheels (7) ultrasonic sensors, and (8) control software (embedded C)

The heart of the system is a microcontroller. That is a central command center of the UV bot. It is programmed to accept inputs to sense obstacles around it and navigate the robot around the room to avoid any collisions. There is a UV bulb along with a dc motor mounted on the UV bot for easy exposure to UV light in all directions. Those locations are the front, left, right, and back of the robot platform. If there is an obstacle in the pathway, two controlled wheels will help steer around that obstacle according to processed signals received from ultrasonic sensors. In case of an obstacle, or a potential collision, the microcontroller controls the wheels of the robot by a motor driver to avoid a collision.

INTERFACE OF **ARDUINO** BOARD WITH **H-BRIDGE**

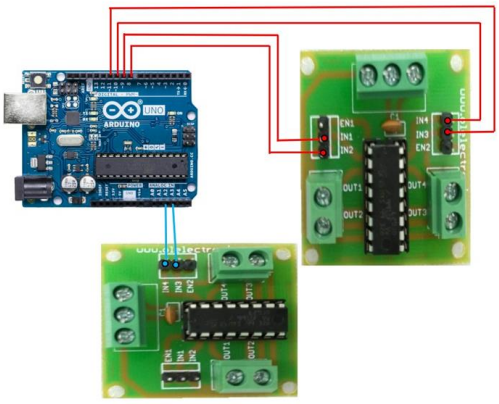


Fig.7 interface of ARDUINO with H-bridge

There are two H-bridges that are used, one for DC motor + wheels and one for the movement of the UV bulb.
The connections of the ARDUINO to the H-bridge are as follows:

- Pin 8,9 of the ARDUINO is connected to the IN2, IN1 of one of the H-bridges.
- Pin 10, 11 of the ARDUINO is connected to the IN4, IN3 of the other H-bridge.
- The OUT1, OUT2, OUT3, OUT4 of the H-bridge 1 are connected to the two Motor +wheels, and OUT1, OUT2 of the H-bridge2 are connected to the UV bulb.

V. CONCLUSION

The developed device is able to work efficiently to disinfect the room and can improve the results of reducing germicidal issues. This device will help reduce healthcare-associated infection rates to a good extent. Hence, this device can be used in places like hospitals where there is a need to disinfect the surfaces and also in public places like railway stations, airports, offices, etc. resulting in improved hygiene and reduction in infections.

VI. ACKNOWLEDGEMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of the Department of Electrical and Electronics Engineering and faculty for their encouragement and support.

VII. REFERENCE

[1] A.M. Spagnolo, G. Ottria, D. Amicizia, F. Perdelli, and M.L. Cristin, "Operating theatre quality and prevention of surgical site infections". Journal of Preventive Medicine and Hygiene, 54(3), 2013, pp.131–137.

[2] D. J Anderson, L. F Chen, D. J Weber, R. W Moehring,
S. S Lewis, P. F Triplett, "Enhanced terminal room disinfection and acquisition and infection caused by multidrug-resistant organisms and Clostridium difficile (the Benefits of Enhanced Terminal Room Disinfection study): a cluster-randomized, multicentre, crossover study". Journal of Preventive Medicine and Hygiene, 2017, pp.805–814.

[3] Cordella Lackey, Sky Tapestry [Internet], "Brightness and Surface Brightness". Astronomy department university of Michigan, 2012. Available from: https://dept.astro.lsa.umich.edu/resources/ugactivities /L abs/brightness/index.html

[4] E.C. Friedberg, G.C. Walker, W. Siede, R.D. Wood, R. A. Schultz, T. Ellenberger, "DNA repair and mutagenesis," ASN Press, Washington, 2006.

[5] Wondemagegn Mulu, Gebre Kibru, Getenet Beyene and Meku Damtie, "Postoperative Nosocomial Infections and Antimicrobial Resistance Pattern of Bacteria Isolates among Patients Admitted at Felege Hiwot Referral Hospital", Bahirdar, Ethiopia. Ethiopian Journal of Health Science, 22(1), 2012, pp.7–18.

[6] I. Kano, D. Darbouret and S. Mabic, "UV technologies in water purification systems", The R&D Notebook 9 A publication of the Lab Water Division of EMD Millipore, 2012, pp.5.

Authorized Entry Using Face Mask Detection and Sanitizer Dispenser

1.Akshata Aski
Student, Department of EEE
Sapthagiri College of Engineering
Bengaluru, India
akshataaski44@gmail.com

2. Arasukumari M S
Student, Department of EEE
Sapthagiri College of Engineering
Bengaluru, India
bhoomiarasu2000@gmail.com

3. Kiran Kumar
Student, Department of EEE
Sapthagiri College of Engineering
Bengaluru, India
kirankiru8668@gmail.com

4. Mohan Raj
Student, Department of EEE
Sapthagiri College of Engineering
Bengaluru, India
mohanjazzraj@gmail.com

5. Mrs. Ramya M
Assistant Professor, Department of EEE, sapthagiri college of Engineering, Bengaluru, India,
ramyam@sapthagiri.edu.in

***Abstract*--T**here are currently no effective face mask detection applications due to Covid-19, which are in high demand for transportation, densely populated areas, residential districts, large-scale manufacturers, and other organisations to ensure safety. In addition, the lack of big datasets of photographs with mask has made this task more difficult.

Using python programming and OpenCV library, Keras, and tensor flow, this project presents a way for identifying persons without the use of a face recognition approach. This independent embedded gadget was created with the Raspberry Pi electronic development board and runs on battery power with a USB modem for wireless internet connectivity. When a person without a mask tries to access the premises, security alert mail is sent to the user's e-mail address.

In comparison to other existing systems, our proposed method is more effective, reliable, and consumes significantly less data and electricity.

Keywords—Rasphberry-PI, PI-Camera, IR sensor, .

I. Introduction

Because of the Covid-19 outbreak, there is a strong need to develop a system that detects persons who are not wearing masks and alerts those responsible for taking the required steps to halt the outbreak.
Novel coronavirus is a new strain of coronavirus that has never been seen in humans (nCoV). Coronaviruses (CoV) are a category of viruses that can cause illnesses ranging from colds to life-threatening diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) (SARS).

Wearing a clinical mask is essential for preventing some respiratory viral infections, such as COVID-19. The public should know whether to wear the mask for source control or COVID-19 aversion. The use of masks has the potential to reduce vulnerability to danger from a noxious individual during the "pre-symptomatic" stage, as well as stigmatise individuals who wear masks to prevent the spread of virus. The World Health Organization emphasises the use of medical masks and respirators for health care assistants. Face mask detection has thus become a critical task in today's global society.
Face mask detection is identifying the location of a person's face and then assessing whether or not they are wearing a mask. The problem is related to general object detection, which is used to identify different types of things. Face identification is the process of categorising and differentiating a certain group of items, namely faces. It has a wide range of applications, including autonomous driving, education, and spying.

II. Related Work

A face is detected from an image that has various attributes in the face detection method. Facial detection research necessitates expression recognition, face tracking, and position estimation, according to [21]. The objective is to recognise the face in a single photograph. Face identification is a tough task due to the fact that faces alter in size, shape, colour, and other characteristics and are not immutable. Using convolutional neural networks (CNNs) in computer vision comes with a strong constraint regarding the size of the input image, making it a difficult task for opaque images obstructed by something not facing the camera. To overcome the inhibition, the common approach is to reorganise the images before fitting them into the

XXX-X-XXXX-XXXX-X/XX/$XX.00 ©20XX IEEE
ISBN: 979-85-27243-61-1

network.

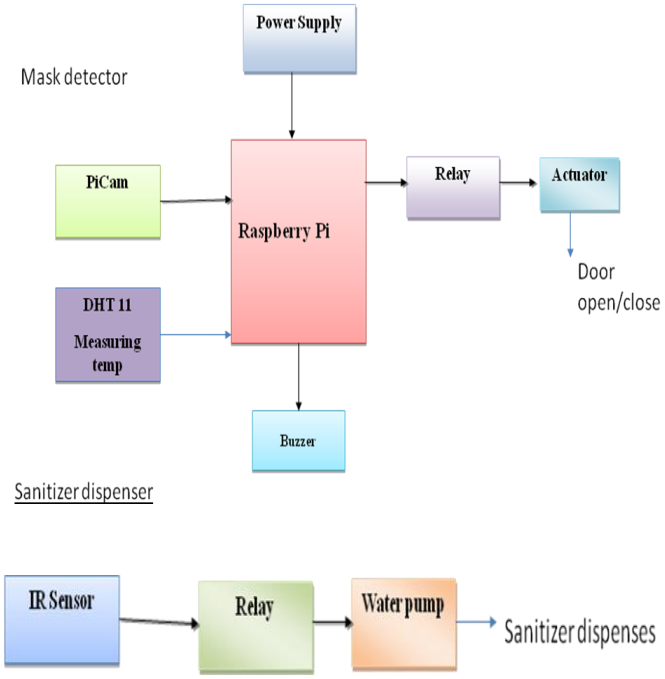
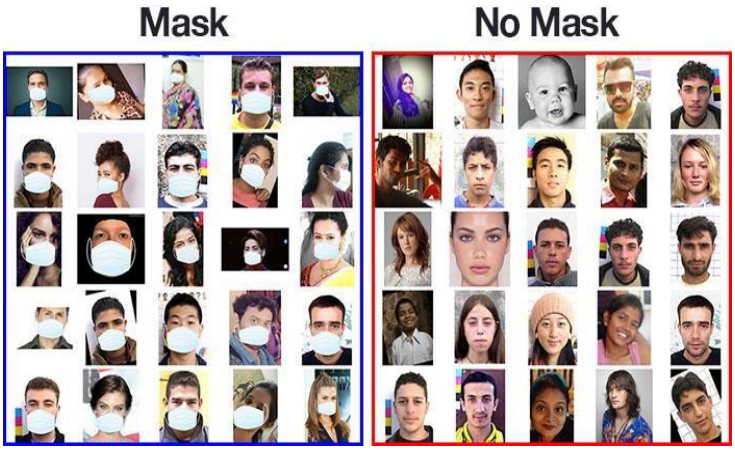


Fig:-block diagram of mask detector and sanitizer dispenser

III. DATASET

For the sake of testing the current approach, two datasets were employed. Dataset 1 contains 1376 photos, 690 of which feature people wearing face masks and the remaining 686 featuring those who do not. The majority of the figures show a front face stance with a single face in the frame and the same style of white mask. We also load many sorts of masks in a variety of colours.



INCORPORATED PACKAGES

1. Keras

Keras provides fundamental reflections and building units for the design and transfer of machine learning arrangements at high iteration rates. TensorFlow's scalability and cross-platform features are fully utilised. Keras' primary data structures are layers and models. Keras is utilised to implement all of the layers in the CNN model. It aids in the compilation of the overall model, as well as the conversion of the class vector to the binary class matrix in data processing.

2.OpenCV

OpenCV (Open Source Computer Vision Library) is a computer vision and machine learning software library that can be used to distinguish and recognise faces, recognise objects, group movements in recordings, trace progressive modules, follow eye gestures, track camera actions, remove red eyes from flash photos, perceive landscape, and set a goal. In order to resize and colour convert data images, the proposed technique makes use of OpenCV's characteristics.

3. TensorFlow

To pursue research, TensorFlow, an interface for expressing machine learning algorithms, is used to implement ML systems into fabrication across a variety of computer science fields, including sentiment analysis, voice recognition, geographic information extraction, computer vision, text summarization, information retrieval, computational drug discovery, and flaw detection. TensorFlow is used at the backend of the proposed model's Sequential CNN architecture (which consists of numerous layers). It's also used in data processing to restructure the data (picture).

HARDWARE COMPONENTS



Figure: Piezo Buzzer

The image above depicts a piezo buzzer, also known as a piezo transducer, that operates at DC voltage. It has a hole on the top face enabling sound to propagate and is encased in a cylindrical plastic coating. Through the hole, you can see a yellow metallic disc that plays a vital part in

sound,production.



Figure: Pi Camera

The Raspberry Pi Camera Module v2 is a custom made add-on board for Raspberry Pi with an 8 megapixel Sony IMX219 image sensor and a fixed focus lens. A camera port has been added to the Raspberry Pi Zero! The new Raspberry Pi Zero Camera Adapter isbeing used.



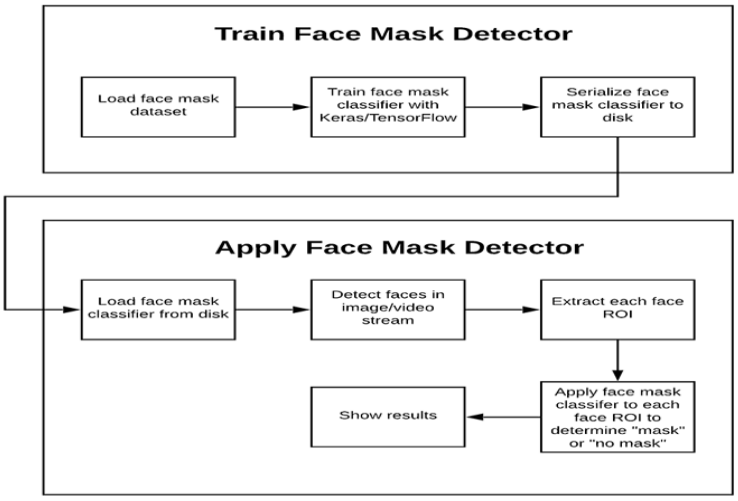
figure:Rasphberry-PI

The Raspberry Pi is a small, low-cost computer the size of a credit card that connects to a computer monitor or television and utilises a conventional keyboard and mouse. It's a capable small device that allows individuals of all ages to learn about computers and programming languages like Scratch and Python.

IV. The Proposed Method

Training: We'll use Keras/TensorFlow to load our face mask detection dataset from disc, train a model on it, and then serialise the face mask detector to disc.

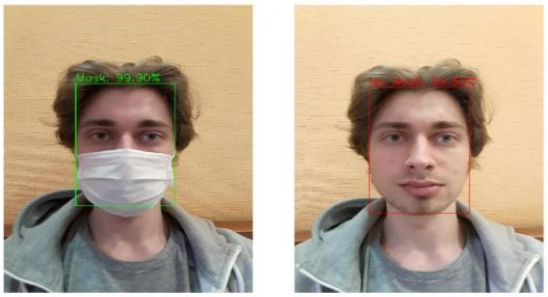
Deployment: We may then load the mask detector, run face detection, and categorise each face as with mask or without mask once the face mask detector has been trained.



The goal of this project is to develop a system for identifying persons without masks utilising face recognition techniques, Python programming, and open source components. This is a standalone embedded device that must be built using the Raspberry Pi. When a person without a mask attempts to enter the premises, an automatic e-mail notification will be sent to the user's e-mail address.

Hand sanitizer dispensers feature a stronger bacteria-killing chemical than regular hand soap, allowing for less contact with adjacent surfaces.

V. OUTPUT



We trained a two-class model of people wearing masks and people not wearing masks to construct our face mask detector.

On our mask/no mask dataset, we fine-tuned MobileNetV2 and produced a 99 percent accurate classifier.

VI. CONCLUSION

1. It can be utilised for a wide range of purposes. Given the Covid-19 situation, wearing a mask may become mandatory in the near future.
2. In order to use many public services, clients will be required to wear masks properly.
3. The implemented approach will make a significant contribution to the public health care system. It could be extended in the future to detect whether or not a person is wearing the mask properly.
4. The model can be refined further to determine if the mask is virus-prone or not, i.e. whether it is surgical, N95, or not. We created an embedded system using Raspberry-Pi that detects people who don't wear masks using a Pi-Camera and notifies them via a buzzer on the premises and email.
5. Using deep learning machine learning models with Keras and Tensor flow, as well as the Open-CV library, this system acts as a safety measure to prevent the breakout of Covid-19.
6. Our method allows a mask-wearing user to enter the premises by opening the door, preventing restricted access to those who do not wear the mask

.

VII. ACKNOWLEDGEMENT

The authors would like to thank Dr.Narayanappa HOD of EEE, and Mrs. Ramya M, Assistant Professor at Sapthagiri College of Engineering, for their support and advice

.

VIII. REFERENCES

1. B. QIN, D. LI, Identifying facemask-wearing condition using image super-resolution with classification network to prevent covid-19 (2020)

2. S. Li, X. Ning, L. Yu, L. Zhang, X. Dong, Y. Shi, W. He, in 2020 International Conference on High Performance Big Data and Intelligent Systems (HPBD&IS) (IEEE, 2020), pp. 1–5

3. P. Khandelwal, A. Khandelwal, S. Agarwal, Using computer vision to enhance safety of workforce in manufacturing in a post covid world, arXiv preprint arXiv:2005.05287 (2020)

4. M. Jiang, X. Fan, Retinamask: A face mask detector, arXiv preprint arXiv:2005.03950 (2020)

5. N.C. Ristea, R.T. Ionescu, Are you wearing a mask? improving mask detection from speech using augmentation by cycle-consistent gans, arXiv preprint arXiv:2006.10147 (2020)

6. W. Liu, Z. Wang, X. Liu, N. Zeng, Y. Liu, F.E. Alsaadi, A survey of deep neural network architectures and their applications, Neurocomputing 234, 11 (2017)

IOT BASED SMART POWER MANAGEMENT SYSTEM FOR BUILDINGS

1. Mrs. Ramya M,
Assistant Professor, Department of EEE, sapthagiri college of Engineering, Bengaluru, India
ramyam@sapthagiri.edu.in

2. Mrs. Divya N S
Assistant Professor, Department of EEE, sapthagiri college of Engineering, Bengaluru, India
divyans@sapthagiri.edu.in

3. Mrs. Ashwini C
Assistant Professor, Department of EEE, sapthagiri college of Engineering, Bengaluru, India
ashwinic@sapthagiri.edu.in

Abstract: Thanks to internet, as one of indispensable parts of our lives, many devices that we use in our daily lives like TV, air conditioner, refrigerator, washing machine, can be monitored and controlled remotely by becoming more intelligent via Internet of Things (IoT) technology. Smart Home applications as one of the elements of smart cities, are individually the most demanded application without question. In this study, Smart Energy Management (SEM) system, based on Node MCU and Android, has been designed for SEM, which is a part of the smart home application. With this system, household energy consumption can be monitored in real time, as well as having the ability to record the data comprising of operation times and energy consumption information for each device. Additionally, it is ensured to meet the energy needs on a maximized level possible, during the hours when the energy costs are lower owing to the SEM system. The Android interface provides the users with the opportunity to monitor and change their electricity consumption habits in order to optimize the energy efficiency, along with the opportunity to draw up of a daily and weekly schedule

I. INTRODUCTION

IoT is a term, which was first suggested by Kevin Ashton in 1999 [1]. IoT is a communication network where the objects are connected to each other or to larger systems. This network converts billions of data, obtained from various devices that we use in our daily lives, into usable information [2]. According to CISCO report, while there were 500 million interactive devices in 2003, it is estimated to be 50 billion by 2020 [3]. This shows that the cities, where we live with IoT, will turn into smart cities keeping pace with more energetic and planned lives [4]. This conversion will also offer many opportunities to us for making our lives easier [5]. Smart Home is a term that is widely used in order to define a living space with lighting, heating, air conditioner, TV, computer, entertainment, audio-visual systems, security and camera system that can communicate with each other [6]. It is placed in the center of our lives with regards to many areas like the TV, audio-visual system in our houses to run once we get home, lighting and electrical devices to be controlled remotely [7], heating system to run via our cell phones by receiving location details [8], as well as making adjustments automatically based on the regional weather conditions [9], monitoring and controlling the power consumption of such devices as refrigerator, air conditioner, furnace, etc. [10], garden irrigation process to be carried not based on the time, but on the humidity level of the soil [11], patients that require continuous monitoring to have a safer life with wearable medical devices [12], smart farms practices [13] and smart grids [14]. In this study, our objective is to reduce the energy consumption with a proper operation planning, by monitoring the energy consumption of a house. In line with this objective, and IoT-based smart energy consumption monitoring and energy management system has been designed. Thanks to the system with Android interface, user can get consumption information of all electrical devices in the household instantly. Using the dish washer, washing machine and dryer, which has the flexibility to be used during the day, to be operated as planned before and during the hours with lower energy costs, helps reducing the energy costs. The energy consumption data for each and every device, which are used with this application, can be taken under record. Owing to this, the measures to be taken for ensuring energy saving will be even easier. It allows the Android interface users, to have the ability to control the devices in their houses via remote access. Additionally, android application has the ability to send notifications via e-mail, twitter, etc. for pre-designated failure codes like over-current, short-circuit, over-temperature and power cut-off, along with such real time data for the devices as current, voltage and power.

The main contribution of this study is presented below.

- Designed as an IoT-based SEM system for home energy management, which is part of smart grids.
- With SEM system, operating hours of electrical household appliances are programmed, considering user comfort and PAR value.
- Having flexible operating hours, loads such as washing machines, dishwashers are shifted to periods where energy costs are low. Therefore, total amount of energy and energy cost is reduced.
- The operating conditions of the electrical household (active, passive, fault etc.) can be monitored in real time via the android based user interface.

• The operating parameters (current, voltage, power etc.) of the electrical appliances used are continuously recorded in the cloud system. In this way, additional measures can be taken to reduce the energy cost by using backward working information.

II. IMPLEMENTATION OF SMART PHONES-BASED AUTOMATION USING IOT

Two bulbs are used in this system instead of connect home appliances, LCD display are among the appliances that can be used in this system. Home automation system is used for controlling and monitoring the home appliances. It can perform in several ways.

In this system WIFI Light1, LCD display, are connected with RaspberryPi.



Fig.11.1. IMPLEMENTATION OF SMART PHONES-BASED AUTOMATION USING IOT

A WIFI enabled coupled with Raspberry pi enables to operate lights/any other appliances using a mobile phone from anywhere anytime. It is the first step towards buzzing word to IOT where every device has an IP address and can be accessed remotely. Switch is powered by home open source home and building application. Android and Window mobile application enables users to operate home appliances remotely from anywhere.

- WIFI enabled
- Works with Raspberry pi and any other single Board computers
- Powered by open source in home automation application
- Mobile app for Android and windows app
- Accessible using any web Browser
- Can automate a single point and can be extended to any number of points as and when required
- Can use with AC-240v or Dc voltages such as 12v/24v/48v.Home server loaded on Arduino and they will be sent through their Raspberry pi through USB connection. Raspberry pi connect through a wired network gets access to internet. Mobile phones when you are inside or outside using internet connection you get a message through your phone.

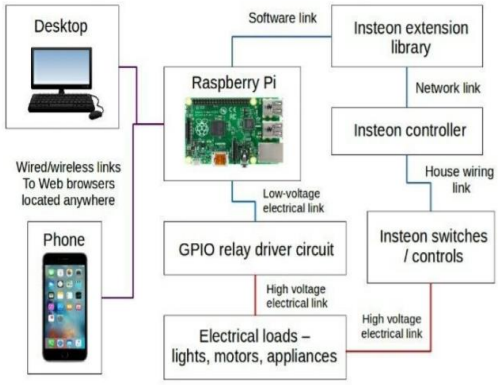


Fig.11.2. SYSTEM BLOCK DIAGRAM ARRANGEMENT

The above block diagram shows the flow of our project, where the power calculated data of all the connected home appliances will be stored in the cloud. As soon as the user enters his username and security key, the entire data will be retrieved by the cloud through WIFI. Thus, the user can control the home appliances as per his requirement from wherever place he is.

After entering the username, password This information will be of the home or building Superior which will have the administrative features of adding deleting and suspending member of home. After becoming super user the user has to log in to the website using this super user has to log into the website using his super user username and password. He can then add user and delete user according to his wish. The members can now be able to access the home appliances.

The display in the mobile, that data display of all the rooms, all the appliances will be displayed as shown below



Fig.11.3. POWER DATA DISPLAY IN THE MOBILE

CONCLUSION:

In this study, an IoT based SEM system has been designed by considering UC in order to reduce energy consumption and unit energy cost. Owing to the IoT based SEM system, the user is instantly provided with such information as current, voltage, power and energy consumption values. With this system, the energy costs can be reduced by operating such devices as washing machine and dish washer with the flexibility to be used during any time of the day, within the hours when the power costs are lower. Additionally, the

energy consumption reports can be drawn up for each device as daily, weekly, monthly and annually. In this way, it will be easier to take the required measure for contributing in the energy saving by carrying out analyses on the energy consumption. The system provides the user with the opportunity to monitor and control the devices in his/her home via internet, as well. It also sends notifications to users via e-mail and twitter with regards to the failure information that are defined over the system. Where the devices operate out of the nominal operational value range, it de-activates the respective device, thus ensuring protection. SEM system guides the users to use the devices that are flexible to use at any time throughout the day, in Period I. SEM system transfers momentary using information via user interface and helps the users for taking energy saving measures. The system in this study, which is designed for just 4 devices, has the groundwork for all electrical home devices. Monthly using analysis shows that the system provides approximately 20% saving for unit energy cost. Thanks to SEM system, the average monthly energy cost on a was decreased from 7.26 cents/kwh to 5.82 cents/kwh. In this exemplary application, where UC is maintained, a monthly saving of 24 kwh energy and $11.13 cost savings has been achieved. In addition, thanks to the proposed SEM system, the working hours of electrical household appliances with flexible working hours shifted to Period-I, when the demand for load is low, and a significant decrease has occurred in PAR. The next study will focus on a SEM system that can measure and control all household electrical appliances from a single center in order to reduce the energy consumption.

ACKNOWLEDGEMENT

Authors here by thank the authorities of Sapthagiri College of Engineering, Bangalore for permitting to publish this work

REFERENCES

[1] Wikipedia, The Free Encyclopedia, S.V. "Internet of things," (accessed February 23, 2017),

[2] Khalid A. Fakeeh et al., “An IOT based smart power management system for technical university”, International Journal of Computer Applications (0975 – 8887) Volume 149 – No.1, September 2016.

[3] Wikipedia, The Free Encyclopedia, s.v. "Microcontroller", (accessed February 25, 2017),.

[4] M. Erol-Kantarci and H. T. Mouftah, “Wireless sensor networks for cost efficient residential energy management in the smart grid”, IEEE Trans, Smart Grid, vol. 2, no. 2, Jun. 2011, pp.314–325.

[5] Ivan Lobachev et al.,”Smart sensor network for smart buildings”, Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2016 IEEE 7th Annual.

[6] A. Ogasawara. “Energy issues confronting the information and communication sector”. Science & Technology Trends Quarterly Review, 21,2006.

[7] Hongming Cai et al., “IOT-based Big Data Storage Systems in Cloud Computing: Perspectives and Challenges”, IEEE Internet of Things, Journal, DOI: 10.1109/JIOT.2016.2619369

[8] L. Li, H. Xiaoguang, C. Ke, H. Ketai, "The applications of WiFi-based wireless sensor network in Internet of things and smart grid", Proc. 6th IEEE Conf. Ind. Electron. Appl. (ICIEA), pp. 789-793, 2011.

[9] Yadhiri Yamini Manogna and Aruna Jyothi Chamanthula, "IOT Based Power Management and Control over WSN using a. Raspberry Pi", International Journal of Scientific Engineering and Technology Research Volume.04, IssueNo.48, b. November-2015, Pages: 10445-10448.

[10] F. Benzi, N. Anglani, E. Bassi, and L. Frosini, “Electricity smart meters interfacingthe households,” IEEE Trans. Ind. Electron., vol. 58, no. 10, pp. 44874494, Oct. 2011

[11] Ashton, Kevin, “That ‘internet of things’ thing,” RFID journal, vol 22, no.7, pp. 97-114, 2009.

[12] Gubbi, J., Buyya, R., Marusic, S. and Palaniswami, M., “Internet of Things (IoT): A vision, architectural elements, and future directions,” Future generation computer systems, vol. 29, no. 7, pp.1645-1660, 2013.

[13] Evans, Dave, “The internet of things: How the next evolution of the internet is changing everything,” CISCO, Int. J. Internet, vol. 3, no. 2, pp.123-132, 2011.

[14] Zanella, A., Bui, N., Castellani, A., Vangelista, L. and Zorzi, M., “Internet of things for smart cities,” IEEE Internet of Things journal, vol. 1, no. 1, pp. 22-32, 2014.

[15] Yun, Miao, and Bu Yuxin, “Research on the architecture and key technology of Internet of Things (IoT) applied on smart grid,” in Proc. of Advances in Energy Engineering (ICAEE), International Conference on. IEEE, 2010.

DEEP NEURAL NETWORK BASED RECOGINITION OF PLANT DISEASES BY LEAF IMAGE CLASSIFICATION

1. Nishitha.R
Student,Department of EEE, Sapthagiri College of Engineering Bangalore,India
nishitharaj1011@gmail.com

2. Raghuveer.B.J
Student,Department of EEE, Sapthagiri College of Engineering Bangalore,India
raghuveer2578@gmail.com

3. Ramya.P.V.S
Student,Department of EEE, Sapthagiri College of Engineering Bangalore,India
ramyapvs111@gmail.com

4. Ranjitha.B.R
Student,Department of EEE Sapthagiri College of Engineering Bangalore,India
ranjitha211999@gmail.com

5. Mr.Dhamodaran.A
Assistant Professor,Department of EEE,Sapthgiri College of Engineering,Bangalore,India
adhamodaran@sapthagiri.edu.in

Abstract **- Agriculture is one of major occupation of people of India and livelihood of many families depend on that, and crop production indirectly/directly effects our import/export and hence economy. Management of crops from early stage to mature harvest stage involves identification and monitoring of plant diseases, nutrient deficiency, controlled irrigation and controlled use of fertilizers and pesticides. Our project will help farmers in applying pesticides in very regulated manner over the farm and where ever disease crop is found the pesticide type and quantity can be managed to eradicate pests at early stage and give optimum yield.**

I. INTRODUCTION

India is developing country and its known for its agriculture production diversity in agriculture. As there are many different crops and due to large growing population our requirement of food are increasing day by day and hence proper crop production is required to avoid famine situation or disturbing economy by large import of foods.

Excessive use of agrochemicals in conventional crop management has caused serious environmental and health problems including loss of biodiversity and human disorders. A number of chemical biocides have shown complex chronic effects such as change in endocrine functions and immune systems. Application of different chemical biocides to the soil and plants have increased substantially over the last five decades. Total consumption of chemical fertilizers worldwide increased tenfold from 1950 to 2000.

This project is a step towards this farm automation a prototype will be developed which can do leaf infection detection in farm and advise pesticides types. This will help control disease at early stage.

II. PROBLEM STATEMENT

Objectives:

- To design such system that can detect crop disease and pest accurately.
- Create database of insecticides for respective pest and disease.

ISBN: 979-85-27243-61-1

- To provide remedy for the disease that is detected

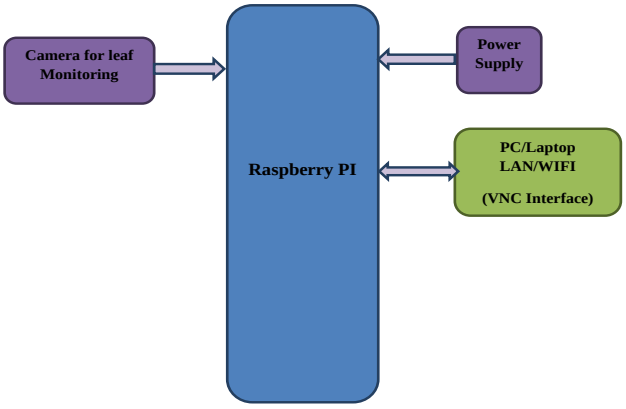
III. METHODOLOGY

- Raspberry PI is exciting piece of hardware and it's very versatile hardware with very good software capability, various ranges of PI compatible modules are available one such module is PI-camera, there is special port given on PI to attach the camera.
- We will give two option to use leaf image:
  1. real time picture using camera.
  2. stored images in test folder.
- In both option leaf disease detection algorithm will be same, first we will take sample square of leaf centre then we will scan all the pixels and try to build a colour histogram which can tell us the extent of infection on leaf or leaf is infection free.



For example:
consider , total number of pixels = 128
number of green pixels= 121
number of spots = 7
Then , the percentage of leaf infected is 5.46
the percentage of healthy leaf is 94.53

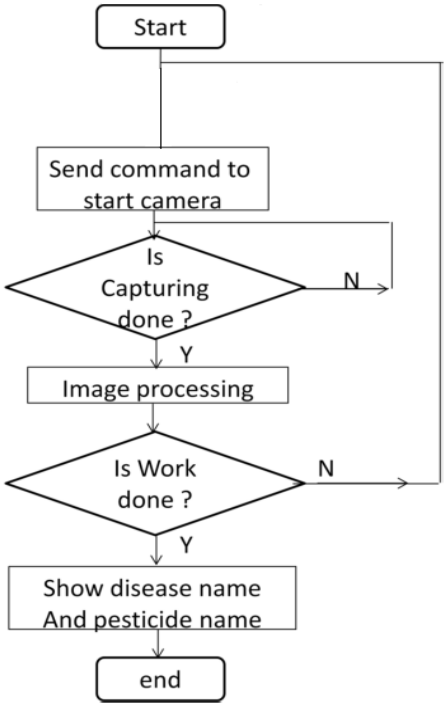
Block Diagram:



Algorithm:

1. Image acquisition is the very first step that requires capturing of an image with the help of camera
2. Square sample of the image is obtained.
3. Image is scanned pixel by pixel.
4. Building a colour histogram which can tell the extent of infection on leaf or leaf is infection free.

Flowchart:



IV. RESULTS AND CONCLUSSION

Advantages:

- Low cost then mat lab and laptop based system
- Early crop disease detection and control
- Judicious use of pesticide avoiding over dose of chemical in plants

ISBN: 979-85-27243-61-1

Applications:

- To design such system that can detect crop disease and pest accurately.
- Create database of insecticides for respective pest and disease.
- To provide remedy for the disease that is detected.

Conclusion:

Crop protection is one of the biggest aspect in farming and our project is key part of this aspect, early detection of diseases can alert farmers and assist them to select correct pesticide to prevent crop failure and increase production, image processing done in raspberry pi with the help of python coding.

V. FUTURE SCOPE

- Can be integrated with robot for automatic scanning of leaves in farm
- Algorithm can be improved to detect any types of diseases for any leaves
- Automatic spraying system can be added for complete automation

VI. REFERENCES

- S. K. Pilli, B. Nallathambi, S. J. George and V. Diwanji, "eAGROBOT — A robot for early crop disease detection using image processing," 2015 2nd International Conference on Electronics and Communication Systems (ICECS), Coimbatore, 2015
- G.R. GAYATHIRI,DR.M.G.SUMITHRA," Leaf Disease Diagnosis and Pesticide Spraying Using Agricultural Robot (AGROBOT)", IJARECE Volume 5, Issue 4, April 2016
- D. A. Shaikh1, Ghorale Akshay G et al, "Intelligent Autonomous Farming Robot with Plant Disease Detection using Image Processing", IJARCCE, Vol. 5, Issue 4, April 2016
- https://en.wikipedia.org/wiki/Raspberry_Pi
- Pi Camera : https://www.adafruit.com/product/1367
- https://www.arduino.cc/en/Tutorial/HomePage
- Datasheets of all ICs used

ISBN: 979-85-27243-61-1

FIRE FIGHTING DRONE (F.F.D)

[1]SWETHA G, [2*]SRINIVASA, [3]NINADA A ASHOK, [4]NEKELESH H, [5]NAVEEN KUMAR H S

[1] Assistant Professor, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
[1]shwethag@sapthagiri.edu.in

[2,3,4,5] Students, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru
[2]srinivasashetty1299@gmail.com
[3]ninadashok21@gmail.com
[4]naveenkumarhs95gmail.com
[5]nikhileshnil99gmail.com

***Abstract* - Firefighting is traditionally done using firemen and fire engine. Later it was modified to firefighting robots. Fire Fighting Robots were controlled by Computers. Our work aims is to manage and provide a solution for firefighting employing a fire extinguisher or any such mechanism fitted on a Drone. This work describes the development of a firefighting Drone equipped with the fighting instrumentation that may be required to be mounted on it. It is operated and controlled by remote user and has the flexible to extinguish flame. Firefighting system is designed to operate automatically and can be controlled manually with radio transmitter. It is design to be controlled with a monitoring system and in wireless mode.**

Keywords – Wireless Secure Shell, Omnidirectional, Computer Vision, Human Intervention, Mecanum Wheel, Autonomous.

I. INTRODUCTION

As we have witnessed many unexpected disasters happening around the world, one of them are fire hazard. These fire hazard can happen anywhere, anytime which has different reasons for its cause. We have witnessed fire in forest, home or fire on electrical devices on poles. Humans are used for extinguishing these raging fires with high pressure water which takes long time without the clear information or view. Hence there are high chance that fire fighter may lose life while fighting these raging fires. The recent innovation and technological influence on robots have created opportunities to make many of the tasks easier and safer that endanger the man who risk their lives every day. One of those technology is in recent era is Drone technology. Drone is known as UAV.

Unmanned Aerial Vehicle (UAV) is a type of aircraft which has no pilot or passenger on board. UAVs include both autonomously controlled (drones) and remotely piloted vehicles (RPVs) controlled via radio transmitter. UAVs is being used in all application. Drones are also developing for fighting with fire. Firefighting drone is in under developing stage, so if drones are used in firefighting will be more helpful in putting off the fire much quicker than usual way. The firefighting drones are designed in hexacopter which has six motors. In firefighting drone the drone is controlled with the radio transmitter remote control and the firefighting part is manually controlled or automatically processed which sense the fire and spray fire extinguish on fire. The aim is to develop a UAV which is capable of stopping the fire or to bring situation under control.

II. MATERIALS & COMPONENTS USED

A. APM Flight controller

The APM 2.8 Multicopter Flight Controller which is a complete open-source autopilot system. APM has unmanned-vehicle autopilot software suite, which has capable of controlling drone autonomously. The ArduPilot software suite consists of navigation software and along with ground station controlling software

ISBN: 979-85-27243-61-1

including mission planner. APM has Ground Control Station with software that gives you an easy

point-and-click setup/configuration, along with a full-featured interface.

B. Hexacopter Frame

This is a highquality carbon fibre hexacopter frame, designed to be large enough to use larger propellers. The arms can fold down for easy storage and transportation. Also included is a durable PCB frame board for an easier and safer wiring of battery and ESCs. Recommended motor: 22 x 12 mm frame, weight: 478 g recommended battery: 3S or 4S LiPo, diagonal wheelbase: 550 mm, propeller size: 10 x 3.8 in or 8 x 4.5inches

C. Power supply

The power supply is the important part of any electronics system. Power supply unit is used to power to the APM, camera, sensors/driver Module and Motors. Where power circuits maintain and control that power with respect to the individual electronic components. The system as method.

D. BLDC Motor and Propellers

A Brushless DC Electric Motor (BLDC) is an electric motor powered by a direct current voltage supply and commutated electronically instead of by brushes like in conventional DC motors. BLDC motors offer high durability and low electric noise generation. Higher efficiency and power density than induction motors.
Propellers are devices that transform rotary motion into linear thrust. Drone propellers provide lift for the aircraft by spinning and creating an airflow, which results in a pressure difference between the top and bottom surfaces of the propeller.

E. Fire Extinguisher

Dry Powder is a highly versatile medium for tackling most types of fire. It is extremely effective with electrical hazards which making it ideal for any fire. CO2 is harmless to electrical equipment and so is ideal for offices and workshops. Both dry powder and carbon dioxide extinguishers have non-conductive, anti-static used to extinguish fire.

.



Fig 1. Hexacopter Frame



Fig 2. APM 2.8

Fig 3. Battery



Fig 4. BLDC Motor



Fig 5. Propellers



Fig 6. Fire extinguisher

III. METHODOLOGY:

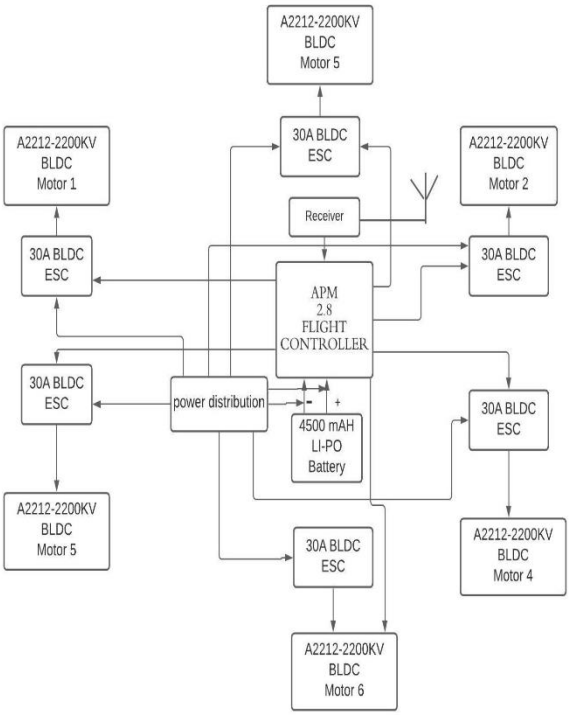
Drone is designed to have Hex copter Configuration

only then the required amount of thrust will be produced by the rotors having small propellers. If Quadcopter

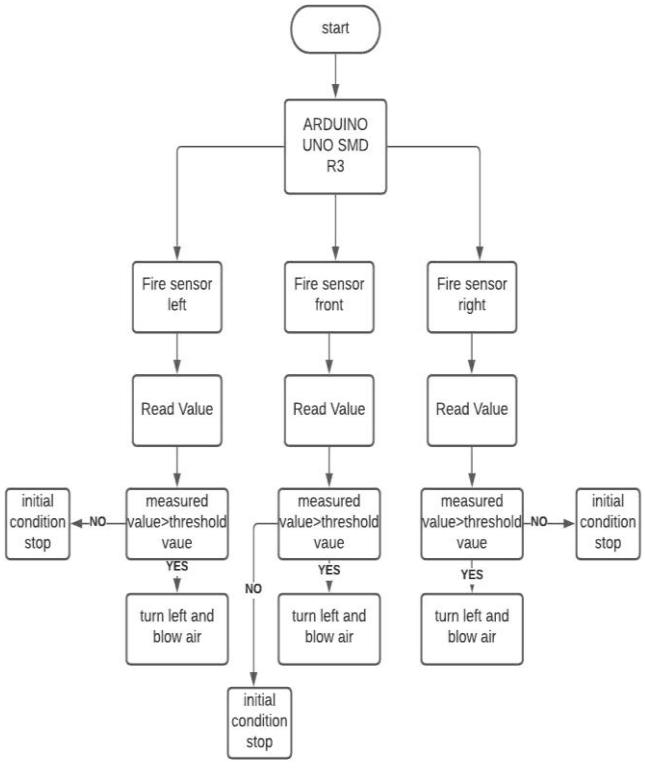
ISBN: 979-85-27243-61-1

configurations were used then each of the propeller size has to be increased to produce thrust as same as thrust produced in hex copter Configuration. The main frame is designed as H- shaped due to which there is enough space to mount the payloads.

Payload: Fire extinguisher to extinguisher flame, Mosfet Z44N sensor for detecting flame, servomotor for spraying mechanism, Esp-32 cam for recording.



Synoptic scheme of the proposed control of drone



Block diagram for control of fire tank trigger

At each free end of the arm, a motor will be fixed and propelled will be mechanically coupled to the motor. For all six motors the output side of an ESC will be connected and the input side of the ESC will be connected to the flight controller. The other input of the ESC will be connected to the power distribution board where the power supply is provided by the Li-Po battery. In similar way all the other ESCs, motors and propellers are connected. A receiver will be connected to the Flight controller to receive signals from the transmitter. The camera is mounted with a separate Li-Po battery power supply. The fire extinguisher tank is mounted under the drone with manual and auto spray mechanism using Arduino.

Operation of drone will be controlled using Flysky remote controller.

- The signals will be transmitted from Transmitter and it will be received by the receiver in the drone.
- From the receiver the signal goes to the Flight controller where the signal will be processed with accelerometer and gyroscope sensors.
- The processed signal will be sent to the ESC, which allows the specific amount to the motor based on the signal it receives.
- The propellers are mechanically coupled to the motors so that they rotate and produce thrust.
- The fire is sensed by the thermal sensing camera which trigger the tank automatically controlled by Arduino or the trigger can manually control by android device. CO2 in tank is sprayed on fire to extinguish the fire.

Fig 7.



ISBN: 979-85-27243-61-1

IV. RESULTS & DISCUSSIONS

The main goal of drones in the context of firefighting is to provide situational awareness so that firefighters can identify hot-spots and effectively direct their efforts to bring the situation under control.

- Two design and develop a low cost firefighting drone.
- To reduce the damage of electrical devices on electrical poles.
- To control manual ad automatic operation of the firefighting drone.
- To reduce the effort of human labour and level of destruction.
- To provide the better view and analyse the situation during fire accidents.

V. CONCLUSIONS

1. The Drone is expected to designed in such a way that carries a maximum amount payload with maximum battery Endurance.
2. The Firefighting device is compact and portable hence can be used at any situation.
3. It reduces the risk to the personnel involved in Firefighting operations.
4. This Drone can be used extinguish devices transformers, and circuit is easy to assemble and dismember the system units based on the circumstances.
5. The drones need to become smart and quick-witted in order to optimize industrial processes, maximum their utility and can be widely established in the future factories.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electrical and Electronics Engineering and faculties for their encouragement and support.

REFERENCES

[1] Na Gabbert, B. "The cost of saving money on wildfiresuppression",2012.
[2] Pat Mika, GIFireE "Emergency Service Use of UAS", The Global Perspective – 7th Edition - June 2009
[3] Barringer, F.A. A's concerns hold up use of wildfire drones., New York Times, 2015
[4] Agoston Restas, "Drone Applications for Supporting Disaster Management", World Journal of Engineering and Technology, 2015, 3,316-321
[5] Ludovic Apvrille; Yves Roudier; Tullio Joseph Tanzi, "Autonomous drones for disasters management: Safety and security verifications" Radio Science Conference (URSI AT-RASC), 2015 1st URSI Atlantic
[6] Milan Erdelj Enrico Natalizio "UAV-assisted disaster management: Applications and open issues" International Conference on Computing, Networking and Communications (ICNC), 2016

ISBN: 979-85-27243-61-1

Self-Driving Garbage Collecting Vehicle

NIRANJAN B A[1], VISHRUTH B R*[2], VISHWAS SHABADI[3], WASEEM PASHA M[4], Dr. NARAYANAPPA[5]

Department of Electrical and Electronic Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1] niranjangowda821@gmail.com

[2] vishruthbr13@gmail.com

[3] vishwas.s.shabadi@gmail.com

[4] waseemrebel143@gmail.com

[5] narayanappa@sapthagiri.edu.in

Abstract **- The aim of the project is to build a self-driving garbage collecting vehicle which is driven using batteries and a motor. It captures video using camera and sends it to Raspberry Pi. It is equipped with sensors which detect obstacles around the vehicle. Raspberry Pi being the main device which runs a machine learning model trained to detect roads, traffic signals, sign boards.**

The four key technologies in self-driving car namely, car navigation system, path planning, environment perception and car control, are addressed. The automatic control, architecture, artificial intelligence, computer vision and many other technologies are integrated into the self-driving car, which is a product of the highly developed computer science, pattern recognition and intelligent control technology.

Keywords–Self-driving vehicle, garbage collection, autonomous driving vehicle, automatic garbage collector,

I. INTRODUCTION

As per the annual report of the Indian government's Ministry of Housing and Urban Affairs, it is estimated that the total generation of solid waste is approximately in several thousand tons per day. There are many places in rural and urban India where the people do not dispose waste in the right way. It is necessary to have an efficient waste collection system so as to reduce the usage of fossil fuels used in garbage collecting vehicles. People will dispose the waste near their locality causing many problems such as destruction of natural habitat and environment, and become the breeding grounds for diseases which affects surrounding animals and humans. A lot of man power is needed to drive the garbage collecting vehicle. The expenditure on fuel is more.

The solution to the problem of consumption of fossil fuels is by replacing IC engines by electric motors and batteries. It is easier for these vehicles as they need to work only in the morning. After collecting waste, they can be charged during the rest of the day using solar energy and be fully charged for the next day.

By automating the driving process, the driver is replaced by a computer. By doing this we will remove the human error and cause less accidents on the road.

II. MATERIALS & METHODS

Collecting garbage is a very important process so as to dispose the garbage correctly. By using self-driving garbage collection vehicle which is implemented using machine learning it is easier to train the model to follow road rules, identify traffic signals, traffic sign boards, etc.

The general method of working of the vehicle is it captures the video using pi camera this is processed using OpenCV all the features are extracted from the video i.e. traffic sign boards, road/lanes, etc.

The vehicle is also embedded with GPS and Magnetometer sensors to help the vehicle with direction and position.

ISBN: 979-85-27243-61-1

A. Raspberry Pi – This is the main computer for the vehicle. This encompasses machine learning model written using TensorFlow written in python. This also handles all the image processing captured by pi camera using OpenCV.

B. Arduino Mega – Raspberry Pi and Arduino are connected in a master-slave configuration. Arduino is connected with GPS, magnetometer and motor driver to drive the motors based on the command given by the master i.e., Raspberry Pi.

C. GPS – This sensor gives the latitude and longitude of the vehicle. This information is necessary to locate the vehicle and to decide where to move next.

D. Magnetometer – This is a digital compass to determine which direction the vehicle is facing. Only the GPS is not necessary to determine the direction of the vehicle. Precise direction is required for proper working of the vehicle.

E. Motor driver – Based on the command sent by raspberry pi, based on the command the Arduino moves the vehicle forward, back, left or right.

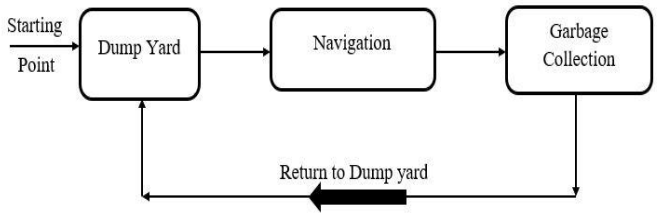
F. Pi camera – This captures video of front of the vehicle. This helps to see what is in front of the vehicle, which is used to extract features such as lanes, sign boards, etc.

G. Motor and Motor driver – Electric motor is used to run the wheels. This is controlled by the Arduino through motor driver. Arduino tells at what speed the motors have to run.

Methodology:

Basic working principle is shown in the below figure,

- Road/Lane Detection
- Vehicle with Autonomous Obstacle Avoidance.
- Vehicle with Autonomous Navigation.



- Traffic light and Signals Detection.

Fig1 – basic working of vehicle

1. Road/Lane Detection Algorithm:

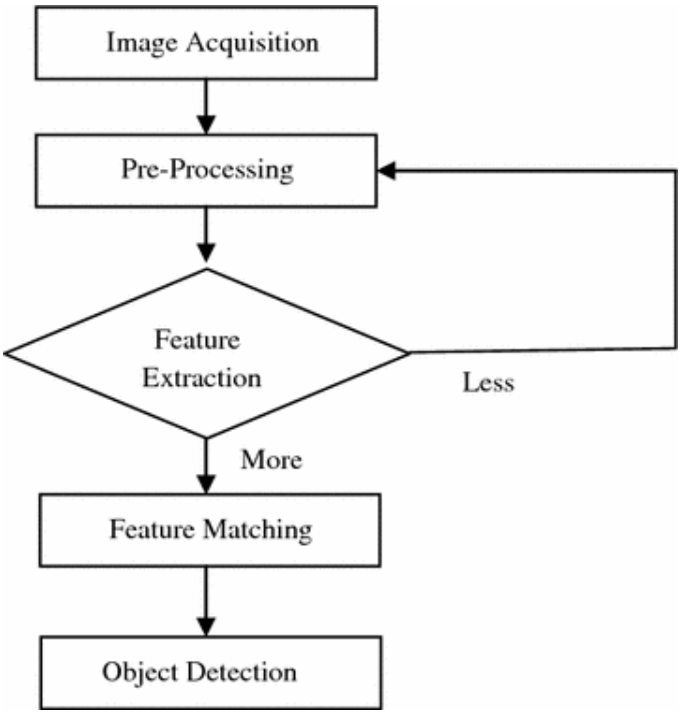
The model-based technique just uses a few parameters to represent the lanes. The model-based technique is much more robust against noise and missing data, compared with the feature-based technique.

To estimate the parameters of lane model, the likelihood function, Hough transform, and the chi-square fitting, etc. are applied into the lane detection.

In the proposed algorithm to detect the lanes, a combination of feature and model base is used. In general, this algorithm is valid for all kind of roads.

2. Sign Board detection:

The machine learning model should detect whether it is free to move, in a signal or should it stop. It will



recognize the sign and perform the necessary actions as programmed. For example, to maintain speed limit, one-way road, no parking, school zone, etc.

ISBN: 979-85-27243-61-1

- Traffic signal and road sign detection.

Fig2 shows workflow of signboard detection.

Vehicle with Obstacle Avoidance:

- Vehicle with obstacle avoidance: Though inverse perspective mapping helps to find the distance of the objects far away from the car with the help of known camera parameters and generating a model but it takes more computations.
- Using ultrasonic sensor is better option in this case as it doesn't require high CPU computations and detects the obstacles as well as help us finding the distance.

III. ADVANTAGES

1. As the vehicle is self-driving no man power is needed to drive the garbage collecting vehicle.
2. Electric vehicle comes with added benefit of no pollution as fossil fuels are not used.
3. When implemented throughout country the disposal of waste in public areas gets reduced.
4. As the vehicle works only in the morning it can be charged using solar energy during the rest of the day.

IV. APPLICATIONS

1. Main application of this is garbage collection.
2. The working can be modified to work in indoor applications such as industrial applications, medical purposes.
3. After various testing and training of the machine learning model this can be implemented for public transport.

V. RESULTS & DISCUSSIONS

Successful implementation of self-driving garbage collecting vehicle which has the following features,

- Road/Lane detection
- Obstacle detection

VI. CONCLUSIONS

The transition from self-driving cars with varying levels of autonomy to fully autonomous vehicles is yet to be made. However, modern AI technologies and machine learning development are making rapid leaps forward in this direction, and that is what's driving the industry forward.

The autonomous vehicle is but one application of artificial intelligence technologies which have an enormous bearing on contemporary and future society. As AI implementations become more diverse, and indeed ubiquitous, there will a greater need to understand the different contexts of decisional application. Essentially this means that in order to accurately frame each unique decision context the technology must to be taken at face value and a nonlinear relational model of classification concepts created.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electrical and Electronics Engineering and faculties for their encouragement and support.

REFERENCES

[1] Zhao, J., Liang, B. and Chen, Q. (2018), "The key technology toward the self-driving car", International Journal of Intelligent Unmanned Systems, Vol. 6 No. 1, pp. 2-20.

[2] Ackerman, E. (2016a), "After mastering Singapore's streets, NuTonomy's Robo-taxis are poised to take on new cities" October 5, 2017.

[3] Ackerman, E. (2016b), "Lidar that will make self-driving cars affordable", IEEE Spectrum, Vol. 53, p. 14.

ISBN: 979-85-27243-61-1

[4] Atia, M.M., Hilal, A.R., Stellings, C., Hartwell, E., Toonstra, J., Miners, W.B. and Basir, O.A. (2017), "A low-cost lane-determination system using GNSS/IMU fusion and HMM-Based multistage map matching", IEEE Transactions on Intelligent Transportation Systems, Vol. 18 No. 11, pp. 1-11.

[5] Banks, V.A. and Stanton, N.A. (2016), "Keep the driver in control: automating automobiles of the future", Applied Ergonomics, Vol. 53, pp. 389-395.

[6] Banks, V.A., Stanton, N.A. and Harvey, C. (2014), "Sub-systems on the road to vehicle automation: Hands and feet free but not 'mind' free driving", Safety Science, Vol. 62, pp. 505-514.

[7] Barker, J., Sam, M., Evan, B., Tim, B. and Justin, G. (2013), An Overview of the State of the Art in Autonomous Vehicle Technology and Policy, University of Washington School of Law, Washington, DC.

ISBN: 979-85-27243-61-1

Power Generation using Piezoelectric Cell from footfall

Chaithra N, Anu H N, Nagashree T, Chandana N, Swetha G*

8TH Semester, Assistant Professor*

department of EEE, Sapthagiri college of engineering

Bangalore-57

chaithra.06n@gmail.com ,anuhn1210@gmail.com ,nagashreet13@gmail.com ,

changowda07@gmail.com,swethag@sapthagiri.edu.in*

***Abstract*— In today's world, energy and electricity are one of the most essential requirements. Because the need for energy is growing by the day, the most effective way to address these issues is to use renewable energy sources. The goal of this project is to generate electricity from footfall as a renewable energy source that we can receive by walking on specified arrangements such as pathways, stairs, and platforms, and these systems may be implemented anywhere, especially in densely populated places.**

The use of piezoelectric materials to harvest energy from people walking vibrations for generating and collecting energy is described in this project study. The piezoelectric effect is at the heart of the "power generation utilising piezoelectric cell" concept. The electrical energy created by the pressure is gathered by floor sensors and transformed to an electrical charge when the flooring is constructed with piezoelectric technology. These sensors are positioned in such a way that they produce the highest possible output voltage. This signal is sent to our monitoring circuitry, which is a microcontroller-based circuit that allows users to monitor voltage and charge a battery. This power source has a wide range of uses.

***Keywords*— Piezoelectric cell, force or pressure, Power**

I. INTRODUCTION

The ability to conduct labour is what energy is. Energy harvesting, also known as power harvesting [4] or energy scavenging, is the process of collecting and storing energy from external sources such as solar power, thermal energy, wind energy, salinity gradients, and kinetic energy for small, wireless autonomous devices such as wearable electronics and wireless sensor networks. For low-energy electronics, energy harvesters deliver a very little quantity of electricity. While the input fuel for some large-scale generators (oil, coal, etc.) is expensive, the energy source for energy harvesters is abundant and free. Temperature gradients, for example, result from the functioning of a combustion engine, while radio and television transmission emit a huge quantity of electromagnetic radiation in urban areas.

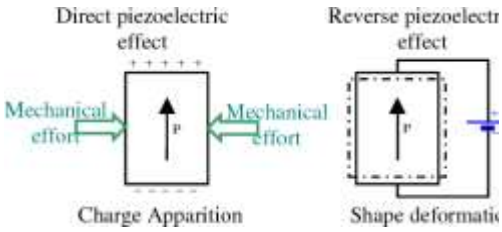
There has been a surge of attention in transferring mechanical energy from human motion into electrical energy over the last two decades. This electrical energy can then be used to power small scale, low-power circuits or to recharge batteries in electronic devices. Hand-crank generators (for powering torches, radios, and recharging mobile devices) and pedal generators are two examples of commercial devices that employ human power to generate energy (that can be used to power larger electrical devices typically generating between 100 and 1000W). These generators, on the other hand, necessitate sustained human effort for long periods of time, which may prevent the user from performing other tasks. While the user is conducting his or her duties, it is desirable to scavenge or harvest energy from human movement. Walking is by far the most prevalent human activity. The average person may walk between 3,000 and 5,000 steps each day. Walking wastes energy in the form of vibrations on the ground. The piezoelectric effect can be used to transform this wasted energy into electricity. The piezoelectric effect occurs when mechanical vibrations, pressure, or strain are applied to piezoelectric materials such as quartz, lead zirconate titanate (PZT), Polyvinylidene fluoride (PVDF), Rochelle salt, Mica, and other piezoelectric minerals. The properties of piezoelectric material (PZT) are superior, and the series-parallel combination is shown to be more effective. The properties of piezoelectric material (PZT) are superior, and a series-parallel combination is determined to be more suited. The system's efficiency can be improved by employing rechargeable nanotechnology batteries, and the voltage can be effectively boosted by employing a Boost converter. More electricity can be created by employing synthesised piezoelectric crystals and a better location for installation.

II . RESEARCH ELABORATIONS

STUDY OF PIEZOELECTRIC SENSORS

Piezoelectric materials are increasingly being explored because they are odd materials with unique and compelling features. In fact, these materials have the ability to convert mechanical energy into electrical energy, for example, by converting vibrations into electricity. Energy harvesters are a sort of device that can be used when external power isn't accessible and

batteries aren't a viable option. While recent research have indicated that these materials could be employed as power generators, the amount of energy generated remains modest, necessitating more optimization. The direct and reverse effects of piezoelectric materials are defined. When mechanical stress is applied to some materials, they produce an electric change on their surface, but when an electric charge is produced, they develop mechanical stress. The piezoelectric sensor requires an external source since it has a very high frequency response and is self-generating. Because of their compact dimensions and large measuring range, they are simple to use. [1]



III . BLOCK DIAGRAM

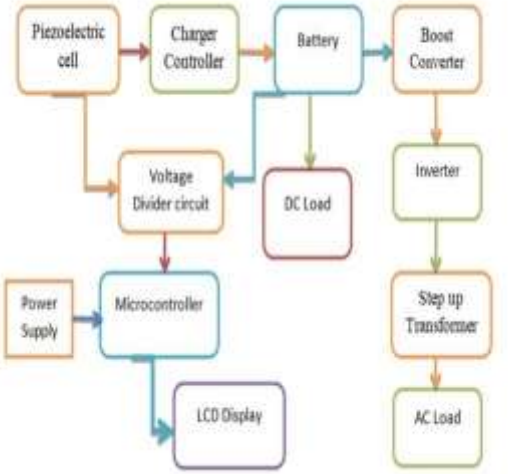


Fig1: block diagram representation

IV. WORKING PRINCIPLE

The pressure supplied to the piezoelectric cell is converted into electrical energy by the piezoelectric material. The source of pressure can either be the weight of driving automobiles or the weight of individuals walking on it. The piezoelectric material's output is not constant. To transform this variable voltage to a linear one, a bridge circuit is employed. An AC ripple filter is utilised once more to filter out any further output variations. A rechargeable battery is used to store the output dc voltage. Due to the low power output of a single piezo-film, a combination of a few Piezo films was investigated. There were two types of connections tested: parallel and series. The voltage output from the parallel connection did not increase significantly. Additional piezo-film results in an increase in voltage output when connected in series, but not in a linear proportion. So, in order to provide a 40V voltage output with a high current density, a hybrid of parallel and series connections are used. To avoid voltage and current fluctuations, a boost converter is connected to the battery. To connect the dc load, battery provisions are provided. A boost converter connects an inverter to the battery, allowing it to connect to an AC load. A LCD may display the voltage generated across the tile. The ATMega328P microcontroller is utilised for this purpose. The microcontroller is powered by a crystal oscillator. The microcontroller's output is subsequently sent to the LCD, which shows the voltage levels. [3]



Fig2: Piezoelectric device

A. PIEZOELECTRIC SENSOR

A piezoelectric sensor, in general, is a transducer that converts applied stress into electrical energy. Simply stated, it is a device that transfers energy from one form to another. It transfers physical stress into electrical energy, in other words. The stress can be in the form of a force, pressure, acceleration, or any other potential contact. Not every substance has piezoelectric properties. Piezoelectric materials come in a variety of shapes and sizes. Natural single crystal quartz, bone, and artificially made materials such as PZT ceramic are only a few examples of piezoelectric materials.

B . CHARGE CONTROLLER

A charge controller circuit that is utilized as a unidirectional current controller allows only one direction current to flow through some devices.

1. Diode

2. Thristors

C . BATTERY

Separately linked or individually interconnected and contained in a single unit, a lead acid battery (electricity) is a collection of electrochemical cells for electricity storage. An electrical cell is composed up of one or more electrochemical cells that convert chemical energy into electrical energy. Batteries can be used once and then discarded, or they can be refilled and used in standby power applications for years. Hearing aids and wristwatches are powered by miniature cells, while larger batteries provide backup power for telephone exchanges or computer data centres.

D . BOOST CONVERTER

A boost converter (step-up converter) is a DC-to-DC power converter that increases voltage while decreasing current from its input (supply) (load). It's a type of switched-mode power supply (SMPS) that has at least two semiconductors (a diode and a transistor) and at least one energy storage element (a capacitor, an inductor, or both). Filters built of capacitors (occasionally in combination with inductors) are typically added to such a converter's output (load-side filter) and input (input-side filter) to reduce voltage ripple (supply-side-filter). One of the most basic types of switch mode converter is the boost converter. It takes an input voltage and boosts or enhances it, as the name implies. An inductor, a semiconductor switch, a diode, and a capacitor are the only components. A source of a periodic square wave is also required. This could be as simple as a 555 timer or as complex as a special SMPS IC like the well-known MC34063AIC.

E . INVERTER

A power inverter, often known as an inverter, is a device or circuitry that converts direct current (DC) to alternating current (AC) (AC). The frequency of the generated AC is determined by the equipment used. Inverters work in the opposite direction of converters, which are huge electromechanical devices that convert AC to DC. The design of the specific device or circuitry determines the input voltage, output voltage and frequency, and overall power handling. The inverter does not generate any power; instead, the DC source provides it.

F . STEP-UP TRANSFORMER

A step-up transformer is one in which the output (secondary) voltage is greater than the input (primary) voltage. The step-up transformer reduces the output current to balance the system's input and output power.

G . VOLTAGE DIVIDER CIRCUIT

The voltage is lowered to the level of a microcontroller using a voltage divider circuit. We can't supply 12 volts to the microcontroller directly. The voltage is divided using a voltage divider. The microprocessor then reads the analog inputs and displays it on the LCD after that. If you're not sure how to measure dc voltage with a microcontroller, the dc voltmeter with microcontroller project can help you learn. [5]

H . ARDUINO

It's a free and open-source prototyping platform with simple hardware and software. Arduino boards can take inputs like light from a sensor, a finger on a button, or a Twitter post and turn them into outputs like turning on a light, triggering a motor, or publishing anything online. By providing a set of instructions to the board's microcontroller, you may tell it what to do. You may do this by using the Arduino programming language (which is based on wire) and the Arduino software (IDE), which is based on Processing.

I . LIQUID CRYSTAL DISPLAY (LCD)

The output of the battery and the output of piezoelectric sensors are displayed on a liquid crystal display (LCD), which is a tiny, flat panel used for electronically displaying information such as text and sensor outputs.

J . DC MOTOR

Any rotary electrical motor that transfers direct current electrical energy into mechanical energy is known as a DC motor. The most common varieties rely on magnetic fields to produce forces. Almost all DC motors contain an internal mechanism, either electromechanical or electronic, that changes the direction of current in a section of the motor on a constant schedule.

ISBN: 979-85-27243-61-1

V . HARDWARE IMPLEMENTATION

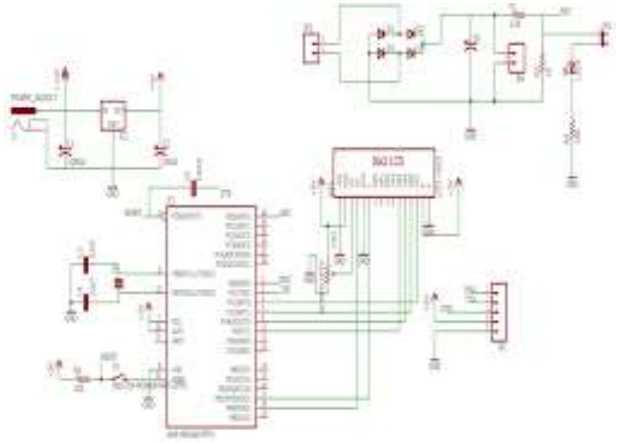


Fig3 : hardware implementation schematic

The schematic diagram is depicted in the image above. A piezo material tile generates voltage across a piezo tile, which is sent to a bridge rectifier circuit to acquire DC voltage, which is then sent to a rechargeable battery, which charges the battery and can be used to drive both DC and AC loads. The battery in this case is a 12V lead acid battery. A microcontroller is connected to an LCD. The ATMega328P microcontroller is utilised in this project, and it has a 16Hz speed and an 8-bit, 32kb flash with 1k RQM. The voltage generated by the piezoelectric tile is displayed using a 16x2 LCD. A clock signal is generated by connecting a crystal oscillator to a microcontroller. Power is supplied to the microprocessor and LCD via the power supply unit. The IC7805 in this unit converts 12V to 5V. [5]

VI. MAXIMUM THEORETICAL VOLTAGE GENERATED

A charge is formed when a force is applied to a piezoelectric material. It's a good bet that it's a perfect capacitor. As a result, it can be subjected to all capacitor equations. On one tile, we link three piezoelectric cells in series and five piezoelectric cells in parallel in this research. When ten piezoelectric discs are wired in series, the corresponding capacitance is:

$$1/ Ceq = 1/ C1 + 1/ C2 + 1/ C3$$

we know, $Q=C*$

So, $C=Q/V$

Hence, $Veq/Q = V1/Q + V2/Q + V3/Q$

Thus, $Veq=V1+V2+V3$

Hence, the net voltage generated in series connection is the sum of individual voltages generated across each piezoelectric disc. Output voltage from 1 Piezo disc is 13V.

Thus, $Veq=V1+V2+V3$

$=13+13+13$

$=39V$

Thus the maximum voltage that can be generated across the piezo tile is around 39V[1]

VII . ANALYSIS DONE ON THE PIEZO TILE

To test the piezo tile's voltage generating capacity, people weighing between 40 and 75 kilogrammes were forced to walk on it. The graph below depicts the relationship between a person's weight and the amount of power generated.From the graph it can be seen that maximum voltage is generated when maximum weight/force is applied. Thus, a maximum voltage of 40V is generated across the tile when a weight of 75kg is applied on the tile.[1]

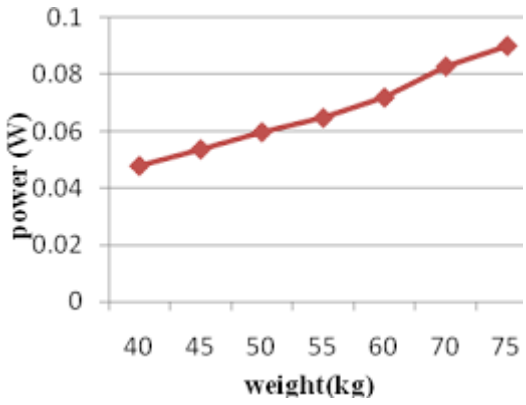


Fig4 : weight V/s power graph of piezo tile

VIII. RESULT AND FINDING

If 30 piezo sensors are employed in a 1 square foot area. Because the power generated by piezo sensors fluctuates with different stages, get 1 V every step as a minimum voltage Each step has a maximum voltage of 10V.If you take an average of 50 kg weight pressure from a single person, the average computation is as follows: To increase the voltage of a battery by one volt, you must do 800 steps.
As a result, to boost the battery's voltage to 12 V,
The total number of steps required is (12 800) =9600.

Because this project is being implemented in a crowded region with available footsteps as a source, an average of two steps per second will be taken. Time required =9600/ (60 2) =80 minutes for 9600 steps. (Approximately)

IX. CONCLUSION

The use of piezoelectric crystals has begun, with encouraging results. More electricity can be generated with additional advancements in the field of electronics, better manufactured piezoelectric crystals, and better selection of installation locations, and it can be seen as a next promising form of generating electricity. It is possible to gather a non-conventional, non-polluting kind of energy while maintaining common people's economic standards. The piezoelectric effect causes mechanical stress on the crystals, which creates the energy needed to charge the battery that powers the streetlights at night, as well as for the city's electricity consumption. Regardless of the outcome of this endeavour, piezoelectric materials have a bright future ahead of them, with research focused on their characteristics and applications in nanotechnology.
As a result, the assembly greatly increases the concern of cost effectiveness, and development continues to improve the system's results.

X . REFERENCES

[1]http://www.ijeit.com/Vol%203/Issue%2010/IJEIT1412201404_51.pdf
[2] https://www.ijsdr.org/papers/IJSDR1707037.pdf
[3]https://iarjset.com/upload/2015/april-15/IARSET%206.pdf
[4]IARJSET ISSN (Online) 2393-8021 ISSN (Print) 2394-1588 International Advanced Research Journal in Science, Engineering and Technology National Conference on Design, Manufacturing, Energy & Thermal Engineering (NCDMETE-2017) AGTI's Dr. Daulatrao Aher College Engineering, Vidyanagar Extension, Karad Vol. 4, Special Issue 1, January 2017 Copyright to IARJSET DOI 10.17148/IARJSET/NCDMETE.2017.15 55 Foot Steps Power Generation using Mechanical
[5]
https://www.academia.edu/35289387/Footstep_Power_Generation_System

HYBRID INVERTER WITH SOLAR BATTERY CHARGING

[1] Karthik Kumar G R, [2] Leela Sai Krishna G, [3] Charan Kumar G, [4] Harsha M S, [5] A M Nagaraj,
[1][2][3][4]Student [5]Associate Professor

Department of Electrical and Electronics Engineering
Dayananda Sagar College of Engineering, Bengaluru, India

***Abstract*— Solar power has enormous potential to illuminate our daily lives. According to experts the amount of sunlight hitting the surface of the Earth in an hour and a half is sufficient to power the whole world for a year. Solar energy is one of the most economical and ecologically friendly technology accessible for renewables. I have proposed techniques for my research that may be utilised for other off-grid applications. To illustrate the design process I will use an off-grid bus shelter as an example. Independent systems that are not connected to any electric grid are known as freestanding systems or off-grid systems. These are available in a range of sizes and are frequently used in regions with limited grid access. With solar photovoltaic panels collecting electricity from electrical devices like LED lighting, Wi-Fi router and billboards, the off-grid bus shelter will operate completely on solar power. If the weather were unexpected, a battery backup would offer an uninterrupted power source. This article will discuss how the system approach off-grid/stand-alone may help reduce grid depdence and allow us to live independently without having to rely on one or more public services. To demonstrate this concept, a PV system is designed for an EIU bus shelter.**

Key words: Solar energy,hybrid inverter,back-up power supply.

I. INTRODUCTION

Energy, like food and water, is a need. All around us needs energy. Over the years, the earth's population has increased, which is also directly proportionate to the energy consumed. All conceivable equipment and devices need some or other kind of energy to work. With the depletion of fossil fuels, effective renewable energy supplies must be identified that may reduce dependence on fossil fuels. This section presents recommendations and methods to the size and design of the stand-alone off-grid photovoltaic system. In principle, a variety of off-grid system configurations are conceivable from a smoother design to a somewhat complicated one, based on its power and load characteristics as well as on-site energy supplies. The main objective of the off-gird system design should, however, be to achieve optimum efficiency, dependability, and flexibility at an affordable price. The next parts address the design of solar photovoltaic systems for off-grid electrification projects while taking the aforementioned considerations into account.

II. DESIGN OF THE MODEL

Off-grid solar system:

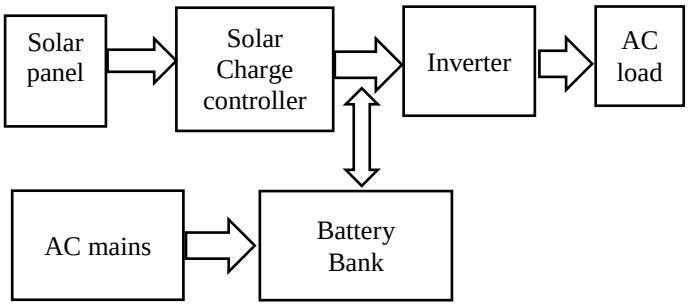


Fig.1. Multi-input off-grid inverter schematic diagram

Figure 1 shows the schematic architecture of the proposed multi-input inverter. An integrated buck/buck boost mixed direct current converter and a full-bridge direct current change inverter are used for this design. The results are as follows when the PV array and the proper wind turbine voltage are utilised as input dc voltage sources. and A Pulse With Modulation (PWM) control system may be used to extract the maximum amount of power either individually or simultaneously from the PV array and the wind turbine in conjunction with an appropriate MPPT algorithm on the power switches and the converter. This is accomplished via the application of the dc bus voltage (SPWM) modulation for the energy-flow balance input-output. This is done via the control of the SPWM. The operating idea of the proposed Multi-Input Inverter is detailed: A PV Array A photovoltaic array is made up of many solar panels connected in series or parallel.

Photovoltaic (PV) cells. Each solar cell is made up of a semi-conductive junction that can generate currents on its surface due to the photovoltaic effect. FIGURE 1 illustrates typical output power characteristic curves for a photovoltaic array at various levels of sun exposure. 2. Each output power characteristic curve exhibits a maximum power point. As a result, a suitable control algorithm must be implemented in order to maximise the PV array's maximum output power.

ISBN: 979-85-27243-61-1

III. INVERTER

While an inverter is an instrument which converts the direct current (DC) voltage to alternating current (AC), it consists of four switches, while the anti-parallel half-bridge inverter is connected by two diodes and two switches. Both switches complement each other because the second switch is disabled when the first switch is activated. Likewise, the first switch is disabled when the second switch is enabled.

If switch S1 is enabled for a duration of 0 to T/2, switch S2 is disabled. This is how Case 1 works (when switch S1 is turned on and switch S2 is turned off).

Using KVL as a guideline (Kirchhoff Voltage Law).
Vs/2-V0=0
In the case of the V0=Vs/2 i0 output voltage, the output current is equivalent to the V0/R output voltage.
The current iS1 = i0 = Vs/2R, the current iS2 = 0 and the diode current iD1 = iD2 = 0 are all equal in the event of current or switch current supplied.

If case 2 is true (when switch S2 is activated and switch S1 is disabled), then if switch S2 is enabled for a length equal to T/2 to T, switch S1 is disabled.

Use of KVL (the Voltage Act of Kirchhoff) as a guide
Vs/2+V0=0
In this case, the V0=-Vs/2 output voltage
In which the output current i0 = V0/R= -Vs/2R and the input current i0 = V0/R=
The currents iS1 = 0, iS2 = i0 = -Vs/2R, and the currents of the diodes iD1 = iD2 = 0 are obtained in the case of supply current or switch current.
FIGURE 3 illustrates the waveform of the output voltage of a single-phase half-bridge inverter as it is generated by the inverter.

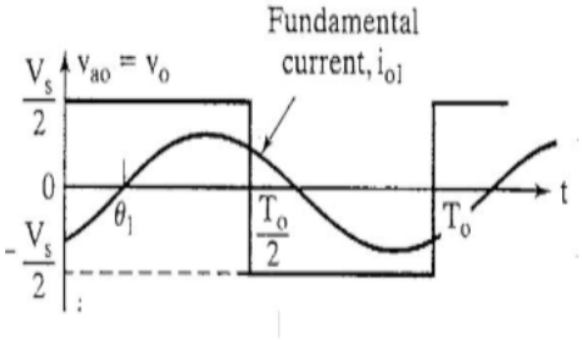


Fig.2. Decomposition of a square wave into sinusoidal waves using the Fourier seriesUsing Fourier series

$$V_{0(\omega t)} = V_{0(avg)} + \sum_{n=1}^{\infty} C_n sin(n\omega t + \phi_n)$$

Where C_n, a_n and b_n are

$$C_n = \sqrt{a_n^2} + \sqrt{b_n^2}$$

$$a_n = \frac{2}{T}\int_0^T V_0(\omega t) cosn\omega t.d\omega t = 0$$

bn=VS/nπ(1-cosnπ)

When replacing even numbers (n=2, 4, 6, etc.), the bn =0, and when substituting odd numbers (n=1, 3, 5, etc.), the bn =2Vs/n. When bn =2Vs/n and an=0 are substituted in Cn, the result is Cn=2Vs/n.

ϕn=tan-1(an/bn)=0

V01(t)=2 VS/* (Sin t) VS/* (Sin t)

Substitute $V_{0\,(avg)} = 0$ in will get

$$V_{0(\omega t)} = 0 + \sum_{n=1,3,5} \frac{2V_s}{n\Pi} sin.n\omega t$$

$$V_{0(\omega t)} = \sum_{n=1,3,5} \frac{2V_s}{n\Pi} sin.n\omega t.....eq(1)$$

Alternatively, the above equation can be written as
$V_{0(\omega t)}$=2V_S/π * (Sin ωt) + 2V_S/3π * (Sin3ωt) + 2V_S/5π * (Sin5ωt) +…….+∞
$V_{0(\omega t)}$= $V_{01(\omega t)}$+ $V_{03(\omega t)}$+ $V_{05(\omega t)}$

The voltage represented by the above equation is the output voltage, which is made up of the fundamental voltage and odd harmonics. It is possible to eliminate these harmonic components in two ways: either via the use of a filter circuit or through the use of pulse width modulation technology.

The fundamental voltage may be expressed as V01(t)=2VS/* (Sin t) where V01(t) = 2VS/* (Sin t) is the time constant.

The maximum value of fundamental voltage V01(max) =2VS/ is the maximum value of fundamental voltage.

The root-mean-square (RMS) value of the fundamental voltage is

$V_{01(RMS)}$ =2V_S/√2π=√2V_S/π

IV. BATTERY CHARGING SYSTEM

With the increasing demand for electricity, an alternate option would be to utilise solar energy as a source of electricity production, which would help to alleviate the deficit of electricity now in place. Aside from that, rural regions afflicted by poverty are the ones that suffer the most from the power shortage. In order to make solar energy conversion devices more widely used as a renewable energy source, the goal is to increase public awareness of their benefits. Solar energy has the potential to capture enormous quantities of energy. Compound solar cells are used in the construction of

ISBN: 979-85-27243-61-1

solar panels. Solar batteries charge in a relatively short period of time. Solar energy is transformed into electrical energy, which is then stored in these batteries for later use. Because of this, the utilisation of solar energy as a renewable energy source will have a significant effect on the global energy crisis's solution in the near future.

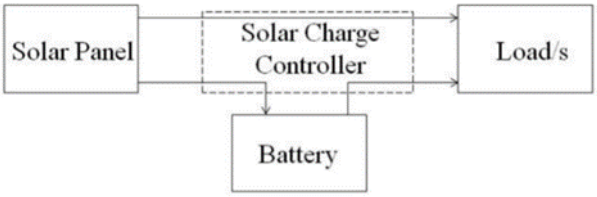


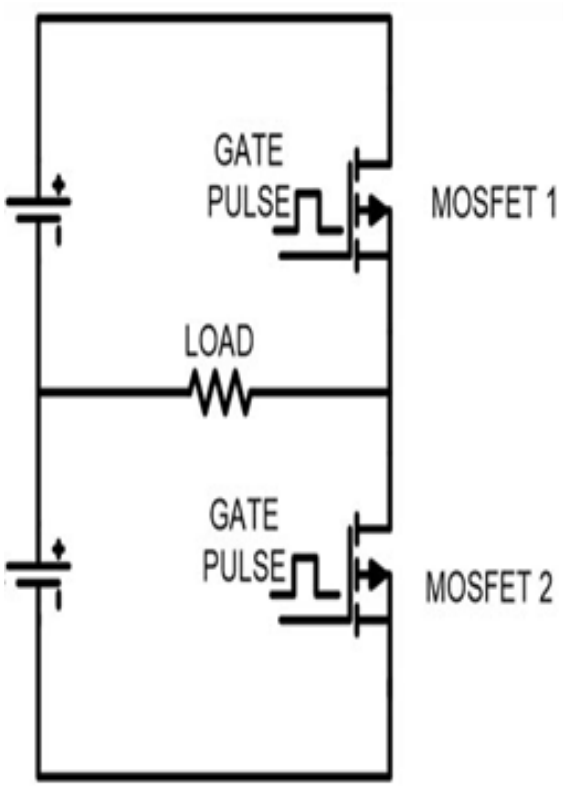
Fig.3.Block Diagram: Solar charge controller

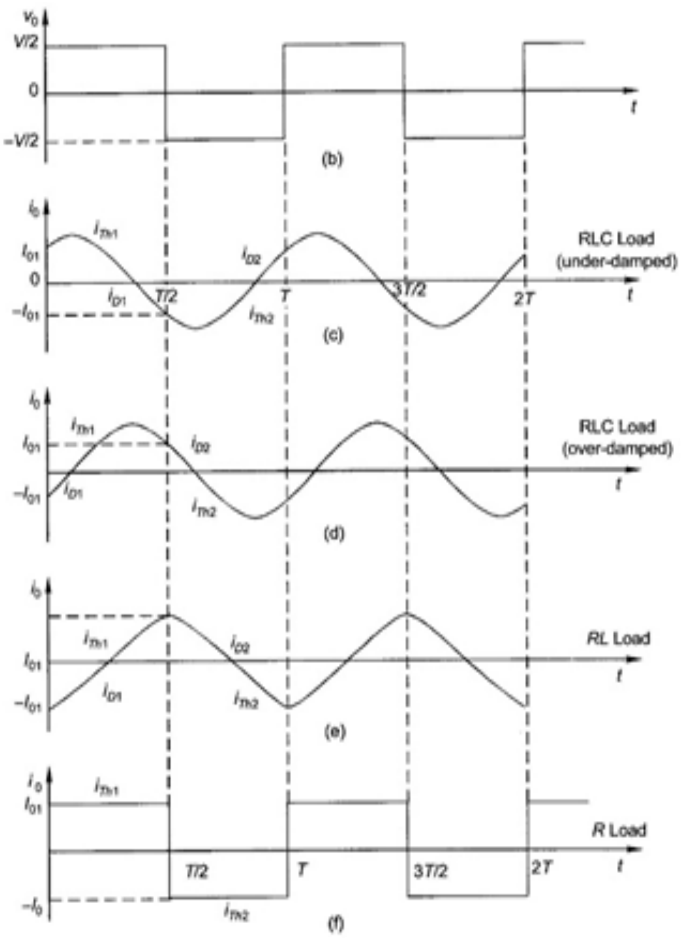
An SCC, as shown in Fig. , regulates the amount of electric current that is taken from or added to the battery. It protects the battery from being overcharged, which is one of the reasons that contribute to the battery's reduced life. Additionally, it protects the battery from being completely discharged by using regulated discharge. SCCs prevent the battery from charging when the battery voltage reaches a high voltage level threshold and let the battery to charge again when the voltage falls below that threshold. Pulse width modulation (PWM) and Maximum Power Point Tracker (MPPT) are two common methods for charging batteries. PWM adjusts the charging rates based on the voltage level of the battery, while MPPT charges the batteries closer to their maximum capacity by adjusting the charging rates based on the voltage level of the battery.

A constant output voltage is generated by regulating the pulse width modulation of the switches (PWM). The direct current voltage is transformed to a square-wave signal that alternates between being totally on and being completely off. PWM is a method of digitally recording the levels of analogue signals. It also has the ability to regulate the amount of current that is used to charge the battery and to offer trickle charging. With the voltage mode PWM controller, we have all of the capabilities required for basic voltage mode operation at our disposal. This PWM controller has been designed to operate at high frequencies on the main side of the control signal. In addition to its distinctive features and advantages, this kind of controller includes the following characteristics:

• A sink/source gate drive for high efficiency operation.
• Up to 1MHz Fsw, which aids in the optimization of size or efficiency.
• External voltage reference, which reduces the number of components required.

V. CIRCUIT DIAGRAM & WAVEFORMS





[3]

Fig.4&5. Circuit diagram and output voltage waveforms of an half-bridge inverter

Fig.8. Pure sinusoidal voltage output(filter output)

VI. RESULTS

In the SIMULINK software tool, a half bridge inverter model with solar PV module input is simulated, and the results are shown in figures 6, 7, and 8.

The output voltage of the PV module is a direct current (DC) voltage (figure 6), which is transformed into a rectangular waveform by the converter (fig.7). This rectangular periodic wave is a combination of various sinusoidal components (harmonics), of which the fundamental component with the greatest magnitude is obtained as an output by passing the rectangular waveform through a band-pass LC filter with the required cut-off frequency as shown in the illustration. As a result, the ultimate intended output, which is a pure sine wave, is achieved (fig.8.).

While coming to the working of hardware model,it consists of a Lithium battery which is being charged by two sources:Solar charging system,AC mains charging system.While the AC mains power is available,the load is run by AC mains,while the battery is being charged. When the climatic conditions are suitable,Solar PV array charges the battery through pwm solar charge controller. When AC mains power is disconnected, battery starts powering the load.

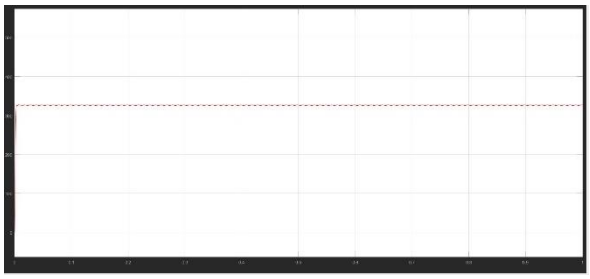


Fig.6. PV array output(DC voltage)

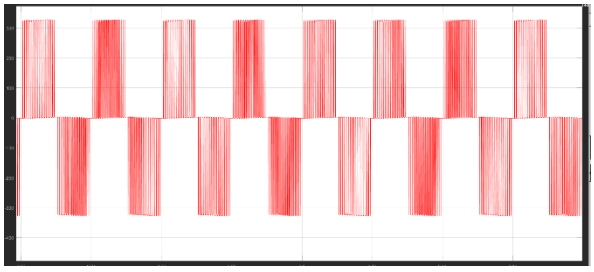
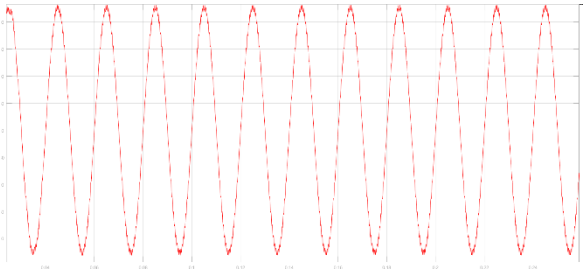


Fig7. Rectangular voltage wave(Inverter output)



VII. CONCLUSION

Because the project aims to construct 1.5 KWP for a rural shelter that is used for business purposes, the use of renewables is more feasible than depending on conventional energy for this project. The solar photovoltaic system is intended to supply the whole energy needs of the shelter electricity, which is anticipated to be 100%. The system gathers the sun's energy using a solar photovoltaic array and stores any excess energy in the battery bank that is then available for use overnight if the solar photovoltaics system cannot fulfil its needs. This idea certainly fulfils the criteria for energy in such shelters/cabins, because it seems to be so encouraging and practical as well as well as to be well adapted for the transfer from non-renewable fossil fuels and to sustainable solar energy. The solar photovoltaic system has been designed with many steps to optimise the rating of the main components needed for the solar photovoltaic system. This was done to decrease solar photovoltaics cost. The results showed that a solar PV system might be a feasible choice.



Fig.9. Hybrid inverter and battery charging system.

I. FUTURE SCOPE

Further research on the design of off-grid PV Solar system for a rural shelter is recommended; to test the system behaviour over the months when the solar radiation is at their bottom values in order to encompass a complete extensive results over the course of a full year or seasonal changes which will result in more conclusive and pronounced outcomes for the future optimization off-grid PV system and get conclusive evidence if any backup generating energy source might be added to cover the slight shortages of the energy demand on those months with minimum solar radiation values. A thorough cost and feasibility study customized to suit the climate, energy demand, and market in Jordan is also recommended.

ISBN: 979-85-27243-61-1

REFERENCES

[1] P. G. Ochnev and Y. B. Shchemeleva, "Renewable Energy: Hybrid Inverter," *2020 International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM)*, 2020, pp. 1-6, doi: 10.1109/ICIEAM48468.2020.9111952.

[2] G. Carli and S. S. Williamson, "Technical Considerations on Power Conversion for Electric and Plug-in Hybrid Electric Vehicle Battery Charging in Photovoltaic Installations," in *IEEE Transactions on Power Electronics*, vol. 28, no. 12, pp. 5784-5792, Dec. 2013, doi: 10.1109/TPEL.2013.2260562.

[3] ALTE store. (n.d.). THE ROLE OF AN INVERTER IN A SOLAR ELECTRIC SYSTEM. Retrieved from ALTE store: https://www.altestore.com/howto/the-role-of-an-inverter-in-a-solar-electric-system-a15/

[4] Alternative Energy.(n.d.). Solar Inverter Sizing. Retrieved from altenergy: http://www.altenergy.org/renewables/solar/DIY/inverter-sizing.html

[5] Bosshard, P. (2006). An Assessment of Solar Energy Conversion Technologies and Research Opportunities. Stanford University. Retrieved from Stanford.edu.

[6] Desideri, U., Zapparelli, F., & Garroni, E. (2013). Comparative analysis of concentrating solar power and photovoltaic technologies: Technical and environmental evaluations. Science Direct, 765-784.

[7] Energy.gov. (n.d.). Grid-Connected Renewable Energy Systems. Retrieved from Energy.gov: https://www.energy.gov/energysaver/grid-connected-renewable-energy-systems.

[8] Franklin, E. (2017, August). Solar Photovoltaic (PV) Site Assessment. Retrieved from Cooperative extension: https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az 1697-2017.pdf

[9] Northern Arizon Wind and Sun. (n.d.). All about Maximum Power Point Tracking (MPPT) Solar Charge Controllers. Retrieved from Northern Arizon Wind and Sun:https://www.solar-electric.com/learning-center/batteries-and-charging/mppt-solar-charge-controllers.html

[10] NREL. (n.d.). NREL's PV Watt calculator. Retrieved from NREL: https://pvwatts.nrel.gov/

[11] Pelamis wave power. (n.d.). Solar Panel Size Guide: How Much Do You Need For Your Home? Retrieved from .pelamiswave.com: https://www.pelamiswave.com/solar-panel-size-guide/

[12] N. Sasidharan and J. G. Singh, "A Novel Single-Stage Single-Phase Reconfigurable Inverter Topology for a Solar Powered Hybrid AC/DC Home," in *IEEE Transactions on Industrial Electronics*, vol. 64, no. 4, pp. 2820-2828, April 2017, doi: 10.1109/TIE.2016.2643602.

[13] G. M. Sharif, S. M. M. Islam and K. M. Salim, "Design & construction of microcontroller based maximum power point PWM charge controller for photovoltaic application," *2009 1st International Conference on the Developements in Renewable Energy Technology (ICDRET)*, 2009, pp. 1-4, doi: 10.1109/ICDRET.2009.5454228.

ISBN: 979-85-27243-61-1

VOICE CONTROLLED SELF POWERED VEHICLE FOR BORDER SECURITY

MOHAN KUMAR B[1], YASHAS P[2], CHANDRASHEKAR H[3]
Sumangala S J[4] (Assistant Professor, Dept. of EEE, SCE Bangalore)
Department of Electrical & Electronics Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India
[1]mohan223b@gmail.com
[2]yashas098@gmail.com
[3]hchandrashekar123@gmail.com
[4]sumangalasj@sapthagiri.edu.in

Abstract **- Nowadays, many expenses are made in the field of defence in adopting primitive security measures to protect the border from the trespassers. Some military organizations take the help of robot in the risk prone areas which are not that effective when done by army men. These Army robots are confining with the camera, sensors, metal detector and video screen. The main objective of our system is to get camouflaged including some additional parameters like blue-tooth module for real time data processed by the camera at the video screen and PIR sensor to trace the intruders.. Thus the proposed system using Wi-Fi reduces errors at defence and keeps the nation secure from the foe. Camouflage Robot plays a vital role in saving human loses as well as the damages that occur during disasters. Thus it will gain more importance in the upcoming era. The robot basically consists of a vehicle mounted with camera, camera which captures the images and detects colour accordingly as part of camouflaging feature and it is used for surveillance purposes. As a new trend we have used wireless transceiver WIFI to increase the range of communication between transmitter and receiver. The robot can quietly enter into enemy area and send information via camera to the controller. One of the salient features of this robot is camouflaging i.e. the camera captures the image and the colour of the surrounding will be detected at the backend and according to that robot will change its colour. Because of this feature the robot cannot be easily detected by enemies. Since human life is always valuable, this robot can be the substitution of soldiers in war areas. It is inspired by creatures such as chameleon. The Camouflage robot can also be used in star hotels, shopping malls, jewellery showrooms, operation aids, rescue crews during disasters, etc.. .Or at places such as where there can be threats from intruders or terrorists.**

Here the Laser gun is placed in the robot such that if any intruder or terrorist is found with the help of laser gun it can attack the intruder who is entering. The hybrid technology has been used in this project.

Keywords –

INTRODUCTION

A robot is an automatic mechanical device often resembling a human or animal. Modern robots are usually guided by a computer program or electronic circuitry. Robots have replaced humans in performing repetitive and dangerous tasks. Basically Army Robot is capable of performing tasks such as locomotion, sensing the harmful gas, sensing the humans beneath the surface, metal detection. Army Robot is an autonomous robot comprising of wireless camera which can be used as a spy. This Army robot is more efficient compared to the

ISBN: 979-85-27243-61-1

soldiers. The main aim of the paper is to implement a Camouflaged technology based Wireless multifunctional Army Robot which can be controlled through smart phone using Wi-Fi. Science is developing new technologies to ease human life. One such invention of this technology is specialized robots in the field of Artificial Intelligence. The word robot means "A machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer". These robots help to make human life much easier especially in dangerous areas & works. One of the concern areas of today is the military. Military robots are specially used to take the risky job which is difficult to be handled manually by humans. These robots act as the assistant of a soldier. Today, many military organizations take the help of military robots to perform risky jobs due to their accuracy of performing the jobs .These robots used in military are usually employed with the integrated system, including video screens, sensors, gripper and cameras. The main motive behind Camouflage Robot is to reduce human losses in military operations or terrorist attacks. Camouflage Robot acts as a virtual spy and can be sent into the strategic locations of military importance for observation and warfare purpose. Since it's very hard to detect it by a naked human eye, the Camouflage robot can be also used to test the various security systems developed in the market and act as a measure to evaluate its efficiency. The main objective of the Camouflage Robot is to enhance the machinery of the defence system. Secondary objective is to work in the field of Zoology for wildlife photography. The idea of the Camouflage Robot is based on the chameleon's camouflage techniques. The aim of the project is to design, manufacture and operate a robot via PC, used as remote control device, a small mobile robot which can duplicate the colours where it moves on, hence being camouflaged to the outside world. To achieve these goals, we used a LED matrix (RGB) which can diffuse uniform colours. Initially, the robot can camouflage itself in red, green and blue colour. The main application of our robot is to camouflage and pilot from afar an object, no matter what its size is. So, in the Defence sector, such a system would allow large sized vehicles (e.g. armoured vehicles) to be much more camouflaged: indeed, the camouflage in the army has become necessary to army missions, to move into an enemy land without being seen and protect soldiers since they can act from afar. Besides, in the Intelligence sector, we could use spying robots like drones. As a last example, in the area of wildlife Photography, hidden picture or video systems would allow totally new shots with the principle of our robot. Finally, one of the main advantages of the Chameleon Robot is that it is not only resistant to mild weather but also will not harm the environment.

EXISTING SYSTEM

Basically Army Robot is capable of performing tasks such as locomotion, sensing the harmful gas, sensing the humans beneath the surface, metal detection. Army robot is an autonomous robot comprising of wireless camera which can be used as a spy and Bluetooth used to control it wireless.

The existing systems suffered many problems like high cost to set up communication between robot and rescue control unit, noisy wireless communication link between robot and control unit which ultimately stopped robot to function etc. In these systems, distance is a limiting factor because the Bluetooth has a specified range that

ISBN: 979-85-27243-61-1

cannot be increased. The manual operation of the gun turret—there must be an operator sitting on the vehicle controlling the gun turret manually.

PROPOSED SYSTEM

A motion tracking airsoft (or nerf gun) turret with a Raspberry Pi which has autonomous motion and fires the gun when it detects motion. There is also an interactive mode so that you can control it manually from your keyboard. Motion Detection uses open CV and computer vision to track moving targets in front of the camera.

The system consists of one colour sensor camera as part of camouflaging feature and for surveillance purpose. because of this feature this robot can't be easily detected by enemies. We have used Wireless transceiver for communication between transmitter and receiver.

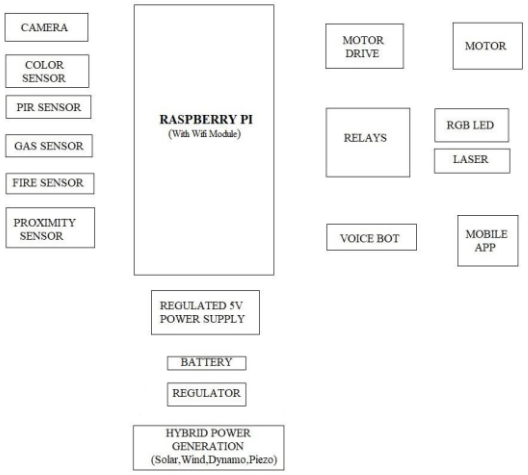
This robot can quietly enter into enemy area and send us the information via camera. The movement of this robot is wirelessly controlled computer.This project is entirely battery operated. There are two modes: Interactive and Motion Detection. Interactive mode allows you to control the turret remote and stream live video. Motion Detection uses open CV and computer vision to track moving targets in front of the camera.

The proposed system consists of one colour sensor camera as part of camouflaging feature and other camera for surveillance purpose. Colour sensor camera senses the color of surface and according to that robot it changes its colour.

The idea of the Army Robot is based on the camouflage techniques . The aim of the project is to design, manufacture and operate via a Smart phone, used as remote control device can reproduce the color accordingly with the ground surface where it will be moving on, hence being camouflaged to the outside world. On the one hand, in order to achieve these goals, we used a LED (RGB) which can diffuse uniform colors, coupled to sensors that can precisely identify ground colors. This robot is designed in such a way that it can reproduce the color independently at various areas each area being able to reproduce color with specific spots of the ground surface which allow the robot to mock up as a checkerboard of multiple colors – the various colors it drives over. On the other hand, we also created a system which can receive and decipher information received from the Smart phone using IOT to further pilot motors which in turn drive the robot in any required direction. The other implementation we have in this module is that fire and gas sensor has been used and if any fire and gas has been detected it will send an message.

ISBN: 979-85-27243-61-1

METHODOLOGY



- The system has transmitter side and receiver side.
- Transmitter side have control over robot and screen for live system status and video which is recorded by wireless using Raspberry Pi.
- The data is transmitted through wireless using Raspberry Pi.
- On receiver side AVR controls the camera and motors using the motor driver.
- Whereas Gas sensor and Metal sensor takes continuous readings and forward it to user side.
- The colour is sensed by using colour sensors and a proportional value id fed to the LED strip.
- Landmine detection using metal sensor.
- Power is generated and supplied for the operation for robot through Solar, Wind, Dynamo and Piezo.

On robot side both the Input and Output is done whereas on PC side all the image processing is done. Robot has all these input devices like color sensing camera, video feeding camera and obstacle sensor to collect all the required data for processing. This data is then transmitted wirelessly to PC via Wifi trans-receiver. Computer then does the processing of the received data using various algorithms for image processing. It determines the color of background and transmits this data to robot. Through PC the user can also movement commands to the robot. One of the important functions of PC is to display the live video feed received from the robot. All the transmission is done serially using Wifi trans-receiver. Robot can output the received color by changing the color of LEDs covering the chasse. This is done by turning on one of the three relays present on the robot. The PC using which we will be able to handle the movement of the robot.

CONCLUSION

- As the Robot is having self power generative technology , it is a new approach that can lead the world in implementing greener technologies that aim at protecting Environment.
- The proposed system is a substitution to human life.
- It enacts and plays an important role of keeping an eye on the war field areas.
- Moreover the Camaflouging feature makes it difficult to detect the robot by naked eye.
- It monitors and analyses the war field’s territory by capturing the live footage of the surrounding.

ISBN: 979-85-27243-61-1

MOBILE TURRET SYSTEM

[1]BHARATH B N, [2]UDAY J, [3]R LOKESH

[1] Assistant Professor, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru

[1]bharathbn@sapthagiri.edu.in

[2,3] Students, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Bengaluru

[2]udayjgowda7@gmail.com

[3]rajaloki15@gmail.com

Abstract **-The evolutionary process of modern robotics helps the military forces to revamp their aged systems with today's advanced technology. For defending any kind of criminal activities to household security systems assistance robot has increased from past time. In this system we have approached a manual controlled robot with some creative features which can assist a defence and security systems to complete a mission with reducing the risk of casualties. We have focused on reliable designs Mechanisms for controlling the system. Nowadays, many expenses are made in the field of defense in adopting primitive security measures to protect the border from the trespassers and also protect lives of military personnel's in warzone areas. These robots are confined with the omnidirectional wheels, camera and sensors for reliable use of the system. It will encompass a combination of hardware and software to match a mounted airsoft weapon's point of aim to the located target in the camera's view. Different from most turrets out there, this will all be controlled from a portable device the user can move around wirelessly.**

Keywords – Wireless Secure Shell, Omnidirectional, Mecanum Wheel, ARM based MCU.

I. INTRODUCTION

The Mobile turret system is a camera-based weapon system that uses software to locate and attack a moving target. It will encompass a combination of hardware and software to match a mounted airsoft weapon's point of aim to the located target in the camera's view. The sentry gun which will have the ability to scan its field of view and user will be able to see the field of view. This robot can be effectively implemented to firing zones to eliminate the risk of casualties. Excellency of this robot is in being operated wireless from remote which offers no risk to the soldier lives. Robots are enhanced to be robust and sturdier increasing the chance of success in the risk prone environment. The main aim of the paper is to implement a Camouflaged technology based Wireless multifunctional Army based Robot which can be controlled through smart devices using IOT.

II. MATERIALS & COMPONENTS USED

A. *Micro-controller*

Heart of the robot is a raspberry pi. Raspberry pi is a series of small single-board computers (SBCs) used for controlling all the operation done by the devices which are interfaced to it. Raspberry Pi is popularly used for real time Processing, IoT based applications and Robotics applications. Raspberry Pi is slower than laptop or desktop but is still a computer which can provide all the expected features or abilities, at a low power consumption. Raspberry Pi is more than computer as it provides access to the on-chip hardware i.e. GPIOs for developing an application. It has ARM based Broadcom Processor SoC along with on-chip GPU (Graphics Processing Unit).

STM32F103RCT6 ARM microcontroller-MCU is another board used in this system for ease of control, both raspberry-pi and this chip works simultaneously reducing the load on both, this communicate via serial transmission. This ARM based chip controls Drivers, Sensors, Motors and other electrical and electronics components, where raspberry-pi controls the software, streaming and transmission loads of the system.

B. *Power supply circuit and unit*

The power supply circuit is the important part of any electronics system. Power supply unit is used to power to the Microcontrollers, camera, sensors/driver Module and Motors. Where power circuits maintain and control that power with respect to the individual electronic components. The system as lithium-ion battery which is charged by conventional method charger and solar based charger which is integrated in the system itself.

ISBN: 979-85-27243-61-1

C. *DC Geared Encoder Motor and Servo Motor*

A motor encoder is a rotary encoder mounted to an electric motor that provides closed loop feedback signal by tracking the speed and/or position of motor shaft. The DC motor encoder provides a mechanism to measure the speed of the rotor and provide closed feedback to the drive for precise speed control.
A servomotor is a linear actuator or rotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

D. *Camera*

Camera installed is being used for the real time data interpretation and video/image capturing, this project use 1080p HD camera with IR and LED installation port and uses OV270 cam module as its camera sensor.

E. Other Integrated circuits and converters

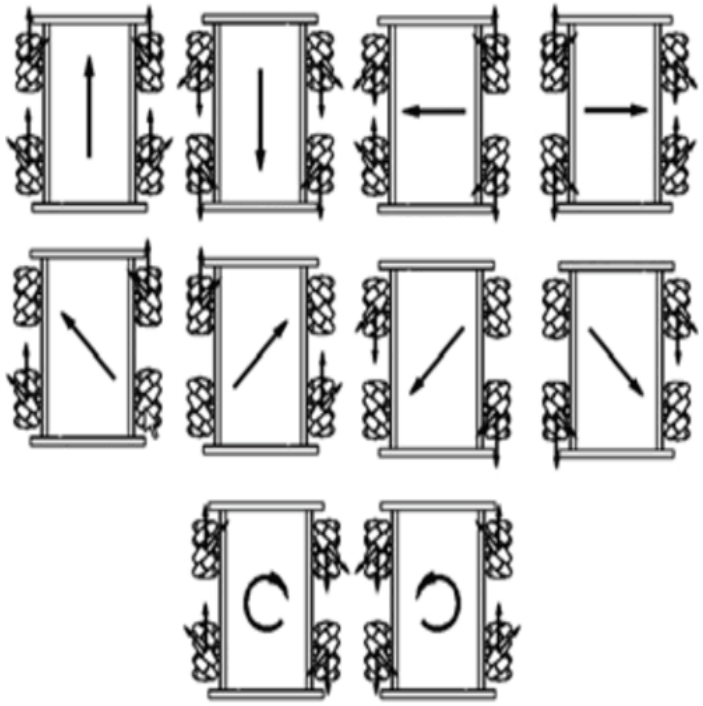
AM8257 driver IC: For the powering and control of the encoder motor, we needed a good motor driver as the requirements to drive the Mecanum wheel is high and specific. As this supports good range of voltage and max current output with low standby current for dual bridge control. Other features are low quiescent current, High temperature protection, Motor stall protection and precise speed control.

XL4005-E1 DC/DC Converter: As the system is powered battery supply which is charged by both solar and a recharger the power circuit requires good converters. This converter is capable of driving 5A load with 32V supply, with low drop out voltage, excellent power conversion efficiency, TTL shutdown capability, enable hysteresis function and good temperature hold.

MPU6050 Sensor: The MPU-6050 devices combine a 3-axis gyroscope and a 3-axis accelerometer on the same silicon chip, together with an onboard Digital Motion Processor, which processes complex 6-axis Motion-Fusion algorithms. This along with encoder gives closed loop feedback for speed control.

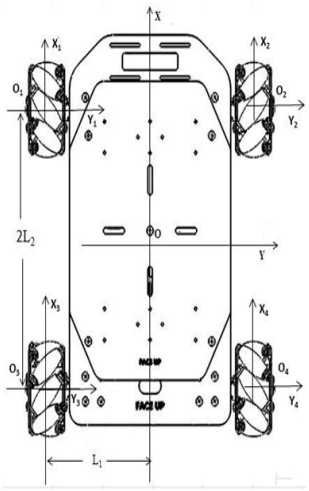
F. *Mecanum Wheels*

The Mecanum wheel is based on a tireless wheel, with a series of rubberized external rollers obliquely attached to the whole circumference of its rim. These rollers typically each have an axis of rotation at 45° to the wheel plane and at 45° to the axle line. Each Mecanum wheel is an independent non-steering drive wheel with its own powertrain, and when spinning generates a propelling force perpendicular to the roller axle, which can be vectored into a longitudinal and a transverse component in relation to the vehicle. A system consists of 4 wheels each can rotate clock wise or anti-clockwise or stopped, based on the combination of this wheels the direction of the motor will take. The

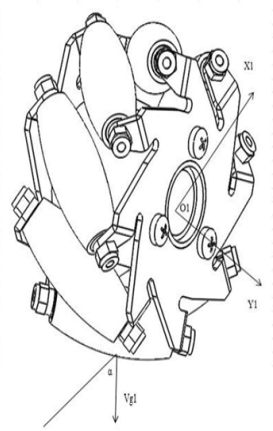


Mecanum Wheel Working Principle (Simplified)

robot can be moved by 16 possible ways.



Global Coordinate System



Local Coordinate System

III. METHODOLOGY:

The project includes two units, a Mobile unit, and turret unit, to ease the transport and usage, which are mounted and can be detached based on working purposes.

- The mobile unit comprises a Raspberry-pi, PCB Board, CPU, IC's, Servo/Motor drive board with a motor installed on the Chassis for the movement of the system. The motor powers the Mecanum wheel

which enables the robot in omni direction (16 direction). This is powered by an independent battery and controlled via serial communication from the raspberry-pi unit.

- Turret unit comprises Nerf gun, Tilt and Pan setup with HQ camera, tilt and pan setup controlled by two servo motor with servo drive board driven by MCU, solar panel with voltage adapter is placed as a continuous power source for a long run of the system

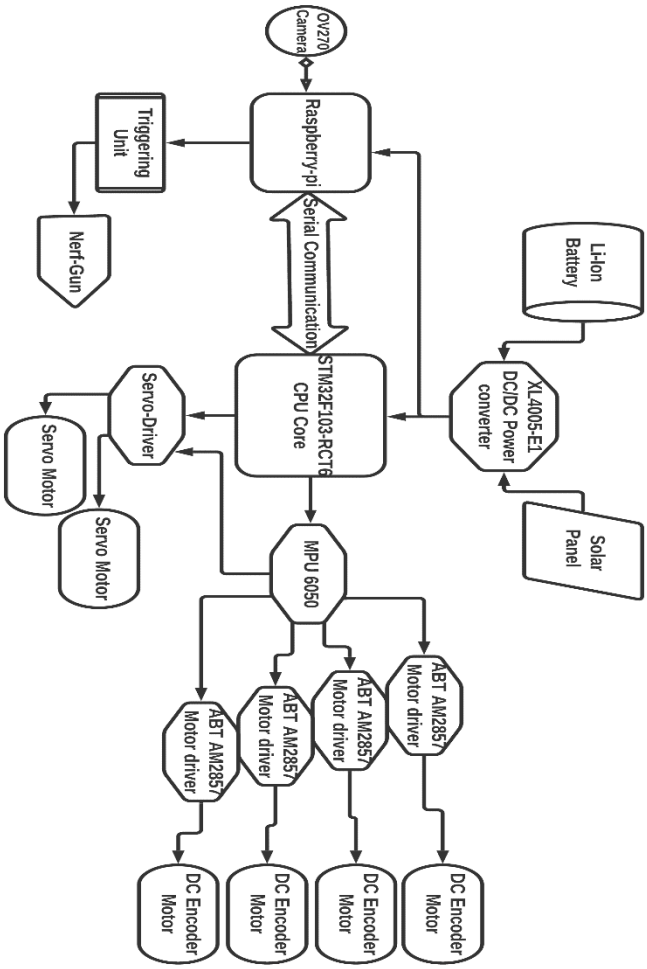


Figure 2. Block Diagram

The system is controlled over a wireless secure shell (SSH) which provides cryptographic network protocol for operating services securely. The system movement is controlled and achieved by serial communication established between raspberry-Pi and MCU. The camera is used for surveillance and detection. The raspberry-pi streams the real time surveillance to the control unit, based on this data, the user operates the turret unit.

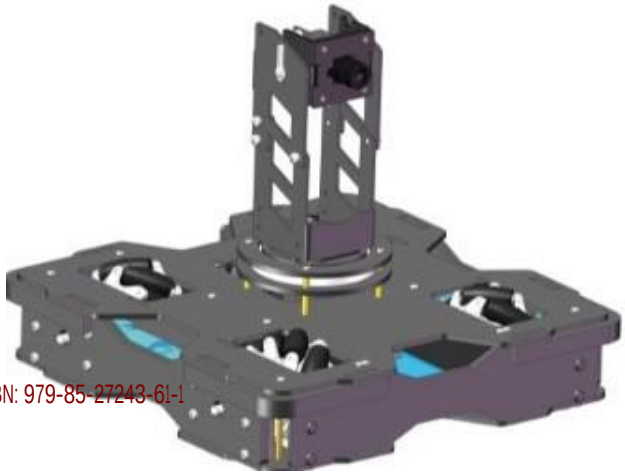


Figure 3. Final Render of Mobile Unit

IV. RESULTS & DISCUSSIONS

The system is controlled via wireless communication and with analog communication and worked with various circumstances and scenarios. The performance of the system is satisfied as proposed project along with various features of the systems like, long run of the system and self-gyro stabilization of the project. The designed and developed system can be used as portable robot for security and defence system, in addition to following objectives:

- To provide support for military operations.
- To aid the ground unit with effective intel and real-time monitoring.
- Providing security over no-man zone without human intervention.
- To neutralize Trespassers by maintaining the stealth using camouflage skin.
- To navigate and process in the night using IR night vision.

Overall the system performed better than expected. It had a lot to do with the area we chose to setup and the teamwork toward the end for the final push to demonstration. For future development the system can be upgraded with the automatic targeting systems and face recognition, with the same hardware components and the effective implementation can be performed by using respective algorithms of machine learning and artificial intelligence.

V. CONCLUSIONS

1. It is possible to develop a portable system for defence for ease of navigation.
2. Easy to assemble and dismember the system units based on the circumstances.
3. Long duration surveillance can be committed where human can't be dispatched.

ISBN: 979-85-27243-61-1

4. Can be hovered over borders without any human casualties.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department, faculties of Electrical and Electronics department for their encouragement and support, and also like to thank our Guide for his timely advice, constructive suggestions and regular assistance in the seminar work.

REFERENCES

[1] Eki Ahmad Zaki Hamidi, Mufid Ridlo Effendi, Hasbi Ash Shiddiq "Design and Implementation Supervisory Control and Data Acquisition (SCADA)" 4th International Conference on Wireless and Telematics (ICWT), 2018.

[2] U. A. Nnolim, "An adaptive RGB colour enhancement formulation for logarithmic image processing-based algorithms," Optik (Stuttg)., vol. 154, 2018.

[3] H. Kato and M. Billinghurst, "Marker Tracking and HMD Calibration for a Video-based Augmented Reality Conferencing System," IWAR'99 Proc. 2nd IEEE ACM Int. Work. Augment. Real., 1999..

[4] M. Daud bin Isa, A. Rakimi bin Mohammad, and M. Zubir Bin Mohd Hanifah, "VISION MOBILE ROBOT SYSTEM WITH COLOR OPTICAL SENSOR," vol. 12, no. 4, 2017.

[5] Campion, G. Bastin, and B. D'Andréa-Novel, "Structural properties and classification of kinematic and dynamic models of wheeled mobile robots," IEEE Transactions on Robotics and Automation, vol. 12, no. 1, 1996.View at: Publisher Site | Google Scholar

[6] M. Wada and S. Mori, "Holonomic and omnidirectional vehicle with conventional tires," in Proceedings of the 13th IEEE International Conference on Robotics and Automation, IEEE, Minneapolis, Minn, USA, April 1996.View at: Google Scholar

[7] G. Pin and S. M. Killough, "A new family of omnidirectional and holonomic wheeled platforms for mobile robots," IEEE Transactions on Robotics and Automation, vol. 10, no. 4, pp. 480–489, 1994.View at: Publisher Site | Google Scholar.

[8] Nasyir, Moh. T., Nurhadi, H., Pramujati, B., Pitowarno, E., "Control Simulation of An Automatic Turret Gun Based on Force Control Method", Proceeding of INAGENTSYS, August 19-21, 2014, Bandung, Indonesia

[9] Kumar, G. Tiwari, P. Y. Marcopoli, V. and Kothare, M. V. "A study of a gun-turret assembly in an armored tank using model predictive control" In *Proceedings of the American Control Conference*, St Louis: USA IEEE, 2009,

Power Quality Disturbance Classification Using Least Square Support Vector Machine While Distribution Generator Interfacing In Grid

MUHAMMAD JABIR SAFI[1], DEEPAK KUMAR SINGH[2], DIPAK KUMAR[3], BIRAJDAR UDAY[4], AVINASH.S* Asst. prof.

Department of Electrical and Electronics Engineering, Sri Krishna Institute of Technology

#29, Hessarghatta main road, Chimney Hills, Chikkabanavara Post, Bnagalore-560090

[1]mdjabirkhan442@gmail.com

[2]deepakumarsingh0323@gmail.com

[3]dipakkumar2666@gmail.com

[4]udaybirajdar13@gmail.com

*avinasheee@skit.org.in

***Abstract* - Distribution Generators (DG) interface with the grid for the need of increased load. The integration of DG with the grid introduces multiple power quality issues. Sag and Swell faults are most probable power quality issue in the grid while DG is integrated. Various forms of sag and swell occurrences caused by change in load, variation in wind speed, and solar insolation are considered in the study. Ten different statistical features extracted through S-transform are used in the classification step. The PQ disturbances in terms of statistical features are classified distinctly by use of modular probabilistic neural network (MPNN), support vector machines (SVMs), and least square support vector machines (LS-SVMs) techniques. The classification study is further supported by experimental signals obtained on a prototype setup of wind energy system and PV system. The accuracy and reliability of classification techniques is also assessed on signals corrupted with noise. MATLAB based implementation is developed in the classification of PQ issue in the DG integration in the grid.**

Keywords – Power Quality (PQ), MPNN, SVMs, LS-SVMs, S-transform

I. INTRODUCTION

Renewable Energy Sources (RESs) are essential in the perspective of a green, fully sustainable, and energetic approach. However, a high RES penetration introduces technical issues and challenges many aspects of the operation of power systems (e.g., power quality, system reliability and safety, and control and protection strategies). Distributed generation (DG) is not dispatchable like conventional generation and does not provide any ancillary service to the system; therefore, a large amount of DG stresses the power system operation, bringing it closer to the stability margin. In particular, the higher the percentage of DG is, the lower the reserve for the primary frequency regulation becomes.

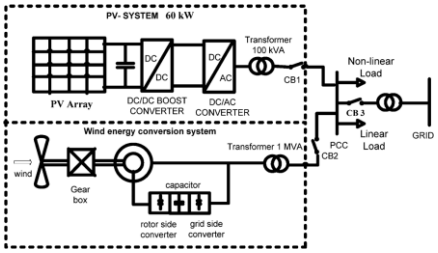


Fig. 1. Hybrid DG system.

To provide better power quality at the load end is a real challenge around the world. A country's development is decided by its manufacturing industries, import-export of products, software hubs, health centers, educational institutes and etc. All these sectors are operated by electrical power and equipped with many sensitive equipment which gets interrupted or malfunction due to power quality issues. There are many power quality issues but only voltage sag has adverse effects on the industrial sector [1]. Mitigation of voltage sag is a very difficult task for the power engineer because of random occurrences of faults in the power system network. On the other hand, we are facing global warming issues so increase in the use of DG resources are foremost important in this recent scenario. There is a steady increase in power demand and keeping environmental issues in mind, adoption of renewable energy has increased significantly in recent times. Hence the use of DGs along with conventional power resources can bring a new era in providing reliable power at the customer end, at the same time mitigating certain power quality issues. DG can be

implemented in a medium or low voltage distribution system. DGs include wind, solar photovoltaic, fuel cell, microturbine and reciprocating internal combustion (IC) engine with a generator. DG influence the power system operation based on different factors like load demand, location, rating, extent of penetration, operating mode, and technology [2]. Therefore, to get maximum benefit out of the DGs, it requires detail evaluation of power flow, stability and voltage profile, DG penetration impact on relay coordination, system reliability ensure good power quality at the customer end. To analysis the impact on power quality before and after installation of DGs in a power system network is an important task because DG might have a negative impact (like harmonics, overvoltage, integration issues, etc.) on the power network as well. A proper integration can help the utility network by proper control of reactive power and voltage, proper use of storage system, voltage regulation and stability [3]. DGs can also mitigate voltage sag and improve the quality of power [4]. Optimal scheme for DG integration in the feeder can mitigate the voltage sag improve voltage profile, minimize system loss. As loss reduction is an important factor for making a profit in the competitive electricity market paradigm [5-6]. There are some disadvantages of DG scheme like 1) Voltage fluctuation in the distribution network, 2) change in system impedance, 3) transient while switching the DGs between on-grid and standalone modes, 4) congestion in the system which influences the power quality and 5) security of the system [2]. Grid faults are experienced at the PCC and can be evaluated by monitoring the variation in impedance at the PCC. When DGs with inverter interface connected at the PCC the fundamental resistance is calculated by considering only real power (reactive power neglected), likewise the fundamental inductive reactance is calculated by considering only reactive power (real power neglected) [7]. Converter connected DGs helps to mitigate the voltage sag at the load point. Mitigation of voltage sag resulted from different types of faults on IEEE 13 bus system is done by different DG units [8]. The main challenge of DG planning is to find a suitable location, size and DG configuration by considering the network and economic constraints so as to obtain pragmatic solution [9-10]. A proper optimization method must be implemented for ensuring optimal location and sizing of DG units. In the past, some studies [11], [12] on islanding detection in grid-connected PV systems have been considered based on frequency variation at the PCC. In addition to these, there are various research works available in the literature for detection and classification of PQ disturbances. Of course most of the works are related to the conventional power system. However, few works are available wherein study of such disturbances has been discussed in wind, PV, or hybrid DG systems. The presence of the DG system opens a new challenging task to researchers in the study of the detection and classification problem. Many of the studies proposed in the literature are based on artificial intelligence techniques such as artificial neural network (ANN), fuzzy logic, expert system, etc. [13]–[15].

Again, Kalman filters and Fourier transform are used for the feature extraction, but these techniques lack the ability to decompose the signal in both time and frequency domains [16]. In this context, wavelet transform (WT) is used along with ANN to detect, localize, and classify the nonstationary due to better time-frequency resolution property [17], [18]. But, the main disadvantage of WT is its inability to detect the disturbances under the presence of noise in the voltage/current signal at PCC [19]. As a result, modified wavelet transform in the form of S-transform [20] along with modular neural network (MNN) and probabilistic neural network (PNN) is used due to its improved time frequency multiresolution analysis for achieving better detection and classification of PQ disturbances even under noisy conditions. In this paper, features are extracted by use of S-transform and techniques like modular probabilistic neural network (MPNN) [21], support vector machine (SVM) [22]–[24], or least square support vector machine (LS-SVM) [25] are applied for classification of sag/swell disturbances in hybrid DG systems. The ten suitably chosen features are fed to these classifier algorithms. In case of MPNN, each module of neural network (NN) is used to identify a single class of PQ disturbance. The parameters of SVMs for classification are selected through cross validation, i.e., a parameter resulting in highest accuracy for successful classification over the chosen parameter range. Also, the performance of LS-SVM, which retains all the advantages of SVM with lesser computational burden, is also discussed.

II. PROPOSED WORK

The PQ disturbance signals, sag and swell caused by change in wind speed, solar insolation and load as discussed in the above section are simulated in MATLAB/SIMULINK as well as experimentally performed on a prototype setup. By use of these signals, the following ten different statistical features are extracted through passage of S-transform:

Feature 1: energy of the magnitude contour (EMC) corresponding to maximum magnitude of each column of the
S-matrix;
Feature 2: standard deviation of the magnitude contour (SDMC) corresponding to maximum magnitude of each;
Feature 3: energy of the phase contour (EPC);
Feature 4: standard deviation of the phase contour (SDPC);
Feature 5: mean of the magnitude contour (MMC);
Feature 6: mean of the phase contour (MPC);
Feature 7: skewness of the magnitude contour (SMC);
Feature 8: skewness of the phase contour (SPC);
Feature 9: kurtosis of the magnitude contour (KMC);
Feature 10: kurtosis of the phase contour (KPC).

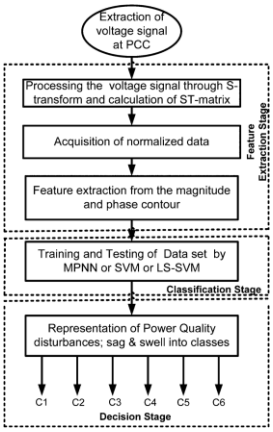


FIG 2. Flowchart for classification strategy using MPNN/SVM/LS-SVM

Ten different features are extracted through magnitude and phase contour of each S-transformed signal. A data set is prepared by taking features of sag in voltage signal and trained using MPNN. The number of modules in PNN is decided according to the number of classes of disturbances to be classified. Each module is trained and tested with a 50-input data set. Similarly, the feature data set corresponding to three classes of sag disturbances is used for training and testing of SVM and LS-SVM. Each element of the matrix is a complex quantity whose rows represent the frequency and columns represent the corresponding time. In total, 100 different simulations are performed in MATLAB/Simulink for the PQ disturbance event.

III. METHODOLOGY

a. Least-squares support-vector machine:

Least-squares support-vector machines (LS-SVM) are least-squares versions of support-vector machines (SVM), which are a set of related supervised learning methods that analyze data and recognize patterns, and which are used for classification and regression analysis. In this version one finds the solution by solving a set of linear equations instead of a convex quadratic programming (QP) problem for classical SVMs. Least-squares SVM classifiers were proposed by Suykens and Vandewalle.[1] LS-SVMs are a class of kernel-based learning methods.

From support-vector machine to least-squares support-vector machine

Given a training set $\{x_i, y_i\}_{i=1}^{N}$ with input data $\in \mathbb{R}^n$ and corresponding binary class labels $y_i \in \{-1, +1\}$, the SVM[2] classifier, according to Vapnik's original formulation, satisfies the following conditions:

$$\begin{cases} w^T \phi(x_i) + b \geq 1, & \text{if} \quad y_i = +1, \\ w^T \phi(x_i) + b \leq 1, & \text{if} \quad y_i = -1, \end{cases}$$

which is equivalent to

$$y_i \left[w^T \phi(x_i) + b \right] \geq -1, \text{if } i = 1, \ldots, N,$$

where $\phi(x)$ is the nonlinear map from original space to the high- or infinite-dimensional space.

Inseparable data

In case such a separating hyperplane does not exist, we introduce so-called slack variables ξ_i such that

The spiral data: $y_i = 1$ for blue data point, $y_i = -1$ for red data point

$$\begin{cases} y_i \left[w^T \phi(x_i) + b\right] \geq 1 - \xi_i, & i = 1, \ldots, N, \\ \xi_i \geq 0, & i = 1, \ldots, N, \end{cases}$$

According to the structural risk minimization principle, the risk bound is minimized by the following minimization problem:

$$\min J_1(w, \xi) = \frac{1}{2} w^T w + c \sum_{i=1}^{N} \xi_i,$$

Subject to

$$\begin{cases} y_i \left[w^T \phi(x_i) + b\right] \geq 1 - \xi_i, & i = 1, \ldots, N, \\ \xi_i \geq 0, & i = 1, \ldots, N, \end{cases}$$

To solve this problem, we could construct the Lagrangian function:

$$L_1(w, b, \xi, \alpha, \beta) = \frac{1}{2} w^T w + c \sum_{i=1}^{N} \xi_i - \sum_{i=1}^{N} \alpha_i \left\{ y_i \left[w^T \phi(x_i) + b\right] - 1 + \xi_i \right\} - \sum_{i=1}^{N} \beta_i \xi_i,$$

where $\beta_i \quad 0 \ (i = 1, \ldots, N)$ are the Lagrangian multipliers. The optimal point will be in the saddle point of the Lagrangian function, and then we obtain,

$$\begin{cases} \frac{\partial L_1}{\partial w} = 0 \quad \rightarrow \quad w = \sum_{i=1}^{N} \alpha_i y_i \phi(x_i), \\ \frac{\partial L_1}{\partial b} = 0 \quad \rightarrow \quad \sum_{i=1}^{N} \alpha_i y_i = 0, \\ \frac{\partial L_1}{\partial \xi_i} = 0 \ \rightarrow \quad 0 \leq \alpha_i \leq c, \ i = 1, \ldots, N. \end{cases}$$

By substituting by its expression in the Lagrangian formed from the appropriate objective and constraints, we will get the following quadratic programming problem:

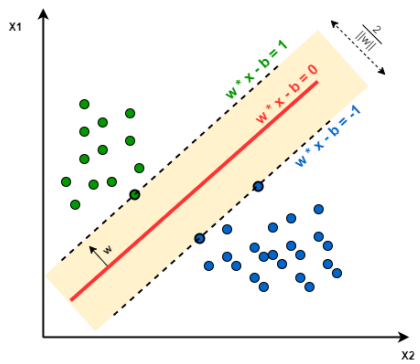
$$\max Q_1(\alpha) = -\frac{1}{2} \sum_{i,j=1}^{N} \alpha_i \alpha_j y_i y_j K(x_i, x_j) + \sum_{i=1}^{N} \alpha_i,$$

where $K(x_i, x_j) = \langle \phi(x_i), \phi(x_j) \rangle$ is called the kernel function. Solving this QP problem subject to constraints in (8), we will get the hyperplane in the high-dimensional space and hence the classifier in the original space.

This section gives a brief introductory description of the discrete S-transform used for feature extraction and classification techniques: LS-SVM to classify PQ disturbances. S-transform has the advantages of better time-frequency resolution and its capability of detection and localization of disturbance even under noisy conditions. The mathematical properties of S-transform, LS-SVM are described in the following subsections. The SVM is a statistical learning technique used for the pattern classification problem. The input vector space is usually mapped into a high dimensional feature space and a hyperplane in the feature space is used to maximize its classification ability. The SVMs can potentially handle large feature spaces as its training is carried out so that the dimension of classified vectors does not affect the performance of SVM. The PQ disturbances, sag and swell as a result of variation in solar insolation, wind speed and load are simulated for the hybrid system. A similar characteristic of voltage profile corresponding to sag and swell occurrence is observed, but these are not given in the manuscript due to space/ page restrictions. The PQ disturbances represented in different classes is given in Table III. In all these cases, the sag/swell magnitude remains in the range as defined above. SVM is a supervised machine learning algorithm that helps in classification or regression problems. It aims to find an optimal boundary between the possible outputs. Simply put, SVM does complex data transformations depending on the selected kernel function and based on those transformations, it tries to maximize the separation boundaries between your data points depending on the labels or classes you've defined.

In the base form, linear separation, SVM tries to find a line that maximizes the separation between a two-class data set of 2-dimensional space points**.** To generalize, the objective is to find a hyperplane that maximizes the separation of the data points to their potential classes in an -dimensional space. The data points with the minimum distance to the hyperplane (closest points) are called *Support Vectors*.

In the image below, the Support Vectors are the 3 points (2 blue and 1 green) laying on the scattered lines, and the separation hyperplane is the solid red line:



The computations of data points separation depend on a kernel function. There are different kernel functions: Linear, Polynomial, Gaussian, Radial Basis Function (RBF), and Sigmoid. Simply put, these functions determine the smoothness and efficiency of class separation, and playing around with their hyperparameters may lead to overfitting or underfitting.

b. Multiclass Classification Using SVM:

In its most simple type, SVM doesn't support multiclass classification natively. It supports binary classification and separating data points into two classes. For multiclass classification, the same principle is utilized after breaking down the multi classification problem into multiple binary classification problems.

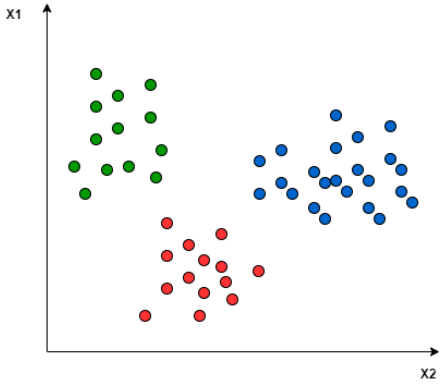
The idea is to map data points to high dimensional space to gain mutual linear separation between every two classes. This is called a *One-to-One* approach, which breaks down the multiclass problem into multiple binary classification problems. A binary classifier per each pair of classes.

Another approach one can use is *One-to-Rest*. In that approach, the breakdown is set to a binary classifier per each class.

A single SVM does binary classification and can differentiate between two classes. So that, according to the two breakdown approaches, to classify data points from classes data set:

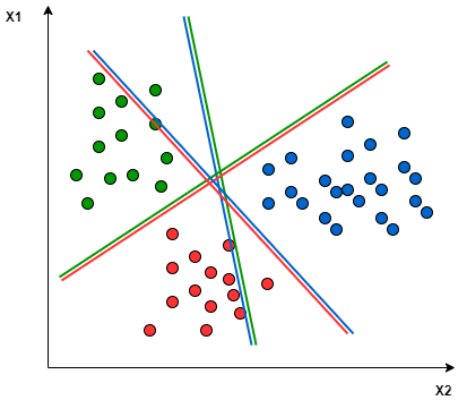
- In the *One-to-Rest* approach, the classifier can use SVMs. Each SVM would predict membership in one of the classes.
- In the *One-to-One* approach, the classifier can use SVMs.

Let's take an example of 3 classes classification problem; green, red, and blue, as the following image:

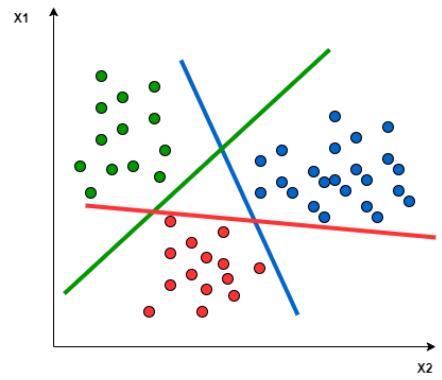


Applying the two approaches to this data set results in the followings:

In the One-to-One approach, we need a hyperplane to separate between every two classes, neglecting the points of the third class. This means the separation takes into account only the points of the two classes in the current split. For example, the red-blue line tries to maximize the separation only between blue and red points. It has nothing to do with green points:



In the *One-to-Rest* approach, we need a hyperplane to separate between a class and all others at once. This means the separation takes all points into account, dividing them into two groups; a group for the class points and a group for all other points. For example, the green line tries to maximize the separation between green points and all other points at once:



One of the most common real-world problems for multiclass classification using SVM is text classification. For example, classifying news articles, tweets, or scientific papers.Playing around with SVM hyperparameters, like *C*, *gamma*, and *degree* in the previous code snippet will display different results. As we can see, in this problem, SVM with RBF kernel function is outperforming SVM with Polynomial kernel function.

IV. RESULTS AND DISCUSSIONS

The PV and Wind generation block is mentioned as PVWIND in MATLAB Simulink environment. Three Phase Source is the Grid which is connected to the PCC through the Distributed Line. Simulink® is a block diagram environment for multi domain simulation and Model-Based Design. It supports system-level design, simulation, automatic code generation, and continuous test and verification of embedded systems. Simulink provides a graphical editor, customizable block libraries, and solvers for modeling and simulating dynamic systems.

It is integrated with MATLAB®, enabling you to incorporate MATLAB algorithms into models and export simulation results to MATLAB for further analysis. Build block diagrams interactively or programmatically, choose blocks from block libraries. Simulink provides customizable block libraries, a graphical editor for interactive model editing, and an API for programmatic model editing.

A comprehensive library of predefined blocks helps you build models to represent dynamic systems. Use the Simulink Editor to add blocks from a library into your model. Then, connect blocks using signal lines to establish mathematical relationships between system components. You can refine your model's appearance and control how users interact with your model.

A type 4 Wind turbine and the PV array are connected through the common inverter which is interfaced to the grid. The VSC controller is used to synchronize the output of this common inverter to the Grid.

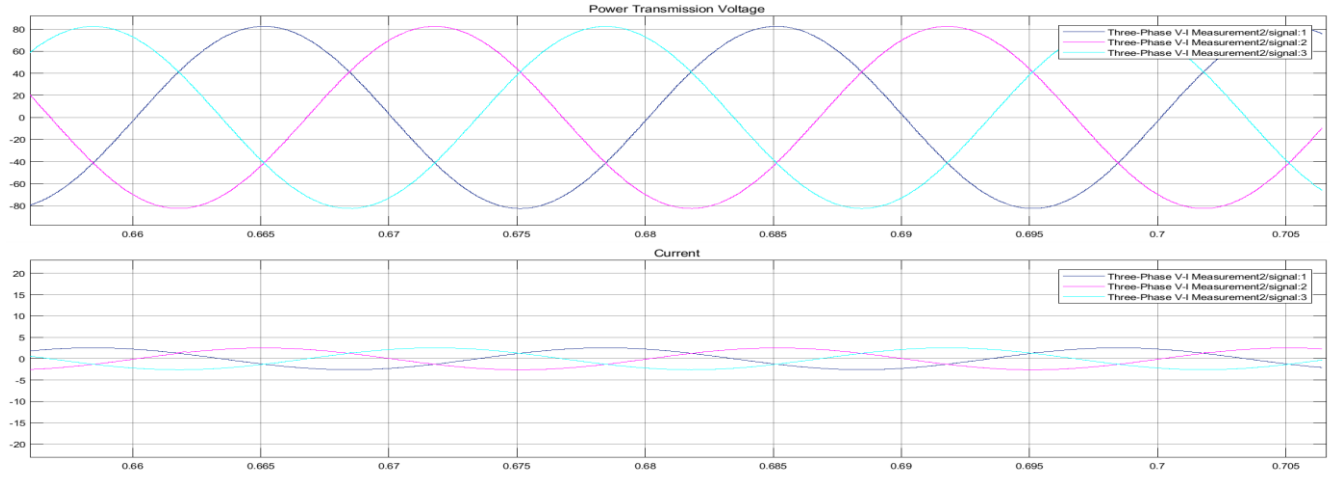


Figure 3. Current and Voltage Waveform at the PCC.

The current and the voltage waveform obtained at the Point of Common Coupling is as shown in Figure 3 which is obtained from the Hybrid PV and Wind generators. For the fault analysis the voltage and the current waveform is taken and this is used for training the model for classification of faults.

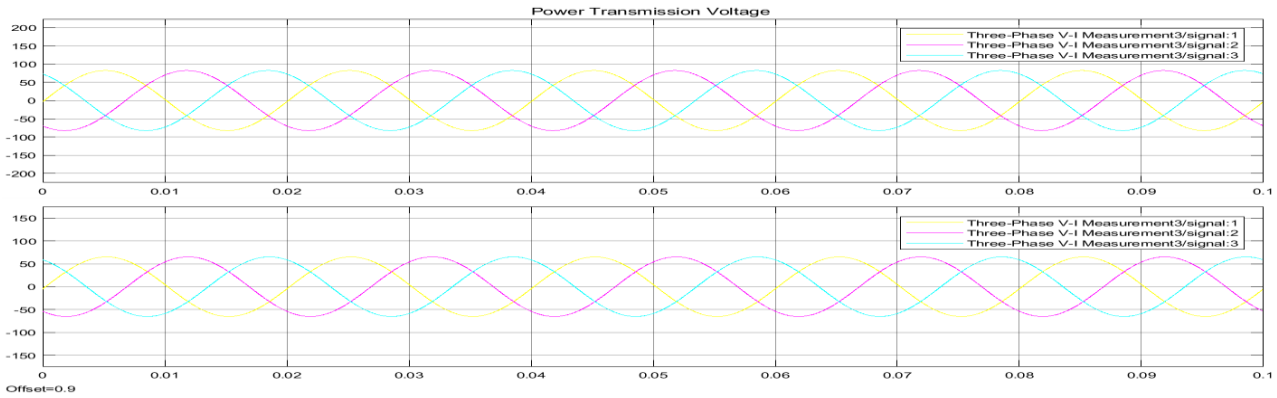


Figure 4. Voltage and Current Waveform from the grid Side

The current and the voltage waveform obtained at the Point of Common Coupling is as shown in Figure 3 which is obtained from the Grid section.

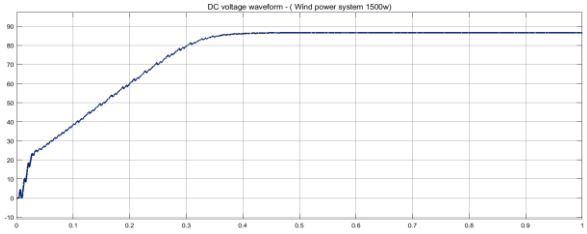


Figure 5.DC voltage obtained at the PV Wind output

Photovoltaic (PV) array which is composed of modules is considered as the fundamental power conversion unit of a PV generator system. The PV array has nonlinear characteristics and it is quite expensive and takes much time to get the operating curves of PV array under varying operating conditions. In order to overcome these obstacles, common and simple models of solar panel have been developed and integrated to many engineering software including MATLAB/Simulink ***S* transform** as a time–frequency distribution was developed in 1994 for analyzing geophysics data. In this way, the *S* transform is a generalization of the short-time Fourier transform (STFT), extending the continuous wavelet transform and overcoming some of its disadvantages. For one, modulation sinusoids are fixed with respect to the time axis; this localizes the scalable Gaussian window dilations and translations in *S* transform. Moreover, the *S* transform doesn't have a cross-term problem and yields a better signal clarity than Gabor transform. However, the *S* transform has its own disadvantages: the clarity is worse than Wigner distribution function and Cohen's class distribution function.

A fast *S* Transform algorithm was invented in 2010. It reduces the computational complexity from $O[N^2 \cdot \log(N)]$ to $O[N \cdot \log(N)]$ and makes the transform one-to-one, where the transform has the same number of points as the source signal or image, compared to storage complexity of N^2 for the original formulation. An implementation is available to the research community under an open source license.

A general formulation of the S transform makes clear the relationship to other time frequency transforms such as the Fourier, short time Fourier, and wavelet transforms here are several ways to represent the idea of the *S* transform. In here, *S* transform is derived as the phase correction of the continuous wavelet transform with window being the Gaussian function.

- S-Transform

$$S_x(t,f) = \int_{-\infty}^{\infty} x(\tau)|f|e^{-\pi(t-\tau)^2 f^2} e^{-j2\pi f\tau}\, d\tau$$

- Inverse S-Transform

$$x(\tau) = \int_{-\infty}^{\infty} \left[\int_{-\infty}^{\infty} S_x(t,f)\, dt\right] e^{j2\pi f\tau}\, df$$

The effects of a sag are often more noticeable than those of a swell. A sag of duration longer than three cycles is often visible in a reduction in the output of lights. Sags often not distinguishable from momentary outages, as the effects to the equipment may be the same. Sensitive equipment, such as computers, may experience intermittent lockups or garbled data. Even relays and contactors in motor starters can be sensitive to voltage sags, resulting in shutdown of a process when the drop out occurs. The effects of a swell can often be more destructive than those of a sag. The overvoltage condition may cause breakdown of components on the power supplies of the equipment,

though the effect may be a gradual, accumulative effect.

The increase in output from incandescent lighting may be noticeable, if the duration is longer than three cycles.

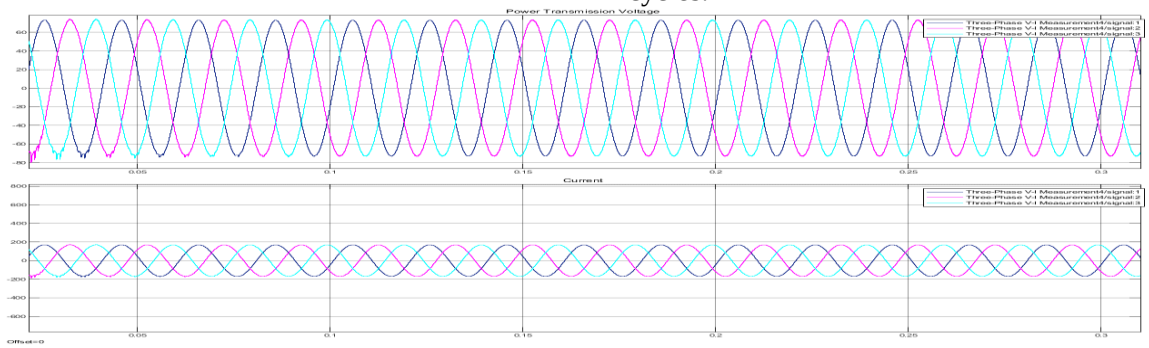


Figure6.Input Voltage from Grid

The causes of voltage sags on a transmission level system are similar to those on a distribution system. They include the weather (especially lightning), construction accidents, transportation accidents (helicopter or light planes are common culprits), animals or a fault on another part of the system causing "sympathetic" sags. There have been recorded instances of the nesting habits of large birds in the towers resulting in phase-to-ground faults when the insulators were "shorted out" by bird droppings that were made into a conductive path during rain storms.

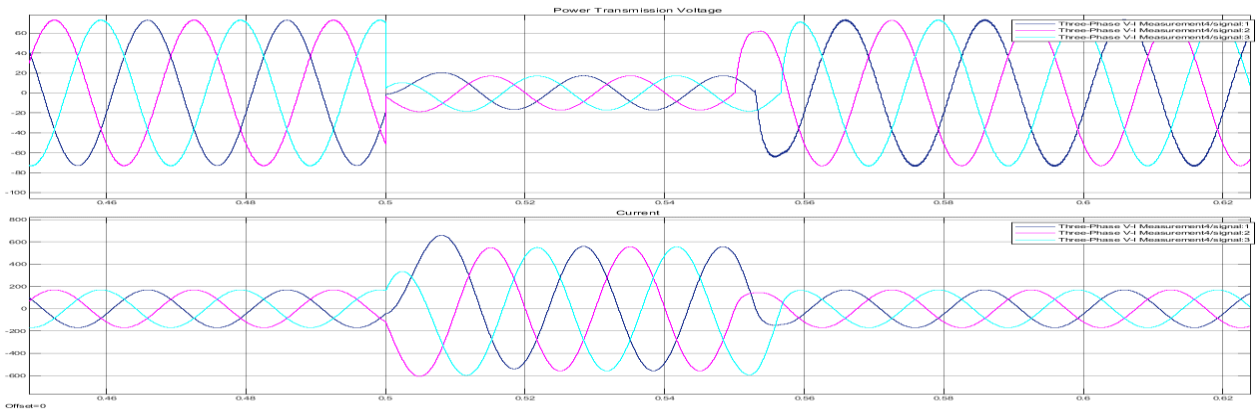


Figure 7. Voltage sag at the point of common coupling

Similar to the transmission system causes, weather (lightning, wind, ice), animal contact, contamination of insulators, construction accidents, motor vehicle accidents, falling or contact with tree limbs can result in voltage sags. Such faults may be 3- phase, line-to-line, or single line-to-ground. The 3-phase faults are the most severe, but are relatively unusual. "Single line-to-ground faults on the utility system are the most common cause of voltage sags in an industrial plant".

A **voltage sag** (U.S. English) or **voltage dip** (British English) is a short duration reduction in rms voltage which can be caused by a short circuit, overload, or starting of electric motors. A voltage sag happens when the rms voltage decreases between 10 and 90 percent of nominal voltage for one-half cycle to one minute. Some references define the duration of a sag for a period of 0.5 cycle to a few seconds, and a longer duration of low voltage would be called a "sustained sag."

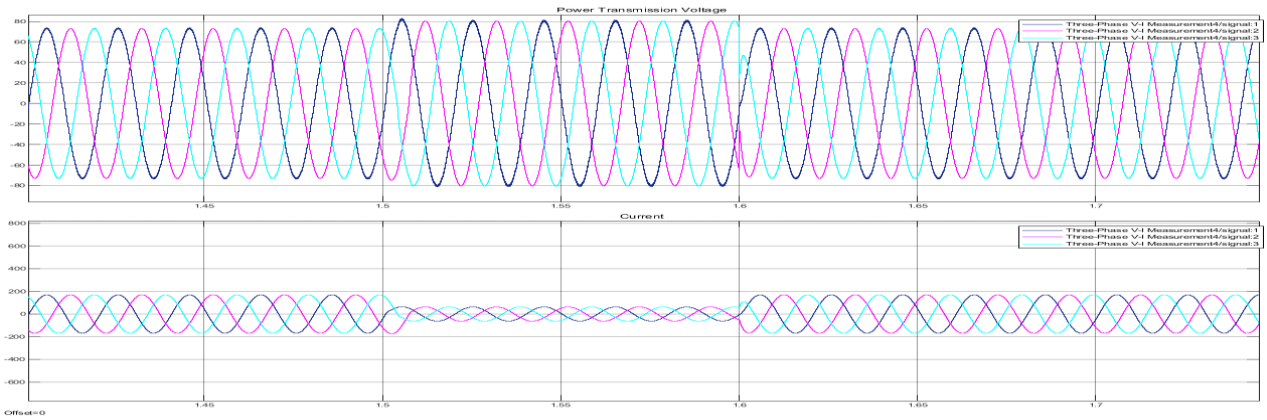


Figure 8. Voltage swell at the point of common coupling

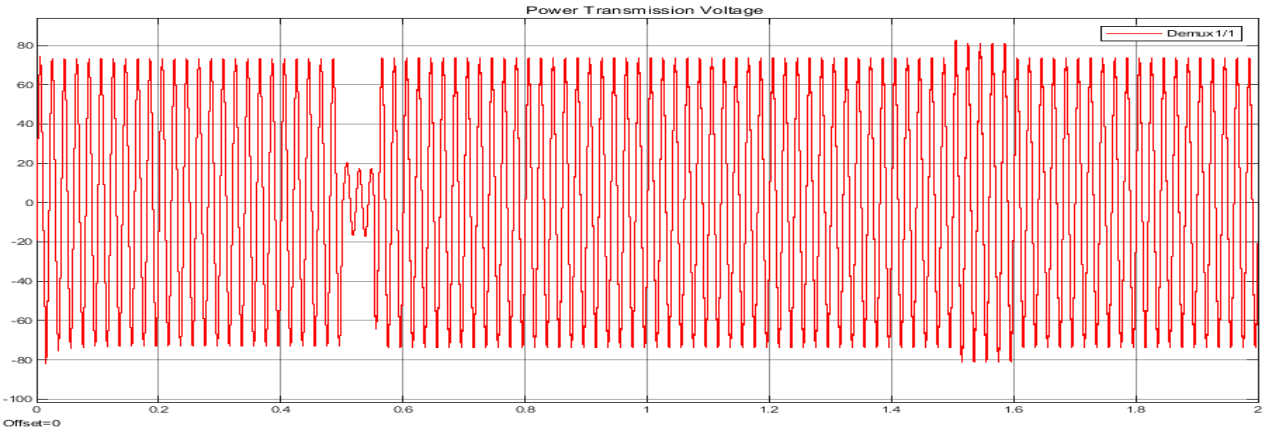


Figure 9. Complete Voltage Waveform

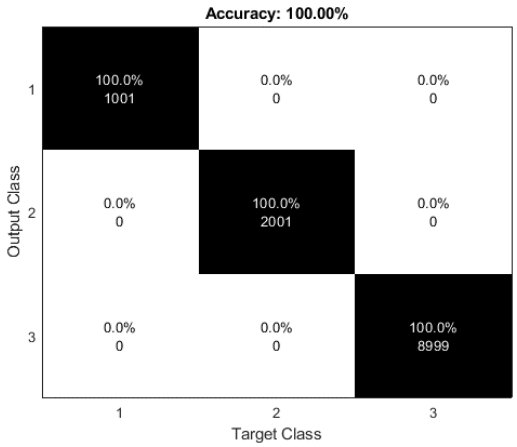


Figure 10. Confusion Matrix

A confusion matrix is a table that is often used to **describe the performance of a classification model** (or "classifier") on a set of test data for which the true values are known. The confusion matrix itself is relatively simple to understand, but the related terminology can be confusing. Let's now define the most basic terms, which are whole numbers (not rates):

- **True positives (TP):** These are cases in which we predicted yes (they have the class), and they do have the class.
- **True negatives (TN):** We predicted no, and they don't have the class.
- **False positives (FP):** We predicted yes, but they don't actually have the class. (Also known as a "Type I error.")
- **False negatives (FN):** We predicted no, but they actually do have the class. (Also known as a "Type II error.")

V. CONCLUSION:

A type 4 Wind turbine and the PV array are connected through the common inverter which is interfaced to the grid. MATLAB Simulink based model is developed for the same and results are obtained.The environmental characteristics like change in wind speed and solar insolation largely affects the voltage signal at PCC creating sag/swell occurrence depending upon their variations. Further the disturbance is to be generated from the model and results needs to be obtained for the Least Square method for fault classification.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal of Sri Krishna Institute of Technology, Bengaluru for the facilities provided and their support. Also we would like to thank the Head of department of Electrical & Electronics Engineering and faculties for their encouragement and support.

VI. REFERENCES:

[1] Kristina Hamachi LaCommare and Joseph H. Eto, "Understanding the Cost of Power Interruptions to U.S. Electricity Consumers", Energy Analysis Department, National Laboratory University of California Berkeley. LBNL-55718, September 2004 [Online]. Available: https://www.smartgrid.gov/document/understanding_ cost_power_inte rruptions_us_electricity_consumers.

[2] Prem Prakash, Dheeraj K. Khatod, Optimal sizing and siting techniques for distributed generation in distribution systems: A review, Renewable and Sustainable Energy Reviews, Volume 57, 2016, Pages 111-130.

[3] R. Angelino, G. Carpinelli, D. Proto, A. Bracale, Dispersed generation and storage systems for providing ancillary services in distribution systems, in: Power Electronics Electrical Drives Automation and Motion (SPEEDAM), 2010, pp. 343–351.

[4] O. Ipinnimo, S. Chowdhury, S.P. Chowdhury, J. Mitra, A review of voltage dip mitigation techniques with distributed generation in electricity networks, Electric Power Systems Research, Volume 103, 2013, Pages 28-36.

[5] J. Lin, W. Yu and X. Yang, "Towards Multistep Electricity Prices in Smart Grid Electricity Markets," in IEEE Transactions on Parallel and Distributed Systems, vol. 27, no. 1, pp. 286-302, 1 Jan. 2016.

[6] S. Jiang, C. Wan, C. Chen, E. Cao and Y. Song, "Distributed photovoltaic generation in the electricity market: status, mode and strategy," in CSEE Journal of Power and Energy Systems, vol. 4, no. 3, pp. 263-272, September 2018.

[7] S. Mortazavian and Y. A. I. Mohamed, "Dynamic Analysis and Improved LVRT Performance of Multiple DG Units Equipped With Grid-Support Functions Under Unbalanced Faults and Weak Grid Conditions," in IEEE Transactions on Power Electronics, vol. 33, no. 10, pp. 9017-9032, Oct. 2018.

[8] S. Yogendra Reddy, Daka Seshi Reddy , G. Kesava Rao, "Optimal Siting and Sizing of Solar Power Sources in Interconnection Grid System Indian". Journal of Science and Technology; Volume 9, Issue 12, March 2016

[9] Thomas Ackermann, Göran Andersson, Lennart Söder, "Distributed generation: a definition".Electric Power Systems Research, Volume 57, Issue 3, 2001.

[10] G. P. Harrison and A. R. Wallace, "Optimal power flow evaluation of distribution network capacity for the connection of distributed generation," in IEE Proceedings - Generation, Transmission and Distribution, vol. 152, no. 1, pp. 115-122, 10 Jan. 2005.

[11] G. H. Choe, H. S. Kim, H. G. Kim, Y. H. Choi, and J. C. Kim, "The characteristic analysis of grid frequency variation under islanding mode for utility interactive PV system with reactive power variation scheme for anti-islanding," in *Proc. IEEE 37th Ann. Power Electronics Specialists Conf. (PESC'06)*, Jun. 18–22, 2006, pp. 1–5.

[12] Z. Y. Wang, B. C. Zhao, X. C. Shi, and Y. W. Zhu, "A newmethod of detecting PV grid connected inverter islanding based on the frequency variation," in *Proc. Int. Conf. Materials for Renewable Energy & Environmental (CMREE)*, May 20–22, 2011, pp. 44–48.

[13] A. K. Ghosh and D. L. Lubkeman, "The classification of power system disturbance waveforms using a neural network approach," *IEEE Trans. Power Del.*, vol. 10, no. 1, pp. 109–115, Jan. 1995.

[14] T. X. Zhu, S. K. Tso, and K. L. Lo, "Wavelet-based fuzzy reasoning approach to power quality disturbance recognition," *IEEE Trans. Power Del.*, vol. 19, no. 4, pp. 1928–1935, Oct. 2004.

[15] M. B. I. Reaz, F. Choong, M. S. Sulaiman, F. Mohd-Yasin, and M. Kamada, "Expert system for power quality disturbance classifier," *IEEE Trans. Power Del.*, vol. 22, no. 3, pp. 1979–1988, Jul. 2007.

PORTABLE SMART ELECTRIC SCOOTER

1.Dhananjaya BN
Student, Department of EEE Student,
Sapthagiri College of Engineering
Bengaluru, India
dhananjaydhanu7888@gmail.com

2. Shivaraja MP
Department of EEE
Sapthagiri College of Engineering
Bengaluru, India
shivrajamp2001007@gmail.com

3. Preetha NP
Assistant Professor,Dept.of EEE.Sapthagiri College of Engineering. Bengaluru,
preethanp@sapthagiri.edu.in

4. UshadeviShetty
Assistant Professor,Dept.of EEE
Dr.Sri Sri Sri Shivakumar Mahaswamy College ofEngineering Bengaluru, India
m1ushadevi@gmail.com

ABSTRACT: Portable electric scooter is gaining attention among our community especially in large/urban areas. An electric scooter is originally inspired from a wheelchair, which is created to ease people to move from one place to another. It can be a stand Electric scooter or seated Electric scooter. This paper is implemented by using a stand Electric scooter and transformed into a portable electric scooter. This Electric scooter is very simple to operate since it is a battery operated vehicle. Earlier the use of electric scooter was limited only for children. But nowadays, the number of electric scooters used by adults have been increased especially in big cities it is widely used for recreation in the evening. Basically this type of vehicle will use DC motor since it is directly connected to the battery as a supply, and the power is transferred to rear wheel by sprocket and chain as its drive train. Also keeping in mind the parking problems nowadays, we decided to make a portable electric scooter which can be folded easily, and so can be easily carried. The design allows users to easily carry the Electric scooter using less space. When it is "folded" it becomes compact in size. This paper is unique as no foldable Electric scooter is presently available in market till now. It is a light-weight foldable Electric scooter, produced on the basis of a brand new concept.

Keywords: Brushless DC Motor, Hall Effect sensors, Electronic speed controller

I. INTRODUCTION

The main aim of this project is to design electrical portable automobile which should be very easy to carry as well as easy to handle by all. An electric scooter is a battery-operated one-person capacity vehicle that is specially designed for urban people. In this Electric scooter lithium battery technology is used in order to provide high performance and great reliability. A standard electric scooter need battery. The run time of electric scooter on each charge depends significantly on its battery type and its capacity. This Electric scooter is also equipped with advanced brake systems, so stopping is simple and comfortable. It consists of electric regenerative braking as well as disc brake for best braking experience. Comprehensive design of BLDC drive system using XMC family processor and MOSFET transistors have been implemented. The hardware architecture is simple and more reliable. The result has been obtained for various load conditions and has good dynamic performance. The BLDC motor with trapezoidal drive has the maximum inverter efficiency as it has the lowest switching loss. Dynamic braking can be used where smooth stopping the machine is important without wasted power. Plugging is not much efficient method as it damages winding but it gives faster braking.

Both hardware and software control algorithms are trustworthy; the running performance of the system is dynamic before or after adding load. This Electric scooter also equipped with advanced braking system so stopping is simple and comfortable. It consists of regenerative braking as well as Disc braking for better experience.

II. PROBLEM FORMULATION

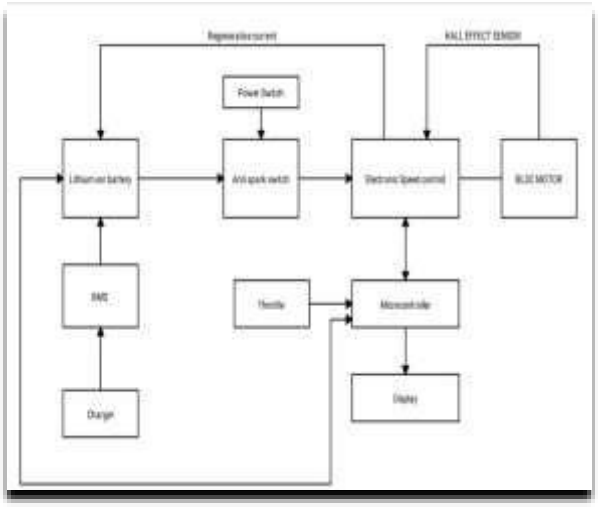


Fig 1: Methodology

The basic aim of our project is to make an environment & eco-friendly Electric scooter which would be easy to handle by both men / women and would emit 0% emission. It solves the parking problems and it can be folded easily. The design allows users to easily transport the Electric scooter using minimum space when it is "folded" into a minimum size. The flexibility of a folding Electric scooter is also appropriate for air travel and inadequate storage and at places where scooter theft is an important concern. Foldable indicates that it can be folded into two parts i.e. the handle and main body. The main body region is of simple aluminium, which makes the whole structure weigh less, easy to carry and handle positions can be bend. It also has smart indication of battery speed and mode of operating.

III. WORKING

The battery is the heart of this project. It uses lithium ion technology, because it can deliver current spontaneously due to high current density. The battery capacity of each cells selected is 4.2V and 2650 mill amps. Totally 50 cells are used to achieve a voltage of 36V and total load demand of 60 amps. For charging battery we make use of 36V, 5 Amps charger but the charger cannot charge each cell properly. It may over flow or damage the battery. So to avoid over flow we make use of Battery Management System(BMS). BMS not only avoid over flow but also protects during shorts circuit, maintenance of the battery temperature, voltage , limits the discharge, state of health, cools batteries, checks the current incoming and outgoing. To avoid spark created at the battery and motor, anti spark switch is to be used. Because of inrush currents flowing through the motor, we didn't use Anti Spark Switch instead we made use of an adapter it is easy to use but there is no alternative. Throttle is used to accelerate the speed of a motor. When we accelerate different resistances sends different voltage to microcontroller. Using PPM in VESC controls the speed of the motor. VESC is main module which controls all the equipment of electric vehicle, which has many features available in retrieving such as motor RMP, battery voltage, testing of motor, limiting of max motor current and voltage, FOC (Field orient control), gives simulations of real-time data such as current Vs. voltage, advance APP control which helps to future project. We used PPM data to control throttle. We make use of FOC to control the motor and hall sensor in BLDC motor. All data collected by microcontroller helps to display battery level, speed and distance covered. To display we used LED which is 127x64 pixel.

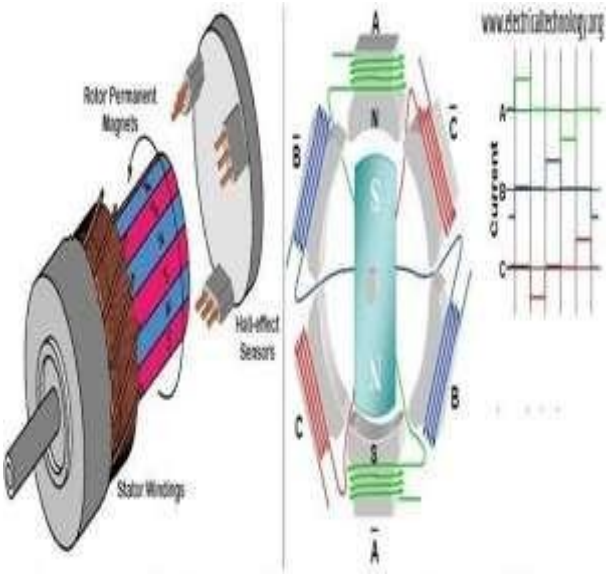


Fig 2: Construction and Working of BLDC Motor

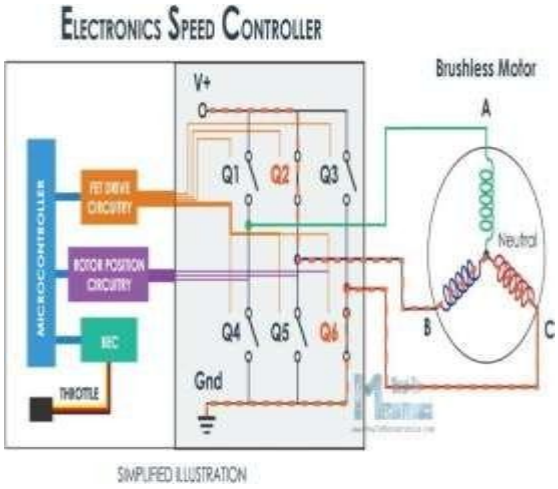


Fig 3: Electronic Speed controller

Brushless DC motor works on the principle of Lorentz force law. An ESC or an Electronic Speed Controller controls the brushless motor movement or speed by activating the appropriate MOSFETs to create the rotating magnetic field so that the motor rotates.

The position of the rotor is necessary and there are two natural methods used for detecting the rotor position. The first accepted method is by using Hall-effect sensors. Corresponding to this knowledge the ESC knows when to stimulate the next commutation sequence or interruption. The second common method used for determining the rotor status is through sensing the backward electromotive force or back EMF. The back EMF strikes as a result of the perfect opposite process of developing a magnetic field or when a propelling or evolving magnetic field pass through a coil it induces current in the coil.

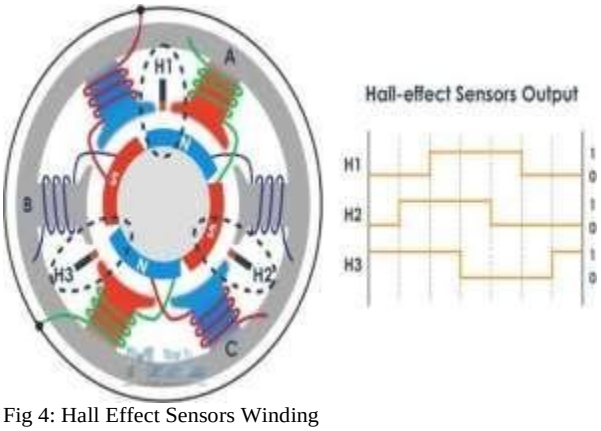


Fig 4: Hall Effect Sensors Winding

When the moving magnetic field of the rotor pass through the free coil, or the one that's not operating, it causes current flow in the coil and as a result voltage drop will occur in that coil. The ESC apprehends these voltage drops as they occur and it figures or calculates when the next interval should take place. So that's the necessary working principle of brushless DC motors and ESCs and it's sparkles indeed if there is increase in the number of poles of both the rotor and the stator. We will still have a three-phase motor, only the number of intervals will step up in order to execute a full cycle.

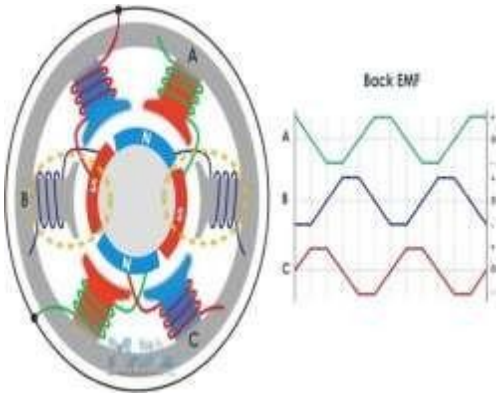


Fig 5: Back EMF

IV. CONSTRUCTION

The four leading practical segments of an efficient lithium-ion cell are the positive electrode, negative electrode, separator, and electrolyte. To toughen the battery's stockpile strength its beneficial for the positive electrode and negative electrode material extending to have huge photographic electrode sectors with excessive porosity to toughen withdrawal area. Therefore, electrodes are composed of fastens formed of dry molecules covered on flat current pack rats (commonly thin copper or aluminum foils).

1. Negative Electrode

The lithium-ion cell negative electrode is composed of a lithium intercalation compound plated in a thin layer onto a metal current collector. The common anode material, usually graphite in powder form associated with binder material. The nature of the carbon can vary considerably in purity, particle size, particle size distribution, particle shape particle porosity,

crystalline phase of carbon, degree of compaction, etc. Anodes composed of silicon, germanium, and Titanate (Li4Ti5O12) materials have also been produced or tested, but at the time of this writing, non-graphitic anodes are rarely implemented.

2. Positive Electrode

There are varieties of positive electrode materials used in traditional lithium-ion cells - as with the negative electrode, these materials are powders that are combined with conductivity enhancers (carbon) and binder, and coated in a flat sheet onto a current pack rat. The most common negative electrode material in lithium-ion cells is lithium cobalt dioxide: a layered oxide material commonly referred to as cobalt oxide. As with negative electrode materials, positive electrode materials can also vary dramatically based on source, purity, particle characteristics, coatings on particles, use of do pants, mixture ratios of various components, crystalline, etc

.3. Electrolyte

The electrolyte in a lithium-ion cell is typically a mixture of organic carbonates such as ethylene carbonate used in lithium-ion cell electrolytes. The mixture proportions vary depending upon importuned cell marks These solvents contain solvated lithium-ions, which are provided by lithium salts, most commonly lithium hexafluorophosphate (LiPF6). Cell manufacturers mostly consist of low concentrations of a mixture of additives to improve performance characteristics.

V. RESULTS AND DISCUSSIONS

A motorized scooter is a miniature of scooter with an attached either electric motor or small internal combustion engine and used to assist the scooter to move fast in closer area. The basic duty of the scooter is to aid individuals to carry over from one place to another place. The basic components of scooters are completely with two wheels, a flat deck which to put the feet, power train and handlebars to steer the front wheel. The scooter designs have made a positive impact on the ability of those who are participating in social events and physical challengers to perform their daily activities. It is also intended to be utilized as a physical assistance device that is not designed essentially for speed but can move just a little bit quicker.

VI. CONCLUSION

From this project we can conclude that the Eco-friendly Portable Electric Scooter has an approximate speed of 25 km/h (15 mph) and range of up to 10 km (25 miles) per charge, and occupies less space compared to regular cycle. This portable scooter features twist-grip acceleration control, a 1260 W BLDC motor, and a lithium ion battery (which can be charged from a regular outlet). There's LED lighting front, Disc brakes on each wheel and a center-mounted LED display on the handlebars that shows remaining charge and speed. Allow the front wheel and handlebars to fold into the body of the scooter. It's reported to be about the size of a golf bag and tips the scales at 15kg. Small stabilizing wheels at the rear come into play when the portable scooter is being dragged behind, and also act as support when the scooter stands upright. This vehicle can be used when there is traffic. As it is dragged, it can be taken anywhere where we go such as in malls, hospitals, airports etc. As it consists of brushless DC motor it is an eco-friendly battery oriented running scooter which doesn't creates pollution.

REFERENCE:

1. FlorinRavigan, NiculaeBoteanu, Marius Dumitriu, IonutZglimbea - BLDC Controller Based on Dedicated System-In-Package. International Journal of Circuits and Electronics, 2017

2. Abdul Rahim Abdullah, MohdArif Abu Hassan- Efficiency Comparison of Trapezoidal and Sinusoidal Method for Brushless DC Motor Drive. Applied Mechanics and Materials 785(2015):248-252 • April 2015

3. M.Rakesh, P.V.R.L. Narasimham - Different Braking Techniques Employed to a Brushless DC Motor Drive used in Locomotives. International Electrical Engineering Journal (IEEJ) Vol. 3 (2012) No. 2, pp. 784-790 ISSN 2078-2365.

4. M.Rakesh, P.V.R.L. Narasimham - Different Braking Techniques Employed to a Brushless DC Motor Drive used in Locomotives. International Electrical Engineering Journal (IEEJ) Vol. 3 (2012) No. 2, pp. 784-790 ISSN 2078-2365.

5. Tako Nama, Anup Kumar Gogoi; Praveen Tripathy-Low Power Electric Two-Wheelers for Hilly Region.INSPEC Accession Number: 18654883DOI: 10.1109/PEDES.2018.8707619Publisher: IEEE Conference.

DESIGN OF PORTABLE CNC MACHINE FOR PCB MILLING

CHANDAN R*[1], CHETHAN R[2], LOKESH RAJU R[3], MANOJ R[4], Dr. NARAYANAPPA[5]

Department of Electrical and Electronics Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]chandanramesh1999@gmail.com
[2]chethanr271@gmail.com
[3]lokeshraju30@gmail.com
[4]manojram766@gmail.com

[5]narayanappa@sapthagiri.edu.in

Abstract **-Sometime for make PCB, we required more time for designing, printing, etching as well as drilling. Therefore to reduce time and more effort we are design this project. In this paper, the design of a PCB milling and drilling machine, where the drill holes and the layout are automatically find out from an image of the circuit in EAGLE software. This paper focuses on the design and implementation of automatic PCB milling and drilling machine using ARDUINO UNO. Further the drilling machine uses path planning through co-ordinate measurement machine method which is used to make the system more stable and accurate.**

1. INTRODUCTION

The term "CNC" is a general term which describe many types of devices such as drills, wood cutters, 3D printers, milling machines. Basically "CNC" stands for computerized numerical controlled and physical movement of the machine is controlled by the instruction such as coordinate position which is generated by computer. Computer Numerical Controlled (CNC) machines are very different in design and construction from conventional machine tools. This difference arises due to the requirements of higher performance levels.

The quality and reliability of these machines depends on the different machine elements and subsystems of the machines. Some of the important components and aspects of CNC machines are to be considered in their design, for example machine structure, guide ways, feed drives, spindle controls, software and operator interface, tool monitoring. Computer Numerically Control can be applied to milling machines, lathe machines, grinding machines, plasma cutters, laser cutters, surface grinders, etc.

CNC is basically a machine whose working is commanded by a computer.

2.OBJECTIVES

- To study various types of CNC machines, their purpose and applications.
- To convert PCB design file into hex file for Arduino

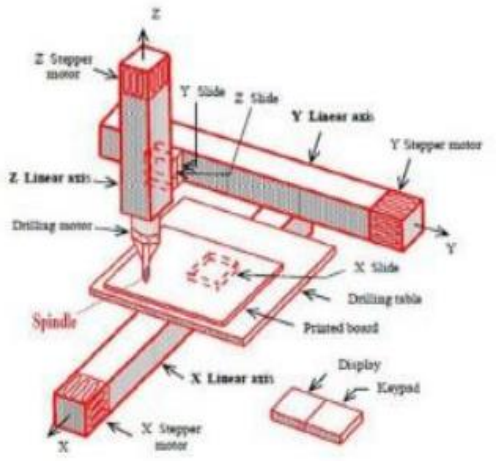
Microcontroller.

- To develop and implement low-cost mini-CNC machine for PCB drawing using Arduino microcontroller.
- To test the developed low-cost mini-CNC machine using Arduino IDE software.

2.1.DESIGN IDEA

The PCB is placed to this system then it is drilled automatically through path planning. The PC provides X, Y, Z co-ordinates and by using the pc software read the file which is generated by the PCB design software. Another system uses the basic 8051 microcontroller and drilling driver are designed by relays makes system bulky and does not provide high amount of current in order to drive the motor exactly. Another method uses microcontroller the c programming. The system consists of three 3 stepper motor and one AC motor to control drill. Thus due this the system is complicated and system becomes instable. The proposed project does not use the path planning method. Further the automatic PCB drilling machine uses a path planning algorithm, which is capable of estimating an exact traversing path for the drill bit. The path planning algorithm optimizes

the use of the motors and other mechanical paths involved in the process while reducing total time taken to cross all the drill holes. In this project, the developed software takes the position of the drill hole. Than it calculates the previous and current co-ordinate and sends the coordinate information Microcontroller unit over USB cable. Stepper motors move on the basis of co-ordinate information to accomplish the drilling of the PCB.

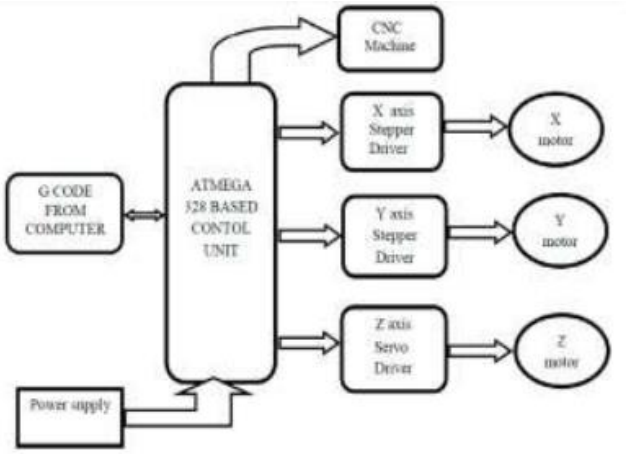


3.LITERATURE REVIEW

Micromachining operations play an important role in precision production industries. Out of the various machining processes, micro-drilling is used to produce micro holes in fuel injectors, printed circuit board, aerospace materials etc. So in order to achieve the optimum working conditions various research were conducted by different researchers from across the globe. This report reviews some of the journal published by them regarding optimization processes. Yogendra Tyagi, Vadansh Chaturvedi and Jyoti Vimal have conducted an experiment on drilling of mild steel, and applied the taguchi methods for determining the optimum parameters condition for the machining process using the taguchi methods and analysis of variance. The work piece used is mild steel (100mm×76mm×12mm) and the tool used is HSS with a point angle of 118° and diameter of 10 mm. Taguchi L9 orthogonal arrays is used here in order to plan the experiment. The input parameters are feed rate, depth of cut and spindle speed whereas the output responses are surface roughness and metal removal rate (MRR).In case of signal to noise ratio calculation, larger the better characteristics is used for calculation of S/N ratio for metal removal rate and nominal and small the better characteristics is used for the calculation of S/N ratio for surface roughness. After the analysis of the data obtained it is found that MRR is affected mostly by feed. Confirmation experiment was conducted using the data obtained from S/N ratio graphs and it confirmed with the results of taguchi methodology. In case of surface roughness analysis same procedure was followed where the significant parameter was found to be the spindle speed. Here too the confirmation experiment was conducted and this confirms the successful implementation of taguchi methods. Timur Canel,A. Ugur Kaya,Bekir Celik studied the laser drilling on PVC material in order to increase the quality of the cavity. Taguchi optimization methods were used to obtain the optimum parameters. The material used in the experimental setup is PVC samples with dimensions of 5mm×85mm×4.5mm. Surelite Continuum Laser is used to form the cavities. The input parameters are wavelength, fluence and frequency and the output response are aspect ratio, circularity and heat affected zone. Taguchi L9 orthogonal array is used to find the signal to noise ratio. Smaller the better characteristics are used for HAZ, larger the better characteristic is used for aspect ratio and nominal the better characteristic is used for circularity. Variance analysis is performed using Project Report 2013 the calculated S/N ratio to conclude optimum stage. It is found that most effective parameter for aspect ratio is frequency, second is wavelength and last is flounce. For circularity it is found that the most effective parameter is wavelength, flounce and frequency.

4. METHODOLOGY

4.1 BLOCK DIAGRAM



Arduino Uno microcontroller core platform is used in this project. It can be easily interfaced with computers,

drivers and stepper motors as well. The Arduino Uno microcontroller needs 12V power supply. Program will be dumped to the Arduino IDE software and then converted to the compiler of Arduino. The driving circuit is designed to control the mechanical setup and to communicate through software with the computer. This project will explore a CNC machine's ability to create its own components. CNC PCB machine is a drawing machine where a computer controls the individual axes of the machine through a motor.

4.2 WORKING

The two stepper motors are driven and controlled by two drivers. These two stepper motors are connected to the X-axis, Y-axis and one Z-axis to servo motor line.

G code from PC

G-code is a programming language for Computer Numerical Control (CNC) in computer aided-design and manufacturing (CAD/CAM). The g-code used in the computer tells the CNC machine how far to move and at what speed.

- Conversion from G-Code to C-Code

To make the G-code interface with the microcontroller, each piece of the G-code line will be treated as a different character, composing a reasonable C-code to display the G code after a few executable C-code instructions are executed. The G-code is interfaced with the Arduino microcontroller used to convert the code to a USB converter, i.e. serial. Furthermore, this code is passed to three motors by easy drivers converting the code and moving the three motors according to the instructions. We need three axis X, Y, Z which operates as follows: -- X motor move left and right, -- Y motor moves front and back, and -- Z motor moves up and down.

5.SPECIFICATIONS

5.1 STEPPER MOTOR (28BYJ-48)

A stepper motor is an electromechanical device that converts electrical power into mechanical power. It is also a brushless, synchronous electric motor that can divide a complete rotation into a wide range of steps. The stepper motor uses magnet operation theory to turn the motor shaft into an accurate distance when an electrical pulse is provided. There are eight poles in the stator, and six poles in the rotor. To make one complete revolution, the rotor will require 24 pulses of electricity to move the 24 steps.

Table-1: Specifications of Stepper Motor (28byj-48)

Steps/revolution	2048
Voltage & Current	12V at 400 mA
Step angle	1.8° full step 0.9° half-step
Drive System	Unipolar
Max continuous power	5 W
Time taken to complete one rotation	4 sec

5.2 SERVO MOTOR (SG90)

Servos are controlled through the control wire by sending a variable width electrical pulse, or pulse width modulation (PWM). There is a minimum pulse, maximum pulse and frequency of repetition. For a total of 180 degrees movement, a servo motor can normally only turn 90 degrees in either direction. The neutral position of the motor is defined as the position in which the servo has the same amount of potential rotation in the direction of both clockwise and counter clockwise

Table-2: Specifications of Servo Motor (SG90)

Voltage	4.8V-6.0V
Connector type	JR type (Yellow: Signal, Red: VCC, Brown : GND)
Speed	0.12sec/60degrees (4.8V) 0.10sec/60degrees (6.0V)
Size	32 × 11.5 × 24mm (Include tabs) 23.5 × 11.5 × 24mm (Not include tabs)

5.3 ULN2003A DRIVER

The ULN2003 is a high voltage monolithic transistor array with high current Darlington. It consists of seven NPN Darlington pairs with high voltage outputs for switching inductive loads with common-cathode clamp diode. A single Darlington pair's current collector rating is 500mA. For higher current capacity, the Darlington pairs maybe parallel. Applications include relay drivers, hammer drivers, lamp drivers, LED gas discharge display drivers, line drivers and buffers for logic. For each pair of Darlingtons, the ULN2003 has a 2.7k series

base resistor for direct operation with TTL or 5V CMOS devices.

Features:

- 500mA rated collector current (single output).
- High voltage outputs: 50V
- Inputs compatible with different logic types.
- Application for relay driver.

6. SOFTWARE ARCHITECTURE

6.1 FLOWCHART

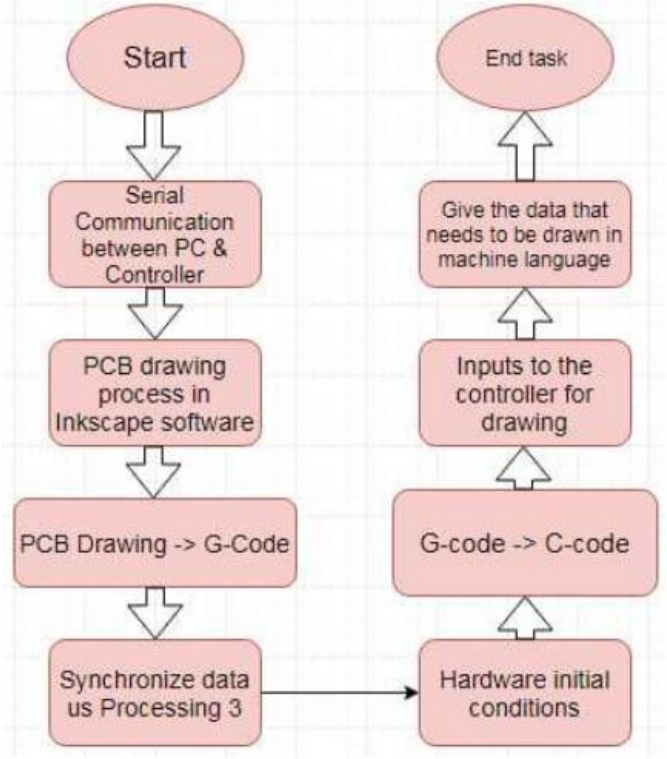


Fig: Flowchart

6.2 ALGORITHM

- Gets inputs of PCB diagram (gerber files)
- Convert gerber files to G-code
- Changes input into machine language of coordinates that is sent to AtMega328P.
- Serial communication between PC and ATMega328P.
- Coordination of servo motor and driver control position stepper motor.
- Checking current that is measured at servo motor
- Checking PCB drawing process.
- Setting initial parameter values by setting initial position values of two stepper motors.
- Drawing on the PCB board (automatic mode, steps per revolution, continue, pause & stop).

7. HARDWARE ARCHITECTURE

7.1 MECHANICAL SETUP



Fig-3: Mechanical Setup

7.2 DETAILS

- The instructions from the Arduino are fed to the CNC machine. We have connected the two Stepper motor driver ULN2003 on CNC shield. The output of the each Stepper motor driver ULN2003 are given to the respective stepper motor.
- Due to X axis stepper motor, the wooden board moves front side and backside. Due to Y axis stepper motor, the spindle moves left and right & due to Z axis servo motor, the tool moves up and down. The depth to the spindle is provided by the Z axis servo motor.
- The spindle requires a PCB engraver pen which will draw the actual image on PCB board

8.CONCLUSION

We studied various types of CNC machines, its purpose and their applications. We studied different research papers, patents and found out their limitations. We created G-code of PCB design using Inkscape software and simulated it using CAMotics software. Automatic mini CNC machine is designed and developed for PCB drawing using Arduino for low cost and for better accuracy

9.ACKNOWLEDGEMENTS

We are grateful to our project guide Dr. Narayanappa for immense support and keen interest shown in project. We also acknowledge our overwhelming gratitude and immense respect to Dr.Ramakrishna, Principal of Sapthagiri College of Engineering and Dr. Narayanappa Head of Department of Electrical and Electronics Engineering who inspired us a lot to achieve the goal and we came to know about so many new things. We would also like to thank our parents and friends who helped us a lot in finalizing this project and supporting us regularly.

10.REFERENCES

[1] A. T. Purnomo, F. I. Hariadi and A. Sasongko, "Development of interface and coordination module of FPGA-based controller for CNC PCB milling and drilling machine," 2017 International Symposium on Electronics and Smart Devices (ISESD), Yogyakarta, 2017, pp. 112-117.

[2] S. H. Ahmed, N. Razzaq, Z. Malik, U. Qadeer, I. Sarfraz and A. Sharif, "Design & fabrication of MATLAB based solar powered CNC machine," 2017 3rd IEEE International Conference on Control Science and Systems Engineering (ICCSSE), Beijing, 2017, pp. 265-268.

[3] Anurag Joshi, Shubham Ghodmare, Vijay Pal, “Open Source Multi tool CNC Router,” 2017 World Journal of Technology, Engineering and Research, Volume 2, Issue 1 343-346.

[4] Tejasvi Sahare, Ketan Deshmukh, Ketki Tandulkar , Prof.S.Y.Gupta “PCB ENGRAVING AND DRILLING MACHINE,” 2017 International Journal of Research In Science & Engineering Volume: 3 Issue: 2.

[5] M. A. A. Ali, A. M. A. EL Shaikh and S. F. Babiker, "Controlling the CNC machine using microcontroller to manufacture PCB," 2016 Conference of Basic Sciences and Engineering Studies (SGCAC), Khartoum, 2016, pp. 116-120.

[6] Palniappa Thangavelu, “New Generation CNC Milling Machine,” Indian Patent 229356, Mar. 20, 2009.

[7] Mukul Gupta, Preety Gupta, Mudita Singh & K.K.Yadav, “Mini Multi-Tool CNC Machine,” 2018 IOSR Journal, Volume 15, Issue 2 Ver. I

Simulation of on Board Electric Vehicle Charger Using MATLAB

Ranjitha N [1], Nagaraja B .S [2], Akshay kumar D[3]

[1]Student, Department of Electrical and Electronics Engineering
Sapthagiri College of Engineering, Bengaluru-57
nranjitha2001@gmail.com
[2,3]Assistant professor, Department of Electrical and Electronics Engineering
Sapthagiri College of Engineering, Bengaluru-57
nagarajabs@sapthagiri.edu.in, akshaykumar@sapthagiri.edu.in

Abstract: **In this work the design of a system to create and handle Electric Vehicles (EV) charging procedures is proposed. Due to the electrical power distribution network limitation and absence of smart meter devices, Electric Vehicles charging should be performed in a balanced way, taking into account past experience, weather information based on data mining or simulation approaches. The main aim of this work is to develop a simulation model in such a way that it should solve the problems of Electric Vehicles charging stations and it should overcome a different charging conditions like over-load, over-peak voltages, over-current and certain atmospheric conditions etc.,**

Keywords: **Electric Vehicles (EV), over-load, over-peak voltages, over-current and certain atmospheric conditions.**

I.INTRODUCTION

Electric charging station is an infrastructure that supplies electric energy for the recharging of electric vehicles, such as plug-in electric vehicles, including electric cars, plug-in hybrids, etc. and charging stations are inevitable part of electric vehicle ecosystem. In case of India, with road network of 54,72,144 kilometers, the country needs nation-wide network of charging stations for electric vehicles as government is planning to sell only EVs by 2030. EVs integration on current electrical distribution network, without violating the system's technical restrictions, requires electrical data consumption analysis and smart charging approaches. In this complex scenario, information knowledge related with charging periods, prices, decision of charging or discharging EV batteries, needs the assistance from data mining processes. Several issues have to be considered and analyzed before taking action.

Depending on the amount of electric vehicles in the system and the charging patterns, electric vehicles integration creates new quantities in the overall load profile that may increase the load peaks. The electric vehicle charging patterns are stochastic since they are affected by the travel behavior of the driver and the charging opportunities which implies that an electric vehicle introduction also will affect load variations.

II.ON-BOARD EV CHARGING SYSTEM

An AC charger provides power to the on-board charger of the vehicle, converting AC power to DC for battery charging. The acceptance rate of the on-board charger varies by types of batteries used but is limited for reasons of cost, space and weight.

A. Types of Charging Stations

Charging an electric vehicle is a simple process: one just has to simply plug the vehicle into a charger that is connected to the electric grid. However, not all EV charging stations are created equal. Some can be installed simply be plugging into a standard wall outlet, while others require a custom installation. The time it takes to charge the vehicle will also vary based on the charger used.

1) Level 1 EV charging stations

Level 1 charger uses a 120V AC plug and can be plugged into a standard outlet. Unlike other chargers, Level 1 chargers do not require the installation of any additional equipment. These chargers typically deliver two to five miles of range per hour of charging and are most often used at home. These are rated up to 3kW and are often used to charge overnight or at the workplace. These chargers are the least expensive, but they take up almost time to charge the vehicle's battery.

2) Level 2 EV charging stations

Level 2 chargers are used for both residential and commercial charging. They use a 240V (for residential) or 208V (for commercial) plug, and unlike Level 1 chargers, they can't be plugged into a standard wall outlet. These electric vehicle chargers deliver 10 to 50 miles of range per hour of charging. They can fully charge an electric vehicle battery in as little as two hours, making them an ideal option for both homeowners who need fats charging and businesses who want to offer charging stations to customers.

3) Level 3 EV chargers [DC Fast Chargers]

DC Fast Chargers, also known as Level 3, can offer 60 to 100 miles of range for EVs in just 20 minutes of charging, however, they are typically only used in commercial and industrial applications as they require highly specialized, high-powered equipment to install and maintain.

III. MATLAB SIMULINK MODEL

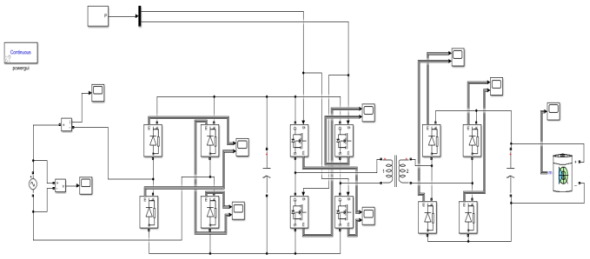


Figure 1: On Board Charging Simulink model

IV.RESULT

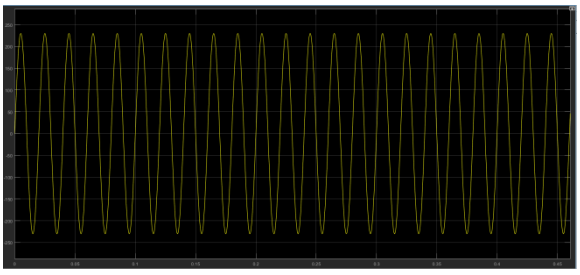


Figure 2: Input Voltage waveform

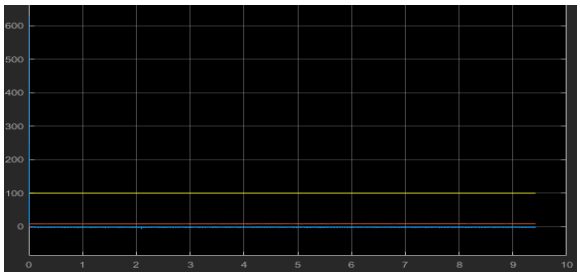


Figure 3: Battery charging waveform

V.CONCLUSION

Electric vehicles currently represent only 2% of worldwide vehicle sales, but over the next decade, vehicle electrification is expected to increase over 15 times. The rapid adoption of

vehicle electrification is fuelled by growing consumer demand for greener transportation options and by regulations requiring carbon emission reductions and improved fuel efficiency. Every major car manufacturer has responded to these twin pressures with plans to release at least one electric vehicle in the coming years. In 2019, BMS products saved 60 million tons of CO2 from entering the atmosphere and will continue to reduce CO2 vehicle emissions by 30% year over year. Hence, EVs being alternative to gasoline vehicles is more advantageous in every aspect.

REFERENCES

[1] G. Razeghi, M. Carreras-sospedra, T. Brown, J. Brouwer, D. Dabdub, and S. Samuelsen, "Episodic air quality impacts of plug-in electric vehicles," Atmospheric Environment, vol. 137, pp. 90–100, 2016.

[2] B. Nykvist and M. Nilsson, "Rapidly falling costs of battery packs for electric vehicles," Nature Climate Change, vol. 5, pp. 329–332, 2015.

IMPLEMENTATION OF MULTI WAY POINT NAVIGATION USING UNMANNED AUTOMATED VEHICLES

[1]Madhukar M, [2] Chandana P, [3] Gowri N Jois, [4] Guru Narasimha V S, [5] Shreenidhi R Kashyap,

[1]Assistant Professor, Department of ECE, Jyothy Institute of Technology, Bengaluru-560082

[2,3,4,5] Student, Department of ECE, Jyothy Institute of Technology, Bengaluru-560082

[1]madhukar.m@jyothyit.ac.in

[2]pchandana444@gmail.com

[3]gowri7jois@gmail.com

[4]vsgurunarasimha@gmail.com

[5]shreenidhirk14@gmail.com

Abstract: **This prototype design demonstrates the ever-growing need for advanced technology and precision driven UAV, Unmanned Automated Vehicle with additional features that can perform various tasks without human intervention. A person can easily control the motion of the robot wirelessly and this robot can also manoeuvre autonomously and reach the destination on its own. The system is also capable of assisting in medical supply delivery. The vehicle is equipped with a unique algorithm which helps it to determine its path between source and destination. Also, a unique concept of multi-way point navigation is incorporated in this system, thus enabling the vehicle to traverse between various sets of coordinates without the need to return to home-base. This system depends on the exchange of OTP for security and collects a picture of the recipient for added authentication purposes and the image captured is time stamped and stored locally.**

Keywords - Multi Way Points, Autonomous vehicle, Navigation Algorithm, Haar Cascade

1. INTRODUCTION

The recent progress in technology has given rise to development and deployment of unmanned robotics in various fields including medical, civilian and military. The unmanned robots can vary from being just a simple arm for pick and place of objects to the advanced concepts as unmanned vehicles. In this paper we explore the world of unmanned vehicles. These vehicles, as the name states are void of on-board human presence and can be controlled either wirelessly or can be made to work autonomously. Unmanned vehicles are categorized into two broad types, namely, remotely operated and autonomous. Autonomous unmanned vehicles were initially developed by the military to transport ammunition and supplies across dangerous terrains. But the hidden potential in these systems allowed for development of vehicles which could be used even in civilian and medical purposes. The earlier versions of unmanned vehicles were restricted to only ground based robots, but with development of helicopters and drones this concept of unmanned vehicle went airborne. These vehicles present several benefits in terms of their size and affordability, in addition to high survivability. These will remove the need to depend on humans to perform tasks such as long-distance delivery.

1.1 TYPES OF UNMANNED VEHICLES

Unmanned vehicles are categorized into two broad types, namely, remotely operated and autonomous.

1.1.1 Remotely operated

These vehicles are also known as tele-controlled systems. Here an operator controls the robot remotely via a communication link. All cognitive actions are given by the operator based on feedback from either line-of-sight visual observation or by using a camera for live streaming. A basic example which depicts the principles of tele-control is a toy remote control car. Here the vehicle is unmanned and controlled at a distance via a wired or wireless connection while the user provides all control based upon the observed performance of the vehicle.

ISBN: 979-85-27243-61-1

1.1.2 Autonomous control

In this mode of operation, the robot does not depend on any human interference to traverse between two locations. Here the GPS acts as the most essential sensor to navigate between two points. The points are termed as way-point in outdoor navigation. A way-point is the geo-location obtained from geo-coordinates, the latitude and the longitude values. While the vehicle in autonomous mode feeds back its path which is monitored by the operator. Primarily, these vehicles are used to replace humans in hazardous situations. Examples are explosives and bomb disabling vehicles, vehicles to explore environments with high background radiation, etc.
These unmanned autonomous vehicles can also be classified as land based and flight based. The land-based vehicles are the ones which operate on the surface of earth and are capable of traversing different types of terrains with a few modifications. Whereas the flight-based vehicles are the ones which are designed around the concept of helicopters and are capable of covering longer distances but face issues due to high power consumption.

1.1.3 Multi-Way Point Navigation

Most autonomous devices are equipped with a feature called return to home, which helps the robot to go to the destination and return back to the home base but restricts its movement to any other location between those locations. In this paper we explore a concept known as multi way point navigation which enables the vehicle to traverse to different locations between a source point and destination point. In this concept the source point or the home base is a single fixed point whereas the destination is an array of geo-locations which may be altered. Here we aim at developing a robot which is capable of travelling to different locations before reaching the final destination.

1.2 OBJECTIVES

The main objectives are:

- To develop an unmanned automated vehicle, capable of independent navigation to desired points.
- To detect obstacles in a pathway and autocorrect its path with help of algorithms.
- To deliver medical supplies in a controlled environment in case of emergency.

2. PROPOSED SYSTEM

The above block diagram provides the layout for the proposed unmanned ground vehicle and the components required for the prototype. This system uses a microcontroller which commands the motor driver that is controlling the motors and helps in traversal of the vehicle. Here the GPS module is used to set locations of waypoints and also to obtain the relative position of the vehicle which plays an important role while travelling between any two given waypoints. The GPS along with the Compass module helps in steering the vehicle to the destination by controlling the position of the vehicle and the position of the vehicle to be in the same direction as that of the upcoming way-point. These two modules work together to get the vehicle back on track if it gets deviated from its path, this is known as auto routing and this auto routing is achieved by our unique navigation algorithm. The ultrasonic sensor is useful for detecting objects and obstacles which come in the path of the vehicle. SD card is used to set multiple way points so that no time is wasted to update the next point using a distant system. The Wi-Fi module is used to transmit data such as geo-coordinates and other values from sensors to track the vehicle. Here the battery management also plays an important role as it directly impacts the operation time which impacts total distance which can be travelled.

2.1 NAVIGATION ALGORITHM

The direction of motion of the vehicle can be monitored by a navigation algorithm which gives the shortest path between two points that is source being heading angle and destination being course angle. The destination angle is the angle of GPS which gives direction between source and destination point. The magnetometer (compass) gives the direction with respect to the source point which points towards the destination. This can be achieved with two possible cases by comparing the

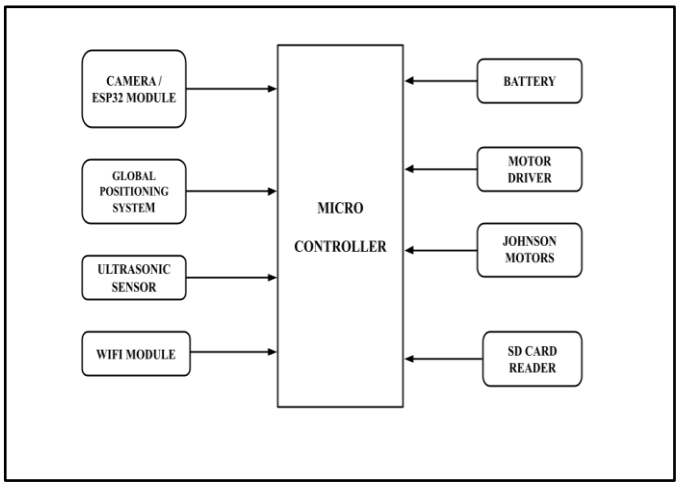


Figure 1 : Block diagram of the unmanned land vehicle

course values and heading values to specify the direction to be left or right.

Case 1: Course value to be greater than heading value
The absolute difference is calculated between the angles. If the difference angle is less than 180 lengthen the direction is towards left or if the difference is greater, then the direction is towards right.

Case 2: Course value to be lesser than heading value
The absolute difference is calculated between the angles. If the difference angle is less than 180 deg, then the direction is towards right or if the difference is greater, then the direction is towards left.

ISBN: 979-85-27243-61-1

Table1: Navigation Algorithm

	GPS > Compass	GPS < Compass
Abs < 180	Right	Left
Abs >180	Left	Right

If course and heading angles are said to be equal, then the direction of motion is forward. Also, if the distance between source and destination is zero then it shows that the destination is reached.

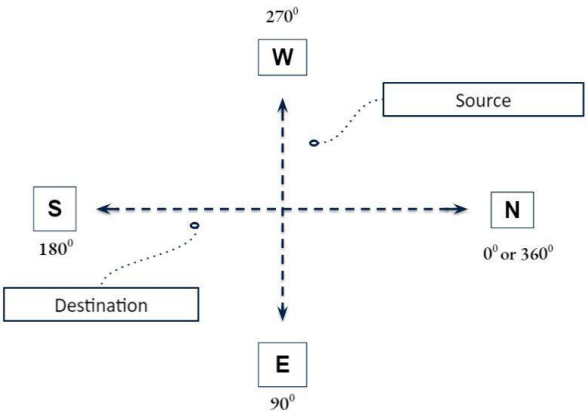


Figure 2: Depiction of Navigation Algorithm

Table 2: Test cases of algorithm

GPS (course value) in degrees	Compass (heading value) in degrees	Direction
190	300	Left
220	150	Right

This algorithm can be explained by considering the following test cases, in test case number 1, we have GPS value as 190 degrees and Compass value as 300 degrees. Clearly in this case Compass value exceeds GPS value and the absolute difference between the angles is 110 degrees which is less than 180 degrees hence the direction taken will be left. In the second case, we have GPS value as 220 degrees and Compass value as 150 degrees, clearly here the GPS value exceeds the compass value. The absolute difference between the angles is found to be 70 degrees which is less than 180 degrees hence the direction taken is right.

As the system is battery dependent there are chances of depletion during run time. The typical solution for such a problem is to return to the home base. But our system is capable of routing itself to the next closest destination or the upcoming waypoint. It is also capable of returning to the home base but it takes the decision to return to the home base or to travel to the next destination based on the shortest travel path.

This concept can also be implemented for a flight-based system which is realized using a quadcopter drone. A drone is the most common example of an unmanned aerial vehicle. The drone, a multi-rotor quadcopter which comes under the family of the helicopter, here there are 4 sets of motors and propellers which help in producing lift and enable the drone to take off. It is one of the best configurations as it is stable and easy to implement. This type of unmanned vehicle will be more effective in covering large distances. The motors are selected such that they provide the necessary thrust required for the flight. The propellers are positioned to provide a smooth and stable lift during take-off and flight. The body is chosen to be a light weight thus reducing the drag. The drone is also capable of hovering in a particular place which helps in the delivery process. The drone has the freedom of motion in 3 axes as roll, yaw and pitch. The vehicle in flight can move in 3 different dimensions which are Roll, Pitch and Yaw.
Roll is a movement around the axis that allows the frontward or backward direction of motion. Pitch is a movement around the axis that allows upward or downward direction of motion. Yaw is a movement around the axis that allows movement in the left or right direction of motion.

2.1.1 MOTION OF A DRONE

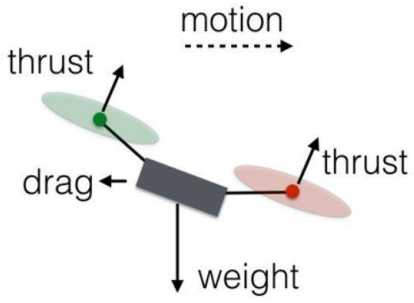


Figure 3: Motion of Drone

ISBN: 979-85-27243-61-1

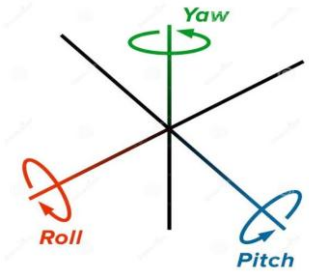


Figure 4: Freedom of motion

- ➔ To move forward, the speed of the rear motors exceeds the speed of the front motors.
- ➔ To move in the reverse direction, the speed of the front motors exceeds the speed of the back motors.
- ➔ To move towards the left, the speed of the right front motor and the right back motor exceeds the speed of the left front motor and the left back motor.
- ➔ To move towards the right, the speed of the left front motor and the left back motor exceeds the speed of the right front motor and the right back motor.

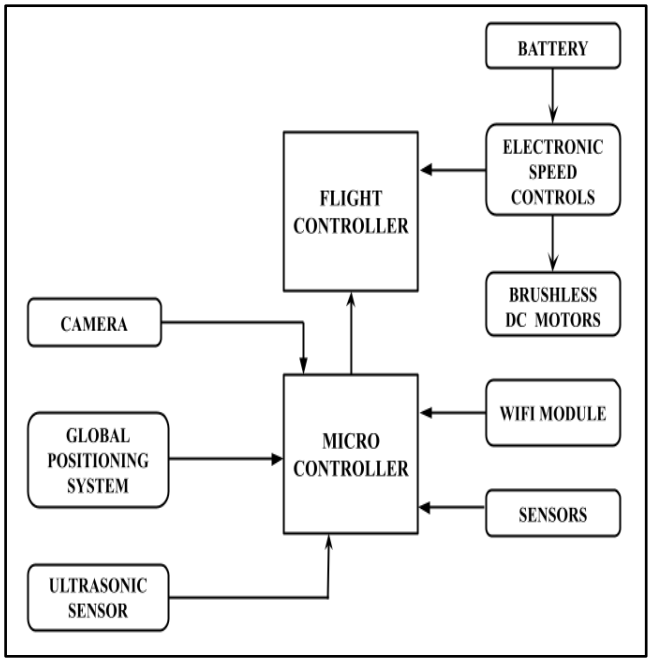


Figure 5: Block diagram for flight-based vehicle

The above block diagram provides the layout for the proposed unmanned aerial vehicle and the components required for the prototype. The flight controller and the microcontroller are the heart and brain of the UAV respectively. In this paper we will be specifying the specifications of the components that can be used to test flight the UAV from the proof of concept tested through the unmanned land vehicle.

The flight controller being used is the KK 2.1.5 a multi rotor controller which helps in stabilising the fight for multi-rotor copters by looking into factors such as roll, yaw and pitch with the help of the gyroscope. The flight controller is powered up using the battery (specify the model). The Arduino Mega microcontroller meets the condition required to test the working of the UAV thus proving to be an efficient pick. Camera being used helps in a good resolution video or photo capture. The GPS module, commonly known as the Global Positioning System gives the coordinates of the UAV, that is the longitude and the latitude of that position along with the course angle. Ultrasonic sensor uses the sound waves to detect the obstacles thus helping in a safe traversal for the UAV. ESP 8266, the Wi-Fi module used, helps in the wireless transmission of data from the UAV to the home-base. Lithium Polymer Batteries, generally known as the LiPo Batteries are used to power up the system through the ESCs. The Electronic Speed Controllers are used to impart specific power to the motors and the propellers according to the movement of the UAV. The propellers provide the necessary lift required for the UAV thus providing the lift. Other sensors like the HMC5883L module (3-Axis Digital Compass), microwave sensors prove to be an additional advantage in the working of the UAV. The set of components mentioned above helps us to build an autonomous unmanned aerial vehicle

3. IMAGE PROCESSING

Image processing is a technique of studying the details in an image and performing further operations on that image. Here we make use of the computer vision concept to identify desired objects in an image or a video. Computer vision is the process in which a computer is trained to behave like a human visual system for detecting and identifying different objects. The algorithms such as YOLO, LBPH and classifiers such as Haar Cascades may be used to detect desired objects. This detection and identification can be used for authentication purposes.

3.1 HAAR CASCADE

The Haar Cascade popularly known as the Haar Cascade Classifier method is a method used to develop computer vision. Haar-Features are good at detecting edges and lines. This makes it especially effective in face detection. In this approach which is based on machine learning, usage of positive and negative image sets plays a very important role in training the classifier. Positive images are the ones where the object of interest is present and we train the cascade classifier to identify that object. Negative Images are the images which do not contain the object we want to detect and preferably the number of these negatives should be greater than the positive ones. The primary step in this process is the

ISBN: 979-85-27243-61-1

conversion of a given image to a grayscale version of itself. The variation in grayscale values is used for generation of features of the object. This process is done for every positive image. This is called training the model. Next comes the step of testing the model. If the set of positive images is given properly, the model will be able to detect the object with a high precision. Here the Haar cascade proves to be advantageous over few other methods as the creation of dataset is very easy and when an ample number of images are provided for training the cascade gives results with very high accuracy. This method also helps us to identify very small details in the image.

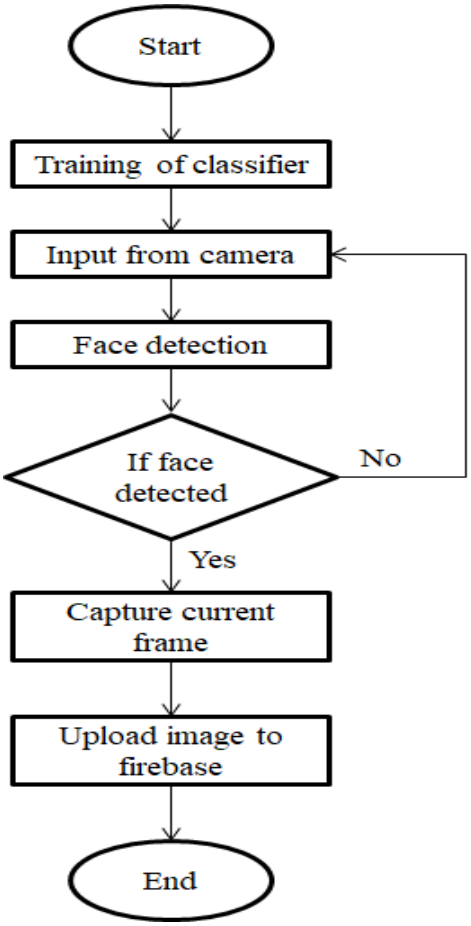


Figure 6: Flowchart of image Processing

For the purpose of detecting faces, this method first creates features of the face by analysing the variations in grayscale values of the face from a huge number of training images. Features like the mouth, eyebrows, nose and eyes among others help a cascade classifier to learn more about how a face is structured and once it is trained properly, it is ready to detect faces in a given image. When there are multiple faces in a given image, this method detects all those faces with a higher accuracy as compared to other methods.
In image processing, here we first train the classifier to detect the required object, in our case the face of the recipient. So, we train our model to detect faces in a live video. Once the task is completed, we perform multiple tests to check whether the system is working accurately or has flaws. Next, we take the input from the camera and the same input is fed to the classifier which checks for the face in the image, once a face is detected it captures that particular image and transmits it to the database along with timestamp and location. Thus, helping us create a database which has the picture of the recipient along with the time and place at which the supplies were collected.

3.1.1 AUTHENTICATION

First the recipient receives an OTP via text, and then the OTP is verified with the system after which the packages can be easily collected by the recipient. In the meantime their picture is also captured simultaneously and stored along with the timestamp. This helps us in maintaining additional security either in a controlled environment or among a trusted group of recipients.

4. CONCLUSIONS

In delivery of essential goods such as medical supplies both time and availability of service plays an important role, when there is lack of human workforce the delivery of these goods cannot be interrupted, thus a smart system capable of delivering these goods is very much needed. Our system is the solution to such problems. This system is capable of carrying medical supplies over long ranges without any human interface and it performs the entire task autonomously. This system is not only capable of travelling between a pre-set source and destination but is also able to traverse between multiple geo-locations. Thus, fulfilling the supply demand in different locations on the same run. This consumes less time and removes the need to depend on an effective human workforce which proves to be costly and scarcely found. Therefore, this delivery bot can be used to deliver essential goods to different locations with maximum efficiency.

5. FUTURE SCOPE

This field of robotics will always have constant advancements, as the batteries will be capable of powering the system to cover even longer distances and in future this system will be able to cover kilometres. With more advancements this system will be able to live stream data such as location directly to the recipient and if there is any change in the way-point then it can be performed dynamically and the vehicle will be able to reach the updated location based on shortest path or even by setting the location with highest priority. With inclusion of more powerful motors this system will be able to lift even larger weights and it can be used in various other fields apart from its primary medical purpose.

ISBN: 979-85-27243-61-1

6. RESULTS AND DISCUSSION

Figure 7 depicts the real time implementation of our concept of autonomous multi way point navigation on a land-based robot. Here we first fed the locations and the robot successfully travelled to all the locations based on the shortest path feasible. Next the robot was fed with a large number of waypoints and to do this we could not use the conventional method of feeding the locations by including them in the code, so we came up with an unconventional method of accessing the EPROM of the Arduino. In this trial we collected location and route data from Google Earth Pro and saved those latitude and longitude values in a text file and saved a copy of the latter in a SD card. Next the contents of the SD card were read by Arduino with the help of a SD card reader module and all the data in the text file was saved on EPROM. Once data is stored on the EPROM, we can remove the SD card and let the robot perform its task. By doing so, we significantly reduced the code density and as a result it increased the efficiency of the whole system. Now the vehicle or the robot was capable of travelling between multiple waypoints in the same run and once those points were covered it successfully reached the final destination.



Figure 7: Real Time Implementation

This vehicle was also capable of returning to the nearest waypoint or the destination point when it faced issues with the battery thus proving our concept of return-to-nearest-waypoint. This system was also tested for its auto re-routing capabilities by forcefully moving it out of its path upon which it analysed its position and corrected its path back to the original route. Further trials have shown that the system is capable of travelling to multiple geo coordinates in one run and delivering supplies to the required location with higher accuracy and efficiency. The location was constantly updated in the database in real time as shown in figure 8. Hence providing us a way to keep track of the route in which the robot was travelling.

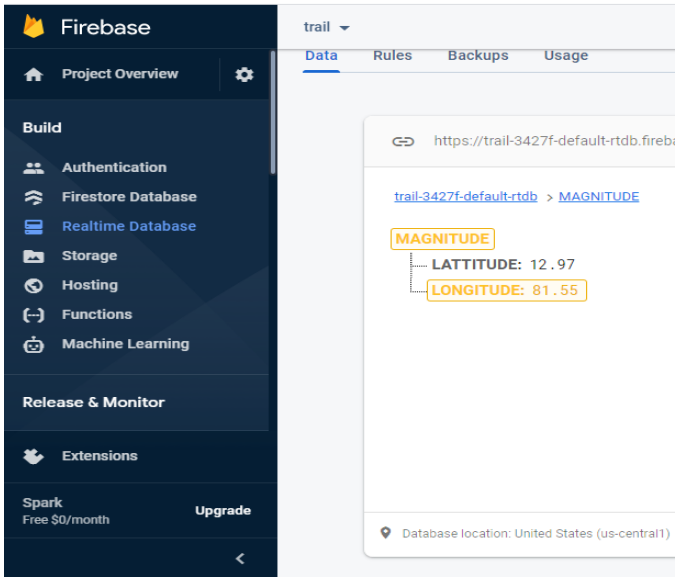


Figure 8: Updation of co-ordinates

7. REFERENCES

[1]. A Brief History of Drones: The Remote Controlled Unmanned Aerial Vehicle

[2]. Unmanned Aerial Vehicles for Package Delivery and Network Coverage Mohammad Javad Khosravi, Hossein Pishro-Nik, University of Massachusetts Amherst,USA.

[3]. Investigating Wireless Network Interferences of Autonomous Drones with Camera based Positioning Control System by Kian Meng Yap, Kok Seng Eu, and Jun Ming Low Faculty of Science and Technology, Sunway University

[4].Tarunpreet Kaur and Dilip Kumar "Wireless Multifunctional Robot for Military Applications", Department of Electronics and Communication Engineering, SLIET, LONGOWAL, Sangrur

[5]. "3-Axis Digital Compass IC HMC5883L" – Honeywell Solid State Electronics Center

[6]. Obstacle-avoiding robot with IR and PIR motion sensors

[7]. A drone-based image processing system for car detection in a smart transport infrastructure

ISBN: 979-85-27243-61-1

SMART MOBILE CHARGER

DEEPAK V. INGALE*[1,2], KESHAVA GOWTHAM[2], SANJAY M.[1], AKHIL L. SUNKAD[1]

[1]*Department of Electronics and communication Engineering, Jyothy Institute of Technology, Bengaluru, India*
[2]*Centre for Incubation, Innovation, Research and Consultancy, Jyothy Institute of Technology, Bengaluru, India*
*deepak.vi@ciirc.jyothyit.ac.in
keshava.gns@ciirc.jyothyit.ac.in
sanjaymohan17@gmail.com
akhilsunkad@gmail.com

Abstract: **Smart charging is a process of charging the battery of a mobile in controlled environment. Smart charging is the combination of both hardware and software environment where the process of charging the mobile battery is included. Problem in conventional charger is that the mobile battery, if charged vigorously or charged for long duration, can damage the battery causing bulging effect or explosion, we can overcome this problem by disabling the power to the mobile charger after the mobile is charged to a certain percentage which would help to increase the battery life.**

Keywords – Smart Mobile Charging, Battery life, NodeMCU, IoT, Android Application

I. INTRODUCTION

Smart mobile charging can greatly enhance reliability and life of mobile battery, Smart mobile charger is an embedded device which is a combination of both hardware and software environments where the process of charging the mobile battery is monitored. This device reads the battery status / percentage and cutoff the input power to the device. If the battery is over charged it can cause the battery to bulge or even explode, also mobile batteries retain up to 80% of their charge capacity after 300-500 charge/discharge cycles. Hence our device ensures to enhance the life of battery.

II. METHODOLOGY

NodeMCU is the heart of the Smart mobile charger, here NodeMCU is configured as Access point and a mobile application which we have developed acts as client. The battery maximum charge percentage is set in the mobile application initially, current battery status is read and if the battery charge percentage is less than set percentage the mobile application will inform the NodeMCU to turn on the charger, similarly once the battery has attained the set percentage the mobile application will inform the NodeMCU to turn off the charger. Figure 1 shows the block diagram of the device. Input from mains supply 230 volts AC is converted to 5 volts DC by the SMPS module, 5 volts is fed as input to the battery charge controller module to charge the LiPo battery. The voltage across the LiPo battery would be 3.7 volts hence we are using a DC-DC boost converter module to convert 3.7V DC to 5V DC. NodeMCU is powered by this 5 volts, once we receive information from the mobile app the microcontroller will turn on/off a port, which in turn will either turn on /off a MOSFET which would act as switch to power the USB port.

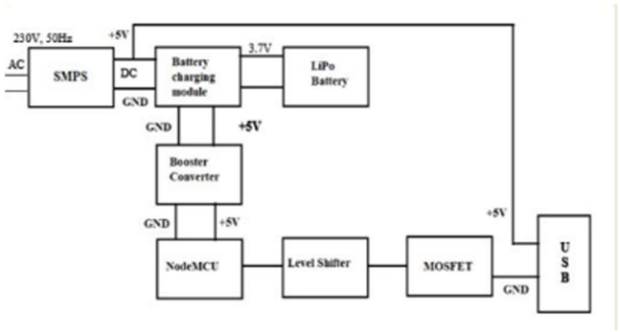


Fig.1 Block diagram of Smart Mobile Charger

III. HARDWARE IMPLEMENTATION

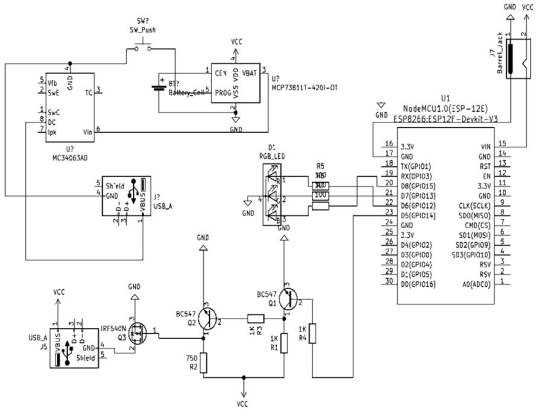


Fig.2 Schematic of the prototype

ISBN: 979-85-27243-61-1

Figure 2 shows the schematic of the prototype developed. In this, we use a NodeMCU Wi-Fi module which receives the data (i.e., Battery percentage) from the mobile. The Node MCU is made to work as such if the Battery percentage reaches a certain limit given by the user, there will be a cut off in the power supply to the mobile which stops charging. Here, NodeMCU acts as access point and mobile acts as the client.

A. NodeMCU



Fig.3 NodeMCU

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. Here NodeMCU is used as a microcontroller. It takes the data from the application and it cuts off the power to the USB port as per requirement.

B. MOSFET

The metal–oxide–semiconductor field-effect transistor (MOSFET, MOS-FET, or MOS FET), also known as the metal–oxide–silicon transistor (MOS transistor, or MOS), is a type of insulated-gate field-effect transistor that is fabricated by the controlled oxidation of a semiconductor, typically silicon. The voltage of the covered gate determines the electrical conductivity of the device; this ability to change conductivity with the amount of applied voltage can be used for amplifying or switching electronic signals.

MOSFET as a switch

- Consider the case where Vin applied is 0V, which means the gate terminal of the MOSFET is left unbiased. As a result, the MOSFET will be OFF and operates in its cut off region wherein it offers a high impedance path to the flow of current which makes the IDS almost equivalent to zero. As a result, even the voltage drop across RD will become zero due to which the output voltage Vo will become almost equal to V_s.
- Consider the case where the input voltage Vin applied is greater than the threshold voltage VT of the device. Under this condition, the MOSFET will start to conduct and if the VS provided is greater than the pinch-off voltage VP of the device (usually it will be so), then the MOSFET starts to operate in its saturation region. This further means that the device will offer low resistance path for the flow of constant IDS, almost acting like a short circuit. As a result, the output voltage will be pulled towards low voltage level, which will be ideally zero.

C. LEVEL SHIFTER

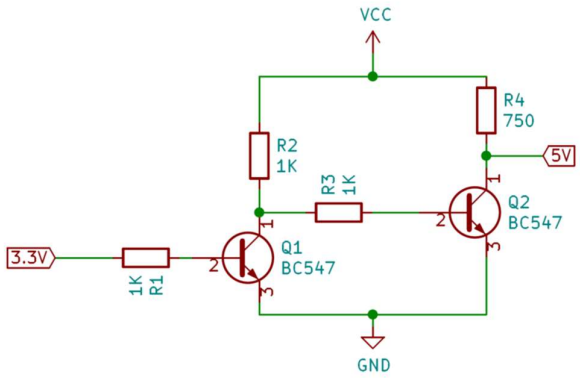


Fig.4 Level Shifter

Level shifter (level translator), in digital electronics, also called logic-level shifter or voltage level translation, is a circuit used to translate signals from one logic level or voltage domain to another, allowing compatibility between ICs with different voltage requirements, such as TTL and CMOS.

Modern systems use level shifters to bridge domains between processors, logic, sensors, and other circuits. In recent years, the three most common logic levels have been 1.8V, 3.3V, and 5V, though levels above and below these voltages are also used.

Here, we are shifting the level from 3.3V to 5V as the data pin of NodeMCU gives out 3.3V but MOSFET requires 5V at its gate to attain maximum current.

ISBN: 979-85-27243-61-1

IV. SOFTWARE IMPLEMENTATION

Software implementation refers to the process of adopting and integrating a software application into a business workflow.

Implementation of new tools and software into an enterprise can be complex, depending on the size of the organization and the software.

A. ARDUINO PROGRAMMING

Arduino, natively, supports a language that we call the Arduino Programming Language, or Arduino Language. This language is based upon the Wiring development platform, which in turn is based upon Processing, which if you are not familiar with, is what p5.js is based upon. It's a long history of projects building upon other projects, in a very Open-Source way. The Arduino IDE is based upon the Processing IDE, and the Wiring IDE which builds on top of it. When we work with Arduino, we commonly use the Arduino IDE (Integrated Development Environment), a software available for all the major desktop platforms (macOS, Linux, Windows), which gives us 2 things: a programming editor with integrated libraries support, and a way to easily compile and load our Arduino programs to a board connected to the computer. The Arduino Programming Language is basically a framework built on top of C++. You can argue that it's not a real programming language in the traditional term, but I think this helps avoiding confusion for beginners. program written in the Arduino Programming Language is called sketch.
One is called setup (), the other is called loop (). The first is called once, when the program starts, the second is repeatedly called while your program is running.

We don't have a main () function like you are used to in C/C++ as the entry point for a program. Once you compile your sketch, the IDE will make sure the end result is a correct C++ program and will basically add the missing glue by pre-processing it.

Everything else is normal C++ code, and as C++ is a superset of C, any valid C is also valid Arduino code.

One difference that might cause you troubles is that while you can spawn your program over multiple files, those files must all be in the same folder. Might be a deal breaking limitation if your program will grow very large, but at that point it will be easy to move to a native C++ setup, which is possible.

Here in this application, the NodeMCU is programmed in such a way that it becomes as an access point and is ready to make connection with the mobile. Once the mobile gets connected to the NodeMCU, it waits for the mobile application to send the info and in turn the digital pin goes HIGH or LOW.

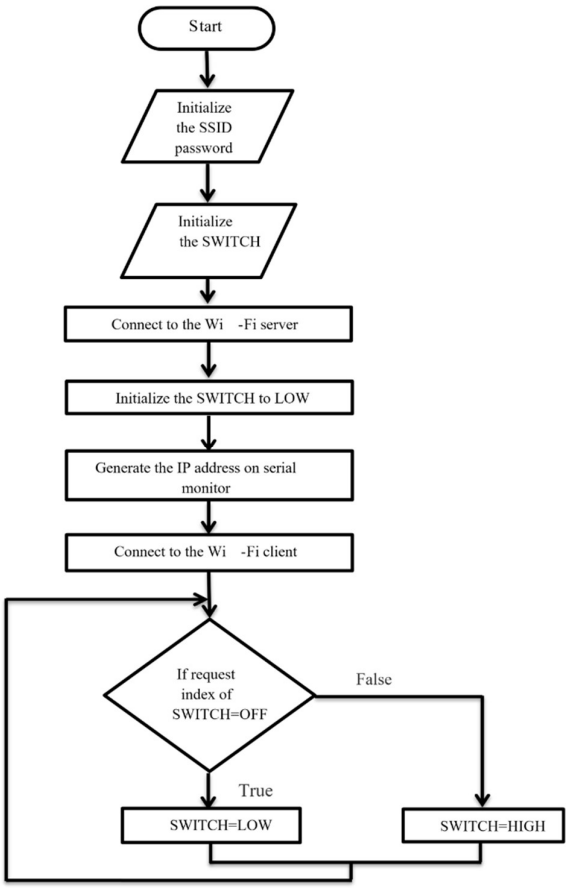


Fig.5 Flow chart of Arduino code for NodeMCU code

B. ANDROID STUDIO PROGRAMMING

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems or as a subscription-based service in 2020. It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development.

ISBN: 979-85-27243-61-1

Android Studio was announced on May 16, 2013 at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0.

The following features are provided in the current stable version:

- Gradle-based build support
- Android-specific refactoring and quick fixes
- Lint tools to catch performance, usability, version compatibility and other problems
- ProGuard integration and app-signing capabilities
- Template-based wizards to create common Android designs and components
- A rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations.
- Support for building Android Wear apps
- Built-in support for Google Cloud Platform, enabling integration with Firebase Cloud Messaging (Earlier 'Google Cloud Messaging') and Google App Engine.
- Android Virtual Device (Emulator) to run and debug apps in the Android studio.

Android Studio supports all the same programming languages of IntelliJ (and CLion) e.g., Java, C++, and more with extensions, such as Go; and Android Studio 3.0 or later supports Kotlin and "all Java 7 language features and a subset of Java 8 language features that vary by platform version." External projects backport some Java 9 features. While IntelliJ states that Android Studio supports all released Java versions, and Java 12, it's not clear to what level Android Studio supports Java versions up to Java 12. At least some new language features up to Java 12 are usable in Android.

Here in android studio code, the application reads the status/percentage of the battery from the mobile phone and if the given percentage is greater than actual percentage of the battery, it pings the NodeMCU and the digital pin becomes high which in turn turns on the USB port through MOSFET.

If the entered percentage is less than the actual percentage, the digital pin of the NodeMCU is low and the mobile does not charge through the USB port.

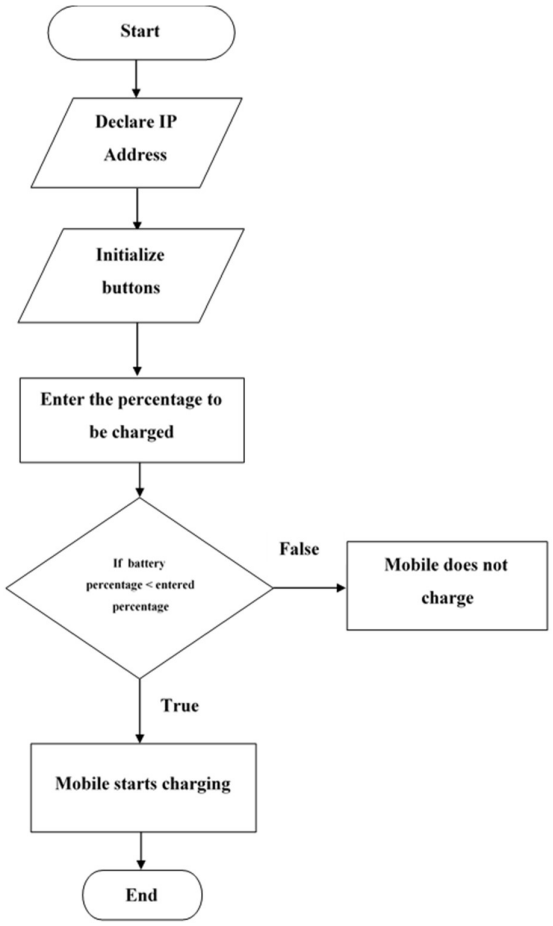


Fig.6 Flow Chart of Android Studio

V. RESULTS AND DISCUSSIONS

In Fig.7 the Blue LED indicates the Smart Charger is ON and ready to connect to a smart phone via Wi-Fi.

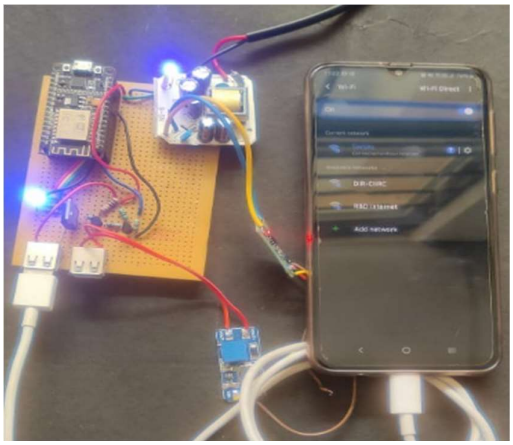


Fig.7 Connected without Internet to NodeMCU

ISBN: 979-85-27243-61-1

In Fig.8 the Red LED indicates the smart charger is connected to a smart phone and is charging the phone.



Fig.8 Status of device Charging

In Fig.9 the yellow LED indicates the smart charger is electrically disconnected the smart phone and is not charging the phone.

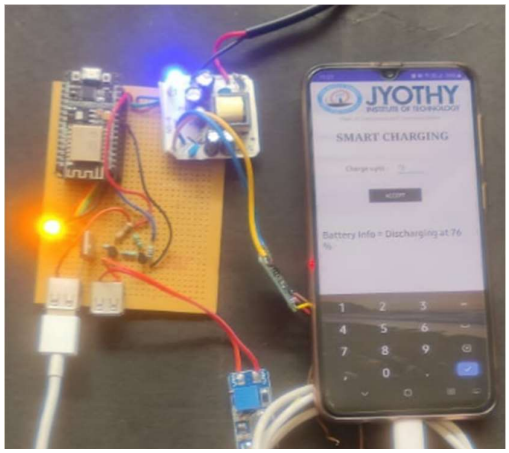


Fig.9 Status of device as discharging

VI. CONCLUSIONS AND FUTURE SCOPE

In this paper, a new method called smart mobile charging system is proposed and implemented using power transfer by a SMPS. This Smart mobile charging technique effectively decreases longer charging time hence provides an efficient alternative battery charging system. The application of Smart mobile charging system is in practice compatible with the modern technology which to a large extent focuses on the following; multitasking ability, portability and most importantly energy-saving ability.

FUTURE SCOPE

Today's portable devices (e.g., smart phones) now are rich multi-media enabled they consume more energy than ever before and advances in electro-chemical batteries cannot keep up with this ever-increasing energy demand. One wants to have at least 16 hours run time to allow an 8-hour overnight recharge and having some safety factor suggests battery lifetime between charges in excess of 24 hours is highly desirable. By having Smart charging, it becomes convenient and possible to charge the phone during the day while away from home in the office and public indoor locations

ACKNOWLEDGEMENT

I would like to express special gratitude to CIIRC®, Bengaluru, for providing internship and project at Affordable Medical Devices Laboratory.

I would like to express my thanks to the Director CIIRC® Dr. Krishna Venkatesh for encouragement that motivated me for the successful completion of internship and project.

REFERENCES

[1] Zhu Xi Zhang Xiaodong Wu Qingyu. "Wireless Charging System Based on Switched Beam Smart Antenna Technique".2007 International Symposium on Microwave, Antenna, Propagation and EMC Technologies for wireless Communications.

[2] Eun S. Lee1, Bo H. Choi1, Yeong H. Sohn2, Gyu C. Lim2, and Chun T. "Multiple Dipole Receiving Coils for 2-D Omnidirectional Wireless Mobile Charging under Wireless Power Zone". 2015 IEEE Energy Conversion Congress and Exposition (ECCE).

[3] Lucas Mearian . "Wireless charging explained: What is it and how does it work?" Year 2018.

[4] Qingwen Liu, Jun Wu, Pengfei Xia, Shengjie Zhao, Yanping Yang, WeiChen, and Lajos Hanzo: "Will Distributed Laser Charging for Mobile Wireless Power Transfer Work?"IEEE` vehicular technology magazine, Year -2016 vol: 11.

[5] https://en.wikipedia.org/wiki/Arduino_IDE

[6] https://en.wikipedia.org/wiki/Android_Studio

ISBN: 979-85-27243-61-1

A DESIGN OVERVIEW ON FACE RECOGNITION SECURITY SYSTEM

PRAJWAL R M[1], SAVITHA C[2], M Z KURIAN[3]

[1] *M.Tech (VLSI & EMBEDDED SYSTEM) Student, Dept of E&C, SSIT, Tumkur, India*

[2] *Asst. Prof., Dept of E&C, ECE, SSIT, Tumkur, India*

[3] *HOD, Dept of E&C, SSIT, Tumkur, India*

E-mail: [1]prajurm2015@gmail.com, [2]savithac1122@gmail.com, [3]mzkurian@yahoo.com

***Abstract*- At present, Security is the most essential section in human life. Present security cameras are used for safety of offices, homes and areas. In the existing security system, there are lot of weaknesses. So, to improve the recognition system, the biometric security system is used. The face recognition system is very effective in such a way that it provides an accurate response included with new quality and with high resolution camera. The maintenance and running of this security system are very easy. The face recognition system is introduced to carry images very rapidly. The passive infrared sensor is used to detect the motion in a specific region. Consequently, the images are attained by webcam. Afterwards, the face is detected and recognized in attained image. At the end of the process, image and notifications are send to the smart phone of an authorized person by using IOT application. So, in order to differentiate a person, the face recognition is one of the important and finest techniques.**

Index Terms- Face recognition, Security.

I. INRODUCTION

Nowadays, the security of the family and the house is important to everybody. For homes, cities and smart offices, the security system is very significant. In addition, the smart system provides the internet of things (IOT). There are a lot of benefits by the use of IOT in the smart areas and that enhance the security of citizens. The IOT has the capability to control the distinct things of the house like refrigerator, lights, gates etc. So, this technique is used in the smart offices, homes and the further security system is provided by computer vision in the IOT platform. It has capability to detect the motion in the incorrect area. Generally, it supports to recognize a person in the familiar areas like homes, offices and banks etc. The face is the important and significant part for human identity.

In olden days the nonliving things like keys, PINs, smartcard etc. were used by humans for authentication and to get entry in the restricted area. The face detection and recognition system are error free and noninstinctive procedure when compared with other biometrics. In face recognition approach, a given face is differentiated with the faces which are stored in the data base to identify specific person. The webcam is capturing the image after the detection of any motion by PIR sensor. Then the captured image is applied by the computer vision technique. Subsequently, by using IOT based application the image and notifications are sent to the smartphone through internet.

II. RELATED WORKS

In [1] N A Othman et al.by using Raspberry PI3 with PICAMERA, the Face detection security system is proposed. If the PIR sensor detects any motion, then the request will take an image suddenly. Afterword, the captured image is applied by the haar cascade algorithm to find the faces. The Adaboost learning is used to recognize the face from the Haar-like characters. Subsequently, smart phone catches pictures through the internet. But there is a problem arise that when use this technique only face is detected. So, the histogram of oriented gradients (HOG) algorithm is applied to the captured image. Then the support Vector Machine (SVM) learning classification is used to detect the human from the HOG features. With this method, only body is detected but not recognized [2]. In [3] Amritha Nag has proposed a Face detection and recognition System by using open CV. Because the open CV is decreasing the size of face images in the suitable faces without losing required features. Facial images of different persons can be kept in the database. But in this method OpenCV based face recognition system which was organised by python language is used to recognize the faces.

In [4] Maulik Upala gives the solution for smart library. Proposed technique forms a capability to upgrade the internet of things surrounding in academic library by using IOT applications. The control the issue such as detecting the occupancy of library study-rooms and decreasing manual effort are the main goals of this technique.

III. FLOW CHART

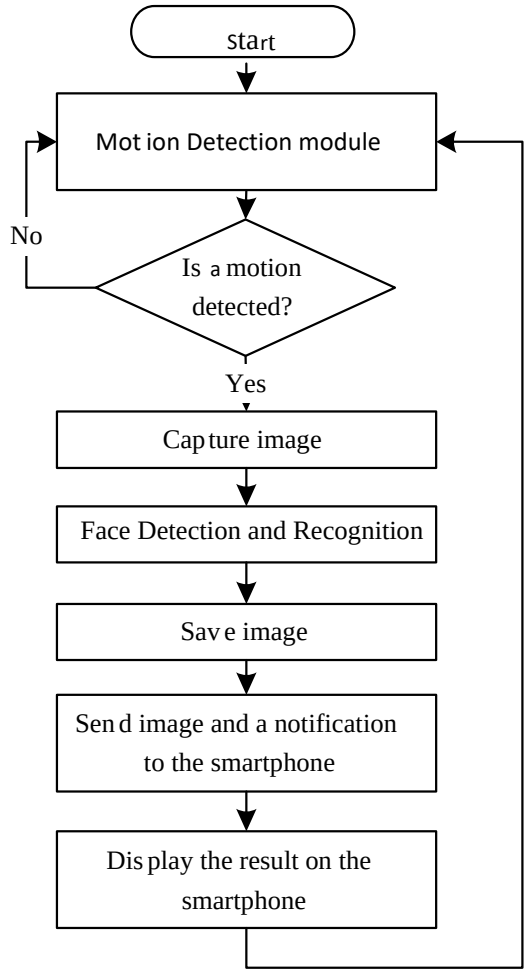


Fig1: Flowchart for Fac Recognition Security system

Figure 1 shows the flowchart of the proposed face recognition security system. The passive infrared sensor is used to detect the movement. It could be adjusted to scan every second. Then the webcam is attaining the images after the detection of the movement. The face detection procedure will restrict and segment the face region only. Then the face recognition process is applied on the face image. If the recognized face is detected, the door lock and chambers of the particular persons in the office are opened. Then the images and notifications are sent to the smartphone of an authorized person by using IOT application.

If the recognized face is not detected, the door lock and the chambers of the particular person in the office are not opened but then also images and notifications are sent to the smartphone of an authorized person. At the end of the process the result is display on the LCD display.

The face recognition system can be dividing in to three steps as shown in figure 2.

They are: 1. Face representation

2. Feature extraction

3. Classification

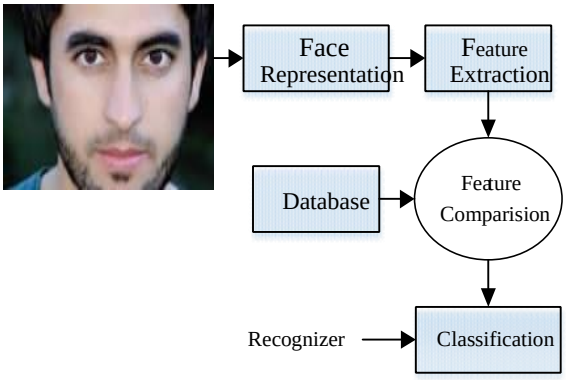


Fig. 2: Steps involved in Face Recognition system.

Face representation

It is the initial step in the face recognition process. This step shows that which algorithm can be used in the detection function and how to expose the face. In this step, Haar like features and Adaboost classifier are used for the face detection. The Haar like algorithm represents the face by dividing colors in the face as white and black because in the captured image there are lot of factor like shine, shape, image size etc. So, this algorithm is more effective in the face representation. For this reason, the captured face is modified in to grayscale and make normal it.

Feature extraction

It is the second step in the face recognition process. This step extracts the special and most useful features in the face image. Then the face image is compared with the images which are stored to get the feature. This step is the core of the face recognition system. For this step the LPB algorithm can be used. This method gives good and efficient results. It can be done in such a way that the face image is divided in to number of small areas. Then the features are extracted from every individual area. After that features are calculate from each area. Then all the areas are combined to a single feature histogram which conforms the pictures.

Classification

The third step in the face recognition process. In this step the face image is compared with the images from the storage to get the features. This can be done by using local features acquired in the earlier step of the algorithm. Then the face recognition is implementing through K-Nearest Neighbor (KNM) classifier based on the histogram matching method, after the LBPH feature vector is extracted.

IV.SYSTEM OVERVIEW

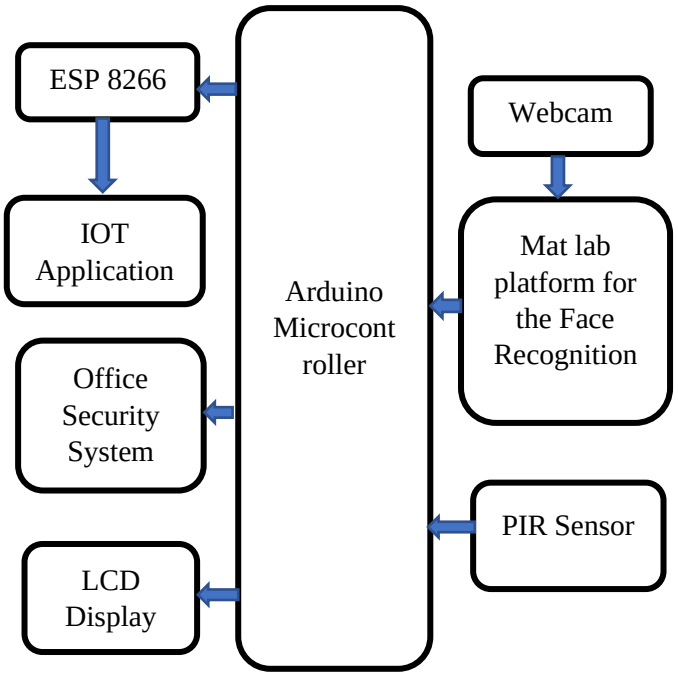


Fig. 3: Proposed block diagram for face recognition security system

Figure 3 shows the proposed block diagram of face recognition security system using Arduino microcontroller. The Arduino microcontroller is connected to the webcam as shown in the fig. 3. Because the Arduino controls the motion of the webcam. When motion is recognized by PIR sensor, the webcam is used to attain the image because webcam has high resolution power. Then to the captured image, the computer vision module is applied to recognize the human faces. When images are attained by webcam and are applied by computer vision module, the face is recognized easily because it has the capability to recognize the face. If the face is recognized it suggests that a particular person is demanding for the door access. Consequently, the door lock is opened and the chambers and system of the particular person in the office are opened. Then the images and notifications are sent to the smartphone of an authorized person by using IOT applications through ESP8266 wi-fi module. If the face is not recognized, it suggests that the door lock is not opened. Then also the images and notifications are sent to the smartphone of an authorized person by using IOT applications through ESP8266 wi-fi module. At the end of the process the result is display on the LCD display.

V. CONCLUSION

When compared to the other biometric systems, the face recognition security system is the finest technique. In a very short time, the people are identified by this security system. This enhances the security of the home and / or office by recognizing people. The face recognition technique substitutes security system. The process of existing biometric recognition system using iris, fingerprint, voice to identify a person is complex, also demanding the cooperation of user. For this reason, the proposed face recognition security system can provide better security compared to other biometric security systems.

REFERENCES

[1] N. A. Othman, I. Aydin, “A New IoT Combined Face Detection of People by Using Computer Vision for Security Application,” in Proc. 2017 IEEE International Conference on Artificial Intelligence and Data Processing (IDAP17), pp. 1-5.

[2] N. A. Othman, I. Aydin, “A New IoT Combined Body Detection of People by Using Computer Vision for Security Application,” in Proc. 2017 IEEE International Conference on Computational Intelligence and Communication Networks (CICN 2017), pp.1-5.

[3] Amritha Nag, Nikhilendra J N, Mrutyunjay Kalmath, “IoT based door access control using face recognition”, 2018 3rd International Conference for Convergence in Technology.

[4] Maulik Upala, WK Wong, ‘’IoT Solution for Smart Library Using Facial Recognition’’, IOP Conf: Materials science and Engineering 495(2019).

A DESIGN OVERVIEW ON HOSPITAL BED MANAGEMENT DURING PANDEMICS AND PATIENT HEALTH MONITORING SYSTEM

[1]KAVANA V, [2]M C CHANDRASHEKHAR, [3]M Z KURIAN

[1]M.Tech (VLSI & Embedded System) Dept. of ECE, SSIT, Tumkur, India
[2]Associate Professor. Dept. of ECE SSIT, Tumkur, India
[3]HOD, Dept. of ECE, SSIT, Tumkur, India
E-mail: [1]kavanav97@gmail.com, [2]mccshekhar@gmail.com, [3]mzkurian@yahoo.com

Abstract- In India, the concept of smart hospitals is slowly gaining popularity, but they are extremely high-priced. The Internet of Things (IoT) is bringing unprecedented change in a variety of fields, including telehealth, smart homes, agriculture, hospitality, and many others. Globally, the usage of moving healthcare monitoring systems with advanced technologies is causing great concern for many countries. Patient monitoring systems in hospitals and other medical centers has experienced progressive growth in recent years. Using medical sensors such as IR sensors, temperature sensors, and heartbeat sensors, this proposed healthcare monitoring system would provide real-time patient information. By combining IoT and image processing, the hospital bed management can be implemented. In this paper, discussed about how IoT can help hospitals to track the status of the beds. Liquid crystal displays (LCDs) track patient health condition. If that condition reaches a threshold, a SMS will be sent to global system for mobile communications (GSM) module.

Index terms- Internet of things, IR sensor, Liquid crystal display, Smart healthcare.

I. INTRODUCTION

Health is a kind of being phsially and mentally vigorous free from infection.It includes energy, strength, fitness, well- being and so on. Every person, regardless of religion, personality or status, should be concerned about their health. A healthy life is a boon to all living things. In this paper main concern is health and how the proposed automated system can be used to hospital management. By utilizing IoT, image processing, and certain medical sensors, the proposed system facilitates the management of beds. IoT describe the interconnection via the net of computing devices embedded in everyday objects, enabling them to send and receive information. Currently, the conception of "Hospital management" is switch to "Smart hospital". A hospital manager is responsible for so many things, including appointment scheduling, laboratory management, bed management, and patient monitoring using medical sensors. For the display of the number of hospital beds available, image processing and an IOT webpage were used.

COVID-19 is the name of a new virus that wiped out most of the universe in 2020. As a result of Corona virus, to protect ourselves and to kill the virus by using sanitizer frequently, wear masks, and maintain physical distance and faced second wave of this virus. New variants of corona virus has come, those are black fungus, green fungus and delta plus. Including this heard a new terms called "Lockdown" and home isolation, containment zone. After research, the immunizing agent for corona has come. An IOT web-based system that facilitates the management of hospital beds as well as monitoring patient health using medical sensors is introduced for this pandemic time. As a result of this hospital bed management program, publics can get beds at any given time during pandemic situations. For example, COVID-19, swine flu, Delta plus, cholera etc...

II. RELATED WORK

Modern healthcare is being aided by the IOT revolution in terms of its technology and social implications. By using it, innovative methods are used to capture, monitor, and manage patient data. It connects the digital world between man and machine. This paper propound a real-time health care monitoring system that is especially helpful for aged peoples and COVID patients. These parameters are monitored by doctors in order to check temperature, pulse rate, and heartbeat. GSM module sends a message to the doctor or nurse if one of the parameters means it has gone beyond the threshold value. By placing a camera in an intensive care unit (ICU) a hospital bed management system utilizing image processing is introduced. This can be observed in IOT webpage. An online dedicated website delivers information about available beds in hospitals. The website is centralized so that all users are able to access it from one location. This helps the hospital to be able to provide medical services during times of need and saves many lives. The proposed system is designed by making use of a arduino microcontroller, GSM module, matlab and LCD display.

The study concluded that they used real-time patient monitoring systems to track the patient's health. This device is equipped with an LCD display, a heart rate sensor, a pulse sensor, and many other medical sensors. In addition to capturing real-time body data, these sensors will allow for better treatment. The data concerning hospital bed availability in hospitals can be viewed on the IOT website for the convenience of hospital bed management during the epidemic. The hospital bed management is introduced here along with that patient health monitoring system. This automated bed management will be helpful for pandemic's like COVID-19, cholera, swine flu and delta plus. They can get beds easily by this technique, it also saves the time and one life. So that, a new automated bed management system is proposed that overcomes all the shortcomings of the current one.

III. SYSTEM DESIGN

The diagram of the propound system is delineated in Figure 1. The system consists of camera to capture the images and some medical sensors like IR sensor, Temperature sensor, Heart beat sensor as input and at output side LCD display, IoT webpage to display result. All these input output devices are controlled by the use of arudino microcontroller.

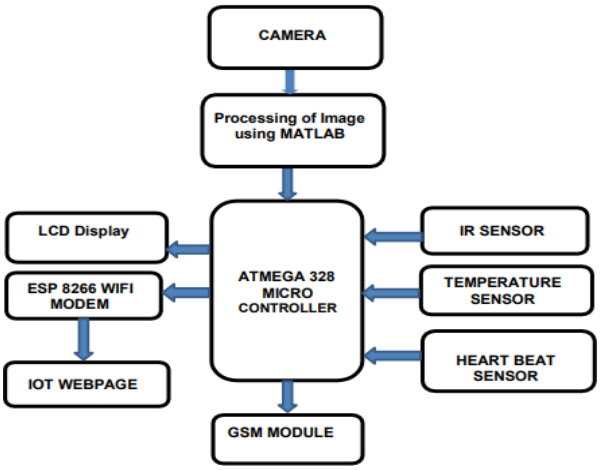


Fig.1: Block Diagram of Hospital bed management and health monitoring system.

The proposed system can provide the status of the hospital beds through IoT webpage. To know the real time status of the availability of the beds in the hospitals two different methods are used.

1. In ICUs image processing is used to know the occupancy of the beds as the patients are expected to be on the bed most of the time. Using this the status of the beds available is constantly updated.
2. In regular wards Sensors are used to know the presence of the patients and their occupancy, this is also updated on a real time basis.

Other than this there are some medical sensors attached to the beds and on patient's body in order to measure health status of the patient and if any thresholds are met then to immediately inform the concerned personnel to take an immediate action and these values are displayed on the LCD attached. All this updated can be accessed using the webpage on IOT platform which is kept open to all seeking for hospital beds.

IV. FLOW CHART

The flowchart of proposed system is depicted in figure 2. Matlab is employed to method the image captured by camera. Some medical sensors square measure won't to assess patient's health. Microcontroller Pass the information collected from Sensors and MATLAB software system to cloud. where ESP8266 act as associate wi-fi electronic equipment. GSM module is use to send SMS to doctors and patient's relatives concerning patient health.

V

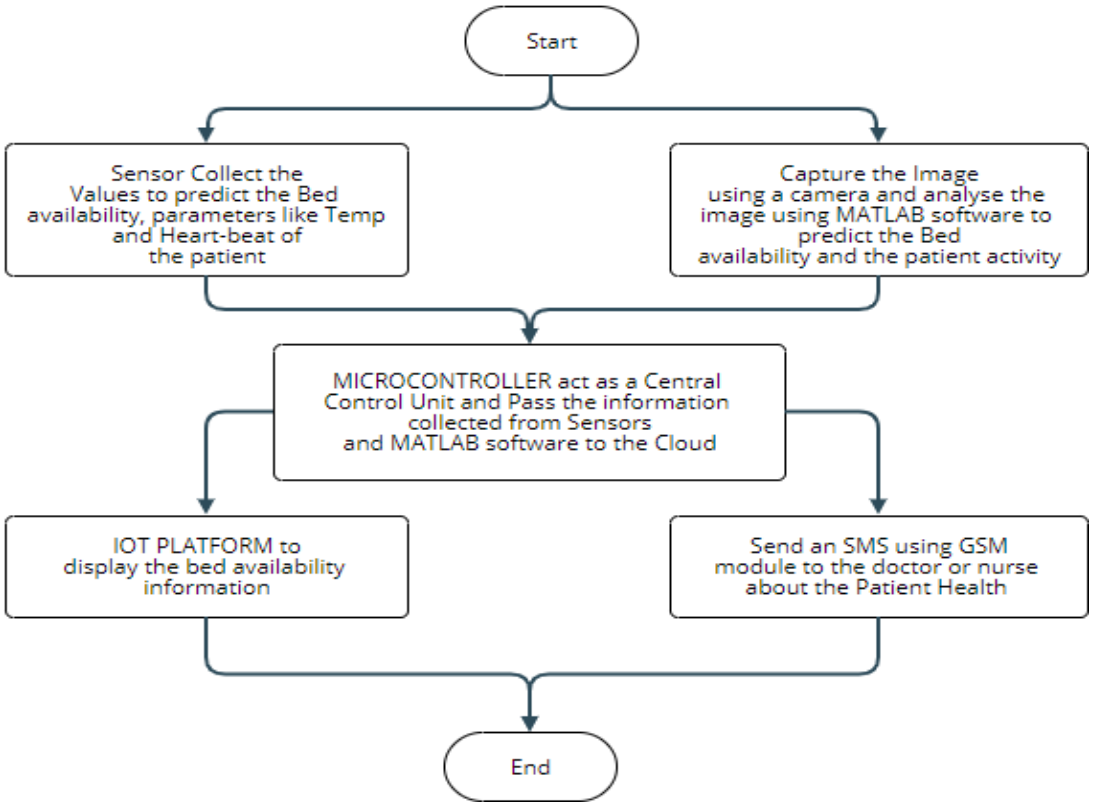


Fig 2: Flowchart of proposed system

V. CONCLUSION

The proposed system has been designed. The working flow has been analyzed for the process. Microcontroller act as an heart of the system. which collects information from matlab and display in IoT webpage. Some medical sensors are attach to patient body to evaluate their health continuously. LCD display use to show the values of sensors. GSM module is use to send an SMS to doctor about emergency conditions. Hence, the system has been designed and analyzed as per the requirements.

REFERENCES

[1] Zanilla A,Bai N,Castelani A, Vangellistta L,Zorrzi M .Internet of things for smart healthcare syetms.IEEE 2019;1:22-33.2019.

[2] Nordin S, Milon Islam M, Sharna FA. An patient monitoring system and web services. Internet Web Services. 2020;9:100130.

[3] Buecker articles from Europe Journal of Transfusion Science are provided here courtesy of Medknow Publications *Asian J Transfus Sci Blood banks*. 2015 July; **3**(2): 57–59.doi: 10.4103/0973-6247.53871 N. /"

[4] C. O. Rollim, et al, "A Cloud Computing Sevice for Patient's Data Collection in Health Care Institutions," First NationalConference on e Health, Telemedicine, and Social Welfare Medicine, 2018.

[5] P.Heryati, A.Aghagani,"Science of robot design and build robot" publication 2019

SMART TROLLEY USING ARDUINO AND RFID

Amrutha B R[1], Anusha S[2], Nadimpalli Rajkumar[3], Nayana K[4]

[1]Students, Dept. of ECE, Sai Vidya instituute of technology, Affiliated to VTU, Bengaluru, India.
[2]Assistant Professor, Dept. of ECE, Sai Vidya instituute oof technology, Affiliated to VTU, Bengaluru, India.
amruthabr.17ec@saividya.ac.in, anushas.17is@saividya.ac.in, nadimpallirajkumar.17ec@saividya.ac.in, nayana.k@saividya.ac.in

***Abstract*— nowadays shopping has become a part of our life. Going to malls or stores for shopping may have its advantage and disadvantage. Usually what people do when they go shopping is, first they take the trolley and search for the product they want, if they don't find it they should take the help of others or ask around. After taking all they want should stand in a queue if it's any occasion then it may have a long queue. At the cash counter, they scan each product, this may take more time. Sometimes customer feels frustrated during the procedure. So to overcome this difficulty we use RFID and Arduino technology.**

***Keywords*—RFID, shopping trolley, Arduino**

I. INTRODUCTION

People are developing a technical system to their requirements. This continues development in the technical field in the world leading to stress-less life to the people and also human day to day life is changing. Humans don't have the time in this hectic life to spend more time in any of the daily life work. Even people don't have time to spend for shopping things in different places so they prefer going to shopping malls where most of the products will be available in one place. So this leads to more people in the shopping malls, so we know in the traditional system the customer take products needed and puts in the basket for the checkouts they have to wait at the exit counter for payments which leads to long queue. Even though technology evolved the traditional method of shopping is not evolved, according to the survey customers spend more time in the billing counter queue rather than the shopping things. Even more, the human resource should be hired by the manager for the traditional method. [1]

So in this project, "Smart trolley using RFID and Arduino" will reduce the time for the customers, and also less manpower can be hired in the shopping mall. This technology is automated where becomes the future for every shopping mall and also grocery shop.

An RFID tag is used for the products in this project, with each product having a unique tag that represents the product name. The RFID reader is then attached to a microcontroller, which is programmed with the tag number and can be reprogrammed. The keypad is connected to the microcontroller. [3]

II. LITERATURE SURVEY

A paper on "Aisle-level scanning for pervasive RFID-based shopping application" by Amine Karmouncheand Yasiine Salih-Alj discussed about replacing barcodes which are expensive in the manual billing system with the RFID tags and reader, even the rush at the billing counter is reduced. Aisle-level scanning is performed in this method where RFID reader is only present in the specific aisle. The main aim of constructing system architecture is to connect between IP based domain and RFID domain. RFID layers interact with instructions received and the data present in the cloud. Advantage is maintenance cost is low, the major drawback since all the products don't have RFID tag there will be high chances of stealing products. In future research mentioned about adaptation of LANDMARC for the passive RFID tags.

A paper on "Robust low-cost passive UHF RFID based smart shopping trolley" by Tharinadu athauda, Juan carlos, Lugo marin, Jonathan lee, nemai karmakar using RFID technology and Zig bee has developed automatic billing system for the shopping mall and also easy to track the various products in the mart for both customers and sales person in the mart. Use of UHF RFID can read both near field and far field and also multiple tags can be read at same time, UHF RFID operates at a frequency of 860 to 960 MHz In the implementation circular polarized antenna antenna and coupler are fabricated to the trolley and UHF RFID tags and reader are fabricated to products and trolley. In the future work RF insulation is suggested to implement in the trolley. This proposed system can be developed by using data mining techniques to get product information at multiple place. The use UHF RFID is demonstrated in this paper.

A paper on "Developing a multitasking shopping trolley based on RFID technology" by Satish kamble, Sachin meshram, Rahul thokal, Roshan gakre proposed project on shopping trolley, components of RFID an antenna, a transceiver, a transponder with unique information. 5V of power supply is used, language used is VB.net and embedded C. the prototype model is easy to develop, low cost easy to use. In the proposed project the classification made is serial to USB converter, contribution and library management system, student attendance system. When the required product is dropped to the cart, RFID

reader scans the tags and updates the bill of that items which are displayed in LCD display.

A paper on "Smart trolley with instant billing to ease queue at shopping malls using ARM7 LPC2148" by Mohit Kumar, Jaspreet Singh, Anju and Varun sanduja discussed about smart trolley where it is an embedded system that uses ARM 7 microcontroller and RFID process for the development of the project. The algorithm used in this paper is start, on the system, searching of RFID tags, read the data from the memory, displaying on LCD, add item prize, print the total bill, and stop. For a LCD display Kiel software is used for creating code and use of flash magic to burn the non-required code. Electronic devices are so helpful in shopping mall which makes shopping easier and lots of benefits to the manager of the shopping mall. Working of this project using RFID and Zig bee technology is easier and a very vast application in the future.

A paper on "RFID based smart shopping: An overview" by Zeeshan Ali and Reena Sonkusare has developed budget limit setter where customer can set the total budget for that particular shopping, LCD display will show the total prize of the shopping and the processor will compare both prize gives signal to the customer. Improving store management and improving commodity allocation is mentioned in this paper which helps the management to improve the mall in better way in low cost. This developed system is ease to use and the communication used in this prototype is not that secure, another signal which is operating at same frequency can easily interrupt other server and then miscommunication with networks will take place and trolley get confused it may show wrong output data. Proper resolved process should be used for the smart trolley.

III. EXCISTING SYSTEM

There are many billing systems available in the current markets. Even now some of the retail shops use manual billing systems. In supermarkets (or) malls, the billing proposal will be done using a barcode scanning system. In these places, customers will place the items in the cart which they are required. For this management will provide one or more billing counters who need to wait or stand in queue till he gets his turn. In the billing counter where staff will scan all the products by the barcode scanner which is in the cart which will take more time. Many of the shops provide online payments and payment through the app like phonepe or google pay, an option of credit card or debit card and also cash. After completing of billing process they start with the packing process [9]. As we mentioned earlier, the biggest problem with the existing system is the customer should wait in a queue.

A. EXISTING SYSTEM PROBLEMS



Fig.1. queues in shopping mall

There is a need for automated billing system which is inbuilt in the cart which helps customer to operate in self-shopping process without any delay in the billing queue. An automated shopping system should include in a place to improve the satisfaction of the customer and fast customer service and to reduce the rush in the shopping malls and also to improve the complete shopping experience. The main aim of the system is to provide customer convenience, time efficiency, and good performance [4]. This can be achieved by using the ZigBee module which is implemented by using RFID technology.

In the present existing is shopping malls are time consumption is a big problem in the billing counter. The customer will not be having any idea about day-to-day offers and availability of stock and sometimes a customer will be shopping more than his budget without his knowledge. So keeping more than his budget without his knowledge. So keeping all the problems in mind, the system should be developed in a way that customers should have an easy to user interface and it should also be helpful to the vendor to know the stock and demand of the product. This all can be achieved by using RFID technology and it is useful to the vendor by GSM technology. GSM technology is implemented to help a vendor to know the details of the products such as availability of products, highly sold products by customers with this information, a vendor can bring the stock of the products in the next day.

IV. PROPOSED SYSTEM

The objective of the proposed system is to provide low-cost technology-oriented, easily usable, and the best system to assist customers for a better shopping experience. The RFID-based customers for better shopping trolleys are built to enhance the good shopping experience for all the customers. After dropping an item into the cart the customer will get to know the information of the product such as expiry date, price, weight, and other information [5]. If the customer does not sure about a location of an item through the cart. It also includes the other features that bill will get generated automatically and the total price will be

updated and displayed in LCD after dropping of every product.

A. *Working*

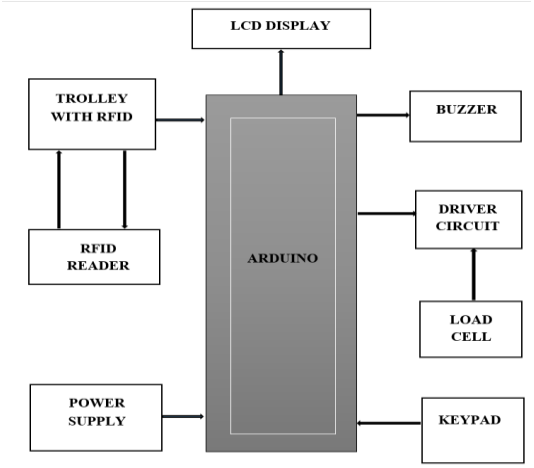


Fig.2.Block diagram

The cart is attached with an RFID reader, ZigBee trans-receiver, and an LCD. At the start the cart is deactivated, after entering the aisle in the shopping mall the cart will be activated with the passive RFID tag and also turning on the RFID reader.

The cart contains an RFID reader that sends the tag ID of the product as and when the customer drops the product or is removed from that particular cart, the price of the product will be updated to the main reader and also to the respective cart [12].

The cart ID and tag ID of the product and also the prize is sent by the RFID reader to the main server. The LCD will show the total bill of the products which are picked up by the customers. The main server constantly connected to the database through the server which contains ZigBee trans-receiver, this main server constantly connected to the database server which contains ZigBee protocol, and also the main server is connected to the exit door RFID reader where no customer can leave the shopping mall without paying the bill [6]. The main server, RFID reader, tag, and the reader in the exit door all are connected and communicated using ZigBee protocol.

B. *ZigBee*

ZigBee is a wireless technology that is used for high-level communication. This consumes low power hence it is more used in home automation and medical industries. ZigBee is also low in data rate and proximity. There are less expensive than WPAN'S or WI-FI, they can transmit up to 10-75 meters [3]. The most important thing is interruption of data from the sensor is avoided. In this proposed project ZigBee is used for the communication from the RFID reader to the main server.

V. DESIGN AND IMPLEMENTATION

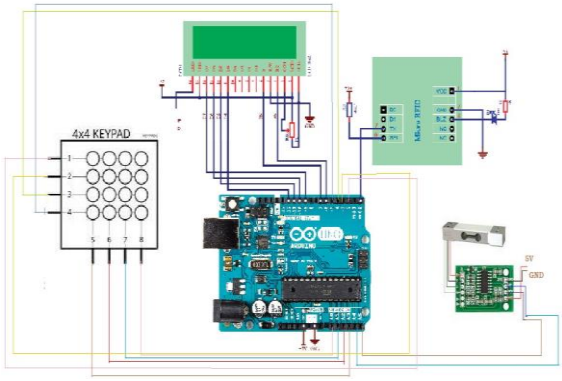


Fig.3. system architecture

A. *Hardware design*

1) *Arduino*

Arduino is a microcontroller board based on the ATmega328P microcontroller from Microchip. The board has 14 digital and 6 analog input/output pins, as well as a USB connector, a power supply jack, an ICSP header, and a reset switch. It will accept voltage between 7 and 20 volts. With the help of the Arduino IDE, it is programmed.

By using special rules of C and C++ languages we can write code on Arduino IDE. The Arduino Uno have many facilities to communicate with computer, and other microcontroller.

Power has several pins, including VIN, 3.3V, 5V, and GND. Each pin is used in a different scenario depending on the need. The microcontroller is reset using the reset button. Analog pins (A0-A5) are utilized to provide analogue input in the 0-5V range. Input/output pins (digital pins 0-13), which can be used as input or output. Serial (0(Rx), 1(Tx)) pins are used as TTL serial data receivers and transmitters. It features external interrupts (2, 3) that can be used to cause an interrupt. For 8-bit PWM output, PWM (3, 5, 6, 9, and 11) is used. SPI is used for SPI communication and has different pins for different operations (10-SS, 11-MOSI, 12-MISO, and 13-SCK). It has Inbuilt LEDs in it (13). It aids in TWI communication (A4-SDA, A5-SCA). The reference voltage for the input voltage is provided by AREF.

2) *RFID*

Radio frequency identification uses electromagnetic field to track and identify which is connected to an object. Some RFID tags are powered by battery, but not many RFID tags are self-powered. This system consists of radio transponder, receiver and transmitter. It is a technology where the digital data which is encoded in RFID tag are captured by reader through radio waves. RFID is similar to barcode but has several advantages over barcode for example rfid tag doesn't require line of sight, whereas barcode must

require line of sight. RFID tag contain information or a unique identification code.

It has 4 components

- RFID tag
- RFID reader
- Antenna
- Controller

RFID tag

RFID tag contain memory in the form of microchip, which stores the unique code for tag identification, this identification is called as tag ID. The basic function of RFID tag is to store data and transmit data to interrogator.

Types of RFID tag are: Active, passive and semi-passive tags.

Active tags: The active tags are powered by a battery and does not require an interrogator for a power source. The battery is used to power the IC and transmitter. The active tags are essential for longer read ranges i.e. from 300 to 750 feet long. It is more expensive, larger and bulkier compared to passive tags. The disadvantage of active tags are the life span is less than that of passive and semi-passive tags.

Passive tags: Passive tags doesn't contain power source. It depends on interrogator for power. The source of power is the radio wave which are emitted by RFID reader. The read range is of 2 to 20 feet. These are simple, cost effective and reliable tags. The life span of passive tags are better than active tags because it only work when it is required. This have limited storage and it do not have a potential to add any additional features. They don't attach any external pressure, light sensor like active tags.

Semi-passive tags: Semi-passive tags contain a battery and perform backscattering mechanism to communicate with reader. The battery allows the external features such as sensors, real time tracking and sound notification which are applied to tags without increasing read range. It does not have active transmitter like passive tags, therefore it makes invulnerable towards radio interference. It has longer read rang compare to passive tags i.e. up to 100 feet. It is costly, temperature sensitive, large in size and has limited life span compare to passive tags.

RFID reader

It is brain of RFID system and necessary for any system to function .It is used to receive information which are sent by RFID tag. RFID reader consists of RF module which is used to transmit and receive radio frequency signal. RFID reader communicate with tags with the help of RF channel to get the information. An integrated RFID reader is built-in antenna that includes an additional port to connect optional external antenna. It is divided into two types- fixed RFID reader and mobile RFID reader.

Fixed reader located in one place and mounted on walls, desks, in portal or other fixed location.

Mobile reader are handheld device which allows flexibility while reading RFID tag when still it is able to communicate with host computer or device. There are two types- reader with onboard computer called mobile computing device and reader which uses Bluetooth connection to smart device called sleds.

CLASSIFICATION OF READERS BASED ON DESIGN AND TECHNOLOGY

1. Read - only reads data from the tag

- It consists of a wound output coil, peak detector hardware, comparator, and firmware
- It is used to transmit energy to a tag and reads information back from it by detecting the backscattering modulation

2. Read/write - reads and writes data from/on the tag

-In this case the reader is a handy, movable device

-The device is placed in a particular place such as entrance gate, or at exit gate of product mobile.

RFID Antenna

It is an important element in RFID system because it converts RFID reader s signal to RF waves which can be chosen by RFID tag. RFID antenna receives power directly from reader. When RFID reader transmit energy to antenna, it generate RF field. And then RF signal is transmitted to tags.

RFID controller

A controller often acts as a PC or workstation running database. It is used to control software which is also called as a middleware. The controller sometimes it is called as host. In this project we are using DT125R reader.

DT125R series

The DT125R series RFID also called OEM reader module, it has a built in antenna which is small in size and frequency of 125 kHz. This reader module which has either internal or external antenna which is used to communicate with read-only transponder through air interface. The type of transponder used here is UNIQUE or TK5530. The tag which contain data, it is sent to host through wired communication internet with protocol which is selected from module pinout.

Features of this module

- Selected UART or wigands26
- No repeat reader
- Plug-and-play , needs +5v to become reader
- Very efficient module for portable reader
- Excellent read performance
- LED indicate tag is in reading operation
- Smaller size and low cost

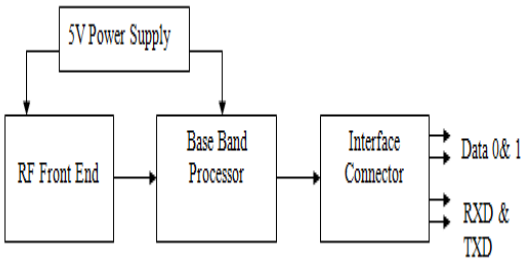


Fig.4. Block diagram of DT125R

The DT125R reader consists of a RF front end connected to base band processor these two are operated by 5v power supply. An antenna is connected to RF front end, and it is tuned to 125 kHz used to detect tag. The RF front end reads the data from tag and it is detected and decoded by baseband processor and the result is sent to UART interface. The reading range of DT125R is up to 50mm to 100mm. The LED and beeper is connected to pin out which indicates tag reading status.

Specifications

- The dimensions of the module (in l×b×h) is 30×30×10
- The frequency required is 125khz
- Reading distance should be great than or equal to 50mm
- Interface used is UART , wiegand26
- It has built-in and external antenna
- Supply voltage of 5v
- Used in -10°c to +50°c(-14°F to +122°F) of temperature
- Tag used is of type UNIQUE, TK5530
- Output format is of type ASCII or wiegand26
- It is in black color

The DATA 0 & DATA 1 (pins 3 & 4) provide tag information in Weygand 26 format. The TXD & RXD (pins 5 & 6) provide tag information in ASCII format.

3) LCD

A LCD is a device which measures electromagnetic radiation that uses light-modulate properties of a liquid crystals to display a certain image. Compared to seven-sided and other multi-segment LEDs, these modules are quite popular. There are several reasons for this, including the fact that LCDs are inexpensive, simple to program, and do not have any specific constraints for showing special characters or even characters.

LCD is used to display the data. We used 16*2 whereas it displays 16 no of characters in each line and it contain two lines of total 32 no of characters to display. It needs +5V to control the display. It will be attached to port 2 of the microcontroller and it will be acting as the output of microcontroller. It take help of ASCII numbers to provide display of characters.

Each of the 16 pins on an LCD has a distinct function. Vcc (gnd) is connected to system ground on Pin-1. Pin-2 is Vdd (+5 volt) and supplies +5 volts to the LCD (4.7v-5.3v). Pin-3 is VE (contrast V), which determines the display's contrast level and is grounded to achieve maximum contrast. Register Select (pin 4) is attached to the microcontroller and is used to switch between registers. Pin-5 is the Read/Write pin, which is used to read or write data to the LCD and is generally grounded to do so. Pin-6 is Enable, It toggled between 1 and 0 and connected to microcontroller. Pin-7to14 is Data pin from 0to7, the total data pins will come from an 8-bit data line, but these LCDs can also operate in 4-bit mode by leaving data pins 4,5,6,7 open. Pin-15 is the LED Positive terminal for the backlight LED. Pin-16 is a negative terminal for the backlight LED.

4) Keypad

Numeric data input device is of matrix form containing four rows and three columns. It has combination of numbers i.e. 0 to 9 and symbol asterisk '*' and hash '#'. Every row and column are connected with wires, therefore there are seven wire in total. The columns are always high and rows are always low.

The use of the keypad device is a user can choose for viewing the product and for ending the trolley.

5) Buzzer

Generally, the sound provided of a sound equipment is consists of piezoelectric diaphragm. A piezoelectric diaphragm will have piezoelectric ceramic plate. The ceramic plate consists of electrodes on either side or a metal plate. By providing DC voltage between electrodes will leads to mechanical distortion due to piezoelectric effect. When we provide AC voltage over electrodes, the blending will be continues, by generating sound waves in the air medium. To be in contact with the buzzer it uses standard transistor interfacing circuit.

High 1 is used to switch ON the buzzer

Low 1 is used to switch OFF the buzzer

It has two pin numbers, one positive and the other negative. The '+' symbol or a longer terminal lead identify the positive pin, which is powered by 6V DC. The short terminal lead on the negative pin indicates that it is connected to the circuit ground.

6) Load cell

The load cell will help to transfer the force into an electrical signals which gives analog output voltage, it is a transducer. The load cell used for theft avoidance, where the products are weighed as and now the products are dropped in the trolley. The load cell is designed to automatically operate and balance pressure. Air pressure is kept at one end of the diaphragm and it will escape from the nozzle at the bottom of the load cell.

The load cell generate output electrical signal which is in millivolts and it cannot sensed by 8 bit or 12 bit ADC. Before it is used it will amplify this low voltage signals with the help of Special instrumentation amplifiers. HX711 24-bit ADC is IC's based module, it is used to eliminate the need of costly instrumentation amplifiers.

7) Power supply

For this project circuit we need two voltage i.e. +5V & 18V to complete the work.

This two voltage are furnished by the specially designed power supply.

The main aim of the power supply is to furnish the required amount of balanced and pure power to the project circuit. This balances DC output can be achieved using three terminal voltage regulator IC. The voltage regulator IC has 78xx for the output voltage position and 79xx for the output voltage negative. For example if we take 7812 given +5V then 7912 gives -5V.These voltage regulator IC's have integral short-circuit problem and also auto thermal cutout supply.

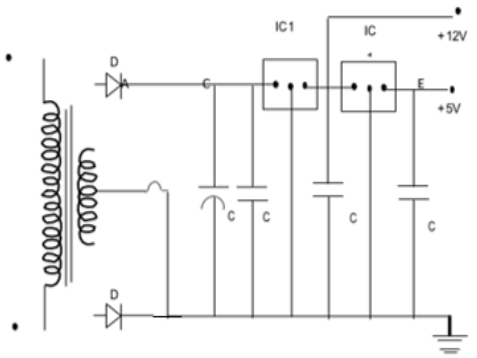


Fig.5.Power supply

Step down transformer: Regardless of the oscillation of the AC mains, this DC power supply keeps the output voltage constant. With the transformer, this supply requires two diodes. This power supply has line and load regulation, as well as output voltages of +5V and +12V and a maximum output current of 1A. There are four parts to the circuit description:

Step down transformer: This transformer has the capacity to supply a current of this current is more than adequate to operate any electronic device or circuit when the primary winding is 230V and the secondary winding is 12-0-12 V, 1A. The peak value is 12 *1.414=16.8V and the RMS value is 12V AC throughout the secondary winding. The value will be limited by the use of a 1N4007 diode, which has a peak inverse voltage of 16V.

Rectifier stage: The diodes D1 and D2 of this transformer's rectifier stage are linked over the secondary winding. The point A of the secondary winding of the transformer becomes positive during the positive half cycle of the secondary voltage, so the diode D1 forward biases and conducts, while the point B becomes negative, so the diode D2 reverse biases and conducts. For both half cycles, the current at the centre top terminal will be in the same direction, and the pulsating DC will be at point 'A.'

Filtering stage: Capacitor C1 is used to filter the signal and is connected to the rectifier output. Given the constant DC voltage, this composition filters the AC components present in rectified DC. C1 is a short capacitor with a low reactance to AC current components and an open circuit to DC current components. The short capacitor stores energy in electrostatic form in position half cycle; in negative half cycle, this capacitor delivers the stored energy to the load.

Voltage regulation stage: A rectified and filtered DC will be present between point D and ground during the voltage regulation stage. The KIA7812 and KIA7805 three-terminal voltage regulator ICs are used in this circuit. The KIA7812 provides a +12V regulated DC output, while the KIA7805 provides a +5V regulated DC output. Pin 1 of a three-terminal voltage regulator IC is connected to rectified and filtered DC, pin 2 is the common pin that is grounded, and pin 3 is connected to a load of stabilized DC output. In this circuit, the decoupling capacitors C2&C3 are employed to provide a ground channel for the high frequency noise signal. The continuous DC output is measured at points 'E' and 'F' w.r.t. ground +5 V and 12V.

B. SOFTWARE DESIGN

Tool used: ARDUINO IDE

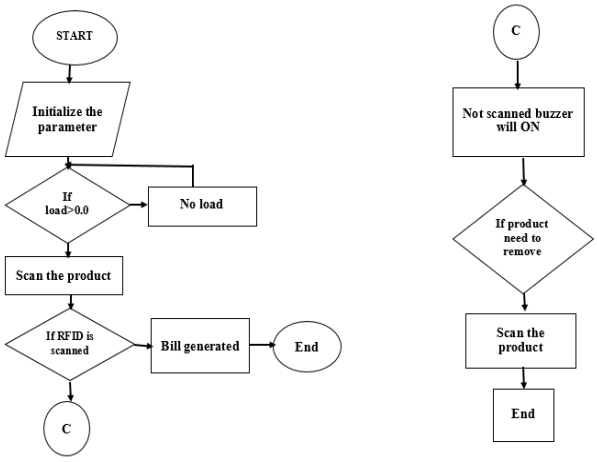
This Arduino IDE (integrated development environment) supports the C and C++ programming languages, resulting in computer code for wired goods with shared input and output. Arduino is a free, open-source platform that is simple to use in terms of both hardware and software. It comes with a programmable circuit board and the Arduino IDE, a ready-to-use software for writing and loading programmers onto the circuit board. A sketch is a program created using the Arduino IDE and saved as text files with the file extension.ino on the development computer.

Arduino IDE has two functions: 1. Setup (): This function is called when the sketch is powered up or reset. 2. Loop (): This method is called after the setup () function has been called.

The following aspects are taken into account while choosing a programming language for embedded systems: size, speed, portability, ease of implementation, and readability. Many programming languages can be used for embedded systems, including C, C++, JAVA, and JAVA script. The programming language utilized in this project is embedded C, which is the most commonly used for the evolution of embedded systems.

Embedded systems are made up of both hardware and software that are meant to complete a task; the hardware is referred to as the "heart" of the system, but the software is as crucial because poorly written program are useless for advanced hardware components. Bit, Sbit, Sfr, small, and large are all keywords in embedded C. Comments, preprocessor directives, global variables, local variables, and main functions are all parts of an embedded C programing.

C. Flow chart



D. Expected outcome



Fig.6. normal cart vs smart cart

This paper's proposed shopping cart will support smart technologies in the trolley, making it more efficient than the current system shopping cart. As a result, the smart technology in the cart is more beneficial to the customers. In the fig.6 we can observe that smart cart can be developed using the algorithm as mentioned in this paper. The cart may be designed for the position of the products, expiry data, and rewards will be shown in LCD for a more efficient outcome.

SL.NO	PRODUCT NAME	QTY	PRICE / PRODUCT	TOTAL COST
1	Dove	5	40	200
2	Close-Up	2	25	50
3	Cheese	1	50	50
4	Kissan Jam	4	30	120
5	Munch	8	10	80
6	Loreal Paris	3	70	210
7	Maggie	6	20	120
8	Parry's Sugar	4	35	140
9	Phillbery	2	55	110
10	India Gate	5	60	300
	TOTAL BILL COST :			1380

Fig.6. Final bill

Above figure is the final bill which will be sent to the customers through mail, and in the above example bill total cost, quantity of each product, product name, price of each product and number of products purchased is also shown.

VI. COST ANALYSIS

The initial cost of this proposed system will be high, where the RFID per tag is ₹199 but this cannot be damaged and it is reusable by changing data. But where as in barcode system the cost of the barcode are high and also line of sight is required. Overall compared to barcode scanning process the RFID scanning products are less costly.

VII. CONCLUSON AND FUTURE WORK

This planned model is straightforward to use and doesn't need the practice to operate it. This model is developed so that product identification is also easier. The whole existing system is changed where the workers in the shopping mall can decrease which is beneficial to the retailers. The time for the customers is saved where the billing is already generated, no need to wait in long queues, only paying the bill and taking of the products. In future the trolley can be modified to fully automate using DC motor and cameras for the trolley to follow the customers without pushing it.

VIII. REFERENCES

1] A. Karmouche and Y. Salih-Alj, "Aisle-level scanning for pervasive RFID-based shopping applications," 2012 International Conference on Computer Systems and Industrial Informatics, Sharjah, 2012, pp. 1-4, doi: 10.1109/ICCSII.2012.6454582.

[2] T. Athauda, J. C. L. Marin, J. Lee and N. C. Karmakar, "Robust Low-Cost Passive UHF RFID Based Smart Shopping Trolley," in IEEE Journal of Radio Frequency Identification, vol. 2, no. 3, pp. 134-143, Sept. 2018, doi: 10.1109/JRFID.2018.2866087.

[3] Kamble, Satish, Sachin Meshram, R. Thokal and Roshan Gakre. "Developing a Multitasking Shopping Trolley Based On RFID Technology." (2014).

[4] "Smart trolley with instant billing to ease queue at shopping malls using ARM7 LPC2148" by Mohit Kumar, Jaspreet Singh, Anju and Varun sanduja.

[5] D. Sinha, K. Cottur, K. B. H., G. C. and B. N. K., "Automated Billing System using RFID and Cloud," 2019 Innovations in Power and Advanced Computing Technologies (i-PACT), Vellore, India, 2019, pp. 1-6, doi: 10.1109/i-PACT44901.2019.8960144.

[6] T. Sarala, Y. A. Sudha, K. V. Sindhu, C. Suryakiran and B. N. Nithin, "Smart Electronic Trolley for Shopping Mall," 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), Bangalore, India, 2018, pp. 2422-2427, doi: 10.1109/RTEICT42901.2018.9012466.

[7] R. Chadha, S. Kakkar and G. Aggarwal, "Automated Shopping and Billing System Using Radio-Frequency Identification," 2019 9th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2019, pp. 693-697, doi: 10.1109/CONFLUENCE.2019.8776944.

[8] P. Chandrasekar and T. Sangeetha, "Smart shopping cart with automatic billing system through RFID and ZigBee," International Conference on Information Communication and Embedded Systems (ICICES2014), Chennai, 2014, pp. 1-4, doi: 10.1109/ICICES.2014.7033996.

[9] A. Kumar, A. Gupta, S. Balamurugan, S. Balaji and R. Marimuthu, "Smart Shopping Cart," 2017 International conference on Microelectronic Devices, Circuits and Systems (ICMDCS), Vellore, 2017, pp. 1-4, doi: 10.1109/ICMDCS.2017.8211723.

[10] H. Pangasa and S. Aggarwal, "An Analysis of Li-Fi based Prevalent Automated Billing Systems in Shopping Malls," 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2019, pp. 449-453, doi: 10.1109/ICCMC.2019.8819693.

[11] M. Sanap, P. Chimurkar and N. Bhagat, "SMART-Smart Mobile Autonomous Robotic Trolley," 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2020, pp. 430-437, doi: 10.1109/ICICCS48265.2020.9120972.

[12] T. Hanooja, C. G. Raji, M. Sreelekha, J. Koniyath, V. Muhammed Ameen and M. Mohammed Noufal, "Human Friendly Smart Trolley with Automatic Billing System," 2020 4th International Conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, 2020, pp. 1614-1619, doi: 10.1109/ICECA49313.2020.9297439

DESIGN OF SURFACE PLASMON RESONANCE IN GAP WAVEGUIDES

Adarsh S K*, Saida S, Manoosha G, Sai Keerthi S, Anantha Vishnu k

Department of Electronics and communication Engineering, *Srinivasa Ramanujan Institute of Technology* Anantapur, Andhra Pradesh, India

*adarsh.ece@srit.ac.in, 174g1a 0482@srit.ac.in

***Abstract* - In this work, the modal analysis and power coupling analysis of gap plasmon wave guides for use in optical sensing applications is presented. The power coupling analysis is carried out by using Lumerical FD TD simulation tool. The structure consists of Silver (Ag) metallic wave guides separated by a very small gap distance in the range of less than 100nm on glass substrate. Two separate Ag- metallic arms attached to the metallic waveguides at the center of the structure is used as nano antenna which acts as an electromagnetic wave sensor. The pro pagation constant of the metallic electrodes used as optical nano antenna to sense the light from Gaussian light beam is analyzed with respect to variations in width of Ag-metallic arms. The optical light beam is illuminated in the direction normal to propagation direction in metallic waveguides. The optical nano antenna is used to couple the optical beam into air gap present between me tallic waveguides. The power coupling analysis is carried out at 1550nm for variations in numerical aperture (NA) of optical source. The modes are coupled to the air gap and results in 4.8% to**
12.17 % of o ptical power coupling by using high numerical aperture optical beam. Such structures can be effectively used to solve light coupling problem in SPR based gap waveguides and can be used in many more optical sensing applications.

Index Terms - Plasmons; Surface plasmon resonance (SPR); Nano-antenna; Gap- waveguides; power coupling.

I. INTRODUCTION

Bio-sensors that rely on rapid and portable screening techniques have been of interest to identify harmful toxins for food safety or to detect chemical or biological agents that could be used in bio-terrorism. The predictable advantage bio-sensors offer over many other bio-physical techniques is that it is label-free, chemical or radio labeled tags, eliminating the need for fluorescent.

Surface plasmon resonance is the resonant oscillations of conduction electrons at the interface between metal and dielectric material.Surface plasmon resonance (SPR) is generally occurs at metal surfaces (typically gold and silver). when an incident light beam strikes the surface at a particular angle. The SPR phenomenon results in a graded reduction in intensity of the reflected light Depending on the thickness of a molecular layer at the metalsurface.

Plasmon generation means when a light incident on the surface of the glass substrate, the light strikes the glass substrate and generates the localized resonant oscillation (i.e., hot carriers) at the same time plasmons are generated at the surface of the gold coated glasssubstrate.

Plasmons are locally generated evanescent waves at the interfacebetween metaland dielectric material. In thispaperthe structure of the optical device consists of Silver (Ag) metallic waveguides separated by very small gap distance in the order of less than 100nm.

II. MODELING AND SIMULATION SETTINGS

A. *Design ofGap PlasmonWaveguides*

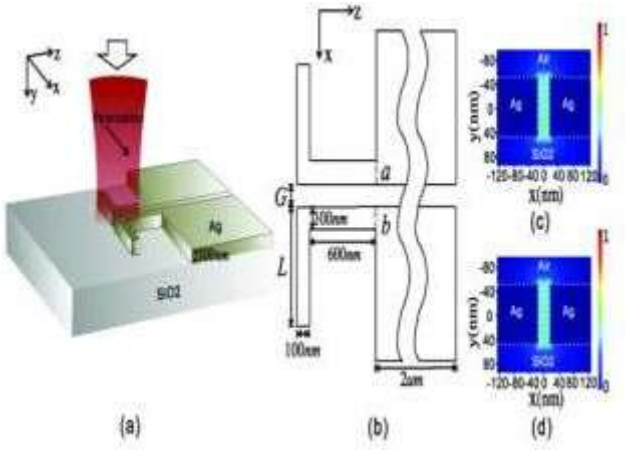


Fig: General block diagram of SPR based gap waveguide with vertical polarization

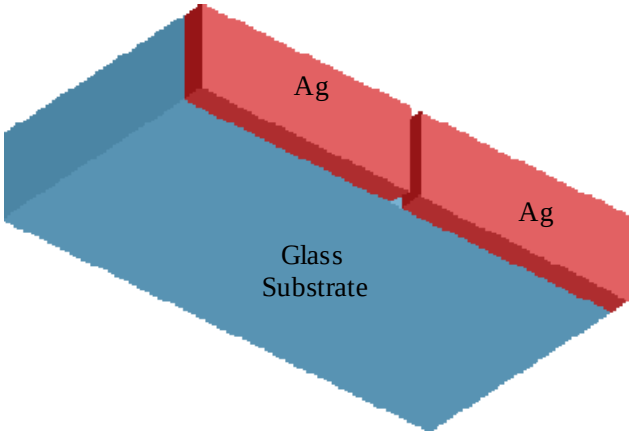


Fig. 1. 3D view of Gap Plasmon Waveguide with air gap

ISBN: 979-85-27243-61-1

Fig. 1 shows the structure of gap plasmon waveguide. It consists of dielectric layer which acts as a substrate which is shown in blue color and two Ag (Silver) metallic waveguides (shown in red color) separated by air gap on top of glass substrate.

The gap plasmon waveguides shown in fig 1 is excited by two metallic (Ag) arms which acts like optical nano-antenna and serves as optical coupler. Each electrode is connected to edge of waveguide at the center The height of two electrodes which forms a nano antenna is calculated using equation (1). Nano antenna couples the optical light beam from source to the center (air gap) of gap plasmon waveguides and is discussed in detail in section III

$$h \leq \lambda/4 \text{ ------(1)}$$

The operating wavelength is selected at 1550nm. The height of the two metallic arms is calculated using equation (1) and is chosen to be 200 nm. The effect of antenna width results in variations in propagation constant of the optical light confined to the gap plasmon waveguides and is discussed in section III.

B. *Simulation settings*

The Lumerical mode solution is used to analyze modal analysis and Lumerical finite difference time domain (FDTD) is used to analyze power coupled from optical source to gap plasmon waveguide using nano antenna structure. The vertically polarized Gaussian optical beam is used as a light source as shown in Fig 2.

In simulation optical power monitor is used to collect the power coupled at the air gap between plasmonic waveguides and the variation in coupled power is analyzed as a function of numerical aperture of the optical source and is discussed in section III.

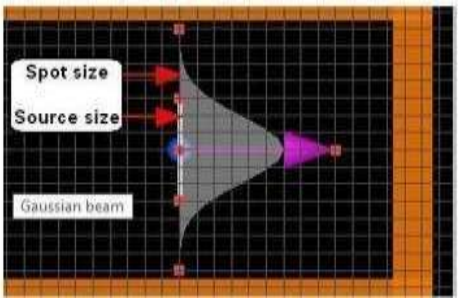


Fig. 2. Gaussian light source

III. RESULTS AND DISCUSSIONS

A. *Modal Analysis*

Modal analysis of plasmon waveguides with air gap shown in Fig 1 is carried out by using Lumerical mode solution simulation tool. Modes are searched near the highest and lowest refractive index of the structure shown in Fig 1 at the wavelength of 1550nm. It results in multiple modes for the structure. Fig 4, shows the TM mode confinement in the gap surface plasmon waveguide. Plasmonics modes confined to the air gap are found and its TE mode confinement at the gap is shown in Fig 5.

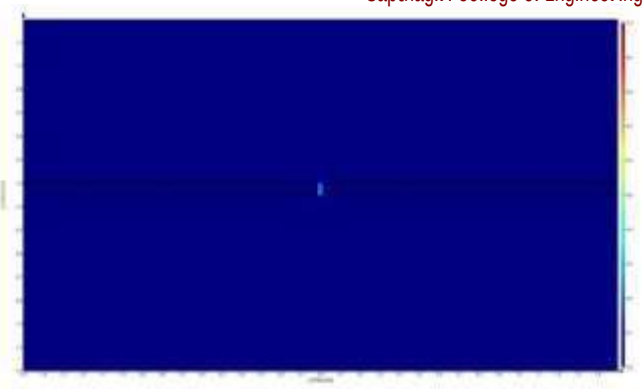


Fig.3 Mode coupling in gap

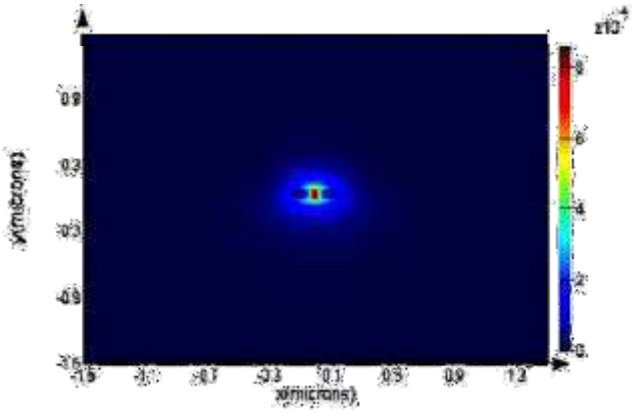


Fig 4. TM Mode confinement in air gap of waveguide structure

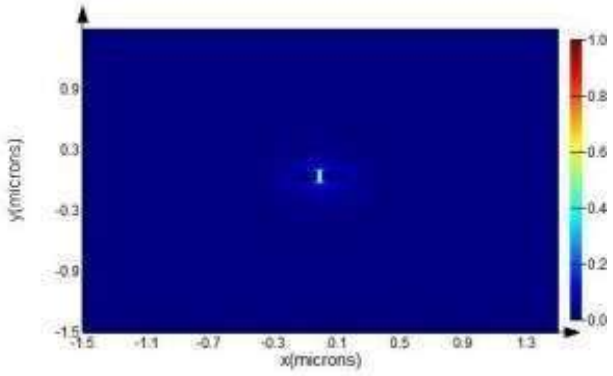


Fig.5 TE Mode confinement in air gap of waveguide structure

A. *Power Coupling Analysis*

The power analysis is carried out as a function of numerical aperture of the optical source and propagation constant of the gap plasmon waveguides is determined for different widths of nano antenna (two Ag-electrodes which forms the nano- antenna) by using Lumerical FDTD simulation tool. The width of the antenna is varied from 50nm to 150nm. The effect of width on real value of the refractive index is shown in Fig 5. It is found that the effective index of the structure is 1.81 at 50nm and it is 1.68 when the width is 150nm.

ISBN: 979-85-27243-61-1

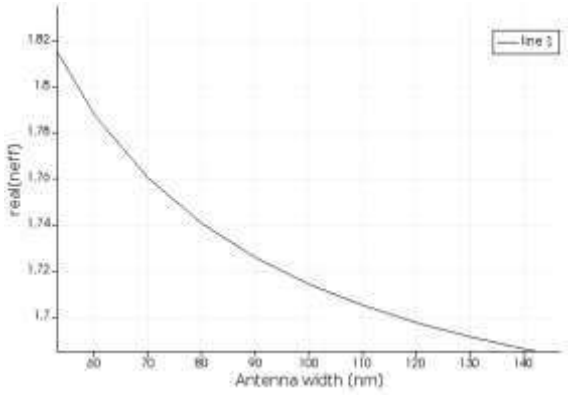


Fig. 6. Effect of Antenna width on a real value of refractive index of gap plasmon waveguide

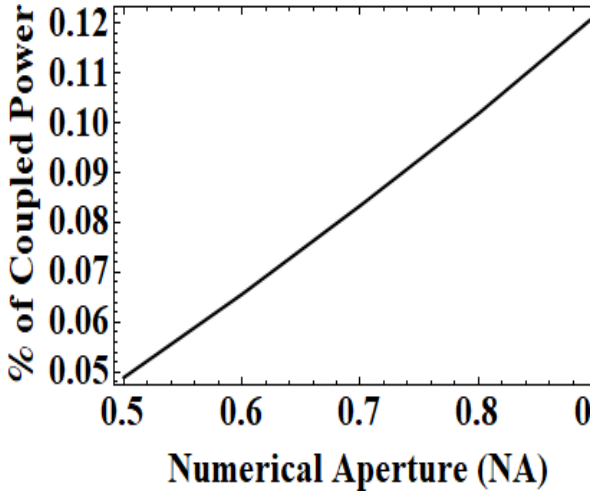


Fig.7 shows percentage of power coupled at air gap between two plasmon waveguides shown in Fig 1. It shows that 4.8 % to 12.17 % of the incoming light is coupled into the gap surface plasmon waveguide by using optical source with 0.5 NA and 0.9 NA respectively. Fig.5 concludes that using high NA light beam and optical nano antenna results in a better confinement of light within the air gap present between two metal electrodes (waveguides) and such waveguides can find many more applications in surface plasmon resonance (SPR) based optical sensing applications.

IV. CONCLUSION

In this work surface gap plasmon waveguide structure is modeled and is excited by using two metal electrodes having length very much less than quarter wavelength which acts as nano antenna. An efficient method of coupling light from high NA source to gap plasmon waveguides is presented and coupled power is analyzed with respect to variations in NA of the optical source. The modal analysis is carried out by using Mode solution and clearly demonstrates the modes are confined at the gap and coupled mode propagation constant is found to be varied from 1.81 to1.68 for 50nm to 150nm sweep in antenna width. Power coupling analysis is carried out by using finite difference time domain simulation tool. This model gives optimum way to couple light into the gap surface plasmon waveguide. This work also gives the coupling efficiency of upto 12.17% by using high numerical aperture source (NA=0.9) with vertical polarization.

The simulated coupling efficiency result obtained in this paper gives an improvement of 26.05% compared to results obtained in Jing Wen et al., Excitation of plasmonic gap waveguides by nanoantennas [12]. Such structures can be effectively used to solve light coupling problem in SPR based gap waveguides and can be used in many more opticalsensing applications.

V. ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal of Srinivasa Ramanujan Institute of Technology, Anantapur for the facilities provided and their support. Also we would like to thank the Head of department Electronics and Communication Engineering and our guide Adarsh sir for their encouragement and support.

REFERENCES

[1] Jianjun chen, chengwei sun & Xiaoyong Hu "Nanoscale optical devices based on surface plasmon polaritons ". Chinese Science Bulletin volume 59, pages2661–2665 (2014).

[2] Badrinathan , Dinesh ,"Waveguide Design Strategies for Surface Plasmon Resonance" IJARIIE-ISSN(O)-2395-4396, Vol-5 Issue-2 2019.

[3] Jing Wen, Sergei Romanov, and Ulf Peschel, "Excitation of plasmonic gap waveguides by nanoantennas," 13 April 2009 / Vol. 17, No. 8 / OPTICS EXPRESS 5925-5932

[4] Savitha, K. S. Rao and P. Sharan, "Detection of oncological cell for breast cancer by using SPR technology," 2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom), 2016, pp. 2747-2749.

[5] M. Nafari and J. M. Jornet, "Modeling and Performance Analysis of Metallic Plasmonic Nano-Antennas for Wireless Optical Communication in Nanonetworks," in IEEE Access, vol. 5, pp. 6389-6398, 2017, doi: 10.1109/ACCESS.2017.2690990.

[6] K. Bremer, J. Walter, M. Rahlves, T. Scheper and B. Roth, "Optical SPR sensor designed for smartphones," 2017 Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference (CLEO/Europe-EQEC), 2017, pp. 1-1, doi: 10.1109/CLEOE-EQEC.2017.8087218.

[7] K.Sharma, R.Jha and B.D. Gupta, "Fiber-Optic Sensors Based on Surface Plasmon Resonance: A Comprehensive Review," in *IEEE Sensors Journal*, vol. 7, no. 8, pp. 1118-1129, Aug. 2007, doi: 10.1109/JSEN.2007.897946.

[8] Ruoxi Yang, Zhaolin Lu, "Subwavelength Plasmonic Waveguides and Plasmonic Materials", International Journal of Optics, vol. 2012, Article ID 258013.

UVC Development for I2C master and slave using System Verilog and UVM

KORASH WAIBA[1],ARUNA.R[2]

[1]VLSI & ES ,[2]ECE

AMC Engineering College,Bengaluru

[1]waibakorash@gmail.com

[2]aruna.ramalingam@gmail.com

Abstract

Nowadays I2C protocol plays very important role in every SOC for the short distance communication. There has only two wire SCL and SDL. UVC developed for I2C master and slave verification purpose. In this UVC, multiple components has developed which name as i2c_sequence_item, i2c_sequence, i2c_sequencer, i2c_driver, i2c_monitor, i2c_scoreboard, i2c_coverage, i2c_interface, i2c_agent, i2c_environment, i2c_test and top module. Functional coverage achieved 100% as well as code coverage 84.28%. This UVC can be used to verify the I2C master as well as I2C slave functionality.

Keywords:-I2C (Inter Integrated Circuit); SCL(Serial Clock); SDA (Serial Data); System Verilog; UVM (Universal Verification Methodology); UVC (Universal Verification Component)

I. Introduction

The I²C (Inter-Integrated IC) bus developed by Philips company, is a simple bidirectional serial bus that supports multiple masters with arbitration method. There is specific address assigned to each IC connected in IIC bus. In IIC, slave can either behave only as a receiver or can function as a transmitter. IIC is a serial bus having low to medium speed and have certain unique features such as, resistance to noise, resistance to glitches, ability to employ bus extenders that facilitates long distance communication, and robustness. The facility of bus extenders makes communication flexible in accordance to the user's needs.

With the growth of technology, designs become more complex and its verification proves to an inevitable part without which product cannot be delivered. It is a fact that around 70% of total effort involved in product development is occupied by the verification process. Critical path of design have to be verified before giving out for implementation. By applying concept of abstraction in verification, considerable amount of time can be saved. It helps designers to achieve a control over gate level designs. In addition by incorporating the concept of randomization, verification becomes automated. This further leads to reduction in time consumption.

Test bench written in System Verilog for design is not reusable [1] Spear, Chris [2008]. In-order to overcome this drawback, a specific set of base class library is created and is used as industry standard [2] Accellera Organization [2011]. UVM provides a specific method to develop test bench for verifying a design. There exist some unique features pertaining to UVM which makes it more preferred as compared to System Verilog. UVM is having a reporting mechanism which can be used to filter out errors and log messages .It also provides different verbosity levels such as warning, error , info and fatal. It reports messages along with line number. All parameters can be configured using configuring class in UVM. Phasing feature of UVM helps in synchronizing each and every component. Unlike System Verilog, UVM allows port to port connection instead of component to component connection. Using create () method, UVM allows programmer to override components. Independency is achieved between test bench and test writer by using the concept of virtual sequencer and sequences. Hence it is reusable as well as more portable while creating verification test bench as compared to System Verilog.

A. I2C Communication

There are basically two signals used in IIC communication, serial data line (SDA) and serial clock line (SCL) is present in Fig 1. Bus is considered as busy when both SDA and SCL is on logic high. SCL line is used to provide clock signal to all the slaves and masters connected in IIC bus. A high to low transition on SDA line followed by high to low transition on SCL is considered as start signal in IIC communication. Address of each device is connected in IIC bus is put serially on SDA line. IIC supports both ten bit and seven bit address. A seven bit address happens only once. Whereas, 10 bit address happens twice. Just after address phase, it is read or write bit. Device which starts communication first is considered as master device and the device which responds to master is considered as slave device. Between address and data phase, idle phase is there at which SCL is kept low. Slave device acknowledge or denote non acknowledgment using ninth bit after data or address. This is done either by pulling SDA line low or by keeping it in logic high. A logic high before ninth clock cycle denotes non acknowledgement and logic zero before ninth clock pulse denote acknowledgement from slave. In case of multi masters fighting for bus, the master device which pull down SDA first gains control over the bus and the other one need to wait until that master raise a stop signal. Communication is considered to be finished when master pulls SDA line high after SCL is pulled to logic one. This is referred as stop signal in IIC communication. Figure 1 shows complete IIC communication covering every states mentioned above.

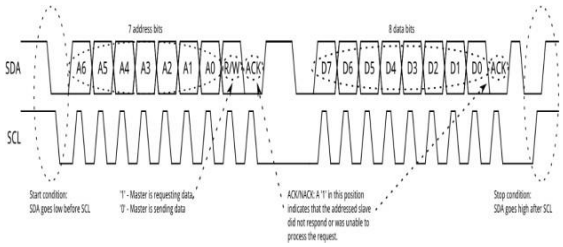


Fig 1 various stages of IIC communication.

II. PROTOCOL DESCRIPTION

I2C protocol has a basic format by which it transfers or receives data. Master and Slave basic functionality along with the extension modes are discussed in this section

A. Master

It acts as a transmitter and a receiver [6] Heinz Ammon, Bruno Scheckel, [1985]. It addresses the slave in both 7-bit and 10-bit addressing formats as follows.

- It generates the clock pulse.
- It acts as a transmitter and a receiver.
- It acknowledges when it acts as a receiver.
- When a master also acts as a slave, its slave address is same as master address.
- It performs clock synchronization when multiple masters send different clocks.

B. Slave

It is addressed by the master and acts as a both transmitter and a receiver as mentioned below.

- It acts as a transmitter and a receiver.
- It acknowledges whenever it is addressed and when it acts as a receiver.
- It can perform clock stretching to hold the SCL line low when it is taking more time to store data or start a new transaction.

III. PROPOSED METHODOLOGY

The first step in creating UVM was creating RTL description of IIC controller. This is coded in Verilog. In I2C Bus Controller, master will initiate the transaction and is used to control clock signal. Slave is the device which is addressed by the master. The different phases of IIC communication like START, STOP, IDLE, ADDRESS, DATA, ACKNOWLEDGEMENT are mentioned as separate states. Clock signal SCL is synchronized with external clock using state machine. Second part was creating a slave IIC UVC and a master UVC in UVM [4][5][6] Ni, Wei, and Jichun Zhang [2015] Prakash Rashinkar, Peter Paterson, Leena Singh [2002] Heinz Ammon, Bruno Scheckel [1985] . Universal verification component describes a certain pattern for writing a test bench to make sure it is reusable and flexible to programmers [4] Ni, Wei, and Jichun Zhang [2015]. Phasing mechanism make sure it runs in a particular flow. Run_test() initialized inside initial block in top level module specifies the test case which runs at that instance. It can also specifies externally using command "+UVM_TESTNAME=" feature [2] Accellera Organization [2011]. A 'run.do' file is created to run entire flow automatically. Build(), Connect(), End_of_elaboration, Start_of_simulation() executes and finishes at time zero itself. The only phase which consumes time is run() phase[5] Prakash Rashinkar, Peter Paterson, Leena Singh [2002].

The implementation I2C in Fig 2.where the various verification components present in UVM are Design-under-test (DUT), Interface, Virtual interface, Driver, Monitor, Scoreboard, Environment, Agent, Sequence library, Sequencer, Transaction, Test case library and top module. Design-under-test is generally written in Verilog describing functionality of the design. With the help of "seq_item_port", driver takes transaction from sequencer and drives to DUT. Environment is linked with design-under-test via interface which provides pin level information. All data is collected and information is extracted in monitor to perform coverage. It is then sent to scoreboard, where comparison is done. Different varieties of sequences are created and stored in sequence library class and various test are mentioned in test class library. Master UVC will drive data and address into I2C master controller and slave I2C UVC give response. This is described in figure 2.

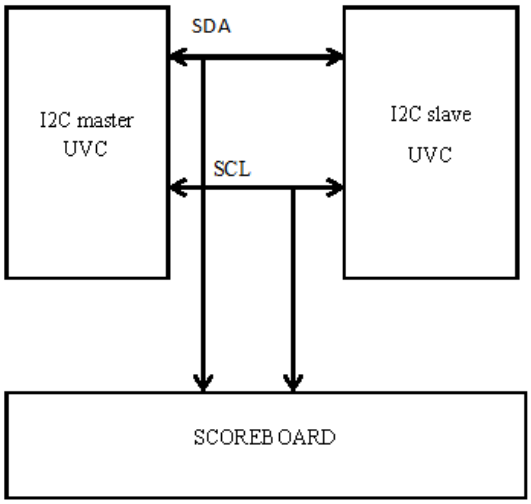


Fig 2. IIC methodology

A. UVM Verification Component

The UVM Verification as shown in Fig 3. The various component as given belows :-

- **Deign Under Test-** The design under test can be written in System Verilog or Verilog or VHDL. This work uses master IIC controller design written in Verilog. Functionality of IIC is completely described in it [9][10][11]
- **I2C Interface-** Design-under-verification and the verification environment are linked together using interface signals. Interface is declared separately as a file. All pinlevel description used in design under test is declared in this file.
- **Virtual Interface-** Every signals used in design can be separated from its abstract model with the help of virtual interface concept. Same instance is allowed to operate in different sections of design by employing virtual-interface concept. It permits programmers to pass same data over other components and help designers to gain control over specific signals.
- **UVM Transaction-** In every test, "Driver" drives generated data items in to DUT. All DUT inputs are represented in interface. Using System Verilog randomizing feature, this data items are randomized with constraints specified by designer. Specific features of transaction are derived from specification given to a designer.
- **I2C Agent-** – In every design, there exist various kind of interface. All interface works on different protocol. For every pin level transaction with respect to designed DUT, there exist a set of UVM component focused particularly for that transaction. Based on this, there exist various agents which group together all such components. This allow users to monitor pin level transaction. This work involves basically two agents. APB agent drives DUT via APB interface and IIC agents perform traffic with respect to it.
- **Sequencer And Sequence-** A continuous flow of randomly generated transaction are known as sequence. Users can control this sequence using sequencer. Sequence class is extended from UVM sequence. This transaction is then fed in to driver. Driver process these transaction and drive into DUT. Corner cases can be verified here by utilizing constraint features of UVM.
- **Environment-** Verification environment in UVM is created using environment class. Environment class is extended from UVM_ENV class. UVM require component to be build, and connect in a specific flow. UVM_ENV base class has

inbuilt method for carrying out simulation in prescribed method. Virtual interface is created inside environment class. In this work, environment is defined at top level. Environment also makes use of virtual sequencer for coordinating sequences of I2C and IIC agent.

- **Driver-** Driver class is extended from uvm_driver. "Seq_item_port" allows transaction to be taken from sequencer. After that, transaction is fed into DUT. Specification prescribed for interface signals decide the nature of transaction driven into DUT. It is then transferred into scoreboard using "UVM_analysis_port". Configuration for DUT is declared here. Sequencer is then connected to instance of driver class created in environment.
- **Monitor-** Monitor is used for monitoring transactions driven by driver. It is a passive entity. It samples all signals involved with DUT. Main functions of monitor are listed below.
    - To collect data items
    - To extract information
    - Coverage

  It is mandatory to check if DUT meets specification laid by that protocol. Data checkers perform this function. Monitor is extended from "uvm_monitor" class. One instance of monitor is created inside environment to connect with DUT.

- **Scoreboard-** Scoreboard extends from uvm_scoreboard.it has two analysis imports to get transaction packets from receiver and driver. Error is asserted if packets from driver didn't match with that from receiver. Compare function of transaction class is used to perform this function.
- **Test case-** Test-case is extended from uvm_test. It is used to specify all test cases of DUT. It contain instance of environment. Build phase is followed by run phase inside test class. One handle of environment is created inside build phase. Objections are raised and dropped inside run phase.
- **Top module-** Instance of interface is declared inside top module. DUT interface is also declared and it is connected with interface. Run test method is called afterwards to start simulation. Test name can be passed either implicitly or by passing by command line Greater precedence by default is for command line.

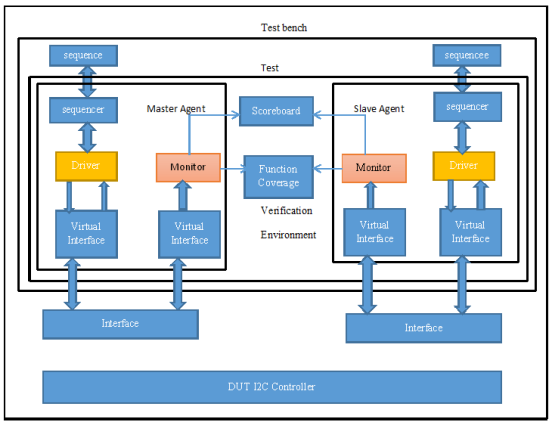


Fig 3. UVM test bench model.

IV. SIMULATION RESULTS

In the proposed system which is shown in Fig 4. The simulated waveforms and coverage reports for the functionality verification of I2C master controller are described below. the UVM(Universal Verification Methodology) based verification environment shows best result compared to other verification environments.

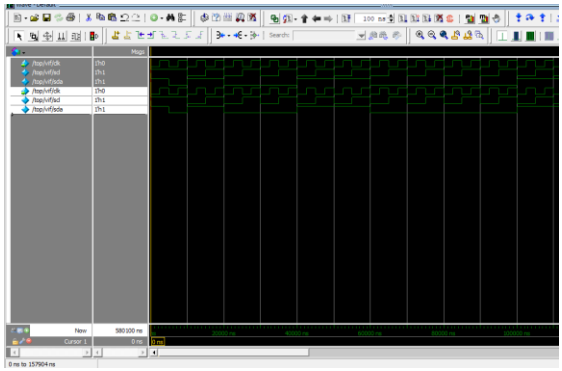


Figure4. Simulation results

The SCL is generated from clock signal. Slave address used here is 7-bit addressing (1001100) and the input data is 1001100. The SDA will have the start condition, slave address, read/write bit, acknowledgement bit, and data followed by stop condition. When the master is ready to write the data, the read/write bit will be active low i.e. '0'. The acknowledgment bit will be low when the slave respond to the master and the acknowledgement bit will be high when the slave doesn't respond to the master. The simulation result for I 2 C Master RTL design is shown in Fig. 4.

v. Verification Environment Results

The address and data are randomized by using Constrained Randomization Technique and the simulation result for the verification environment using UVM. The comparison result is obtained from the scoreboard. In the Scoreboard, the transmitted data and the address from the driver are compared with the data and address in the reference part of the scoreboard and it is verified that the transmitted address, data and the received address and data obtained are same. The comparison result for the verification environment by using UVM(Universal Verification Methodology). Now Code Coverage report as shown in Fig 5. So, The total code coverage obtained for DUT is 92.38%. Several variants exist which track more detailed coverage. Common variants include branch, statement, toggle, expression, FSM coverage, and condition. The Statement Coverage hits 8 bins out of 8 bins and the coverage obtained is 84.28%. The Branch Coverage will check whether if statement is executed for both the true and false branches. The Branch Coverage hits 8 bins out of 8 bins and the Branch Coverage is 84.28%.

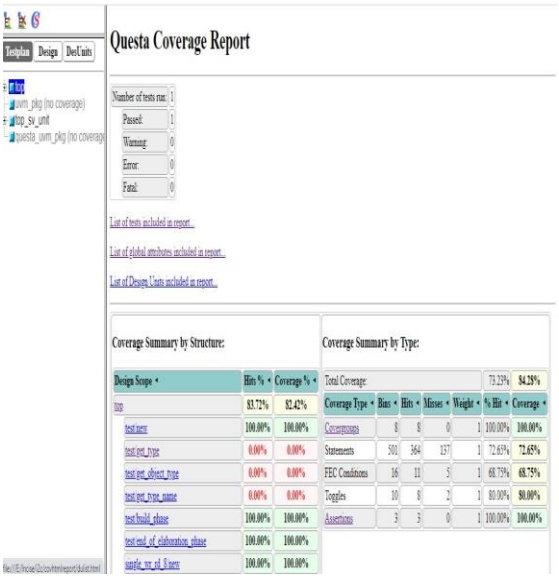


Fig 5. Code Coverage Report

The Function coverage report shows in Fig 6.The Functional Coverage of I2 C Master is obtained 100% using the cover groups. In the test plan, if all the scenarios are tested then 100% Functional Coverage will be obtained.

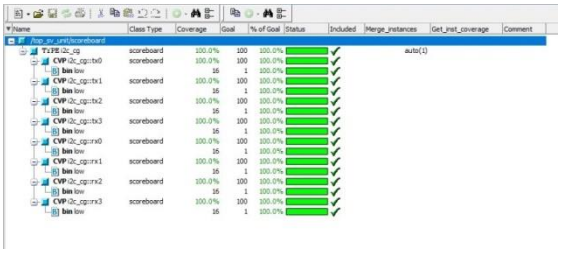


Fig 6. Function Coverage Report

V. Conclusion

This work involves designing a master IIC controller and created a self-checking test bench for it in UVM. Master IIC controller is created in such a way that it can handle 7 bit address and data. The

constrained randomization technique is applied for the design and verification environment. The functional coverage obtained was 100% by using the cover groups. The code coverage obtained for DUT was 92.38% .

REFERENCES

[1] Spear, Chris. SystemVerilog for verification: a guide to learning the testbench language features. Springer Science & Business Media, 2008.

[2] Accellera Organization, "Universal Verification Methodology (UVM) 1.1 Class Reference", June 2011

[3] Philips Semiconductor, "I2C-bus specification and user manual", Rev. 6 - 4 April 2014.

[4] Ni, Wei, and Jichun Zhang. "Research of reusability based on UVM verification." 2015 IEEE 11th International Conference on ASIC (ASICON). IEEE, 2015.

[5] Prakash Rashinkar, Peter Paterson, Leena Singh, "SoC VerificationMethodology and Techniques" 2002

[6] Heinz Ammon, Bruno Scheckel, "1.3 GHz PLL WITH 12C.BUS," IEEE Transactions on Consumer Electronics, Vol. CE-31, No. 3, Aug. 1985.

[7] Elakkiya, C, N.S Murty, C Babu and Gaurav Jalan. Et al "Function Coverage-Driven UVM Based JTAG Verification" 2017 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC). IEEE, 2017.

[8] Sangepu Baby Dhivya and G.L.Madhumati , "Implementation and Verification of I2 C Single-Master Multiple Slave Bus Controller using System Verilog and UVM," International Journal of VLSI System Design and Communication Systems, vol.3, Issue 8, pp. 1239-1243, October 2015.

[9] Anuja Dhar, Ekta Dudi, and Hema Tiwari, "Coverage Driven Verification of I2C Protocol using System Verilog," International Journal of Advanced Research in Engineering and Technology, vol.7, Issue.3, pp. 103-113, May-June 2016.

[10] Elakkiya, C., N.S Murty, C Babu and Gaurav Jalan, et al. "Functional Coverage-Driven UVM Based JTAG Verification." 2017 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC). IEEE, 2017.

[11] Deepa Kaith, Janakkumar B.Patel, and Neeraj Gupta, "An Introduction to Functional Verification of I2C Protocol using UVM," International Journal of Computer Applications, vol.121, Issue.13, pp. 10-14, July 2015.

Plant leaf Disease Prediction using Image Pre-Processing and Dynamic Feature Scaling for Naive Bayes Classifier

Komala T [1], Ashwini S S [2] and Dr. M Z Kurian [3]

[1] M.Tech, Dept. of Electronics & Communication Engg., Sri Siddhartha Institute of Technology, Tumakuru, India.
[2] Asst. Professor, Dept. of Electronics & Communication Engg., Sri Siddhartha Institute of Technology, Tumakuru, India
[3] Professor & HOD Dept. of Electronics & Communication Engg., Sri Siddhartha Institute of Technology, Tumakuru, India.
komalathippeswamy@gmail.com, ashwini_249@yahoo.co.in, mzkurianvc@yahoo.co.in

Abstract: Disease identification in plants is the major work in a nation. Agricultural production plays very important role in nation economy and it also important for the nation improvement. Diseases or infection in the plants leaves can cause the minimum crop yield and due to this farmers effort gets down and also it affects the nation economy and livelihood. Dynamic feature scaling technique and an image processing technique is introduced in this paper which differentiates leaves diseases in plants and categorizes them by utilizing Naïve Bayes classifier. Feature scaling technique like Min-Max scaling, Z-score normalization technique etc. are utilized for scaling factors normalization. Equal weights are assigned to all the features in Scaling technique, which might result in a non-ideal cases. This paper introduces another strategy with allocate weights to each and every feature with the assistance of out of bag errors acquired from developing different decision tree models.

Keywords: Disease, Plant Leaf, image processing, Agriculture, Machine Learning.

1. INTRODUCTION

In several nation agriculture plays very important role in nation's economy. Based on the several factors production in the agriculture depends. Two to four times effective improvements in agricultural field maximizes the income of poor people instead of other fields.

Nation income as well as agricultural production can be increased by the accurate detection and avoiding techniques of leaves diseases when there is no accurate detection and prevention of plants occurs it leads less yield and due to this revenue of the nation also decreases. Searching for the farm specialists in village region is very big task [1] for the proper guidance on disease prevention and increasing the agricultural production. It requires spontaneous observance from the specialists, and for large farming land it takes much time to monitor and it is not that easy to handle. It is costly and time consuming [2]. Because of these difficulties handled by the farmers new technique called Image processing techniques can be invented it gives proper identification and treatment for the infections in the plants at the initial level before infection gets increased [3]. In many situations symptoms of the infections observed on leaves, stem, fruits so for the identification of disease leaves are considered.

Continuous visit of farmers to their farms getting prevented by utilizing the remotely systems it also utilizes less time to manage and all. By recognizing the symptoms of infection this technique recognize the infection. Due to the rapid growth in population the changes in the climate also appeared it affects the growth of plants [7-8]. Detection of diseases can be done easily through advanced methodologies. Io maximize the life of post cultivate and the crop yield [9] continuous observations on the leaves is necessary. With the highest clarity considering the infected leaf image and process it to recognize the infections

called Alternaria, Cercospora leaf spot, bacterial blight, Anthracnose.

To maximize the evaluations accuracy providing uniform feature weights is normally a good plan and this uses the spatial estimations predictions like NB but this is not suitable to all scenarios. Less exactness of estimations can be obtained when dataset is appeared with the various noisy features. Noisy features [8] denotes the attributes that might consist data prone to the maximum erroneous outcomes and not consists any estimated contributions. Feature relevance with the weighing can be considered and are utilised and weights can be provided to them. To obtain the better outcome NB model gets trained and retrained with the features weights and this is done by utilizing several methods. This yields in a large performance upon.
To meet the required maximum exactness it is necessary that to continuously providing a training to the NB model. During Random Forest Model training feature weights dependent feature importance so that it solves training problem. With the random subspace technique model of the random forest creates many decision trees. For maximizing the models diversity which is utilized for the ensemble from randomly choosing for providing the training to the algorithms of in addition to selecting all the samples subset to train with Bootstrap sampling support. For every certain dimensions out-of-bag error can be evaluated easily with the help of various subset dimensions by several constructing models, and for feature importance this can also utilized as metric.

Innovated technique known as Feature Importance dependent Dynamic Scaling technique (and is represented as FIDS), to maximize the exactness in the evaluation and to measure the features dynamically by train up a random forest algorithm feature importance value is utilized.

2.LITERATURE REVIEW

For the characterization of diseases on leaves of plants several techniques can be analysed in the paper [10]. Probabilistic Neural Network, Support Vector Machine, k-Nearest Neighbour Classifier, There are such huge numbers of grouping systems, Fuzzy rationale, artificial neural system, Principal Component Analysis, and Genetic Algorithm these are some grouping techniques. For the plant leaves malady order several characterization model can be used are reviewed. Four guideline steps which are involved in the created planning strategy, For the information RGB image is done at the starting a concealing change structure, this RGB is changed over to HSI in light of the fact that RGB is for concealing age and his for concealing descriptor, finally the surface bits of knowledge is figured from SGDM lattices.
[11] This paper lean towards to this problem with the focus of forming image processing estimations that can observe problems in outcomes from the images in yields from images, shading lights, shape and surface to identify illness naturally or various scenarios that might affect yield and provides the fast and accurate answer for the rancher along with the SMS assistance. [12] Here, by using the image processing methods collecting and organizing the plants leaves and infection acknowledgements which provides the exhaustive document. By this way available image has got included with the affirmation of diseases on leaves. Gathering of leafs and identifiable evidence are the two standard classes which are involved in this paper [13].
By using the fake neural system (ANN) and various image handling methodologies, the current method introduces a systematic way for identifying a disease in the plant in early stage and identify it very exactly. For the sickness of the plants this current method is intended to construct fundamental disease

identification model. This task begins with capturing the images. Distinguished and classified by using Gabor channel. Capabilities list which is obtained by the ANN where Trial outcomes discriminated the order execution with the accuracy of 91%.[14] For grape ailments were obtained as the fitting accuracy with 100 % of accuracy rate and for wheat infections it obtained with the 100% of accuracy and with the fitting precision, During the elements of the elements data which is not reduced by utilizing the principal component analysis (PCA). 97.14% of desire precision and 100% of fitting accuracy is obtained for the grapes ailments and for wheat both precision accuracy and conjecture exactness both are 100% obtained the fitting accuracy during the elements of the elements data were minimized by utilizing the PCA and provides the exact affirmation outcomes.

As compared to the neural frameworks course action execution of SVM is very good this is predicted by the test outcomes in [15]. Instead of simply utilizing the highlights of shapes it is good to use Affirmation right rate of cucumber infection which is based on SVM of surface segment and shape. [16] For avoiding area it is predicted very good technique by pointing the picture distinguishes the evidence. For 24 hours this system operates. Several problems occurs in these times such as impacts of shadow, conditions of lighting, obstacles in between the things. etc. [17] from the development of leaves ulcer sore descriptor is utilized to differentiate citrus unfortunate sore. Thirdly, to identify the contamination breakage and AdaBoost is obtained in classifier learning and feature assurance so for this a two-level different levelled area structure is done [18]. This method improves the system model for the identification of contamination in paddy such as Narrow Brown-Spot Disease (NBSD), Blast Disease (BD), Brown-Spot Disease (BSD). Technique involves the variations upon the RGB image converts as twofold image by utilizing advanced threshold reliant upon the ostu technique and adjacent entropy farthest point. With 94.7 percent of exactness can be obtained on the infections in paddy by utilizing the age rule technique [19]. Downey Mildew, Powdery Mildew these are the diseases which empower the setback Grape natural item. Minor centre point, genuine turn, etc are extracted by the leaves and provided to the classifier for identifying analysing of contamination characters of leaves.

3. PROPOSED METHOD

Proposed technique implementation flow is represented in the figure below:

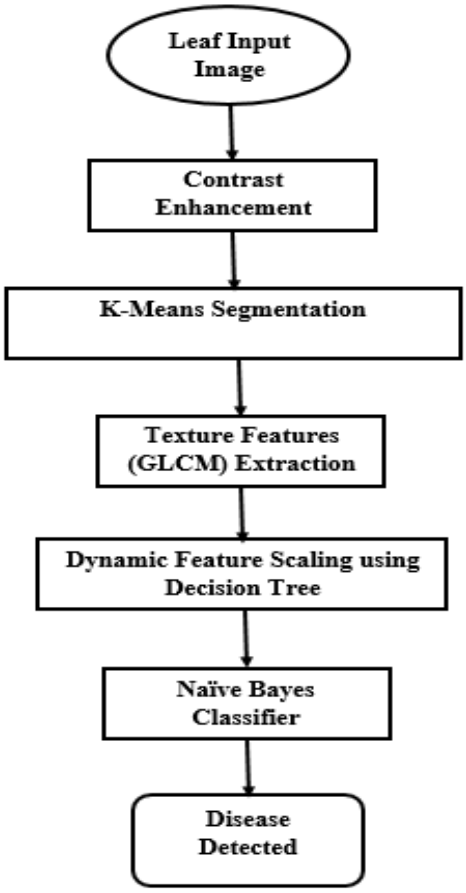


Figure 1: Implementation Flow

Steps in the implementation model can be followed to identify the infections in the leaves and this identification can be done by utilizing the technique called machine learning and image processing here in this method mainly focus on to predict the

leaves infection. With that implementation flow model colour leaf is considered as input which is pre-processed to increase there contrast and by utilizing the k-means segmentation algorithm leaf image gets segmented with the texture(GLCM) features are obtained for the image of leaves. Then dynamically scaled characteristics and obtained characteristics are extracted for the fine tuning of the features it is done for the good process of testing and learning of the machine, optimal features can be obtained by utilizing the filter technique and testing and training of these features can be done by using Naïve Bayes classifier.

Dynamic Feature Scaling: The Feature Importance dependent Dynamic Scaling technique utilizes feature importance obtained by training random forest technique on the training data to weigh the features for training the NB Algorithm. In case of identification issues and co-variant shift particularly NB is utilized prediction issues like item recommendation this NB can be utilized.

According to the random forest technique, formula for the Z-score normalized feature importance is denoted by

Error (i, j) = Error with the feature (i, j) - Error without feature (i, j)

$$Average\ error(i) = \frac{Sum\ of\ all\ trees\ with\ error(i,j)}{Number\ of\ trees}$$

For every features average error can be multiplied when We Z-score normalize the features in the data.

Feature importance (i) =Average Error (i)

Weighted Feature (i) =Feature Importance (i)*Feature (i)

To reach the good outcome this weighted data utilized to train the algorithms of Naïve Bayes.

4. RESULTS

Following discuss the experimental outcomes. Image of the input leaf is shown in Figure 2, image of the enhanced leaf is shown in figure 3 and image of the segmented leaf is shown in the figure 4 as implementation process part. Along with the NB classifier the comparison of the exactness in presence and absence of dynamic feature scaling is represented in the Figure 5 and table 1.

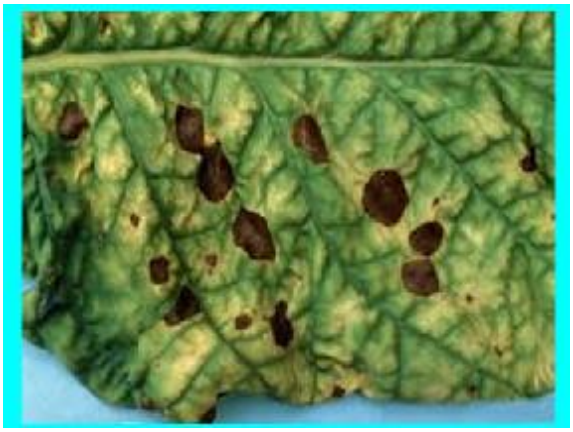


Figure 2. Leaf input Image

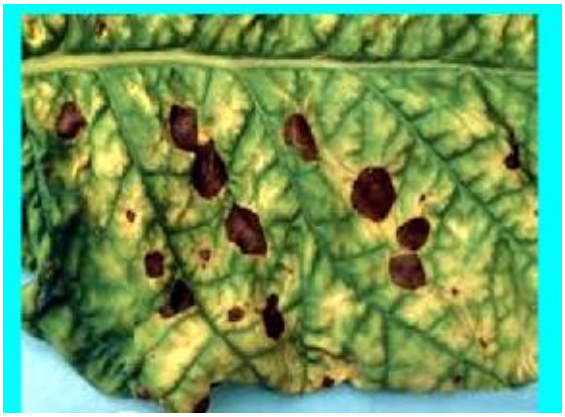


Figure 3. Enhanced Leaf Image

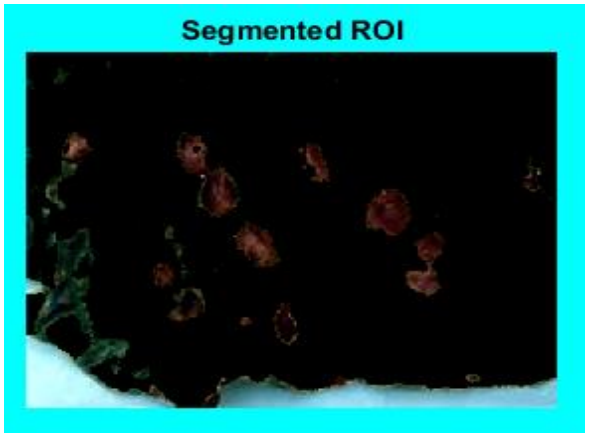


Figure 4. Segmented Leaf Images

Table1: Accuracy of proposed

Sl. No.	Disease	Affected Region (%)	Accuracy without dynamic feature scaling (%)	Accuracy with dynamic feature scaling (%)
1	Alternaria Alternata	16.321	86.80	96.11
2	Bacterial Blight	15.234	84.23	92.42
3	Anthracnose	15.201	86.33	93.02
4	Cercospora Leaf Spot	15.121	82.55	94.21
5	Healthy leaf	None	91.10	96.09

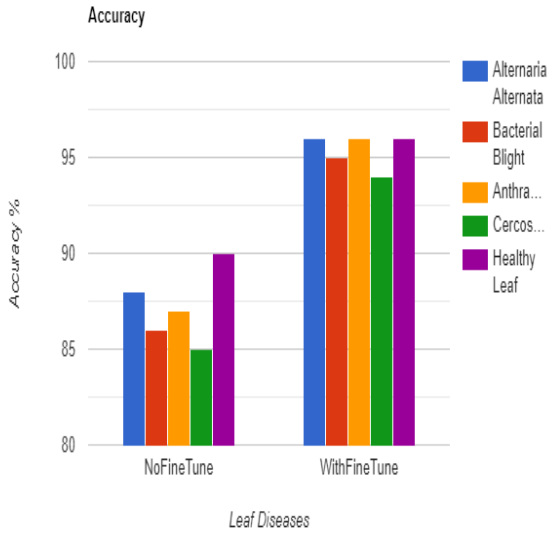


Figure 5. Accuracy Plot

5. CONCLUSION

The main aim of this innovated technique is the identification of irregularities which are appeared on the plants leaves in their greenhouse environment. In this model advanced accurate outcomes are obtained and with algorithms of image processing and machine learning which gets contrasted in the matter of accuracy. Here advanced identification of plant leaves can be obtained by the process of dynamic feature scaling. In the result section The table and graph is shown which provides the comparison of outcome With and without dynamic feature scaling.

6. REFERENCES

[1] Reena Tijare, Pawan Khade, Rashmi Jain, The Survey of Disease Identification of Cotton Leaf, International Journal of Innovative Research in Computer and Communication Engineering, 2015.

[2] Sasirekha N, Swetha N, An Identification of Variety of Leaf Diseases
Using Various Data Mining Techniques, International Journal of Advanced Research in Computer and Communication Engineering, 4 (10), 2015.

[3] Suja Radha, Leaf Disease Detection using Image processing, Journal of Chemical and Pharmaceutical Sciences, March 2017.

[4] Prabhjeet Kaur, Sanjay Singla, Sukhdeep Singh, Detection and classification of leaf diseases using an integrated approach of support vector machine and particle swarm optimization, International Journal of Advanced and Applied Sciences, March 2017.

[5] Saradhambal.G, Dhivya.R, Latha.S, R.Rajesh, Plant disease detection, and its solution using image classification, International Journal of Pure and Applied Mathematics, Volume 119 No. 14 2018, 879-884.

[6] Abirami Devaraj, Karunya Rathan, Sarvepalli Jaahnavi, and K Indira, Identification of Plant Disease using Image Processing Technique, International Conference on Communication and Signal Processing, April 4-6, 2019.

[7] Vishal Mani Tiwari&Tarun Gupta "Plant Leaf Disease Analysis using Image Processing Technique with Modified SVM-CS Classifier" Research Gate2017.

[8] B.V. Ramana Reddy, A. Suresh, M. Radhika Mani, and V.Vijaya 50 Kumar, "Classification of Textures Based on Features Extracted from Pre-processing Images on Random Windows", International Journal of Advanced Science and Technology, Volume 9, pp 9 – 18, August2009.

[9] H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik, and Z. AL Rahamneh, "Fast and Accurate Detection and Classification of Plant Diseases", International Journal of Computer Applications (0975 – 8887) Volume 17– No.1, March 2011.

[10] Sanjay N. Ghaiwat, ParulArora, Detection and Classification of Plant Leaf Diseases Using Image processing Techniques: A Review, International Journal of Recent Advances in Engineering and Technology, ISSN(online) :2347-2812, Volume 2 Issues 3 2014

[11] Prof. Sanjay B. Dhaygude and Mr.NitinP.Kumbhar, Agricultural plant Leaf Disease Detection Using Image Processing International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering Vol. 2, Issue , January 2013

[12] Mr. Pramod S. landge et.al , Automatic Detection and Classification of Plant Disease through Image Processing, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 7, July 2013 ISSN: 2277 128X

[13] Gittaly Dhingra Vinay Kumar Hem Dutt Joshi Study of digital image processing techniques for leaf disease detection and classification Springer Science+Business Media, LLC, part of Springer Nature 2017

[14] Haiguang Wang, Guanlin Li, Zhanhong Ma, Xiaolong Li, Image Recognition of Plant Diseases Based on Backpropagation Networks, 5th International Congress on Image and Signal Processing (CISP 2012) 2012

[15] PiyushChaudharyAnand K. Chaudhari Dr. A. N. Cheeranand- ShardaGodara Color Transform Based Approach for Disease Spot Detection on Plant Leaf,International Journal of Computer Science and Telecommunications [Volume 3, Issue 6, June 2012

[16] Tian Touwen, Li Tianlai, Niu Yan The Recognition of Cucumber Disease Based on Image Processing and Support Vector Machine, 2008 IEEE

[17] R. Yusnita, FarizaNorbaya, and NorazwinawatiBasharuddin, Intelligent Parking Space Detection System Based on Image Processing, International Journal of Innovation, Management and Technology, Vol. 3, No. 3, June 2012

[18] Min Zhang, Qinggang Meng, Citrus canker detection based on leaf images analysis, 2010 IEEE.

[19] Nunik Noviana Kurniawati, Siti Norul Huda Sheikh Abdullah, Salwani Abdullah, Saad Abdullah Investigation on Image Processing Techniques for Diagnosing Paddy Diseases, 2009 International Conference of Soft Computing and Pattern Recognition.

Design of Photonic Crystal Fiber (PCF) Biosensor in Tetrahertz Spectrum.

S.K. Adharash, BHUVANESHWAR REDDY P , PRASANNA KUMAR S, NAVEEN KUMAR V, SANDHYA RANI P

Department of Electronics and Communication Engineering, SRINIVASA RAMANUJAN INSISTITUE OF TECHNOLOGY. ANANTAPURAMU

Adrash.ece@srit.ac.in, 174g1a0418@srit.ac.in

Abstract **- Tetrahertz instrumentation has improved altogether as of late with the end goal that THz imaging frameworks have gotten more moderate and simpler to utilize. THz frameworks would now be able to be worked by non-THz specialists extraordinarily working with investigation into numerous and its high affectability to delicate tissues, there is an expanding revenue in biomedical applications incorporating both in-vivo and ex-vivo contemplates. Furthermore, research proceeds into understanding the begining of differentiation and how to decipher terahertz biomedical pictures. In this undertaking, "Plan of Photonic gem Fiber (PCF) Biosensor In Terahertz Spectrum," means to plan a PCF based biosensor in terahertz range. PCF based biosensors are utilized to distinguish the biometric segments like RBCs, hemoglobin, WBCs, plasma and water. A PCF based sensor additionally conquers the challenges of regular frameworks just as strong main elements by guaranteeing the bigger variety and improvement of optical properties. It requires some investment to identify organic analyte than traditional framework. The main benefit of the PCF based sensor is that the optical properties can be altered by tuning the example, size and state of air openings.**

Keywords – Biosensor, Sensitivity, Confinement Loss, Beam divergence, Tetrahertz sensor.

INTRODUCTION

A biosensor is a systematic system, utilized for the vicinity of a compound substance that blends a natural element in with a physicochemical locator. The biosensor device Interfaces with the related hardware or sign processors that are essentially at hazard for the presentation of the prompts an clean-to-recognize way.

This occasionally represents the primary costly a bit of the sensor gadget. Anyway, it's plausible to get an clean-to-understand show that has transducer and sensitive factor. The biosensor includes three portions especially, sensor and related electrons. In the predominant portion, the sensor might be a responsive natural component, the subsequent section is that the indicator part that adjustments the subsequent sign from the touch of the analyte and for the results it shows in an open manner. A definitive location involves a speaker that's comprehended as sign moulding circuit, a show off unit likewise due to the fact the processor. The makes use of of those biosensors for the maximum part include checking herbal infection manage, in horticulture field likewise as food organizations. The maximum highlights of biosensors are dependability, fee, affectability, and reproducibility.

TERAHERTZ SPECTRUM

It is the spectrum that lies between the operating freaquency of 100GHz to 10THz

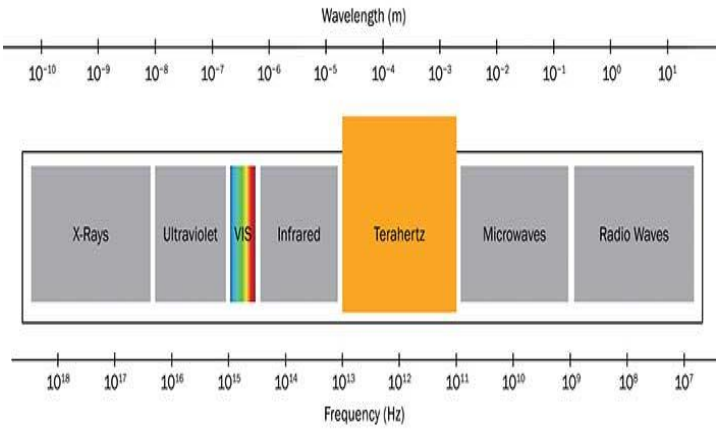


Figure 1:Terahertz spectrum

SIMULATED MODELS AND RESULTS

MATHEMATICAL MODELING

The mathematical modeling and the material selection for our project was made keeping the base papers of "Terahertz detection of alcohol using a photonic crystal fiber sensor" by Jakeya Sultanaa, Mohd.Saiful Islam, Alex Dinovitser, K Awsar Ahmed, Brian W. and Derek Abbott along with a secondary reference paper i.e., "Refractive Index Based Blood Components Sensing in Terahertz Spectrum" by Kawsar Ahmed, Fahad Ahmed, Subrata Roy, Bikash Kumar Paul, Mst. Nargis Aktar, Dhasarathan Vigneswaran, and Md. Saiful Islam.

The selection of materials for our model was selected by surveying and outweighing the pros and cons of both of these base papers.

An external limit PML is added here to diminish the undesirable nonphysical radiation and in this way it assumes the job of retention limit condition (ABC). Cyclic-olefin copolymer, TOPAS® has a low material absorption of 0.20 cm−1 at frequency of 1.35THz, compelling refractive record of 1.53 in the scope of 0.1–2 THz and is independent of water vapors. In addition, it has an across the board application in biosensing as a result of its bright photosensitive property. Along these lines, it has been picked as the foundation material. Furthermore, the material absorption loss of TOPAS® is substantially less in contrast with Teflon or PMMA. The explanation behind utilizing Topas over other polymer materials incorporates; lower material absoption losses, steady refractive list n=1.53 in the recurrence scope of 0.1-1.5 THz. Moreover, zero scattering and moistness lack of care of Topas encourages the fiber. Zeonex can be considered as fiber material since it gives consistent RI (1.53) all through the THz range. Additionally, Zeonex is high temperature-independent and exceptionally bio-compatible.

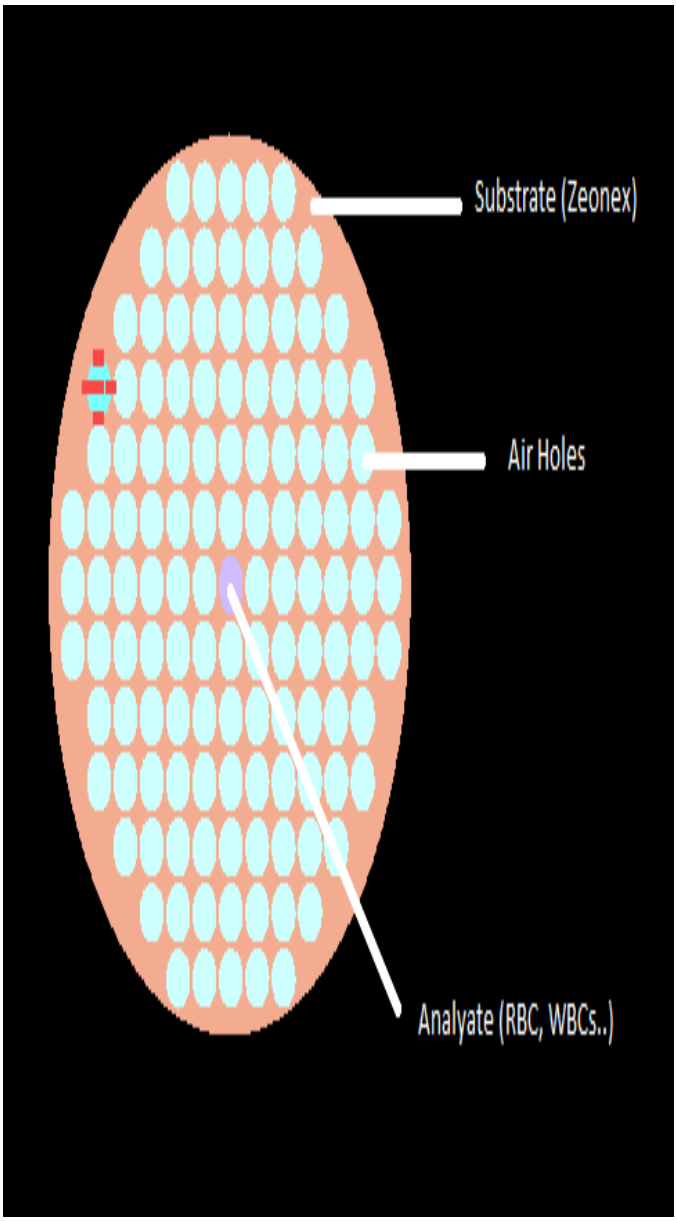


Figure 2: Top view/2D view or XY view of the structure

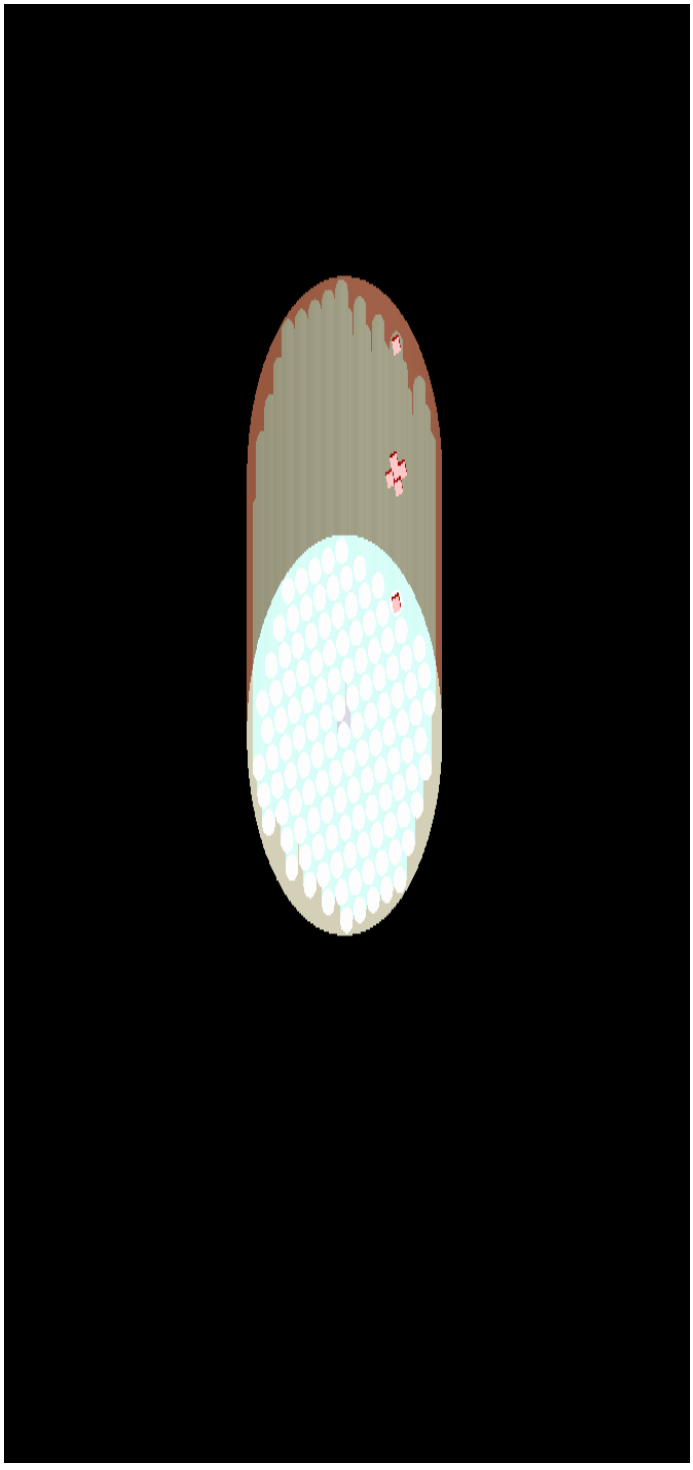


Figure 3: Geometric 3D view of the structure

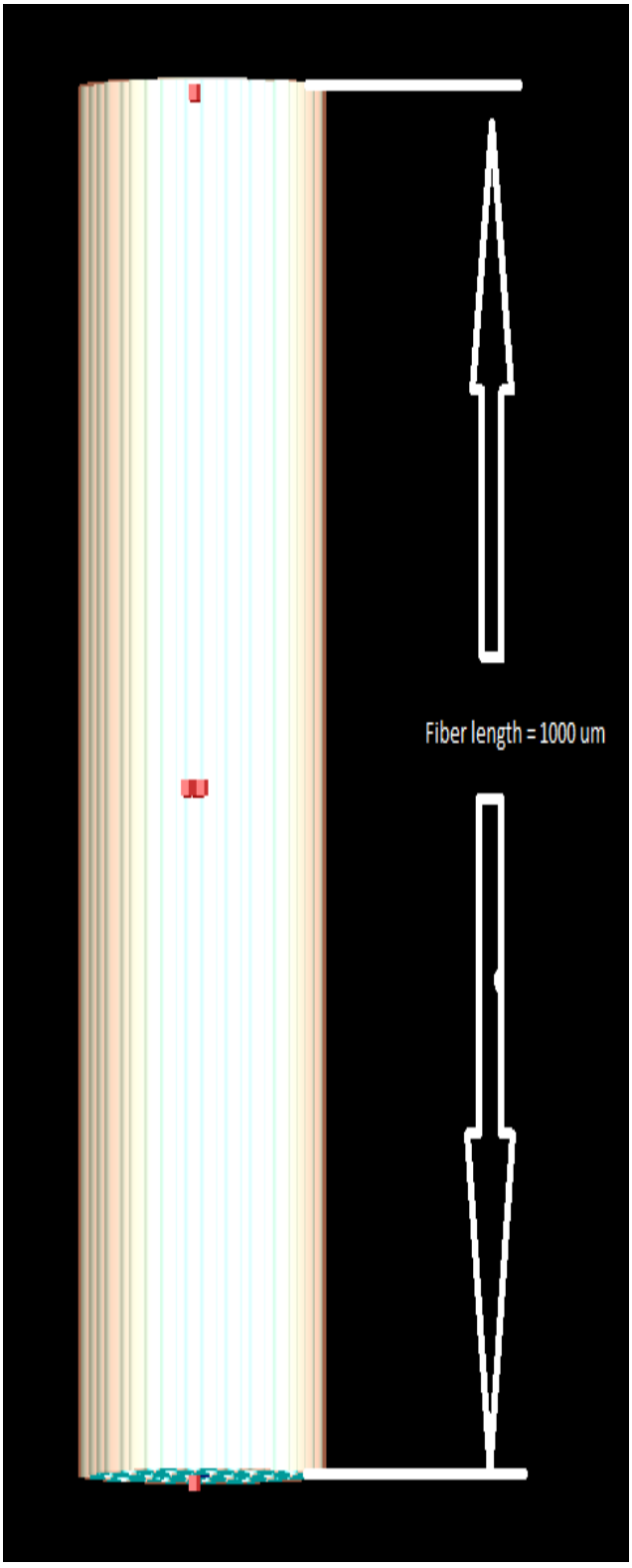


Figure 4: Perspective view of the structure

ISBN: 979-85-27243-61-1

DIMENSION PARAMETERS:

Parameter of the substrate	Measurement in um
Thickness (Z span)	0.5
Length (Y axis)	1000
Radius (R)	165

Table 1: Dimensions of the substrate

Parameter of the Core group	Measurement in um
Pitch (air holes)	24
Thickness (Z span)	0.11
Radius (r)	11

Table 2: Dimensions of the core

The structure was constructed over a substrate material Zeonex. The fiber length was considered to be 1000um. A central defect was created where the bio component or anaylate (RBCs, WBCs, Plasma, Water) can be placed for analysis. The central core group of air holes was structured in the form of a hexagon lattice derived from the base papers. The pitch, that is the distance between the centers of adjacent air holes was taken as 24um. The thickness of the substrate was considered to be 0.5um and the thickness of the core group as 0.11 um. The radius of the substrate was taken to be 165um and the radius of each of the air holes is taken as 11um.

BOUNDARY CONDITIONS USED FOR ANAYSIS

1.PML BOUNDARY CONDITIONS

A perfectly matched layer (PML) goes about as a virtual engrossing layer performing wave equations, which are utilized to shorten computational areas in numerical techniques to mimic issues with open limits in FDTD.

2.METAL BOUNDARY CONDITION

Metal boundary conditions are utilized to indicate limits that act as a Perfect Electric Conductor (PEC). The segment of the Electric field parallel to a metal boundary is zero and the segment of the attractive magnectic field perpendicular to a metal boundary is likewise zero. Metal limits are perfectly reflecting which permitting no vitality to get away from the reenactment volume along that boundary

3.SYMMETRIC AND ANTISYMMETRIC BOUNDARY CONDITION

Symmetry boundary conditions can be utilized at whatever point the ElectroMagnetic fields have a plane of symmetry through the center of the computation area. By exploiting this symmetry, the reenactment volume and time can be decreased by elements of 2, 4 or 8. Symmetric and antisymmetric to symmetric boundary conditions are utilized when the model to be mimicked shows at least one planes of symmetry; both the structure and source must be symmetric.

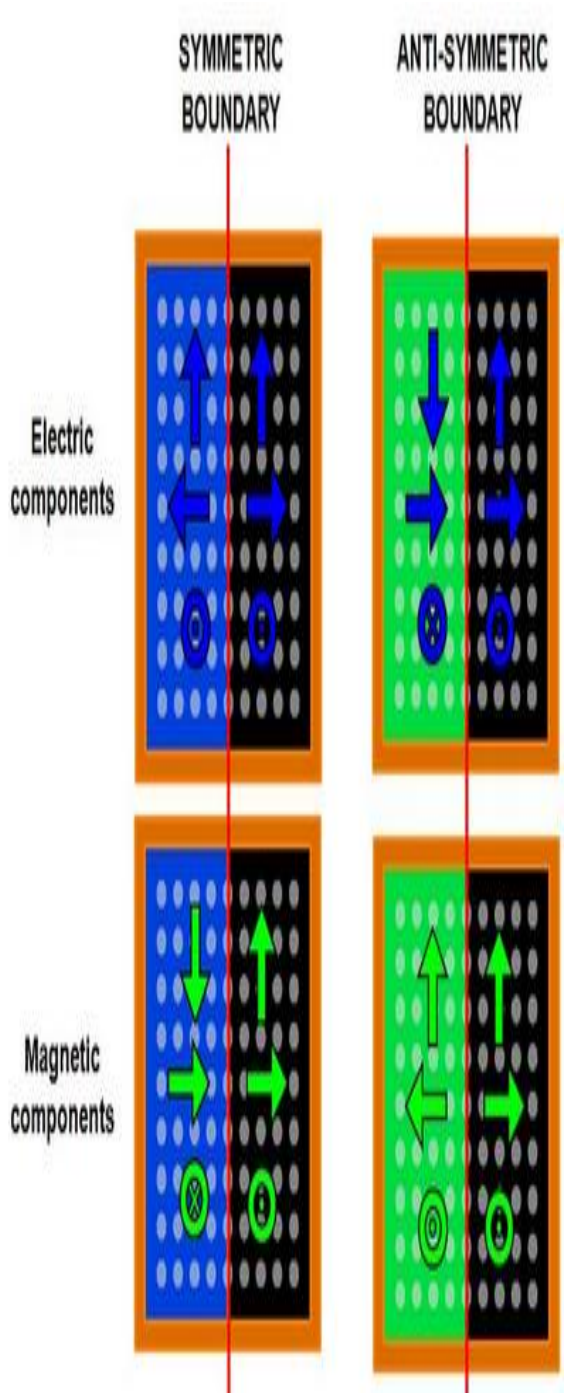


Figure 5: Symmetric-Antisymmetric boundary conditions

MONITORS USED FOR ANALYSIS

1.TIME DOMAIN MONITORS

These screens give time-domain data to field parts through the span of the reenactment. Time-domain
screens comprises of variouos focuses, line, or region to catch this data over various spatial degrees inside the FDTD reenactment regions.

2.FREQUENCY DOMAIN MONITORS

Frequency-domain field screens gather CW, consistent state EM field information in the frequency domain. Frequency-domain field screens gather the field profile in the frequency domain from reproduction results over some spatial district inside the recreation in the FDTD. There are two comparative kinds of frequency domain field screens: 'Frequency domain field profile' and 'Frequency domain field and force' screens..

RESULTS

The designed structure was simulated for different types of analytes like RBCs, WBCs, Haemoglobin, Plasma and Water. The effective indicies, along with the propagation constant (beta), electric and magnetic field confinement, dispersion and the RI profile was determined for each of the anaylate and the following results were obtained over an operating frequency range of 1.5 THz to 5 THz.

The refractive index of the designed structure is seen in Fig. 5.4.1. The substrate that is Zeonex provides a constant refractive index of 1.53 throughout the fiber the air holes can be observed as 1 and the central defect where the analyate is place is observed as 1.35 (for plasma).

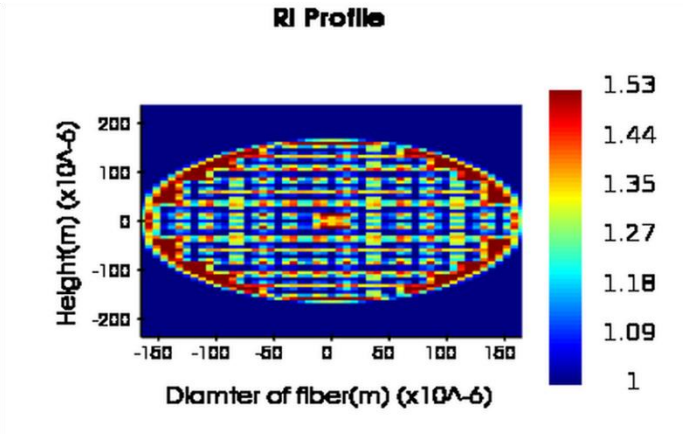


Figure 6: Refractive Index profile of the structure

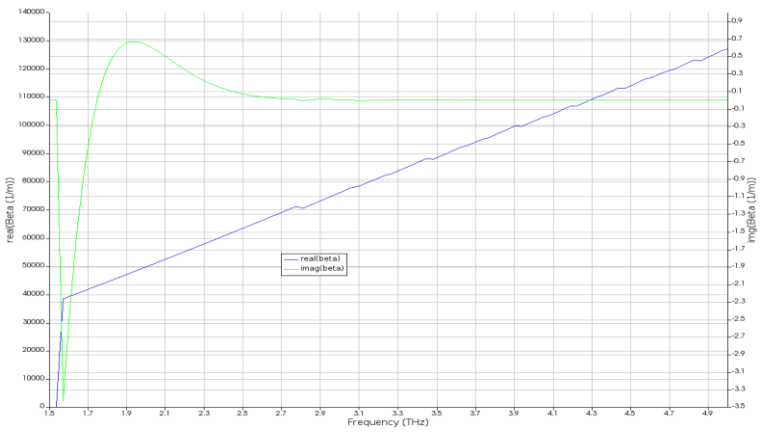


Figure 8 : Propagation constant variation over frequency

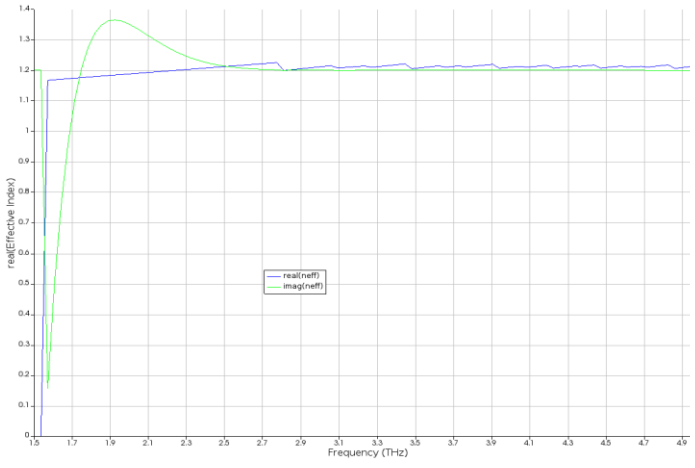


Figure 7: Effective Index (plasma)

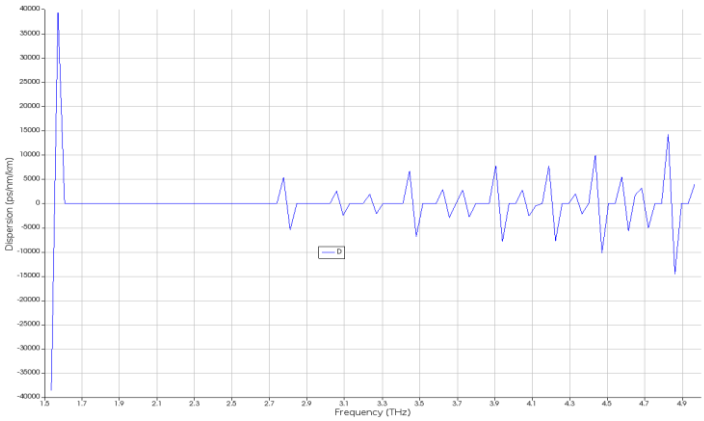


Figure 9: Dispersion variation over frequency

The propagation constant and the dispersion can be observed in figures 5.4.3 and 5.4.4 respectively. Propagation constant is the product of effective refractive index and wave number. The frequency dependence of the propagation constant's imaginary part determines the group delay and the chromatic dispersion of the waveguide. It can be observed that the imaginary part of the propagation constant in 0 for frequency above 1.5 Thz. Ideally, for a loss-less fiber the imaginary part of beta is 0, therefore the designed fiber acts as loss-less fiber for operating range above 1.5Thz.

The graph shows that there is no dispersion for the range between 1.5 Thz to 2.8 Thz, which is the optimum operating frequency range for the designed fiber.

The electric and magnetic field distributions shown in figure indicate the magnetic and electric field distributions across the fiber diameter. These parameters gives us a good understanding of the electric and magnetic confinements across the fiber.

ISBN: 979-85-27243-61-1

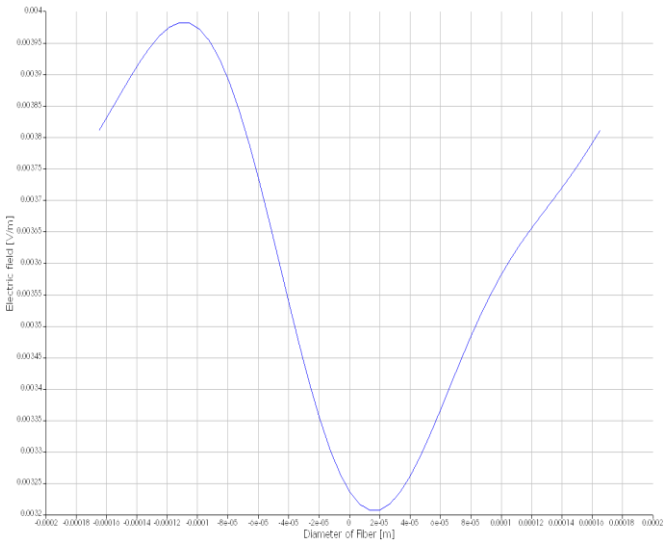


Figure 10: Electric field distribution

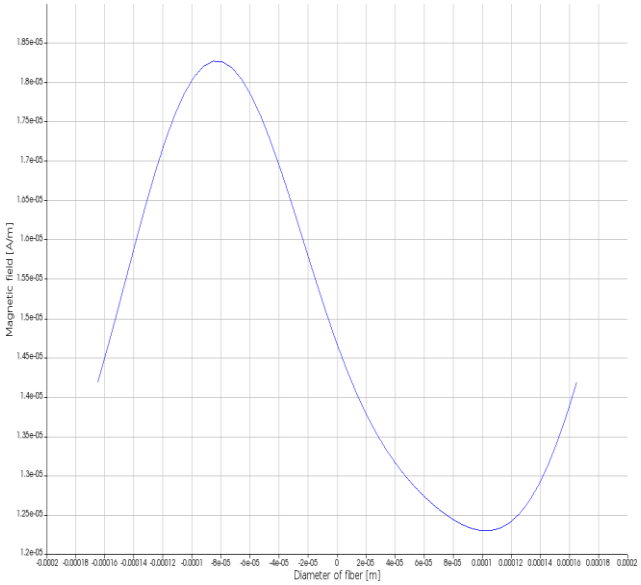


Figure 11: Magnetic field distribution

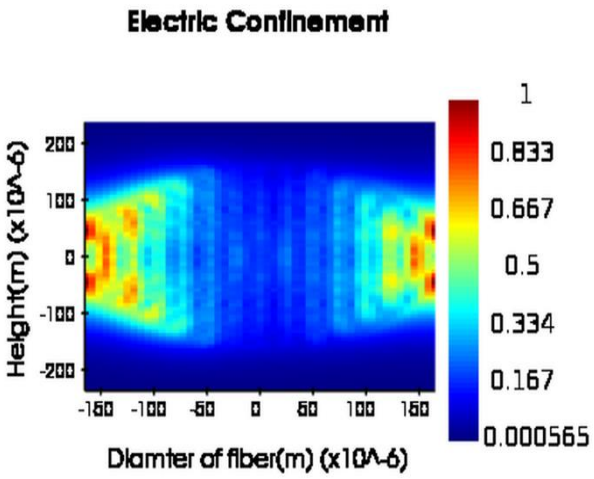


Figure 12: Electric field confinement

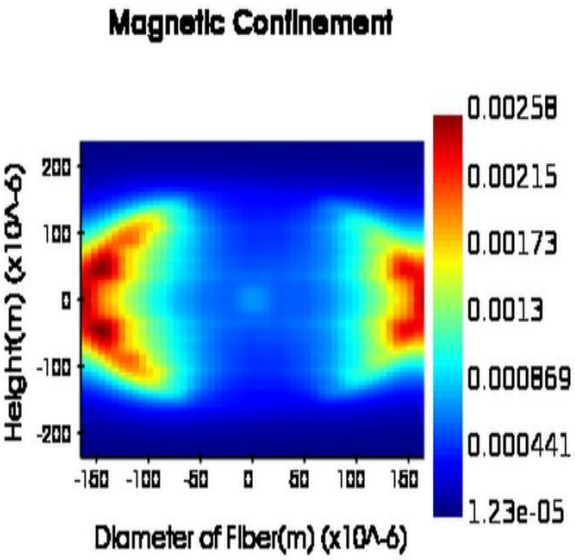


Figure 13: Magnetic field confinement

The magnetic and electric confinement shows how well the E and H field is confined within the fiber structure. The structure shows resonance at frequencies where maximum magnetic and electric field is confined or is maximum. The representation of the mode is TE01 where the electric field is perpendicular to the direction of propagation.

Confinement loss is a loss mechanism that showcases the light-confining ability of a photonic crystal fiber. It relies on the size of the center air gaps, the quantity of rings utilized n the cladding, and the cladding AFF.

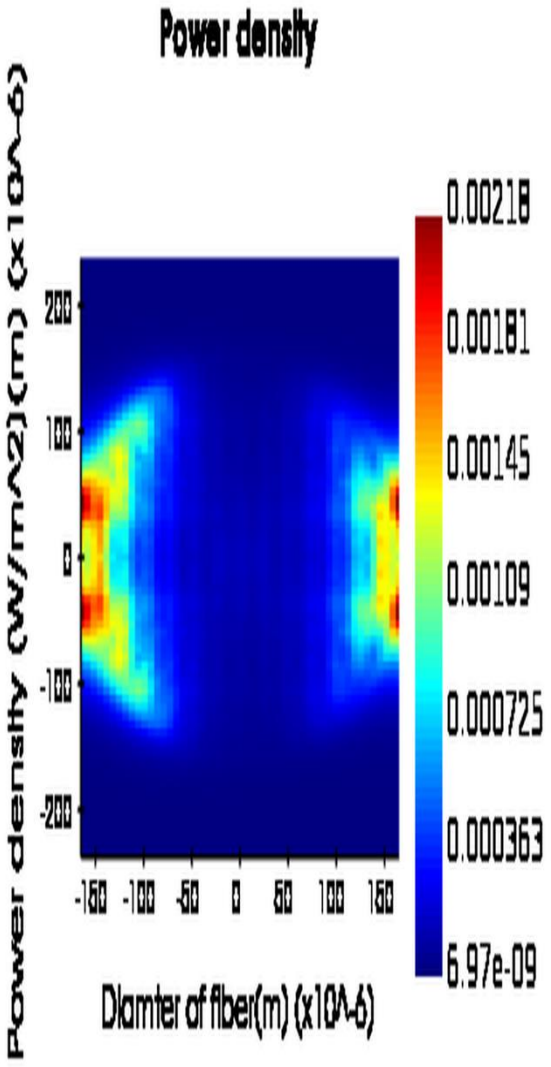


Figure 14: Power density

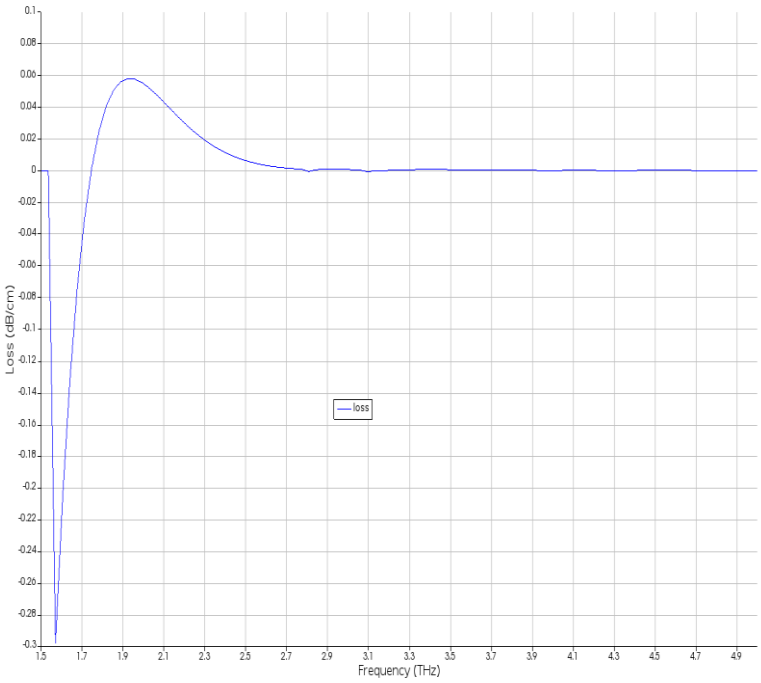


Figure 15: Loss (dm/cm) variations over frequency

Blood Component	RI	Effective index
RBC	1.4	1.18441
HB	1.38	1.18438
WBC's	1.36	1.18436
Plasma	1.35	1.18435
Water	1.33	1.18436

Table 3: Effective Index and R.I of analytes

Power density is the product of effective area and the output power of the designed structure. It can also be calculated from the spot size.

Loss (db/cm) v/s Frequency variation shows that the designed structure experiences very little loss over 2 Thz. Hence, for operating frequency range of over 2 Thz the desgined structure gives optimum result.

The table shows the different effective indices and refractive indices for 5 different analytes i.e, RBCs, WBCs, Haemoglobin, Plasma and Water. It can be seen that the effective index is maximum for RBCs (1.18441 and 1.18435) and minimum for Plasma respectively.

ISBN: 979-85-27243-61-1

CONCLUSION

- A photonic crystal biosensor for sensing different bio-analytes was designed and simulated using Lumerical FDTD and MODE solutions software.
- Zeonex which was used as fiber material provided constant RI (1.53) throughout the THz spectrum with tiny absorption loss.
- E and H field confinement losses, and distribution were observed through the simulations.
- Loss (db/cm) was confirmed to be 0 for operating frequency above 2 Thz, thus establishing the optimum range of frequency in which the designed structure can be used without experiencing any losses.
- Effective Refractive indices was calculated and tabulated for each of the bio analytes.

REFERENCES

[1] V. Sharma and V. L. Kalyani, "Designing four channel nano cavities coupled photonic crystal based bio-sensor for detection in water bacteria,"

[2] 2017 International Conference on Computing and Communication Technologies for Smart Nation (IC3TSN), Gurgaon, 2017, pp. 84-88, do: 10.1109/IC3TSN.2017.8284456.

[3] A. Duval et al., "Photonic crystal fiber based antibody detection," SENSORS, 2004 IEEE, Vienna, 2004, pp. 1222-1225 vol.3, doi: 10.1109/ICSENS.2004.1426399.

[4] D. Wu, B. Kuhlmey, and B. Eggleton, "Ultrasensitive photonic crystal fiber refractive index sensor," Opt. Lett. 34, 322-324 (2009).

[5] A. Candiani et al., "PNA-modified photonic crystal fibers for DNA detection," 2013 Conference on Lasers & Electro-Optics Europe & International Quantum Electronics Conference CLEO EUROPE/IQEC, Munich, 2013, pp. 1-1, doi: 10.1109/CLEOE-IQEC.2013.6801518.

[6] D. J. J. Hu et al., "Photonic Crystal Fiber-Based Interferometric Biosensor for Streptavidin and Biotin Detection," in IEEE Journal of Selected Topics in Quantum Electronics, vol. 18, no. 4, pp. 1293-1297, July-Aug. 2012, doi: 10.1109/JSTQE.2011.2169492.

[7] D. K. C. Wu, B. T. Kuhlmey and B. J. Eggleton, "Ultra-sensitive photonic crystal fiber refractive index sensor," 2009 Conference on Lasers and Electro-Optics and 2009 Conference on Quantum electronics andLaserScience Conference, Baltimore,LaserScience Conference, Baltimore, MD, 2009, pp. 1-2, doi: 10.1364/CLEO.2009.CThE1.

IOT Based Air Quality Monitoring System

Mrs. Mamatha K.R[1], Anusha K[2], Deepthi Pavanika R[3], Divya Y[4], Rekha U D [5]

[1]*Assistant Professor, BMS Institute of Technology and Management, Bangalore, Karnataka, E-mail: mamathakr@bmsit.in*
[2]*Student, BMS Institute of Technology and Management, Bangalore, Karnataka, E-mail: 1by17ec022@bmsit.in*
[3]*Student, BMS Institute of Technology and Management, Bangalore, Karnataka, E-mail: 1by17ec043@bmsit.in*
[4]*Student, BMS Institute of Technology and Management, Bangalore, Karnataka, E-mail: 1by17ec049@bmsit.in*
[5]*Student, BMS Institute of Technology and Management, Bangalore, Karnataka, E-mail: 1by17ec138@bmsit.in*

ABSTRACT— *Late forceful logical and mechanical advancements all these emphasis on a worldwide natural issue considering air quality framework, uncovers the way that India is confronting serious wellbeing dangers. In late reports, more than 10 metropolitan networks in India are recorded on top. The Air Quality Record (AQI) in India dispatched in 2014 under Swachh Bharat Abhiyan screens air defilement on 10 scales going from low (green) to coordinate (yellow) to certified (red) through data assessment of various air spoiling matters like PM 2.5, O_3, NO_2, SO_2, CO. The current paper develops Internet of Things (IoT) that enabled air quality checking system flexible in nature examining parameters including data assessing Smoke, Temperature, Pressing factor, Dampness, Dew point and PM level. The structure can measure neighborhood contamination and produce the data accordingly. The easy to use and simple treatment of the framework innovation is with the end goal that it tends to be introduced in houses and in little places.*

KEYWORDS— *Air Quality Record (AQI), Internet of Things (IoT), Hypertext Transfer Protocol (HTTP), ThingSpeak, temperature, pressure, humidity, MQ 135 sensor, NodeMCU*

I. INTRODUCTION

Air contamination is the greatest regular and general prosperity challenge in the world today. Air tainting prompts hostile effects on human prosperity, air and climate. Air is getting tainted considering appearance of harmful gases by ventures, vehicular outpourings and extended centralization of dangerous gases and particulate issue in the environment. Particulate matter is perhaps the main limits having the basic obligation to the extension in air tainting. This makes a necessity for assessment and examination of progressing air quality noticing so appropriate decisions can be taken in a helpful period.

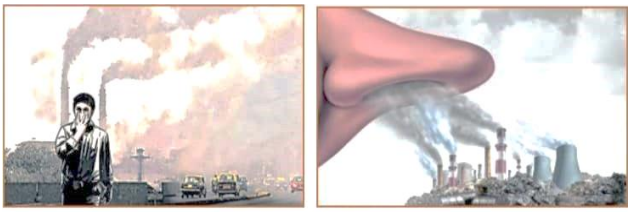


Figure 1: Gives the idea of air pollution level in environment.

II. PROBLEM ANALYSIS

Openness to significant degrees of air contamination can cause an assortment of antagonistic wellbeing results. It builds the wellbeing hazard. More extreme effects influence individuals who are now sick. Kids, the old and needy individuals are more defenseless. The most wellbeing unsafe poisons firmly connected with inordinate untimely mortality are fine PM2.5 particles that infiltrate profound into lung ways.

Air Pollution may lead to:
- Asthma attacks and Bronchitis (respiratory problems)
- Lung cancer
- Hospitalization
- Developmental effects
- Premature death

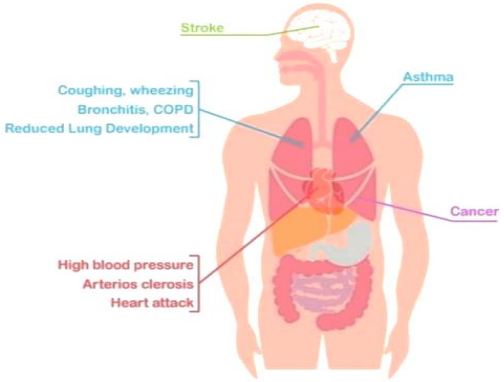


Figure 2: Diseases caused due to inhaling of contaminated air

III. PROPOSED SYSTEM

This model is planned utilizing IoT innovation. It is a reasonable framework which detects the ongoing encompassing information with the assistance of 2 sensors to be specific MQ135 sensor and BME 280. MQ135 is utilized to detect the air quality regarding ppm. BME 280 is a pressing factor and moistness sensor that detects the temperature, pressing factor, dampness and utilizing these boundaries dew point and pressing factor inch.

Every one of these sensors offer readings to the NodeMCU as a handling unit and this sends the distinguished information to the web. ThingSpeak is an open cloud stage that is utilized to store and recover information through hypertext move convention (HTTP)over web. With the assistance of ThingSpeak platform, the detected information can be plotted in graphical structure.

Below section gives the list of components used in this project:

Software requirement:
1. Arduino IDE
2. ThingSpeak

Hardware requirement:
1. Node MCU ESP8266
2. BME 280
3. MQ135
4. Connecting wires
5. Bread Board
6. USB Cable, etc.

IV. BLOCK DIAGRAM

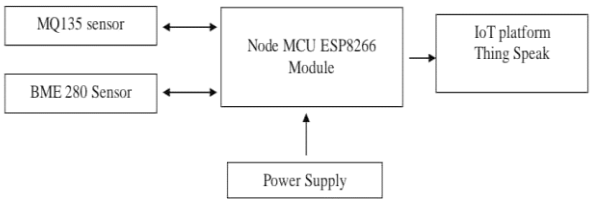


Figure 3: Block diagram

This project involves monitoring of some parameters of air like pressure, temperature, humidity, air quality in terms of ppm, dew point using the NodeMCU and programming it using arduino. The output can be seen using the serial monitor and the data is also sent to cloud and is observed in the form of graph in the online platform Thingspeak. This project is mainly focused to be implemented in areas where factories are more to see if the factories and industries release the purified air from the exhaust end to the environment. Also, the quality of air can be determined at those places to see if that environment supported the livelihood of the people without causing any diseases and health hazardous.

V. MODEL DESCRIPTION

1) Sensing the air

This is initial step and we use sensors like BME 280 Sensor and MQ135 sensor to sense and the parameters which are sensed by these sensors are humidity, pressure and temperature and also detecting presence of a wide range of gases, including NH_3, NOx, alcohol, benzene, smoke and CO_2 which are harmful.

2) Detection of air parameters

As air pollution is widely affecting all living organisms it is very much important to measure and maintain all the measurable parameters of air like humidity level, temperature, etc.

3) Air quality detection

Detection of qualitative parameters is important and this process can be achieved by maintaining proper levels of all parameters of air. The more these air parameters are stable the better will be the air quality.

VI. FLOW OF THE PROCESS

Starting with the connection of Node MCU ESP8266, A0 pin is connected to the AOUT pin of MQ135, Vcc and gnd pin of Node MCU to Vcc and gnd pin of MQ135. Then D1, D2, D3, D4 pin of Node MCU is connected to SCL, SDA, CSB, SDO pin of BME 280 sensor respectively.

Circuit Diagram:

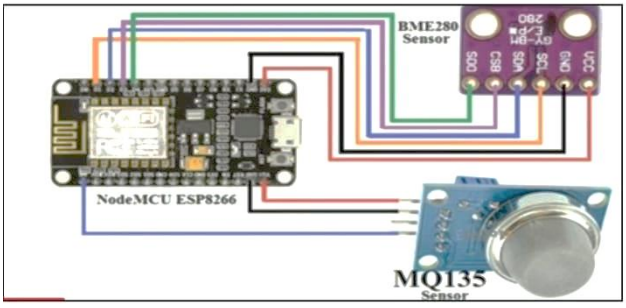


Figure 4: Circuit Connections

Applications: -

1) Industrial perimeter monitoring
2) Indoor air quality monitoring.
3) Site selection for reference monitoring stations.
4) Making data available to users.

Advantages: -

1) Easy to Install
2) Accurate Pollution monitoring
3) Remote location monitoring

VII. RESULTS

This paper depicts how output will be the data as measured by sensors that is by MQ 135 and BME 280. MQ 135 will sense the quality of air in terms of PPM and displays the data through Node MCU. BME 280 will sense the temperature, pressure and humidity and displays the data.

The dew point can be calculated using the below formula:

dp = t1 - 0.36 * (100.0 - h)

where,

dp -> dew point

t1 -> temperature in °F

h -> humidity

The temperature that BME 280 senses will be in default °C.

this can be converted into °F for calculating dew point using the formula:

t1 = t*1.8 + 32.0

where,

t -> temperature in °C

Pressure inch is calculated using the pressure value sensed by BME 280 as follow:

pin = 0.02953 * p

where,

pin -> pressure inch

p -> pressure in mb (1 mb = 100 pascal)

Pressure is multiplied by 0.02953 to express it in inch of mercury (in of Hg) which is called as pressure inch. The unit of measurement for pressure is Inch of mercury (inHg and ″Hg). It is used for barometric pressure in weather reports, refrigeration and aviation in the United States. The temperature to which air must be cooled so that it becomes saturated with water vapor is known as the dew point. When cooled further, liquid water (dew)is formed from the airborne condensed water vapor. Water will condense on the surface, when air cools to its dew point through contact with a surface that is colder than the air.

Dew Point	Comfort Level
< 50	Dry
50 - 55	Pleasant
56-60	Comfortable
61-65	Sticky
66-70	Uncomfortable
71-75	Oppressive
76 +	Miserable

Figure 5: Comfort Level as per Dew Point

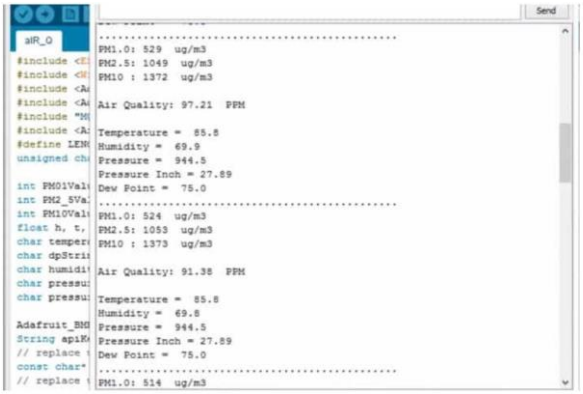


Figure 6: Display of different readings

The model is trained to get maximum accuracy and with minimum loss. Testing is done on valid locations with different air conditions. The model is developed so as to give an accuracy of around 90%.

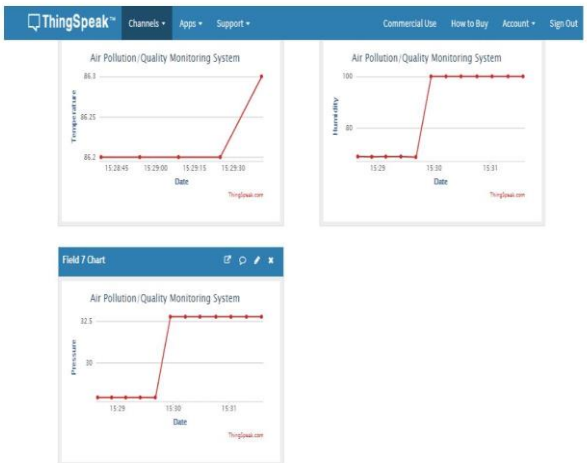


Figure 7: Display of results in ThingSpeak

VIII. CONCLUSION

According to various surveys done, there is no perfect solution for suggesting the exact methods for a particular particulate concentration reduction in air. This paper suggests the suitable pesticides that the amount of air pollutants present and other environmental factors as mentioned earlier. The main advantage of this paper is that it suggests the solution to the problem at a very low cost and not much hardware is required. The outcome can also be shown in an additional screen. The accuracy of the model is tried to be maintained at a high rate for good possible outputs.

IX. FUTURE SCOPE

The present paper shows the effective features to describe the quality of air. This can also be improved by adding on some of the features as shown below.

i. Instead of reading results from laptop, we can use the OLED display to display the readings.
ii. The components that are used in this paper detect only some of the parameters of air. More parameters can be analyzed in the air like PM 2.5, PM 5 using the particulate matter sensor connected to the Node MCU.

ACKNOWLEDGMENT

The authors of this paper would like to thank the management of BMS Institute Of Technology for providing support to execute this project.

REFERENCES

[1] Ajitesh Kumar, Mona Kumari, Harsh Gupta, "Design and Analysis of IoT based Air Quality Monitoring System",28-29 Feb,2020, IEEE.

[2] Temesegan Walelign Ayele, Rutvik Mehta, "Air pollution monitoring and prediction using IoT", 2018, IEEE.

[3] J. Esquiagola, M. Manini, A. Aikawa, L. Yoshioka and M. Zuffo, "Monitoring Indoor Air Quality by using IoT Technology",2018, IEEE.

[4] Bikash Kumar Moharana, Prateek Anand, Sarvesh Kumar and Prakash Kodali, "Development of an IoT-based Real-Time Air Quality Monitoring Device", 28-30 July 2020, IEEE

[5] Hocine Mokrani, Razika Lounas, Mohamed T. Bennai, Dhai Eddine Salhi, Rachid Djerbi, "Air Quality Monitoring Using IOT: A Survey",2019, IEEE .

[6] Sean Mc Grath, Colin Flanagan, Liaoyuan Zeng, Conor O'Leary, "IoT Personal Air Quality Monitor", 2020, IEEE.

[7] Somansh Kumar, Ashish Jasuja, "Air Quality Monitoring System Based on IoT using Raspberry Pi", ICCCA2017, 2017, IEEE.

[8] Pearl Pullan, Chitra Gautam, Vandana Niranjan, "Air Quality Management System", 2020, IEEE.

[9] S. Muthukumar, W. Sherine Mary, S Jayanthi, R Kiruthiga, M Mahalakshmi, "IoT Based Air Pollution Monitoring and Control System", 2018, IEEE.

[10] Tigor Hamonangan Nasution, Ainul Hizriadi, Kasmir Tanjung, Fitra Nurmayadi,"Design of Indoor Air Quality Monitoring Systems", 2020, IEEE.

FACIAL AND VOICE RECOGNITION BASED SECURITY SYSTEM TO DOOR

(HARSHINI T, PAVAN K, PRAVEENA B, MOUNIKA S)

Electronics and Communication Engineering, Srinivasa Ramanujan Institute Of Technology, Rotarypuram , Anantapuramu, 515701, Andhra Pradesh, India.

174g1a0425@srit.ac.in

ABSTRACT-The principle topic of our task is to give security to the entryway by utilizing a facial and voice acknowledgment based framework. our framework will catch the essence of the individual who needs to open the entryway and afterward it contrasts the caught face and the beforehand put away face in the information base in the event that it is coordinated, the individual can go to the second step of the check assuming the face isn't coordinated, the picture of the unapproved individual will be shipped off the higher specialists mail id by utilizing IoT. Assuming the face is coordinated, the individual will go into the second step confirmation then the individual needs to provide voice orders through the voice module. If the voice order got by the voice module is coordinated with the recently put away voice orders then the second step check is effective. On the off chance that the voice order isn't coordinated, SMS is shipped off the higher specialists utilizing the GSM module. Then, at that point he needs to enter the secret word this is the last advance of check assuming the entered secret key isn't right, SMS will be shipped off higher specialists in the event that the entered secret word is right, the entryway will open.

Keywords- Face recognition, voice recognition, Keypad, GSM module, Door lock module.

INTRODUCTION

These days, such a lot of are going through crucial safety problems; Thule, they want an incredibly pre- organized now no longer many. Surveillance and safety structures. Nevertheless, this safety machine finally tumbles because of thriller key hacking or encoded or unscrambled information. In this way, to cope with such problems and to make sure the safety of the doorway biometric structures like face confirmation, iris confirmation are used. Among those Face discovery System is greater useful and clean to do moreover, it moreover perceived the unauthenticated character with out their understanding. Already the facial confirmation changed into achieved with the assist of PCA and LDA calculations. However there are numerous limitations to those calculations. The vital difficulty of the PCA calculation is that it's miles much less touchy to distinctive getting prepared information experience and it's miles in like way computationally exorbitant with excessive time complexity.The chief issue of the LDA calculation is just in case there's any selection within the gift or during any condition in a similar image the speech act of bumble rate is extended. A structure may be controlled and detected remotely/subsequently with the assistance of Windows IoT ten. Hence, the system is formed with Windows IoT 10 which may beat the shortcomings of the PCA (Principal half investigation) and LDA (Linear discriminant examination). Direct discriminant examination discourse is that the most worthy limit. changed speaker affirmation (ASR) structures acknowledge folks utilizing the articulations. contingent the chance of the application, speaker recognizing verification or speaker affirmation systems can be shown to figure either in text-ward or text-free modes. The essential objective of this security system is to confirm the prosperity of the access by perceiving unauthenticated folks and exploitation voice affirmation.

LITERATURE SURVEY

[1] Anil k.Jain "Longitudinal Study of Automatic Face Recognition", The two mystery premises of changed face confirmation are uniqueness and lastingness. This paper reviews the perpetual quality property by keeping an eye out for the going with: Does go facing attestation breaking point of top level constructions debase with sneaked past time among picked and question face pictures? Given that this is legitimate, what is the speed of decay w.r.t. the sneaked past time? While past evaluations have revealed defilements assessment, no formal certain assessment of giant degree longitudinal information has been driven. We direct such an assessment on two mugshot enlightening assortments, which are the best facial creating educational assortments thought to date the degree that couple of subjects, pictures per subject, and spent events. Blended impacts break faith models are applied to certified similarity scores from best in class COTS face matches to measure everyone mean the speed of progress in true blue scores over the long haul, subject-express impulse, and the impact develop enough, sex, race, and face picture quality. Longitudinal assessment shows that in spite of diminishing certifiable scores, 99% of subjects can, in any case, be seen at

0.01% FAR up to around 6 years sneaked past time, and that age, sex, and a race just indistinguishably influence these models. The method familiar here ought to with be on occasion repeated to pick age-invariant properties of face insistence as bleeding edge makes to even more plausible region facial creating.

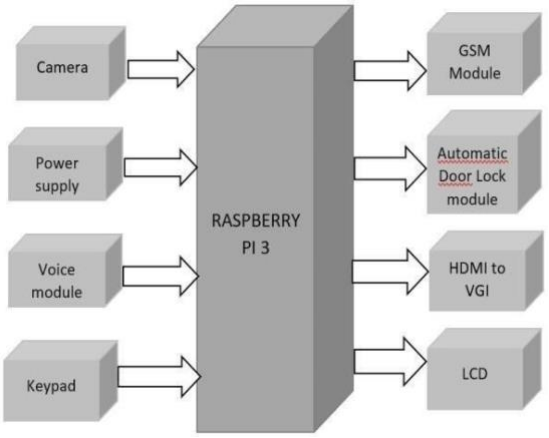
[2] Navaf Yousef almudhahka and Mark S. Nixon, "Programmed Semantic Face Recognition", Ongoing improvement in perception structures has animated exploration in sensitive biometrics that engage the unconstrained affirmation of human appearances. Relative fragile biometrics show common affirmation execution than unmitigated sensitive biometrics and have been the point of convergence of a couple of assessments which have included their ability for affirmation and recuperation in constrained and unconstrained conditions. These assessments, regardless, just would in general defy affirmation for recuperation using human-delivered attributes, offering an ice breaker about the believability of thusly making comparable names from facial pictures. In this paper, we propose a method for the adjusted near naming of facial delicate biometrics. Plus, we research unconstrained human face affirmation using these moderately sensitive biometrics in a human- stamped display (and the opposite way around). Using a subset from the LFW dataset, our investigations show the reasonability of the modified period of close to facial names, highlighting the normal extensibility of the best approach to manage other face affirmation circumstances and greater extents of characteristics.

[3] Hteik Htar Lwin, Aung Soe Khaing, Hla Myo Tun "Programmed Door Access System Using Face Recognition", This paper explains that how self-administering vehicles will act while opening the entrances with the help of face affirmation. There are different ways to deal with open entrances with the most insightful way yet facial affirmation will be generally secure as two people can never have similar appearances. This framework is using PCA (Principal Component Examination) which is used for facial affirmation, to genuine the supported individual for the vehicle.

Proposed system

In the proposed system, we are providing high-security system to the door by three-step verification. When a person wants to open the door of the room then the camera which is integrated with a Raspberry Pi captures the image of the person then the captured image is verified with the previously stored images in a Raspberry Pi SD card if both the images are not matched then the image of an unauthorized person will be sent to the owner mail I D by using SMPT protocol Otherwise he will enter into next step that is voice recognition now the person has to give commandif the given command and voice of the person is matched with the previously stored voice commands in the voice module then he will enter to the final step of verification that is password entering step otherwise SMS will be sent to the owner by using GSM module. Finally, if the password is correct, the door will open, otherwise, a message will be sent to the owner.

Block diagram of proposed system:



Components used in the Proposed System:

1.Camera

A digital digicam is an optical device that's used to get a photograph. At their all matters taken into consideration basic, cameras are constant boxes (the digital digicam body) with pretty opening (the outlet) that awards mild in to get a photograph on a mild-sensitive floor (commonly photographic movie or a well known sensor). Cameras have exclusive structures to manipulate how the mild falls onto the mild-sensitive floor. Focal shines shine the mild getting into the digital digicam, the dimensions of the outlet may be prolonged or restricted to present for all intents and functions mild permission to the digital digicam, and a display screen shape alternatives the quantity of time the photo touchy floor is familiar with the mild. The licensed photograph digital digicam is the imperative device withinside the electricity of pictures and regarded photos is probably imitated up straightaway as a bit of the instance of pictures, automatic imaging, photographic printing. The comparative innovative fields withinside the transferring photograph digital digicam location are movie, videography, and cinematography.

2.Power Supply

Reference to a wellspring of electric force. The framework that provisions electrical energy to yield burden or gathering of burden is called power supply unit. This segment is needed to change over AC signal to DC signal.

3. Voice Recognition Module

Voice Recognition Module is a restricted fundamental control talking insistence board. It's anything but's a speaker-subordinate module and supports up to 80 voice orders. Any strong could be pre-pared as solicitation. Clients need to set up the module first before seeing any voice demand. Voice orders are dealt with in one goliath get-together like a library. Any 7 voiced solicitations in the library could be brought into recognizer. It recommends 7 orders are powerful meanwhile. Particulars of Voice attestation module.

1) Voltage: 4.5-5.5V
2) Current: <40mA
3) Digital Interface: 5 V TTL level UART interface
4) Analog Interface: 3.5 mm mono-channel intensifier connector + collector pin between face
5) Recognition exactness: 99% (under ideal environment)
6) Support most outrageous 80 voice orders, with each voice 1500 ms
7) Maximum 7 voice orders practical at same time
8) Easy Control: UART/GPIO
9) User-control General Pin Output

4. Keypad

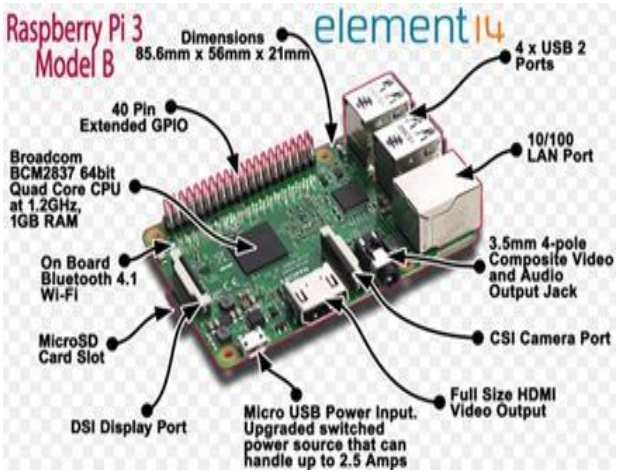
A keypad is a bunch of catches organized in a square that typically bears digits and different images however not a total arrangement of sequential letters.

5. GSM Module

GSM (Global System for Mobile interchanges) is a mobileular organization, which means that mobileular telephones interface with it through seeking out cells withinside the brief area. GSM networks paintings in 4 numerous recurrence ranges. Most GSM networks paintings withinside the 900 MHz or 1800mhz groups.

6. RASPBERRY PI:

The Raspberry Pi three is the contemporary interpretation of Raspberry Pi. It additionally encourages the tough display and Wi-Fi speed. The version has numerous equal specifications as its original, regardless, it brings the rate of the processor as much as 1.4GHz. Not honestly Processor but furthermore the corporation is in addition upheld upon this version. The version furthermore has a Micro USB connection for strength withinside the middle, a full- sized HDMI port, and a valid framework sound and composite video yield at the right.



7. HDMI to VGA:

This HDMI to VGA Adapter permits you to consistently streams content from HDMI gadgets like Apple TV, furthermore, other HDMI-fit gadgets to your projector, old screen, or other VGA show. It likewise incorporates an additional sound link to carry sound to your VGA gadget. VGA associations just convey visual data. The included sound link guarantees your substance shows up complete with sound.

8. Liquid Crystal Display:

LCD is a slim, level presentation gadget. The working voltage of this LCD is 4.7V-5.3V. Comprised of monochrome pixels showed in front of the light source. A Most regular gadget connected to a miniature regulator.

Future Scope:

In the proposed security structure, face assertion with Windows IoT 10 is gotten along with the voice certification framework for thriving reasons. Facial and voice attestation both are making improvements, with the assistance of these advances we can develop different things. Different calculations are made on the embodiment of confirmation, yet they have different weights. Google API is one of the fit frameworks in voice insistence which eats up less an ideal opportunity to change over any message into demand an embraced.

Conclusion:

The proposed system almost gives twofold security because of a mix of face affirmation with Windows IoT 10. Thusly, the face acknowledgment system with the help of windows IoT 10 improves the security of the room without-out permitting unapproved individuals to enter it. Expecting someone endeavors to open the entryway, then, at that point the photograph of the unapproved individual will be shipped off the higher specialists. The voice affirmation is moreover used for the prosperity of secure the room. In this manner, the

proposed structure is particularly valuable, effective for getting the room from unapproved individuals.

References:

[1] Automatic Door Unlocking System UsingFaceRecognition:https://thestempedia.com/project/automatic-door-unlocking-system-using-face recognition/amp/

[2] Face Recognition Door Lock SystemusingRaspberryPi: https://iotdesignpro.com/projects/face-recognition-door-lock-system-using-raspberry-pi

[3] Voice Recognition System and its WorkingOperation: https://www.elprocus.com/voice-recognition-security-system/

[4]Facial and Voice Recognition Based Security and Safety System in Car: https://ieeexplore.ieee.org/document/9197886

[5] Home Security System and Door Access ControlBasedonFaceRecognition:https://www.irjet.net/archives/V4/i3/IRJET-V4I385.pdf

[6] How to build a face detection and recognitionsystem: https://towardsdatascience.com/how-to-build-a-face-detection-and-recognition-system f5c2cdfbeb8c

[7] Facial Recognition TechnologyGuide:https://www.techfunnel.com/information technology/facial-recognition-technology/

[8] Facial Recognition using Deep Learning: https://www.cronj.com/blog/face-recognition-facial-recognition/

[9] 5 Pros and Cons of Face Recognition Technology: https://www.techfunnel.com/information-technology/5-pros-and-cons-of-face-recognition technology/

Providing Knee movement Assistance using Android and IOT

Aditya K[1], Gowri M[2], Pranav K R[3],Namana[4]

Department of Electronics and Communication Engineering, Shri Madhwa Vadiraja Institute of Technology and Management,Vishwothama Nagar,Bantakal-5764115,Udupi,Kanataka,India

[1]aditya.17ec003@sode-edu.in

[2]gowri.17ec021@sode-edu.in

[3]pranav.17ec041@sode-edu.in

[4]namana.17ec030@sode-edu.in

Abstract— Aging in living beings is a natural process and with aging one encounters challenges with walking or standing for long hours. Obsolete solutions like walking sticks do not provide satisfactory and effective solutions permanently neither can they be integrated with smart features to help in physical ailments. This paper aims to provide external metallic joints attached to the legs, in particular the knee which will help in effective transfer of the body weight onto the ground thus making it convenient for movement and other actions.This is made possible using the Gear Bearing Drive System with 18000 RPM base motor and 32 Kg/cm holding torque. Lead Screw Mechanism uses the power generated by the motor to facilitate movement. Arduino Uno with the microchip ATmega328P controls the motor. The bluetooth module(HC-05) helps in connecting the microcontroller to a mobile app created using MIT app inventor. The Mobile App is integrated for user convenience, through which the movement is assisted as desired by the user. Elderly people can now move easily without any hassle. This device can be used by people who are severely injured, by relieving the pain and assisting them in a speedy recovery. It can be used as a rehabilitation device. Patient populations with stroke or neurological disorders who have lost their walking capabilities can also walk easily.

Keywords— Knee brace,Lead screw mechanism,MIT app,Bluetooth module, DC motor.

I. INTRODUCTION

The Knee is one of the most complex joints in the human body. Its importance in stabilizing the body is evident in a range of activities, from everyday activities such as standing, walking etc. On aging our elderly encounter challenges in performing the above mentioned activities. Through extensive research and survey it is found that around 25% of people around the world, who are above 50 years of age have serious problems related to knee joints. In India 15% of people are already taking treatments for knee pain, which is about 18 crore people roughly. But a lot of people in India go for domestic medicine ,ayurveda etc hence the above number at minimum and on a rough estimation will be double i.e 30% or about 36 crore people. In addition, it is an important fact that women undergo these pains a lot more frequently than men ,about 10-20% more.An orthosis is defined as a device designed to align, correct or prevent neuromuscular or musculoskeletal dysfunction, disease, injury or deformity.There are various devices that were/are under development and already present for the above mentioned complications. Some of the devices are, passive gravity balancing passive leg orthosis [2],Powered Leg Orthosis [3], Hybrid Assistive Limb (HAL) [4], Rewalk [5] and Ankle Foot Orthosis [6] etc.But these devices are complex, not portable, device is bigger in size, consumes more power, more expensive, hence not affordable. A person is always required to set up the device.

The most efficient way to deal with this problem is by overcoming the previous drawbacks and to inculcated new features is to design a wearable knee brace comprising of outer exoskeleton, Motor which is the driving force, Microcontrolers to actuate the device, bluetooth module as well as wifi module to act as interface between the android app and wearable device.

The body of the exoskeleton used is primarily made of aluminium 7075 alloy as it is lighter in weight and has high strength, toughness, good resistance to fatigue and has significantly better corrosion resistance.Other heavy metals are conventionally used, galvanised iron makes up the base to strengthen the material steel is also employed on the movable part to provide robustness.

The proposed system is a compact rotary series elastic actuator for knee joint assistive system.CRSEA is a system

with torsion spring in a chain of spur gears and worm gears which controls the generated torque.A DC motor is used which contributes to maximum speed and torque of 8200rpm and 0,181Nm. CRSEA system torques upto 10.87Nm.The basic principle used in the system is that the reduced speed reduction ratio obtained by worm gear and worm wheel maximizes the torque.while considering the requirements such as precise and large torque generation, backdrivability, low output impedance,the system gives good performance. but, since the torque amplification ratio of the worm gear is sensitive to the friction coefficient,it introduces an uncertainty to the system model and reduces the overall efficiency.[7] The knee-ankle orthotic device incorporates a low transmission ratio which produces a higher torque output.An AC servo is used to provide with peak torque of 7.2Nm and speed of 80 rpm. since the device weighs around 4.88kg, we can infer that the overall design is not compact.besides ,the system's response time time is too high due to low speed and the feedback mechanism in servo motor trying to correct any drift from the desired position,it results in poor stability of the system.[8].A powered prosthetic leg designed in [9] embodies high density actuators which serves several benefits like free swinging in knee motion and compliance with ground.The motor used is ILM85X26 motor kit with peak torque rating of 8.3Nm and velocity upto 1500 rpm .Additionally it is driven with motor driver which has a rated current of 17.6A. Active knee rehabilitation orthotic device is majorly created to serve as a gait rehabilitation device for patients past stroke.It involves several techniques to prevent hypertension amongst individuals.On comparing the motors in [7]-[9],Gear bearing drive is a novel mechanism is used in the system in [10] GBD is a compact system which integrates a brushless DC and gear bearing.GBD is not a heavy system and its volume is ⅛ of the volume when compared with actuators in[7]-[9]The torque rating of GBD is 3.42Nm with rpm rating of 266.Thus We can infer that GBD proves to be a novel technology that can be utilized in robotic orthosis devices.

The microcontroller employed to actuate the motor is arduino uno equipped with a high level programming facility needed for deciding the degree and time for motor operation, Receiving signals is a bluetooth module or a wifi module independent of one another so as to provide convenience to the user which is a unique attempt made and is absent in other knee braces.

Out of the numerous ways to create an App. An app can be created using android studio to control the RPM and directions of the motor and also to control the motor through voice [9-10]. MIT app inventor is easy to use in comparison with android studio. It has a graphical interface, conventional coding is not required to create the app, instead drag and drop the interface to be performed. This can be used to interface the microcontroller with the motor and control the RPM and directions through the Bluetooth module[11-16].

II. DESIGN

A. *Design Overview:*

We derive the requirements for the knee actuators from the necessary torque, velocity, position, and power requirements Machined components are made of 7075-aluminum, with a few shafts, gears, and bearings made of stainless steel.An aluminium 7075 alloy is moulded in the shape of a typical knee brace providing a 12 inch circumference for the arrangement so as to comfortably accommodate the knee. An adjustable velcro is also tied and can be loosened if the user feels uncomfortable. The thickness of the material will be around 5mm so as to optimise and keep a balance between strength of material without adding unnecessary weight. A micro controller and driver IC will be placed on the side of the mould so as to give signal to the motor.The high torque motor is placed at the sides of the aluminium mould so to facilitate expansion and contraction of knee joints.The jaws of the knee braces can only support movement of the knee upto 90 degrees and not beyond that, higher degrees of freedom can be obtained by using open design knee brace.

B. *Details of components:*

1) *Body Material:*

Aluminium 7075 is an alloy, with zinc as the primary alloying element. It is used in the framework to provide a strong exoskeleton and also provide a suitable structure to help in sharing of weight with the knee joint. Additionally strips of GI are provided as base foundation and support on top of the aluminium alloy this also facilitates movement. The variable length part outer body is made of 0.75 inch breadth and inner steel body also made of steel is 0.5 inch breadth, the inner steel body is welded to the leadscrew.



2) *Gear Bearing Drive System:*

It is a combination of brushless DC motor and gearbox. It generates high torque to assist and support in any kind of movement desired by the user like standing,sitting and any other activities involving knee joint by providing a good degree of freedom.High-torque motors typically used in industrial settings have large masses and volumes due to their robust housings and heat sinks. In addition, these motors are typically fixed in place, leading to minimal consideration of weight in their design. However, for implementation into a powered prosthetic leg, it was necessary for us to select a motor with high torque density, to ensure that our actuator could produce the required torque while remaining as light as possible.So, we have chosen a motor with 30 RPM 12V DC motor with metal gearbox,18000 RPM base motor ,6mm diameter shaft with M3 thread hole Gearbox diameter of 37mm ,Motor diameter of 28.5mm 63mm without shaft,Shaft length 30mm,180g weight,32Kg/cm holding torque,800mA no load current, load current max upto 7.5A.

Current controlled Drive:

This motor comes with a current controlled drive for Industrial grade high torque dc motor with various types of input signals. High-Current DC Constant-Torque motor drive is integrated with the motor. Motor speed control interface via UART, I2C, PPM signal and analog input, Speed control is possible in both directions down to almost 1% of max. speed,Small package and integration allows for easy installation and operation,Speed can be controlled using a terminal or MCU via simple UART commands, I2C master device can control multiple RMCS-210x via simple I2C command structures.An RC receiver or any PPM source can directly control the speed of the motor.An analog signal or fixed analog voltage from a potentiometer can directly control the speed of the motor.

3) ARDUINO:

The Arduino Uno is an open-source microcontroller board based on the microchip ATmega328P microcontroller and developed by Arduino.c.c.The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.The board has 14 Digital I/O pins ,6 analog I/O pins,and is programmable with the Arduino IDE (Integrated Development Environment).

4) Bluetooth module(HC-05):

HC-05 is a Bluetooth module is designed for wireless communication .Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.It ranges upto less than 100m which depends on transmitter and receiver ,atmosphere, geographic & urban conditions.It uses serial communication to communicate with devices.It communicates with microcontroller using serial port (USART).

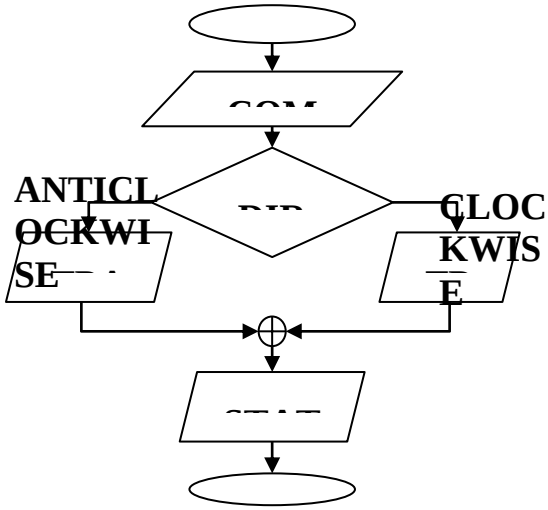
5) MIT app Inventor:

MIT app inventor is used to create an Android app which will be used by the user to provide instructions to the Arduino through bluetooth to carry out the desired motor functions.MIT App Inventor is an intuitive, visual programming environment that allows everyone to build fully functional apps for smartphones and tablets. The MIT App Inventor user interface includes two main editors: the design editor and the blocks editor. The design editor, or designer, is a drag and drop interface to lay out the elements of the application's user interface . The blocks editor is an environment in which app inventors can visually lay out the logic of their apps using color-coded blocks that snap together like puzzle pieces to describe the program. To aid in development and testing, App Inventor provides a mobile app called the App Inventor Companion that developers can use to test and adjust the behavior of their apps in real time.

III. METHODOLOGY

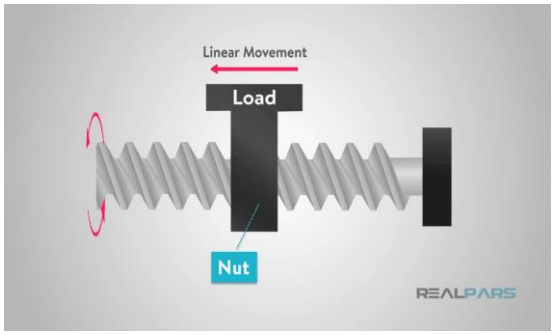
A wearable brace is fabricated or moulded in the shape so as to cover the upper and lower regions of the knee joint so as to facilitate free movement but also provide support when required. A velcro or adjustable belt is provided to facilitate any knee size.The major component facilitating the movement of knee and movement assistance are the small yet high torque motors, these motors when rotated in clockwise direction helps in sitting down or actions involving bending the knee, when turned counterclockwise it assists standing up or actions involving stretching of knee joint. The controlling of the motor is done using an user friendly android app which has standard commands to actuate the motor.IOT acts as an interface between the hardware component and the software aspect of android, to efficiently control and manage the entire system. The device is connected to the motor through bluetooth as per the convenience of the user.the nodal center or the operation is initiated by the user when he/she selects the desired operation on their android mobile, the signal is received by the bluetooth module this in turn sends a signal to the microcontroller device installed. The microcontroller then sends a signal to the motor through wires to rotate in the appropriate direction. The rotation of the motor is directly related to movement of the metallic joint attached to the knee brace through a mechanism called "Lead screw mechanism" Additionally the app also provides emergency contact to medical staff and family members in case of any mishap.

ISBN: 979-85-27243-61-1



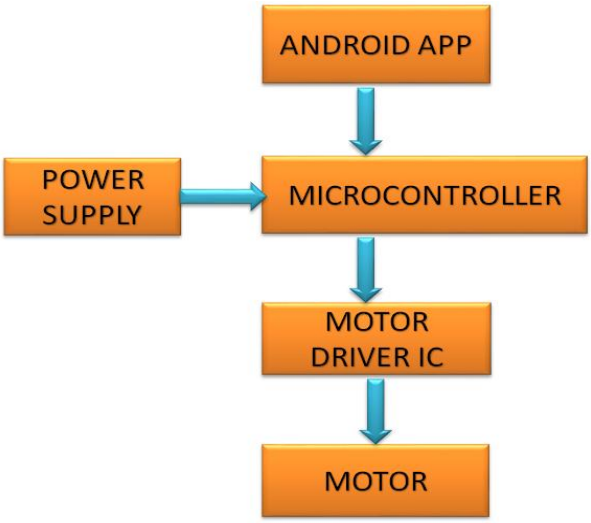
Lead Screw Mechanism:

This is a simple machine that can generate very large forces. The screw can be thought of as a wedge or ramp that has been wrapped around a shaft. Holding a nut and rotating the shaft will allow the nut to slide either up or down the shaft via the key.In this way, a relatively small moment on the shaft can exert very large forces on the nut. Lead screws are commonly used in linear actuators, machine slides such as machine tools, vices, presses, and jacks. Lead Screws are made in the same way as other thread forms. They can be rolled, cut or sanded. A lead screw uses the helix angle of the thread to convert rotary motion into linear motion, combining a screw and nut with the screw thread in direct contact with the nut thread.



The above demonstrated lead screw mechanism is used to obtain the required force to overcome the weight of the person, the arrangement is connected in a linear fashion, diagonally from the upper thigh to the lower thigh, when the motor rotates the length of the lead screw either increases or decreases based on the direction of rotation, the increasing length facilitates the stretching of the leg or in this case the person transiting from sitting posture to standing posture, on the other hand the rotary motion on the opposite direction results in the decrease in length of lead screw which in turn signifies the transit between standing to sitting posture as length between the upper and lower thigh is less in sitting posture.

Block Diagram:



IV. RESULT:

Our wearable smart device assists in sitting and standing using the Lead Screw mechanism.This is achieved by receiving input from the user through an Android app, which has been developed.The app instructs the microcontroller to actuate the motor in desired direction and speed to help in movement.

V. CONCLUSION:

Movement and other normal action involving the knee joint has been a very old problem since the beginning of mankind, especially in old people. This project has provided a better smart, effective and permanent solution to this age old problem.Old people will be able to stand, walk and live normally without the help of caretakers.

VI. REFERENCES

[1] 360 O&P, “360 Orthotics & Prosthetics,” http://www.360oandp.com/360-Dictionary.aspx?l=O, 2009.

[2] S. K. Banala, S. K. Agrawal, A. Fattah, V. Krishnamoorthy, W. L. Hsu, J. Scholz, and K. Rudolph, “Gravity-Balancing Leg Orthosis and Its Performance Evaluation,” Robotics, IEEE Transactions on, vol.22, pp. 1228-1239, 2006.

[3] S. K. Banala, A. Kulpe, and S. K. Agrawal, “A Powered Leg Orthosis for Gait Rehabilitation of Motor-Impaired

Patients," in Robotics and Automation, 2007 IEEE International Conference on, 2007, pp. 4140-4145.

[4] H. Kawamoto, S. Kanbe, and Y. Sankai, "Power assist method for HAL-3 estimating operator's intention based on motion information," in Robot and Human Interactive Communication, 2003.Proceedings. ROMAN 2003. The 12th IEEE International Workshop on, 2003, pp. 67-72.

[5] ReWalk, "Argo Medical Technologies." vol. 2009.

[6] J. Blaya, "Force-controllable ankle foot orthosis (AFO) to assist drop foot gait," in Dept. of Mechanical Engineering. vol. S.M. Cambridge: MIT, 2002.

[7]. Kong, Kyoungchul, Joonbum Bae, and Masayoshi Tomizuka. "A compact rotary series elastic actuator for human assistive systems." IEEE/ASME transactions on mechatronics 17.2: 288-297, (2011).

[8]. Schick, Johannes, Markus Glaser, and Steven Huber. "Design, Realization and Verification of a Novel Knee Joint Actuator for Robotic Exoskeletons." 2019 IEEE International Conference on Mechatronics (ICM). Vol. 1. IEEE, 2019.

[9]A. Khanna and P. Ranjan, "Solar-Powered Android-Based Speed Control of DC Motor via Secure Bluetooth," 2015 Fifth International Conference on Communication Systems and Network Technologies, Gwalior, pp. 1244-1249, doi: 10.1109/CSNT.2015.100, 2015.

[10]Kumar, R., Ushapreethi, P., Kubade, P. R., & Kulkarni, H. B. "Android phone controlled Bluetooth robot", Volume 3,Issue No 4, e-ISSN: 2395 -0056 , p-ISSN: 2395-0072, Apr-2016.

[11]K.S. Varsha , P. Sudharshan Palaniappan , S. Susmithaa , M.Prabhu Raj,Speed and Direction Control of DC Motor using Android Mobile Application ,International Journal of Engineering Science and Computing, Volume 7, Issue No.3,March 2017.

[12]D. Sarb and R. Bogdan, "Wireless motor control in automotive industry," 2016 24th Telecommunications Forum (TELFOR), Belgrade, pp. 1-4, doi: 10.1109/TELFOR.2016.7818790, 2016.

[13]Deepashri K M , Sachidanand P B, Latha.H.S, Industrial Appliances Control Using Android Mobile & Bluetooth technique, Volume 8, International Journal of Engineering and Manufacturing Science, ISSN 2249-3115 , pp. 33-42 ,2018.

[14]Mr. B. N. Patil , Mr. Sandesh Sonar , Mr. Pavankumar Karadiguddi , Mr. Shivanand Banti, Speed Control Single Phase Induction Motor Using Android Phone, Volume 2, Issue No 3, International Journal of Engineering and Techniques , May -June 2016.

[15]J. Nádvorník and P. Smutný, "Remote control robot using Android mobile device," Proceedings of the 2014 15th International Carpathian Control Conference (ICCC), Velke Karlovice, pp. 373-378, doi: 10.1109/CarpathianCC.2014.6843630, 2014.

[16]A. Sivakumar, K. A. Jain and A. I. Maalouf, "Voice Controlled Servo Motor Using an Android Application," 2020 IEEE 6th World Forum on Internet of Things (WF-IoT), New Orleans, LA, USA, 2020, pp. 1-2, doi: 10.1109/WF-IoT48130.2020.9221333.

Design and Implementation of AI Tree

Sangeetha R, Mahima S, Subbarayappagari Sowmya, Thorla Naga Pavan, Pavan Kumar E
Department of Electronics and Communication Engineering
Sai Vidya Institute of Technology
Bengaluru, India
sangeetharamakrishna5@gmail.com

Abstract- **Oxygen plays an important part in the respiration process. Ventilators are manufactured for helping patients who need help to breathe. But, ventilator-caused lung wounds or injuries may occur. We must have sufficient oxygen levels in our surroundings/room, otherwise, it may lead to some unexpected severe conditions. To address this problem, we came up with the advanced-electronic based ventilator, called Artificial Tree.**

Keywords—*Ventilator, Oxygen, Artificial Tree*

Introduction

Life is precious for each one of us. We value it and most of us make gifts blessed upon by God. As we all know, our lives have an expiry date. So, we value our lives. When we suffer from a disease or ailments, doctors are there to rescue it. They cure the ailments and enhance our lives. But, there are very few conditions that doctors also cannot cure, such as Cancer, Parkinson's disease, Alzheimer's disease, and some more. When we look into these concerns and to facilitate doctors in their work, especially during emergencies, many types of equipment have been developed, such as MRI Scanning, ECG, EEG, Ventilators, Ultrasound Scanning, and many more. Advancements in Engineering are hand-to-hand with the requirements for enhancing people's lives.

Among all the essential medical devices which have helped mankind, an utmost important ICU device and very much required for patients during any medical emergencies is the Ventilators, which, invented during the 1950s as a mechanical ventilator initially, assist the patients who are in critical condition, in breathing and the developments in medical science and healthcare made people to realize the role and the importance of Mechanical Ventilators and thus, its usage increased and resulted in the manufacture of the advanced Electronic Ventilators.[14]Ventilators assist the patients who suffer from breathing problems or who are suffering from other medical emergencies, which even doctors cannot assist.

A device helping a person in a life-dependent, involuntary function of the body, is indeed amazing.Ventilators were invented as mechanical ventilators in the twentieth century, a form of non invasive negative pressure ventilators widely used during the polio epidemics of the twentieth century.After a few decades of the improvement of the mechanical ventilators, its disadvantages were found out. They were very bulky and heavy, making it harder for the doctors and patients to handle them. Moreover, Ventilator-Induced-Lung injuries occured a lot Hence, To address these issues, there was a switchover from mechanical to electronic ventilators which are in compact size but cost wise it is expensive.

They are very small in size, portable and are more efficient in terms of performance and maintenance.Hence, ventilators are very essential and hence, used in hospitals for helping the patients who need help to breathe. But, ventilator-caused lung wounds or injuries may occur. Also, we must have sufficient oxygen levels in our surroundings, otherwise, it may lead to some unexpected severe conditions. Due to the increase in air pollutants, the number of respiratory-related problems is increasing. Hence, to address these concerns, we propose a project on a multipurpose, advanced electronic ventilator called Artificial Tree.The artificial tree senses the approximate quantity of gases present in the environment in which this ventilator would have been installed and presents the details, followed by taking the input from the surrounding and provides only the required vital gas, oxygen in the required amount to the user by using advanced techniques and algorithms.

However, nowadays the indoor and the outdoor air is polluted as days goes on, where the gases as been increased and the oxygen in our surrounding it should be 21% minimum.[13] If the oxygen levels are less than the required amount, human beings will get Chronic Obstructive respiratory disorder (COPD) which causes them to struggle for breathing , if it's severe then require the one therapy for oxygen later if there a necessary then need to use the oxygen generator.[12] it communicates to the users through smart devices and supplies sufficient oxygen. This artificial tree comes up with a built-in security by face recognition technology. Face can be noticed by emerging a system using Template Matching Algorithm. By centred on the scores, the face will be spotted and dataset color images are then converted to in the measure of gray. The PCA is a simple approach.[11]so that only authorized persons can use it and it halts the interference of third-party users. This proposed artificial tree can be enhanced by installing additional sensors such as temperature sensors, humidity sensors, and other required sensors to monitor the air pollutants in the external environment.

RELATED WORKS

To improve the patient's life with COPD and some lung disease where it is Oxygen therapy represents the elective therapy was the problem observed to solve it, They took versus Compressed Oxygen Cylinder with Oxygen Concentrator in some Lung Disease using method 6-minute walk test experiment they compared both them. In this paper, they experimented with a (6MWT) 6 min walk test, which demonstrated exceptional desideration on room air by monitoring the patient's breathing and comparing the efficiency of the 2 system. The back draw was The patient

XXX-X-XXXX-XXXX-X/XX/$XX.00 ©20XX IEEE
ISBN: 979-85-27243-61-1

affects adherence and psychological status and encourages active involvement in outdoor social activities.[1] As the world is becoming modern the sterility of air is reduced, which may lead to many health problems so we need to be more concerned about Indoor also with outdoor air quality, where it has been not take to picture for a long period. But we majorly be indoors only not outdoors, so it is paramount to monitor the air we breathe. Monitoring of indoor air by using IoT the brack dorp Oxygen is not monitored and We can use machine learning and AI but they didn't use this technique.[4]

In this pandemic situation there were a lot of requirements of the ventilators. We saw many organizations providing low-cost ventilators or pneumatic ventilators for such a ventilator to provide the alarm. Marking the prototype is quick by using the low-cost microcontroller and equipment. The major drawback was It doesn't store past samples since it has less memory and it's for few calculations, No Improvement in the efficiency of pressure yield emergency and It's not more like a commercial ventilator[2] Chen, Yanjun., et al. There was a deterioration of air. The haze weather phenomenon is becoming a serious issue. where a potential association between exposure and neurological diseases. this system Compact in size, low power consumption, simple operation and It simultaneously measures and displays temperature, humidity, harmful gases but The working efficiency of sensors decreases in clean air and They can use high precision and high-quality sensors an be used to get more accurate value[3]

[5]Yu-Te Liao, Shao-Yung Lu, Hau Lin, Hsu-Tah Kuo, Chien-Liang Wu, Wen-Jui Wu, Chao-Hsien Chen, and Yu-Te Liao-" Design and Study of a Portable High-frequency Ventilator for Clinical Applications"Mechanical Ventilators are bulky in size, expensive and are meant for hospital settings only. Moreover,because of the air injections by these ventilators,Ventilator-induced lung injuries (VILI), including organ damage and chronic lung injury occur. A portable, high frequency ventilator which can be used in clinical, in ambulance and home healthcare.

[6]Mohiuddin Ahmed, Md. Rakibul Islam, Muhammad Muinul Islam, Sk. Farid Uddin Ahmed, Md. Shahid Hussain-" Designing an Electro-Mechanical Ventilator Based on Double CAM Integration Mechanism" Mechanical Ventilators are meant for hospital settings only. These ventilators are complex and expensive and thus, would be challenging to implement in rural areas. The proposed device is compact, low weight, and performs efficiently. It can be supplied around the rural area hospitals for immediate treatment with affordable cost.

[7] James M Bailey, Behnood Gholami, Wassim M Haddad-"AI in the ICU" Each machine in the ICU thought of assisting the patient, each machine operating only a discrete part of the body, but they are not working in synchronisation. And it is impossible for the ICU team to keep watch at every patient's bedside. This system discusses about the coordination of machines in assisting the patient by utilizing the AI platform.

[8] Haihui Zhang, Yan Liang, Qingzhen Zhou, Hongpan Fan, Jianguo Dai, "A self-adaptive greenhouse co2 concentration monitoring system based on zigbee". The proposed system monitors and controls the greenhouse Co2 concentration by Co2 sensor B530 based on ZigBee wireless Network. The self-adaptive greenhouse monitoring system can work with a stable performance. Problem with the ZigBee is it includes a short range of communication The system can be used for indoor wireless application.

[9] Wu Yaoyu, Liu Jijun, WangZhong Meng Qingyou, "Development and Application of Miniaturized Emergency &Transport Ventilators". The proposed system uses the principle of Electro Pneumatic Control with pressure and time switches. The main objective of this miniature intelligent ventilator is to provide first aid to the hospitalized patients with respiratory failure. This Ventilator is small, light and can be able to work for long hours. It has control, manual, auxiliary and other ventilation modes to match with the different patient's needs.

[10] Esuabom David Dijemeni, Obert Dickinson, "Portable Mobile Real Time Oxygen Monitoring Auto-Ventilation System". In recent days, for the COPD and Hypoxia related diseased patients, no system was designed to monitor the blood oxygen saturation and heart rate at home. The proposed portable mobile real time oxygen monitoring auto ventilation system monitors the patient's blood oxygen saturation and heart rate through Oximeter and sends it to the Smart Phones. Home treatment management of COPD and OSA can be improved by this system so that the Patient gets the Oxygen at the right time.

[11] Vaishnav J, Thomson Poulose, Vishnu Harilal, "Automated Oxygen Monitoring System for Hospitals". The proposed system acquires the values of physical phenomena like pressure and Oxygen in the hospitals. These parameters can be obtained by sensors and the data is sent to the microcontroller (which is programmed using Arduino IDE) and it uploads to Webpage (Designed using HTML), it is accessible to all authorities in the hospital. If any unbalanced condition is there means the alarm is activated and supply of Oxygen is controlled by the Actuator. This method can be implemented in every hospital with very less cost.

HARDWARE AND SOFTWARE COMPONENTS

Artificial Intelligence:

Artificial Intelligence, it is a reflection of Human intelligence in the electronic machines which is designed in such a way that it thinks and analyses like a human mind. These machines can easily learn and accept the data according to the changes

Micro-Controller or Processor:

All the collected data from the sensors will send to the microcontroller or processor to processor for this idea can make use the any Wi-Fi module of the controller it can be Node-MCU esp32 module or Node ESP8266 module, where we can also use of the Raspberry pi which know as the micro computer or micro-cpu because it works as PC also this board is embedded with IoT where it is connected to internet. the exchange of the data can happen.

Gas Sensor:

The sensor which can detect the gases. because as we know if the gases in air it will affect the human being. The living beings inhale the oxygen where in the present situation air is polluted where the oxygen level becomes less in air where it will harm the human beings and it's utilized for seeing the oxygen present.

Temperature Sensor:

This sensor senses the surrounding temperature, converts this information into electronic data and then sends this data to the Microcontroller or Microprocessor for the further process. Thus, it indirectly measures the surrounding temperature.

Camera:

Camera is installed for providing security and thus, allowing only the authorised owner of this device to use it. The camera captures the face of the person, in different angles in order to collect more information so that the security system works efficiently, without any errors.This information is then sent to the Microcontroller or Microprocessor and the database is stored inside it. Finally, using suitable software, this database is accessed and thus, helps in detecting the face of the person. If the face of the person in real time does not match with the captured image stored in the database, an alert signal is initiated and that person is not allowed to use the device. The camera, hence, assists in Face Recognition technology for security purposes.

Security using IoT:

Security is provided to the system using Face Recognition technology on the Internet-of-Things platform.

Monitor:

The Microcontroller or Microprocessor operates on the data received from the input devices and then sends the result to the monitor for further calculation and to display the result in the correct format.

Display Unit:

After the process, the output data of the purity of Oxygen, amount of the required gases present in the surroundings, temperature of the surroundings and the required amount of Oxygen supplied to the patient is displayed on the display unit which is easy to read.

Oxygen is supplied to the person using the device through the Air Duct.

ARCHITECTURE

Ventilators were invented for assisting the patients to breathe, in critical conditions. Initially, they invented the mechanical ventilators and in the coming years, many modifications have been made to them. But, major problems such as Ventilator-induced lung injuries, difficulty in handling them due to their complex structure, are not addressed. Then came the electronic ventilators which were easy to handle because of their compact size and many modifications or advancements were done to address these issues. This ventilator is to solve these issues, but still, a few other concerns such as an error in matching with the respiratory rate of the ventilator, different functioning and operation for different-aged people, such as for adults, children, and neonates have yet to be addressed. Also, Cost-efficient ventilators have to be manufactured so that treatment costs can be reduced, thereby benefiting everyone. To address these concerns, we have proposed an advanced electronic ventilator called “Artificial Tree”.

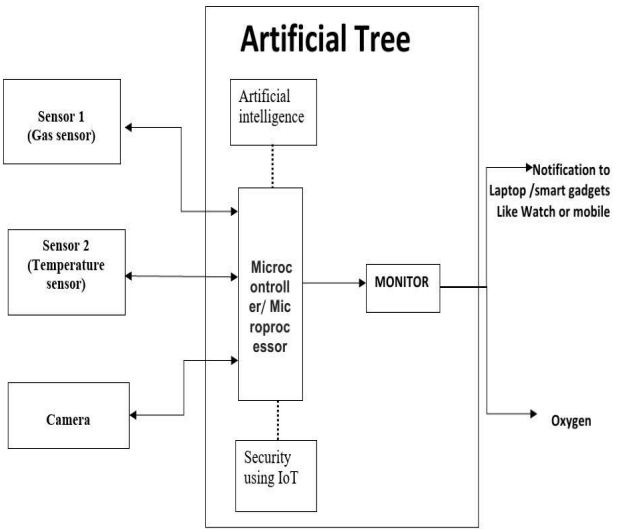


Fig1 Block diagram

This ventilator (Artificial Tree System), initially, detects the presence of the mixture of gases in the atmosphere in which it is installed with the help of gas sensors installed in it. This data collected is then processed and displays the output of each gas, in the form of a percentage.

The output data is sent to the display units like Laptop or smart devices such as smart watches or mobiles. The main purpose of a ventilator is to assist the patient in breathing. So, after detecting and getting to know the number of

atmospheric gases, the artificial tree now takes this input, collects the air from its surrounding, processes using Microcontroller or Microprocessor and Artificial Intelligence platform, and finally supplies the right amount of Oxygen according to the requirement of the patient, at the right time.

Right time means that the functioning of the ventilator in helping the person to breathe matches with his/her respiratory rate to avoid any problem.

To allow only the authorized persons to operate this ventilator, a face-recognition security system is built in this machine. A camera is installed to capture the face of the person who would like to use it, initially.

It is then sent to the built-in system which stores this data. Finally, that person can now start using the ventilator. The Internet of Things (IoT) platform is used to enhance security.

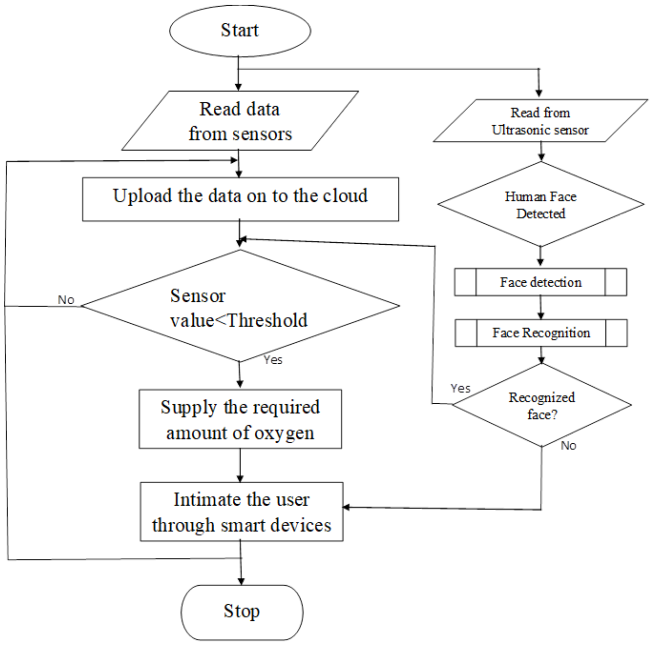


Fig 2 Flow chart

The artificial tree has other benefits. It can be utilized for observing the pollution of the outside environment. So, when it is implemented in the environment, for instance, on the roads, it detects the existence of the pollutants in its surroundings using gas sensors, temperature sensors(employed to get the temperature levels around us and the sensors are distinguished as Contact and non-contact sensors which finds application in the cooking devices and electronic machines) processes these data with the use of Microprocessors or Microcontrollers, Artificial Intelligence platform and supplies Oxygen.

IMPLEMENTATION AND RESULT

Interfacing of DHT11 with ESP32 Cam

The interfacing of the DHT11 sensor to the ESP32 Cam is fairly simple. We have to start the connections by putting the ESP 32 Cam on to the breadboard. Make the connections as mentioned below.

DHT11 Sensor	ESP32 Cam
VCC	5V
DATA	D4
GND	GND

Fig 3 Table of pins for connecting DHT11 with ESP32

The image of the connections we have made while interfacing the DHT11 sensor with ESP32 Cam is shown.

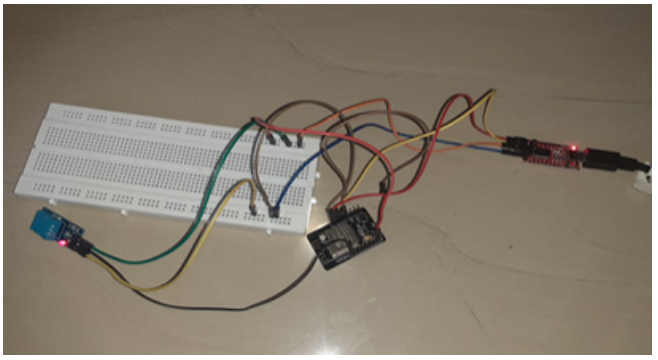


Fig 4 Connection of DHT11 with ESP32

Installing the DHT sensor library

Install the DHT library. Upload the code to the ESP32 board. After successful execution, We can clearly see the temperature readings on the serial monitor of the Arduino IDE.

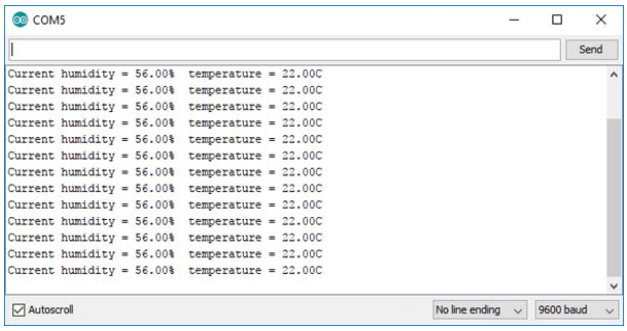


Fig 5 Readings obtained from the interface of DHT11 with ESP32

Interfacing MQ135 gas sensor with ESP32

MQ135 gas sensor is interfaced with ESP32 to obtain the readings of the amount of Oxygen present in the surrounding in ppm.

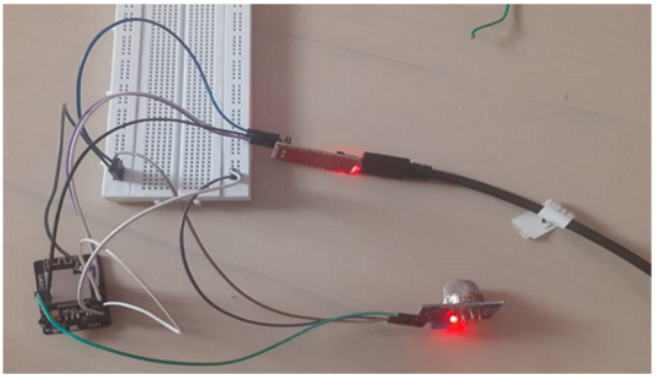


Fig 6 Interfacing MQ135 with ESP32

Building ESP32 based Facial Recognition

The ESP32 CAM is a tiny ESP32-based chip camera module, it comes with a OV2640 camera and provides an onboard TF card slot. This assists in face recognition of the person. Initially, install the ESP 32 library in the Arduino IDE. Then, interface ESP32CAM to the FTDI connector and connect it to the Arduino IDE. After execution, ESP IP address gets printed on the serial monitor.

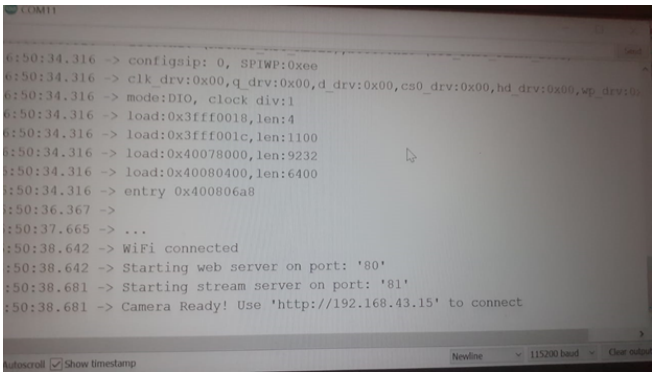


Fig 7 ESP IP address

Accessing that IP address leads us to a software on a new webpage.

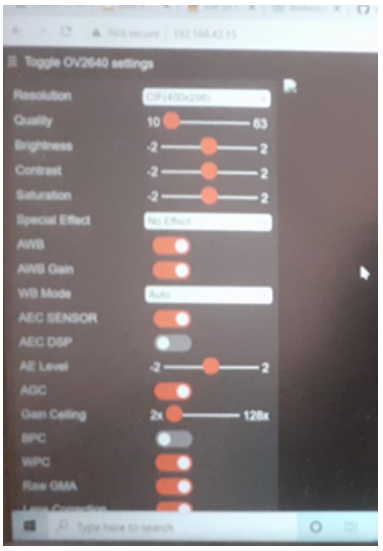


Fig 8 Software obtained from ESP IP address

This software assists in face recognition of the authorized person. If any unauthorized person tries to access the device, this software will block him/her from using it and shows that person's face as an intruder.

CONCLUSION

The proposed advanced ventilator is built with gas and temperature sensors, camera and display units and is constructed in a size such that it should be portable. It senses the gases present in the surrounding and then supplies the required quantity of Oxygen to the patient. It also provides security by providing authentication. This system is built keeping the cost also in mind so that it could be afforded by all the people. Furthermore, we can develop another technology with the existing one to calculate the tidal volume and respiratory rate automatically using sensors. Smart electronic ventilators will become a large field for clinical purposes and in research fields.

ISBN: 979-85-27243-61-1

ACKNOWLEDGEMENT

We express our deep sincere feelings of gratitude to our Institution, Sai Vidya Institute of Technology, and to our Electronics and Communication Engineering Department, Sai Vidya Institute of Technology, Bengaluru, for providing us an opportunity to work on this project. We are also grateful to Visvesvaraya Technological University, Belagavi, for providing us the opportunity to implement our knowledge in building this project.

References

[1] *Moretta, Pasquale, Antonio Molino, Michele Martucci, Salvatore Fuschillo, Alberto De Felice, Pietro Guida, Andrea Motta, Michele Vitacca, and Mauro Maniscalco. "Subject Preferences and Psychological Implications of Portable Oxygen Concentrator Versus Compressed Oxygen Cylinder in Chronic Lung Disease." Respiratory Care 66, no. 1 (2021): 33-40.*

[2] *Corey, Ryan M., Evan M. Widloski, David Null, Brian Ricconi, Mark Johnson, Karen White, Jennifer R. Amos et al. "Low-Complexity System and Algorithm for an Emergency Ventilator Sensor and Alarm." arXiv preprint arXiv:2006.03664 (2020).*

[3] *Chen, Yanjun, Rami Ghannam, and Hadi Heidari. "Air Quality Monitoring using Portable Multi-Sensory Module for Neurological Disease Prevention." In 2019 UK/China Emerging Technologies (UCET), pp. 1-4. IEEE, 2019.*

[4] *Ladekar, Vrushali, and Rohin Daruwala. "Indoor Air Quality Monitoring on AWS Using MQTT Protocol." In 2019 10th International Conference on Computing, Communication and Networking Technologies (ICCCNT), pp. 1-6. IEEE, 2019*

[5] *Lu, Shao-Yung, Hau Lin, Hsu-Tah Kuo, Chien-Liang Wu, Wen-Jui Wu, Chao-Hsien Chen, and Yu-Te Liao. "Design and study of a portable high-frequency ventilator for clinical applications." In 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), pp. 2353-2356. IEEE, 2019s*

[6] *Islam, Md Rakibul, Mohiuddin Ahmad, Md Shahin Hossain, Muhammad Muinul Islam, and Sk Farid Uddin Ahmed. "Designing an electro-mechanical ventilator based on double cam integration mechanism." In 2019 1st International Conference on Advances in Science, Engineering and Robotics Technology (ICASERT), pp. 1-6. IEEE, 2019*

[7] *Zhang, Haihui, Yan Liang, Qingzhen Zhou, Hongpan Fan, and Jianguo Dai. "A self-adaptive greenhouse CO2 concentration monitoring system based on ZigBee." In 2012 IEEE 2nd International Conference on Cloud Computing and Intelligence Systems, vol. 3, pp. 1137-1140. IEEE, 2012*

[8] *Yaoyu, Wu, Liu Jijun, Wang Zhong, and Meng Qingyou. "Development and application of miniaturized emergency & transport ventilators." In 2011 IEEE International Symposium on IT in Medicine and Education, vol. 1, pp. 177-181. IEEE, 2011.*

[9] *Dijemeni, Esuabom David, and Robert Dickinson. "Portable mobile real time oxygen monitoring auto-ventilation system." In 2013 E-Health and Bioengineering Conference (EHB), pp. 1-4. IEEE, 2013.*

[10] *Vaishnav, J., Thomson Poulose, Vishnu Sukumaran, and Vishnu Harilal. "Automated Oxygen Monitoring System for Hospitals." In 2018 International Conference on Circuits and Systems in Digital Enterprise (ICCSDET), pp. 1-5. IEEE, 2018.*

[11] *Wati, Dwi Ana Ratna, and Dika Abadianto. "Design of face detection and recognition system for smart home security application." In 2017 2nd International conferences on Information Technology, Information Systems and Electrical Engineering (ICITISEE), pp. 342-347. IEEE, 2017.*

[12] *Dijemeni, Esuabom, and Danielle Roberts. "Desktop based real time oxygen auto-ventilation and gas monitoring system for homecare respiratory application." In 2014 International Conference on Applied Electronics, pp. 67-70. IEEE, 2014.*

[13] *Mukkundi, Basava Kumar, Goutham Prasad, Yaagyanika Gehlot, Nachiket Deval, Nitesh Kumar Jangir, Sujay Shetty, Gopikrishnan G. Babu, A. S. Nageshwaran, Vimal Kishore Kakani, and Abu Tauheed. "Implementation of conventional air—oxygen blending in multi-powered continuous positive airway pressure (CPAP) Device." In 2019 11th International Conference on Communication Systems & Networks (COMSNETS), pp. 807-812. IEEE, 2019.*

[14] *Li, Zhengjun, Miao Zhang, and Minning Du. "The study of intelligent control algorithm in CPAP ventilator." In 2017 Chinese Automation Congress (CAC), pp. 386-391. IEEE, 2017.*

Flower Classification using Deep Neural Network

ANUSHREE RAO*[1], BANU N S*[2], BHARATH SHENOY*[3], DISHA D SHETTY*[4]

Department of Electronics and communication Engineering, shri madhwa vadiraja institute of technology and management, vishwothama Nagar, Bantakal-576122

[1]anushree.17ec008@sode-edu.in
[2]banu.17ec012@sode-edu.in
[3]bharath.17ec013@sode-edu.in
[4]disha.17ec018@sode-edu.in

Abstract **- Biodiversity of earth is very rich. As we know that there are 250,000 named species of flowering plants over the World. As a result , identification of flowers becomes complicated. Many flower recognition systems are in use and identifying the flowers to meet the major requirements of proposed system but the problem arrises when it comes to identify the flower which are identical. In this regard, this work aims at designing and developing a portable and easy APP to afford flower classification system for application pharmaceutical industry, botany, agricultural, trade activities and also for the common people. The proposed system uses Deep CNN and Android studio to identify the flowers . The work involves analyzing the best system for classification with maximum efficiency.**

Keywords – Identification, Deep CNN ,Android Studio

I. INTRODUCTION

Flowers are the most important producers of the earth that can grow in a wide variety of climates in terms of their habitats. They also keep on playing a very important role in the food chain by feeding almost all insect species in the world. In addition to this they play an important role in the food chain, and many drugs can be produced by using their healing properties. For such reasons, having a good knowledge of flowers and knowing their species is very important in terms of recognizing a new or rare plant species. There are many flowers around the world which belong to about 250,000 named species. Most people see flowers every day, but they cannot identify them. They ask specialists, browse flower books, or search the Internet through keywords searching to identify these flowers names [1]. An easy and fast way to identify flower name can be done by classifying flower images. Especially with the widely use of mobile digital cameras in all the world. Caption flower image, sending it to a flower recognition system which classifies flower image will help people in flower identification. automatic classify flower image according to its features. Since flower images have a natural complex background, classification flower systems give more attention for extracting the flower region with high accuracy. After segment flower region, the flower features is extracted dependent on features like color, shape and texture. Then these extracted feature are used to train the classifier to classify flower image. So our flower classification approach proposed is designed to include these phases which are segmentation, feature extraction, and classification phases. Such flower classification system can be used in many real life applications. For examples, it can be used as an interactive educational tool to enhance learning methods for both young and adult persons. agricultural waste a s filter material in obtaining pure drinking water.

[1] Mohd Azlan Abu (2019) used DNN for taring the model as it gives high percentage of accuracy but classified the flowers which were not identical.[2] Swati Kosankar (2019) has shown experimental performance of mobilnet model on tensorflow platform to retrain the flower category dataset. In his paper [3] Archana L. Lakesar (2018) they have present literature survey of various methods for classification of flowers using Artificial Neural Network (ANN) classifier. The proposed method is based on textural features such as Gray level co-occurrence matrix (GLCM), discrete wavelet transform (DWT) and Color features such as normalized color histogram. The database has different flower images with similar appearance. Further [4] Isha Patel (2019) work attempts to explore a novel morphology for feature extraction and the applicability of symbolic representation schemes along with different classification strategies for effective multi-label classification of flower spices [5] M.V.D.Prasad (2018) have discussed the proposes of classification of flower images using a powerful artificial intelligence tool, convolutional neural networks (CNN). A flower image database with 9500 images is considered for the experimentation.

II. METHODOLOGY

This work includes Tensorflow as the open source software which uses python as its programming language where we can apply our DNN model. Then, the process is continued to collect some of the images (inputs), finally the images will be identified and the features will be displayed.

A. Implementation of Deep Neural Network (DNN):

It consists of several data inputs and undergoes training with multiple hidden layers. The inputs are also set with fixed-size of the 224x224 RGB image. Input data uses thousands of

Hibiscus flower images from online platform. DNN model consists of two phases like training and testing.

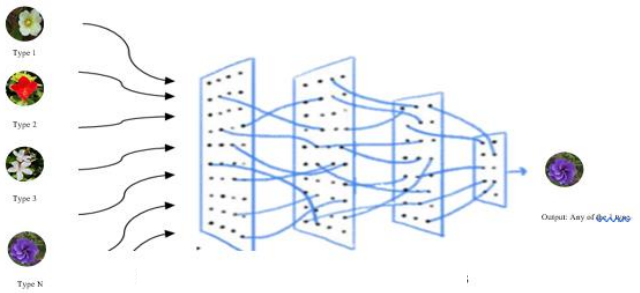


Fig 1: DNN towards flower classification

Deep convolutional neural network has recently been applied to image classification with large image datasets. A deep CNN is able to learn basic filters automatically and combine them hierarchically to enable the description of latent concepts for pattern recognition. However, many deep CNNs have the problems of overfitting and huge processing time. Each micro neural network is an MLP consisting of multiple fully connected layers with nonlinear activation functions. The MLP is shared among all local receptive fields and without the Softmax layer. Unlike the structure in [42], we divide the input feature maps into two f-maps, as shown in Fig. 16. One f-map is for periodicity property abstraction, and another is for FRF abstraction. The proposed micro neural network consists two fully connected layers. Each fully connected layer has 1024 neurons. The simple way of DNN is shown below

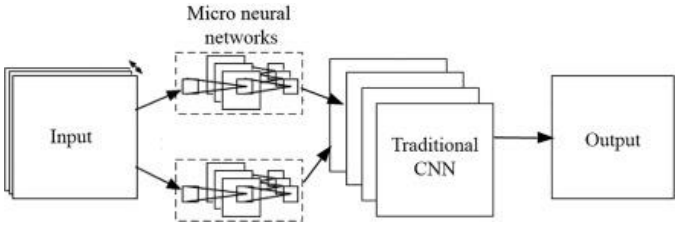


Fig 2 : Traditional way of DNN

Lets consider the flowchart of overall process. Based on Figure 2, the flowchart of image classification that will be implemented using DNN. The programming language that will be used in the software in Python. The flowchart shows that the systems will be started by collecting images of the flowers. After that, DNN is applied to train the model. Running for validation or testing and if it is not the image of a particular flower that supposedly acts as output then it needs to start over again from DNN. The process ends after the output is classified into the right type of flowers. The flowchart starts with inserting sets of flower images as an input. After that, all of these input images undergo 'training' with the deep neural network (DNN). The deep neural network (DNN) had to train all of these sets of data until the systems recognize each of these images. Then, each of the classifications occurred when one of the images being tested whether it belongs to any flower species.

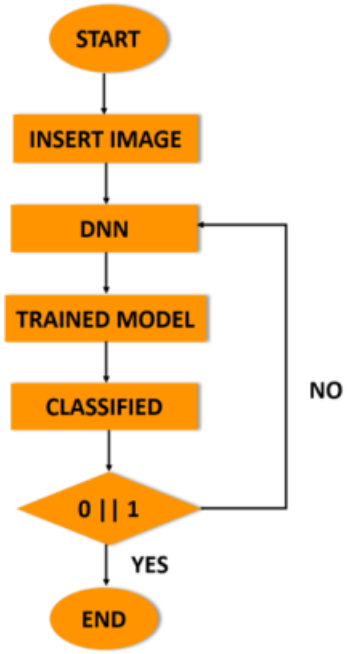


Fig.3. The flowchart of image classification system

B. Development of Android APP

An android app is used here to display the name, characteristics of the flower. Once the flowers are classified to their groups, the name and other characteristics of the flower should be displayed so that the recognition of flowers becomes easy to all users. The output of the classifier becomes input to the android app. It initially should give access to the mobile camera to click a photo, then it should be able to identify the type of flowers and display the results in our mobile display. Here we make use of Andriod Studio version for the development of an android app. Since android studio is an open source its easy to work in this platform. The project is first downloaded to our computer and then it is given to the android studio version. The final output will

be the image of the flower with its name and user specified/designed characteristics.

Here once the tensor flow model is build and tested the model is downloaded and then fed directly into the android studio version 4.1. an opem source Android studio is used because to provide easy usage for common people.

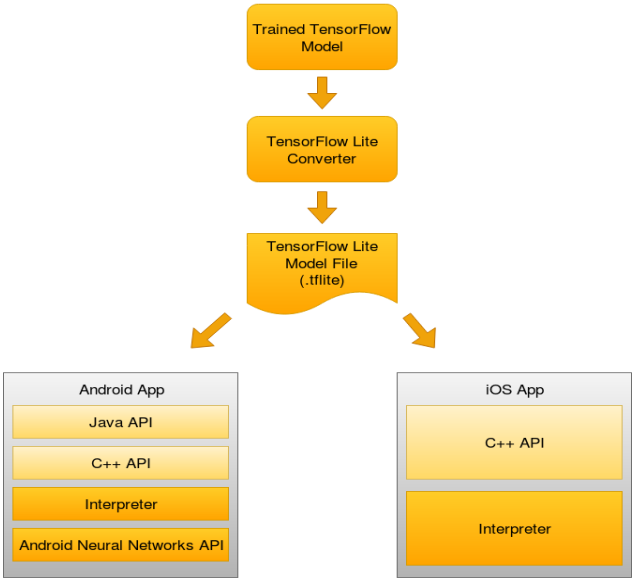


Fig 4: The flowchart for development of Android App

III. RESULTS & DISCUSSIONS

This section covers all the details of an experiment carried out on the flower image dataset. Moreover, it contains the result analysis of the classifications algorithms considered in the experiment.

A. Flower Image Dataset

Accumulation of related dataset is a crucial for carrying out experiment and producing results. In this experiment, we have considered the dataset of hibiscus flowers,which were procured from internet resources. These were true-color photos with varied resolution. Since we have not managed the image acquisition and camera activity, the images in the dataset having completely different distinction and illumination. Therefore, it is very much required to apply a correct pre-processing technique(s). The final dataset considered for experiment consists with 15000 flower images with 12 different species.

B. Experimental Results

The experiment was carried out using Tensor flow and android studio. The images of the dataset is resized with dimension of 250 × 250 pixels. After applying the appropriate pre-processing and segmentation techniques, the features are extracted and the dataset is prepared to apply the proposed Deep CNN algorithm with the integration of multi-label power dataset. It gives the information about the common name, botanical name, family ,species, uses ,origin, type, height ,light requirement .



Fig 5: the output of Prediction Model with flower botanical name, family of flower etc.

C. Performance Analysis

To measure the performance of the classification algorithms can be obtained through accuracy, precision, recall, and F-measure.

TABLE 3
Description of performance analysis

Performance analysis	Formula
Accuracy	TP+TN / TP+FP+FN+TN
Precision	TP / TP+FP
Recall	TP / TP+FN
F-measure	2*(Recall*Precision)/(Recall + precision)

IV. CONCLUSIONS

It is possible to develop a system to classify the similar flower species affordable and easy. This research is about image classification by using deep learning via framework TensorFlow. It can be concluded that all

results that have been obtained, showed quite impressive outcomes. The deep neural network (DNN) becomes the main agenda for this research, especially in image classification technology. DNN technique was studied in more details starting from assembling, training model and to classify images into categories. The roles of epochs in DNN was able to control accuracy and also prevent any problems such as overfitting. Implementation of deep learning by using framework TensorFlow also gave good results as it is able to simulate, train and classified with up to 90% percent of accuracy towards .Lastly, Python have been used as the programming language throughout this research since it comes together with framework TensorFlow which leads to designing of the system involved Python from start until ends.. The device can effectively classify the similar flowers and is designed to be used in any place or environment.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Shri Madhwa Vadiraja Institute of Technology and Management, Bantakal for the facilities provided and their support. Also, we would like to thank the Head of Department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] Mohd Azlan Abu, Nurul Hazirah Indra, Abdul Halim Abd Rahman, Nor Amalia Sapiee and Izanoordina Ahmad**,** **"**A study on Image Classification based on Deep Learning and Tensorflow", international Journal of Engineering Research and Technology, Volume 12, Number 4, 2019.

[2] Swati Kosankar, Dr. Vasima Khan ," Flower Classification using MobileNet: An Optimized Deep Learning Model", International Journal of Advanced Research in Computer and Communication Engineering Vol. 8, Issue 4, April 2019.

[3] Archana L. Lakesar, "A Review on Flower Classification Using Neural Network Classifier" International Journal of Science and Research, volume 7 Issue 5, May 2018.

[4] Isha Patel, Sanskruti Patel, "Flower Identification and Classification using Computer Vision and Machine Learning Techniques" , International Journal of Engineering and Advanced Technology (IJEAT) , Volume-8 Issue-6, August 2019

[5] M.V.D.Prasad, B. Jwala Lakshmamma, Hari Chandana, K. Komali, M.V.N. Manoja , P. Rajesh Kumar , Ch. Raghava Prasad, Syed Inthiyaz , P. Sasi Kiran, "An efficient classification of flower images with convolutional neural networks", International Journal of Engineering & Technology,2018.

Classification and segmentation of paddy seeds

PREETHAM KUMAR[1], PRATHAM S KANCHAN[2], SHAMITH[3], S SRIHARI[4], KRISHNA KUMAR[5]

4th year B.E Electronics and Communication Engineering, SMVITM Bantakal[1,2,3,4]
Associate Professor, Department of Electronics and Communication Engineering, SMVITM Bantakal[5]
[1]preethalevoor@gmail.com [2]prathamskanchan@gmail.com [3]shamithk20@gmail.com [4]satishraki122@gmail.com
[5]krishnakumar.ec@sode-edu.in

***Abstract*-- In order to train the neural network, a sufficient amount of training data must be prepared, which requires time-consuming manual data annotation process that often becomes the limiting step. In this project we are training neural network model to instance segment and classify the crop seeds for different rice cultivar using synthetically generated datasets. Our attempt is based on the concept of domain randomization, where the large amount of dataset is generated randomly orienting the seed object to a virtual canvas. Constructing and utilizing such synthetic data can be a powerful alternative method for human labour costs, this dataset is used for deploying deep learning-based analysis in the agricultural domain to get the best yields. The goal of instance segmentation is to classify individual objects and localize(identify) each object instance using a bounding box. For generation of synthetic data, we are using domain randomization technique and for training neural network model we use mask RCNN. The model will do the instance segmentation of the seeds which is present in validation dataset which are synthetically generated with enough accuracy and with less error.**

Keywords – Agriculture, Domain Randomization, Deep learning.

I. INTRODUCTION

In this project we are training neural network model to instance segment the crop seeds for different rice cultivar using synthetically generated datasets, where the large amount of dataset is generated randomly orienting the seed object to a virtual canvas. Constructing and utilizing such synthetic data can be a powerful alternative method for human labour costs, this dataset is used for deploying deep learning-based analysis in the agricultural domain to get the best yields. The goal of instance segmentation is to classify individual objects and localize(identify) each object instance using a bounding box. For generation of synthetic data for model training and validation we are using domain randomization technique.

A. Problem Statement

To train instance segmentation neural network for classification and segmentation of paddy cultivars using synthetic dataset, opting a technique called domain randomization, in this method we will generate large amount of synthetic data by randomly orienting the seed from seed pool onto the virtual canvas, where we train our model for different situation using the generated dataset.

B. Objective

- To generate sufficient amount of synthetic dataset.
- To train a deep learning model to instance segmentation using synthetic dataset.
- To evaluate the model using real world dataset.

II. RELATED WORK

K Kiratiratanapruk, et al [1] In this paper author presented a study that utilized machine vision technology to classify 14 Oryza sativa rice varieties. Each cultivar used over 3,500 seed samples, a total of close to 50,000 seeds. There were three main processes, including pre-processing, feature extraction, and rice variety classification. First a quality screening method was applied to detect unusual physical seed samples. Their physical information including shape, colour, and texture properties were extracted to be data representations for the classification. Four methods (LR, LDA, k-NN, and SVM) of statistical machine learning techniques and five pretrained models on deep learning techniques were applied for the classification performance comparison. In their study, the rice dataset was classified in both subgroups and collective groups for studying ambiguous relationships among them. The best accuracy was obtained from the SVM method at 90.61%, 82.71%, and83.9% in subgroups 1 and 2 and the collective group, respectively, while the best accuracy on the deep learning techniques was at 95.15% from InceptionResNetV2 models. Drawback of

this method is, that it requires large amount of training data.

Samson damilola fabiyi, et al [2] The authors present a new RGB and HSI system for rice seedvariety classification. RGB images and hyperspectral image data cubes which offer high spatial and spectral resolution respectively were acquired using the proposed system. Experimental results show that very good classification results and elimination of impure species from rice seed samples can be achieved by taking advantage of spatial features from high spatial resolution images and fusing them with spectral features from hyperspectral data cubes. Accuracy is less due to a smaller number of seeds per class. Increasing the number of seeds per class during training can improve the results.

Joao Borrego, et al [3] proposed that using synthetic datasets that are not necessarily photo-realistic can be a better alternative to simply fine-tuned pre-trained networks. The availability of advanced object detectors, these systems and their variations have found many applications ranging from face detection, to medical applications, and to robotics. However, training these systems from scratch is still a challenge as these methods rely on the availability of large, annotated, and high-quality datasets. One common approach to circumvent this issue is to re-use detectors that were pre-trained on large and available datasets such as Common Objects in Context (COCO) and ImageNet and later, apply some form of domain adaptation Technique to overcome these challenges, in this work, we are investigating the usage of domain randomization to facilitate the adaptation of an object detector, namely Single Shot Detector (SSD), to detect three classes of objects cylinders, spheres, and boxes. According to Author experiment, domain randomization can substantially increase Author has shown substantial improvements in the accuracy of SSD. However model fails, if the objects are stacked on top of one another.

Josh Tobin, et al [4] focused on domain randomization, a simple technique for training models on simulated images that transfer to real images by randomizing rendering in the simulator. With enough variability in the simulator, the real world may appear to the model as just another variation. Author focus on the task of object localization, which is a stepping stone to general robotic manipulation skills. Author find that it is possible to train a real-world object detector that is accurate to 1.5cm and robust to distractors and partial occlusions using only data from a simulator with non-realistic random textures. To demonstrate the capabilities of our detectors, this paper show they can be used to perform grasping in a cluttered environment. This is the first successful transfer of a deep neural network trained only on simulated RGB images (without pre-training on real images) to the real world for the purpose of robotic control. The purpose of domain randomization is to provide enough simulated variability at training time such that at test time the model is able to generalize to real-world data.

Yosuke Toda, et al [5] Yosuke Toda et al, in this paper author, takes a step ahead in deep learning, He talks about training an instance segmentation neural network with synthetic datasets for crop seed phenotyping mainly for barley seed. Generally training a deep learning model takes a large number of datasets for model training and requires manual data labelling. In this paper, the author creates a synthetic data of barley seed using domain randomization technique, where a large amount of image is generated by randomly orienting the seed to a virtual canvas. For instance segmentation, he used state of the art Mask-RCNN algorithm and trained model showed 96% recall and 95% average precision against the rea-world test dataset.

Kaiming He, et al [6] proposed that in this paper the methodology will efficiently detects objects in an image while simultaneously generating a high-quality segmentation mask for each instance. The method, called Mask R-CNN, extends Faster R-CNN by adding a branch for predicting an object mask in parallel with the existing branch for bounding box recognition. Mask R-CNN is simple to train and adds only a small overhead to Faster R-CNN, running at 5 fps. Moreover, Mask R-CNN is easy to generalize to other tasks, e.g., allowing us to estimate human poses in the same framework. The Author show top results in all three tracks of the COCO (Common Objects in Context) suite of challenges, including instance segmentation, bounding box object detection, and person keypoint detection. Instance segmentation is challenging because it requires the correct detection of all objects in an image while also precisely segmenting each instance.

Mask R-CNN is conceptually simple: Faster R-CNN has two outputs for each candidate object, a class

label and a bounding-box offset; to this we add a third branch that outputs the object mask. Mask R-CNN is thus a natural and intuitive idea. But the additional mask output is distinct from the class and box outputs, requiring extraction of much finer spatial layout of an object.

Joshua Colmer, et al [7] presents the Seed Germination system, which combines cost effective hardware and open-source software for seed germination experiments, automated seed imaging, and machine-learning-based phenotypic analysis. In this method, they are processing multiple image series simultaneously and produce a reliable analysis of germination- and establishment-related traits, In both comma-separated values (CSV) and processed images (PNG) formats. For the experiment, they have used five different crop species, including tomato, pepper, Brassica, barley, and maize. For the analysis of the seed germination these seeds they have used Machine Learning algorithms, which will remove the background image, extract the features, traits and detect germination for more generalized analysis they've used supervised and Unsupervised Deep learning networks. used YUV color model for background mask, this model trained using labelled background (filter paper) and foreground (seeds) pixels, which are subsequently applied to retain seed-related objects. Descriptive statistical moments (Hu moments) are used to measure seed morphological features for each seed in a given germination panel. for the measurement of morphological features, they have utilized the scikit library. Over the course of the experiment, they have automated the hardware imaging process using Raspberry-Pi and python GUI software.

André Dantas de Medeiros, et al [8] proposed a novel approach for seed quality classification, Optical sensors combined with machine learning algorithms have led to significant advances in seed science. These advances have facilitated the development of robust approaches, providing decision-making support in the seed industry related to the marketing of seed lots. They have developed classifier models using Fourier transform near-infrared (FT-NIR) spectroscopy and X-ray imaging techniques to predict seed germination and vigor. For the study, A forage grass was used as a model species. FT-NIR spectroscopy data and radiographic images were obtained from individual seeds, and the models were created based on the following algorithms: linear discriminant analysis (LDA), partial least squares discriminant analysis (PLS-DA), random forest (RF), naive Bayes (NB), and support vector machine with radial basis (SVM-r) kernel. In this method, the models individually reached an accuracy of 82% using FT-NIR data, and 90% using X-ray data. For seed vigor, the models achieved 61% and 68% accuracy using FT-NIR and X-ray data, respectively. The use of X-ray data and the LDA algorithm showed great potential to be used as a viable alternative to assist in the quality classification of U. brizantha seeds. However, the estimation of seed vigor was not reliable.

II. METHODOLOGY

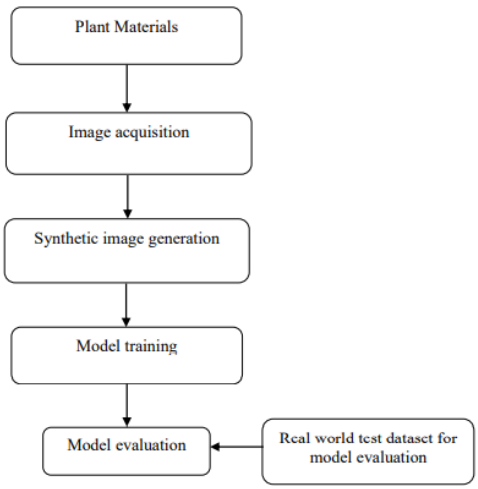


Fig 1: Block diagram of the proposed system

i. Plant Material: For the Instance segmentation of crop, we collected 4 different classes of paddy seeds namely Gidda, Jaya, Jyothi and M4 which will be used in model training.

ii. Image Acquisition: Selecting the necessary crop seed which required for the Image Acquisition, in image acquisition capturing the necessary image using a digital camera while capturing the image, seeds are uniformly spread for better quality image. While collecting the images, seeds are placed

uniformly on white paper and image is captured using SonyIMX471 sensor with fixed dimension of 3000*4000 pixels.

iii. Synthetic Image Generation: Synthetic image generation, using the domain randomization technique. In this technique, four different paddy seeds are used thus creating a seed pool, and dimension of these images are reduced to 1024*1024 pixels. With a help of seed pool images, we randomly choose one image and place it in the virtual canvas this process is continued several times for the generation of enough number of synthetic Images.

iv. Model Training: We used Mask R-CNN implementation on the Keras/Tensorflow backend. Configuration predefined by the repository was used, including the network architectures and losses. The residual network ResNet101 was used for the feature extraction. From the initial weights of ResNet101 obtained by training using the MS COCO dataset, thus performed fine-tuning using our synthetic seed image dataset for 10 epochs and steps for epochs set to 100 and with a learning rate of 0.001. From the 400 images of the synthetic dataset, 300 were used for training, 100 for validation. No image augmentation was performed during training. The synthetic training data have a fixed image size of 1024 × 1024. However, the input image size for the network was not exclusively defined such that variable sizes of the image can be fed upon inference, and it took 31m 46s for model to train for 10 epochs

v. Testing Model: For testing the model, using the mask R-CNN model in inferencing mode and validating the images in validation dataset. In validation, model will randomly pick an image from validation folder and the network outputs a set of bounding boxes and seed candidate mask regions with a probability value and class of the seeds in an image. For real-world test, the dataset consisting of 10 images with which each image containing seeds derived from a different paddy rice cultivar. Each image has a size of 1024x1204. Label of real-world test dataset was manually annotated by us. For reference, we also prepare 200 synthetic images for testing (synthetic test dataset), which were not used for the model training or validation.

III. RESULTS & DISCUSSIONS

To understand the use of synthetic data for deep learning, we must have a precise understanding of "what type of features are critical to represent the real-world dataset". In the case of seed instance segmentation, we presumed that the network must learn the representation that is important for segregating randomly placed or overlapping seeds into an individual object. Therefore, in the course of designing synthetic images, prioritized the dataset to contain numerous patterns of seed orientation, rather than to contain massive patterns of seed texture. It is expected that the model performance will be greatly influenced by the image resolution and variance of seed images used to create the synthetic image, as well as the number of images that constitute the training dataset. Optimal parameters will also depend on the type of cultivars that constitute the test dataset. Our model was able to identify instances in the image given and able to instance segment the respective seed with the bounding box and mask for the corresponding seed object.

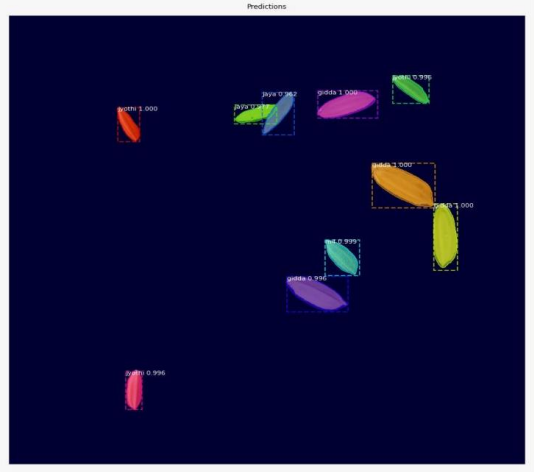


Fig 2: Model Output

IV. CONCLUSIONS

As per our knowledge there are many existing models which are capable of instance segmentation and classification, that are trained using large set of manual data which is time-consuming labour-intensive work.

In order to overcome we have generated synthetic dataset by using domain randomization technique, and this dataset is used for training the model and the trained model is tested using validation dataset. The model will do the instance segmentation of the seeds which is present in validation dataset which are synthetically generated with enough accuracy and with less error. In the future the model can be tested for real world dataset and the accuracy can be increased by increasing the number of datasets.

REFERENCES

[1]. Kantip Kiratiratanapruk, Pitchayagan Temniranrat, Wasin Sinthupinyo, Panintorn Prempree, Kosom Chaitavon, Supanit Porntheeraphat,and Anchalee Prasertsak, "Development of Paddy Rice Seed Classification Process using Machine Learning Techniques for Automatic Grading Machine", Hindawi Journal of Sensors Volume 2020, Article ID 7041310, Published on 01 Jul. 2020.

[2]. Samson damilola fabiyi, Hai vu, Christos tachtatzis, Paul murray, David harle, Trung kien dao, Ivan andonovic, Jinchang ren and Stephen marshall, "Varietal Classification of Rice Seeds Using RGB and Hyperspectral Images", Vol 8, DOI: 10.1109/ACCESS.2020.2969847, page no. 22493 – 22505, Jan 2020.

[3]. Joao Borrego, Atabak Dehban, Rui Figueiredo, Plinio Moreno, Alexandre Bernardino, and Jose Santos-Victor "Applying Domain Randomization to Synthetic Data for Object Category Detection", arXiv:1807.09834 [cs.CV], 2018.

[4]. Josh Tobin, Rachel Fong, Alex Ray, Jonas Schneider, Wojciech Zaremba, and Pieter Abbeel, "Domain Randomization for Transferring Deep Neural Networks from Simulation to the Real World.", 2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Electronic ISBN:978-1-5386-2682-5, Date of Conference: 24-28 Sept. 2017.

[5]. Yosuke Toda, Fumio Okura, Jun Ito, Satoshi Okada, Toshinori Kinoshita, Hiroyuki Tsuji and Daisuke Saisho," Training instance segmentation neural network with synthetic datasets for crop seed phenotyping", Communications biology vol 3, DOI: doi.org/10.1038/s42003-020-0905-5, 173, April 2020.

[6]. Kaiming He, Georgia Gkioxari, Piotr Dollar, and Ross Girshick, "Mask R-CNN", 2017 IEEE International Conference on Computer Vision (ICCV), Electronic ISBN:978-1-5386-1032-9, Date of Conference: 22-29 Oct. 2017.

[7]. Joshua Colmer, Carmel M. O'Neill, Rachel Wells, Aaron Bostrom, Daniel Reynolds, Danny Websdale, Gagan Shiralagi, Wei Lu, Qiaojun Lou, Thomas Le Cornu, Joshua Ball, Jim Renema, Gema Flores Andaluz, Rene Benjamins, Steven Penfield, and Ji Zhou, "SeedGerm: a cost-effective phenotyping platform for automated seed imaging and machine-learning based phenotypic analysis of crop seed germination", Vol 228, Issue No 2, pages 778-793, 2020.

[8]. André Dantas de Medeiros, Laércio Junio da Silva, João Paulo Oliveira Ribeiro, Kamylla Calzolari Ferreira, Jorge Tadeu Fim Rosas, Abraão Almeida Santos and Clíssia Barboza da Silva. "Machine Learning for Seed Quality Classification: An Advanced Approach Using Merger Data from FT-NIR Spectroscopy and X-ray Imaging", Sensors doi:10.3390/s20154319, 3 August 2020.

[9]. Mart´ın Abadi, Paul Barham, Jianmin Chen, Zhifeng Chen, Andy Davis, Jeffrey Dean, Matthieu Devin, Sanjay Ghemawat, Geoffrey Irving, Michael Isard, Manjunath Kudlur, Josh Levenberg, Rajat Monga, Sherry Moore, Derek G. Murray, Benoit Steiner, Paul Tucker, Vijay Vasudevan, Pete Warden, Martin Wicke, Yuan Yu, and Xiaoqiang Zheng, "TensorFlow: A system for large-scale machine learning.", published on OSDI '16 is sponsored by USENIX, 2016.

[10]. Yu Jiang and Changying Li, "Convolutional Neural Networks for Image-Based HighThroughput Plant Phenotyping", AAAS Plant Phenomics, Volume 2020, Article ID 4152816, 22 pages, 2020.

[11]. Xiangyu Zhang, Kaiming He, Shaoqing Ren, Jian Sun, "Deep Residual Learning for Image Recognition", Microsoft Research, arXiv:1512.03385v1 [cs.CV], 10 Dec 2015.

[12]. Davy Neven, Bert De Brabandere, Marc Proesmans, and Luc Van Gool, "Instance Segmentation by Jointly Optimizing Spatial Embeddings and Clustering Bandwidth", arXiv:1906.11109, 2 Aug 2019.

[13]. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", Name and location of publisher: The MIT Press, Cambridge, MA, USA Number of pages: 800 Language: English ISBN: 978-0262035613, 2016.

[14]. Girshick, R. "Fast R-CNN". in IEEE International Conference on Computer Vision (ICCV) 1440–1448 IEEE, 2015.

[15]. Guo, W. et al. "Aerial imagery analysis—quantifying appearance and number of sorghum heads for applications in breeding and agronomy". Front. Plant Sci. 9, 1544, 2018.

[16]. Ghosal, S. et al. "A weakly supervised deep learning framework for sorghum head detection and counting". Plant Phenomics 2019, 1525874,2019.

Agriculture Marketing Using Web Based Technology

SOWBHAGYA D RAI[1], SOWJANYA D RAI[2], SUSHMA S[3], SUSHMITHA N DEVADIGA[4], Mr. GANESH S SHETTY[5]

Department of Electronics and Communication Engineerimg, Shri Madhwa Vadiraja Institute of Technology and Management, Vishwothama Nagar, Bantakal – 574 115, Udupi District, Karnataka, India

[1]sowbhagya.17ec066@sode-edu.in

[2]sowjanya.17ec067@sode-edu.in

[3]sushma.17ec074@sode-edu.in

[4]sushmitha.17ec075@sode-edu.in

[5]ganeshshetty.ec@sode-edu.in

Abstract **- Even though India is an agricultural country still its agricultural marketing has been defective. The one main defect of Indian Agricultural marketing is the presence of too many middlemen and the exploitation of farmers by them. On one hand, these middlemen exploit the farmers by purchasing the produce at lower prices, and on the other hand, they exploit the customers by demanding higher prices from them. The only aim of a number of commission agents, brokers etc. is to derive a higher income from the middle processes. These middlemen take undue advantage of the poor former on the basis of their financial resources. The Vision of this project is to ensure fair price to the farming community by devising new techniques and by making use of online market. An application, that serves as a platform for movement of agricultural products from the farms directly to the consumers or retailers. This application provides privilege for both farmers and consumers or retailers to buy and sell the required farm products without the involvement of a middleman at its right profitable price. Hence it provides freedom of pricing and freedom of access. Through this we can ensure farmers to make selling decisions most advantageously.**

Keywords – Web application, Agricultural marketing, producer, consumer

I. INTRODUCTION

Earlier world used to depend on agriculture and now, agriculture is depending on the world. Agriculture is something that people have started to become exhausted on, forgetting that it is what is keeping us alive. The Vision of this project is to ensure fair price to the farming community by planning new techniques and by making use of online market. An application, that serves as a platform for movement of agricultural products from the farms directly to the consumers or retailers. This application provides privilege for both farmers and consumers to buy and sell the required farm products without the involvement of a middleman at its right profitable price. Hence it provides freedom of pricing and freedom of access. Through this we can ensure farmers to make selling decisions more advantageously.

To benefit the farming community from the new global market access opportunities, the internal agricultural marketing system in the country also needs to be united and strengthened. In particular, the market system has to be strengthened to: a) provide motivations to farmer to produce more; b) convey the changing needs of the consumers to the producers to enable production planning; c) foster true competition among the market players and d) to enhance the share of farmers in the ultimate price of his agricultural produce. Farmers, right from sowing the seeds to dispatching the grown crops spend a lot of blood and sweat. They will obviously expect the right amount of money for their efforts. But not every consumer gets the farm products at the "FACTORY PRICE". They go through three to four middlemen and reach the customer with almost double the actual price. The same goes with the farmers. If they have to buy manure or some pesticides, they don't get it at the right price at the right quality. This is not a recent occurrence. This corruption even on the farm products has been happening over a long period of time. In order to avoid this, there has to be direct relationship and communication between the farmers and customers. With the world being more modern and technical oriented, smart phones has come into the hands of people even in the rural areas. Farmers have started to realize the importance of smart phones and technology. A web cum mobile application will ease this problem. The requirements needed for the functionality are: Details of products from farmers and consumers, Expert analysis, Cost estimation, Quality check.

II. LITERATURE REVIEW

Software application are basically for sustainable development of farmers. Many times, farmer is confused to take decisions regarding selection of fertilizer, pesticide and time to do particular farming actions. So, to avoid this problem this application is very useful. Fertilizer schedule of every form of crop can get registered. Based on sowing date of crop, farmer will get reminders about application of fertilizer, herbicide as per schedule, pesticide for diseases and weather alerts if particular crop exceeds its favorable temperature range. Crop suggestion are given supported Soil

ISBN: 979-85-27243-61-1

kind, geographical location. Farmer will get real time national level crop rates to get more befit. This system combines fashionable net and mobile communication systems with GPS for economical and sleek farming. This review paper presents the introduction, theories and analysis of DBMS, use of Smartphone in agriculture. This paper developed on brief study of some common problems faced by the farmers across the nation [2]. It talks about the AgriCom, an android application. This application encourages use of android mobile phones which were not used in the agriculture field. This application proven useful in providing suggestions to farmers about the crop, cultivation method, Agriculture Marketing Using Web based Technology Page4 fertilizers required etc. This indirectly helps in increasing productivity of crops and thereby has a positive impact on GDP of India reducing poverty. It also tells the new techniques which can be used to increase farmers productivity [3]. Author propose that the web is fundamentally changing, and will continue to change, marketing thought and practice. The paper suggests that the web-based markets of tomorrow may have little resemblance to the markets of today. Discuss the emergence of reverse marketing, customer-centric marketing, effective-efficiency, adaptation, expectation management, marketing process focus and fixed cost marketing in the context of marketing theory and practice. In addition, we discuss customer behaviours such as cocreation, universal availability, use of infomediaries, temporal shifts, open pricing and a move toward bricks to clicks [4]. Paper developed Farm manager app which provides the management of small farms, designed and developed to respond to the needs and Characteristics of farmers of Greek. It can store database, do farm customization, easy field management, land field data, easy job recording process, employees and equipment [5]. Agro mobile app Develop Especially for the Indian farmers to assist them in agricultural needs. It is used for botanical species recognition and disease detection using a simple mobile phone with camera [6]. Krishi Ville App takes care of the updates of the different agricultural commodities, weather forecast updates, agricultural news updates. The application has been designed taking Indian farming in consideration [7]. Agriculture Supply Chain Management app have the complete package for farmers who want to do farming on sugarcane and obtain good production with proper management [8]. E-agree Used to detect detects leaf diseases. Also provides online market place, market rate guide, weather report and soil information to the farmer [9]. MahaFarm Helps in their farming activities that include agro-based crop information, weather updates, daily market prices and news/loan informational updates [10]. The eAgro crop marketing will serve as a better way for the farmers to sell their products within the country with some average knowledge about using the website. This would provide information to the farmers about current market rate of agro-products, their sale history and profits earned in a sale. This site will also help the farmers to know about the market information and to view agricultural schemes of the Government provided to farmers [11]. E-farming will serve as a way for the farmers to sell their products across the country just with some basic knowledge about how to use the website. The site will guide the farmers in all the aspects, the current market rate of different products, the total sale and the earned profit for the sold products, access to the new farming techniques through e-learning and centralized approach to view different government's agriculture schemes including the compensation schemes for farming. Getting availed to the required information related to the markets and different products can be made possible through the SMS facility provided by the system [12].

III. MATERIALS AND METHOD

The development of this application will be a very productive source for a common man. The ultimate aim of making this as a responsible model is to put an end to the disturbance and difficulty faced by the farmers because of the middlemen. Basically, this model consists of some module they are:

- Login module: In this module, The Customer, seller and the admin can login to the system by entering login id and password. System opens main account page after login.
- Customer module: The customer can register to the website by entering profile details. The customer can send purchase request for purchasing farm produce which is uploaded by farmers. After quality test and price quotation, the customer can approve or reject the purchase request.
- Seller module: the farmers are the sellers where they can sell their productions online. The system will display farm produces in the main page of the website.
- Article module: In the article module, admin can post news and blogs. This article module is farmers ca view the article by browsing article menu.
- Dashboard module: Dashboard module is for admin. In the dashboard module, admin has complete setting of the website.
- Location module: This is the page were admin can add country, state, city.
- Product module: In this module farmer can send their products directly.
- Billing module: The system generates billing after purchasing the product. The system calculates total cost automatically. In the billing report, it displays customer contact details, billing details, and purchased product information.

ISBN: 979-85-27243-61-1

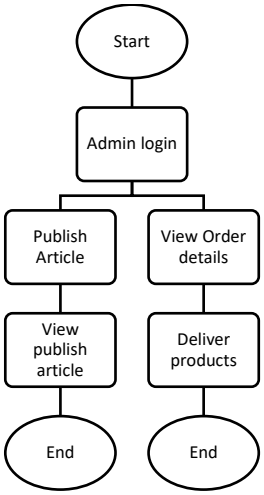


Fig. 1. Flow diagram of ADMIN action

The figure 1 represents the flow of admin action in web application, admin has complete authority on website. Admin should login through their login ID and password. Once they login they can publish a recent news and blogs in article menu and also, he can view or edit published article. Also, admin can view the ordered details about product after that he can deliver the product to customer.

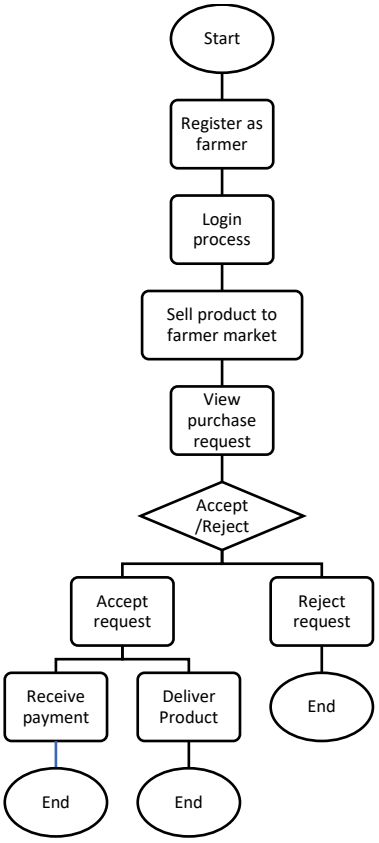


Fig. 2. Flow diagram of FARMER action

The figure 2 represents the flow of farmer action in web application. In farmer action, first a farmers should register themselves by providing certain details Once a farmer gets registered to this application, he/she should login through their login ID and password. Next, they can sell their product into farmer market by uploading the images of crops and its details along with the price. Later if a customer makes a purchase request farmer can decide whether to accept it or reject. If they reject, then the process will stop their itself. If they accept it, the next process of payment receiving and delivering the product occurs. And now the farmer action will be completed.

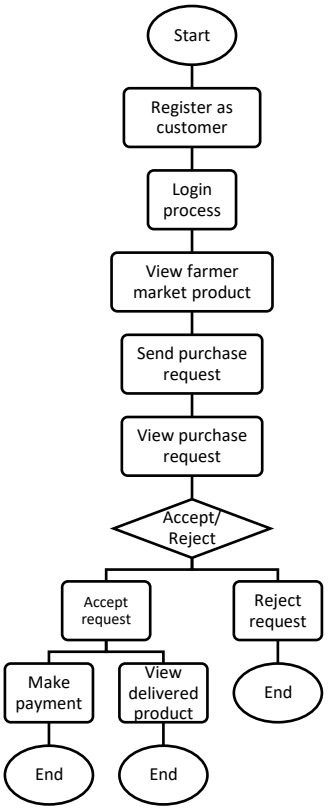


Fig. 3. Flow diagram of CUSTOMER action

The figure 3 represents the flow of admin action in web application. In customer action, first a customer should register themselves by providing certain details. Once a customer gets registered to this application, he/she should login through their login ID and password. Next, they can view product details in farmers market menu. If customer wants to purchase product, he can send purchase request and view purchase request sent by them. Later t farmer can decide whether to accept it or reject. If they reject, then the process will stop their itself. If they accept it, the next process of payment making and can view delivered product. And now the customer action will be completed.

ISBN: 979-85-27243-61-1

TABLE 1. Difference in prices when products are sold normally and through our application

Sr. No.	Products Price	Actual Price for 1 kg each	Price (Using Middlemen) 1 kg each	Price (Using App) 1 kg each
1	Pepper	Rs.300.0	Rs.600.00	Rs.450.00
2	Arecanut	Rs.400.0	Rs.700.00	Rs.550.00
3	Paddy	Rs.30.00	Rs.45.00	Rs.35.00
4	Coconut	Rs.40.00	Rs.60.00	Rs.50.00
5	Chickpeas	Rs.30.00	Rs.60.00	Rs.40.00
6	Onion	Rs.30.00	Rs.50.00	Rs.40.00

The Table.1 provides a clear analysis that when a middleman is not involved in the transaction of one agricultural product, the buyer can get a minimum of 10% profit firmly.

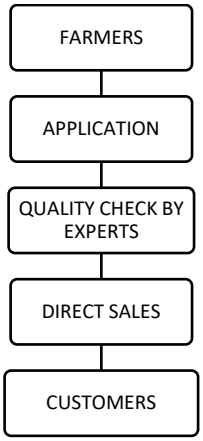


Fig. 3.4 Flow of farm product when application is used

Using this web application huge gap that has been filled and the communication between the farmers and the consumers have been made simple. There is no involvement of middleman. The products are produced by the farmers and then it is given directly to the hands of the customers with the help of our application. There is a huge difference in the profit margin when this application is used and when not. Through this application we achieve our main objective, which is to increase the profit margin of the farmers and make sure they get the right price for their efforts.

IV. RESULT AND DISCUSSION

Thus, expected outcome is web application. This application, that serves as a platform for movement of agricultural products from the farms directly to the consumers or retailers. This mobile and web application provides privilege for both farmers and consumers or retailers to buy and sell the required farm products without the involvement of a middleman at its right profitable price. The agriculture experts shall analyse the product that comes into this platform, approve it and provide ratings based on quality. This makes all the available farm products easily accessible. Hence it provides freedom of pricing and freedom of access. Through this we can ensure farmers to make selling decisions most advantageously.

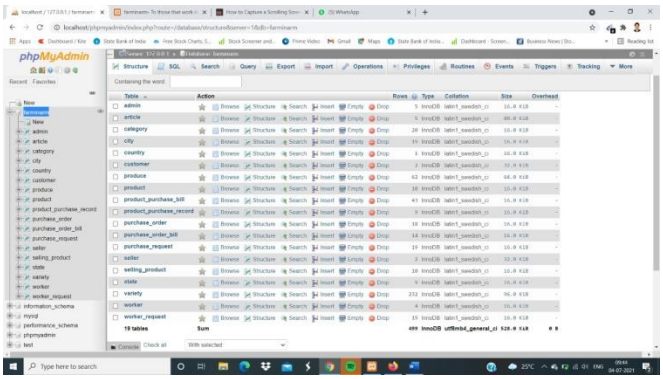


Fig. 5 database design in phpMyAdmin

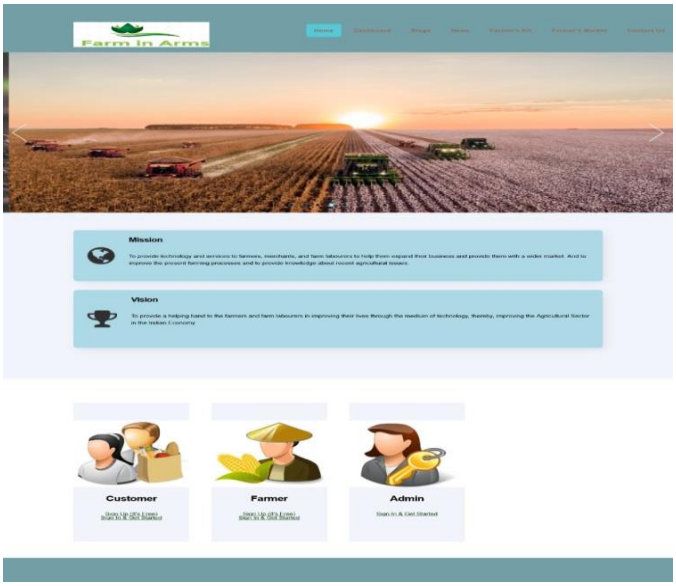


Fig. 6 Home page of website Farm in Arms

ISBN: 979-85-27243-61-1

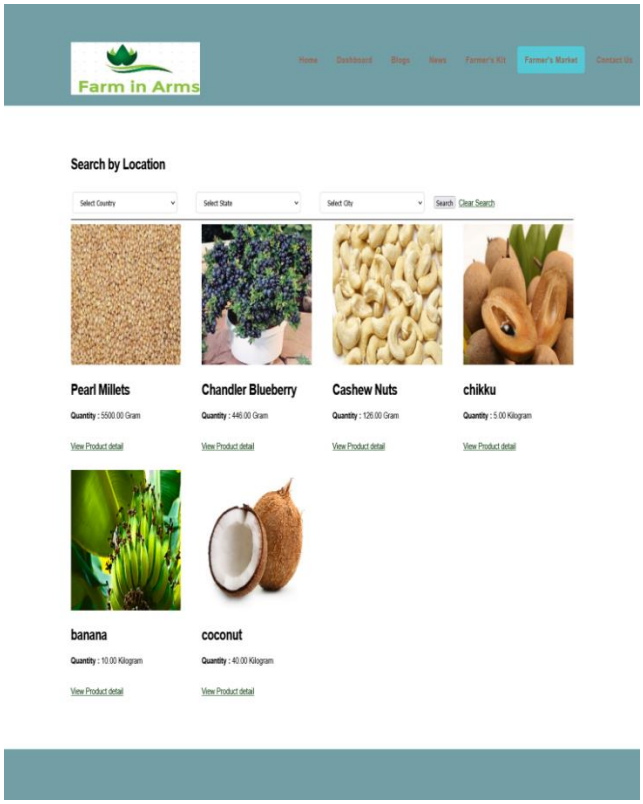


Fig. 7 Farmer's Market page to purchase product for customer



Fig. 7 Admin control page

V. CONCLUSION

From the literature survey, we studied some different apps are developed and used by farmers for their specific purpose. All this apps have different usage as per its functionalities. Many apps are being utilized for different kind of functionality regarding the farming activities like cropping information, pesticides, fertilizer, seed, selling of crop, irrigation information, estimation of crop production, weather information and information regarding the best practices of farming. Through this web application, we can make sure it is profitable for both the farmers and consumers. Since agriculture is still called the back bone of our nation, it is our responsibility to keep it as the same for a lot more generations to come and not let the chain break off. Marketing of agriculture can be made effective if it is looked from the collective and integrative efforts from various quarters by addressing to farmers, middlemen, researchers and administrators. It is high time we brought out significant strategies in agricultural marketing with innovative and creative approaches. This application will be one such strategy that will encourage the farmers to continue farming and make sure they get the right fruit for the labour.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Shri madhwa vadhiraja institute of technology and management Bantakal for the facilities provided and their support.

REFERENCES

[1]. Abishek, A. G., M. Bharathwaj, and L. Bhagyalakshmi. "Agriculture marketing using web and mobile based technologies." 2016 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR). IEEE, 2016.

[2]. Prof. Aradhana D, Shiva Prasad K. S., Shrivaishnavi J. K., P. Soumya, Tina Aggarwal," Agriculture based android application." NCICT-2016, 124-131.

[3]. Lantzos, Theodoros, George Koykoyris, and Michail Salampasis. "FarmManager: an Android application for the management of small farms." Procedia Technology 8 (2013): 587-592.

[4]. Prasad, Shitala, Sateesh K. Peddoju, and Debashis Ghosh. "AgroMobile: a cloudbased framework for agriculturists on mobile platform." International Journal of advanced science and technology 59 (2013): 41-52.

[5]. Singhal, Manav, Kshitij Verma, and Anupam Shukla. "Krishi Ville—Android based solution for Indian agriculture." 2011 Fifth IEEE international conference on advanced telecommunication systems and networks (ANTS). IEEE, 2011.

[6]. Chirmade, Monika, et al. "Agriculture Supply Chain Management Based Android Application." International Journal of Advanced Research in

ISBN: 979-85-27243-61-1

Computer and Communication Engineering 4.4 (2015).

[7]. Reddy, Santosh, et al. "A Survey on Crop Disease Detection and Prevention using Android Application‖." International Journal of Innovative Science, Engineering & Technology 2.4 (2015): 621-626.

[8]. Bhave, Aniket, Rahul Joshi, and Ryan Fernandes. "Mahafarm-an android based solution for remunerative agriculture." International Journal of Research in Advent Technology 2.4 (2014): 43-47.

[9]. Vinoth, D., K. Nisharth, and K. Shanmugapriya. "Eagro Crop Marketing for Farming Community." International Journal in Foundations of Computer Science & Technology (IJFCST) 5.2 (2015).

[10]. Sindhu, M. R., Pabshettiwar, A., Ghumatkar, K. K., Budhehalkar, P. H., & Jaju, P. V. (2012). E-Farming. Int J Comput Sci Inform Tech, 3(2), 3479-3482.

[11]. Vinoth, D., K. Nisharth, and K. Shanmugapriya. "Eagro Crop Marketing for Farming Community." International Journal in Foundations of Computer Science & Technology (IJFCST) 5.2 (2015).

[12]. Sindhu, M. R., Pabshettiwar, A., Ghumatkar, K. K., Budhehalkar, P. H., & Jaju, P. V. (2012). E-Farming. Int J Comput Sci Inform Tech, 3(2), 3479-3482.

ISBN: 979-85-27243-61-1

Design Of Low Power Full Adder With Minimum Number Of Transistor For Applications

Prerana P[1], Reshma Nayak[2], Supreetha S Rao[3], Suvidha[4], Ms.Sowmya Bhat[5]

Department of Electronics and communication Engineering, Shri Madhwa Vadhiraja Institute Of Technology & Management, Vishwotama Nagar, Bantakal-574115, Udupi District, Karnataka

[1]prerana.17ec047@sode-edu.in

[2]reshma.17ec049@sode-edu.in

[3]supreetha.17ec072@sode-edu.in

[4]suvidha.17ec076@sode-edu.in

[5]sowmyabhat.ec@sode-edu.in

Abstract **-Xor is the basic building block of the full adder of logic and arithmetic circuit. This paper explains a new approach to design a 1 bit full adder circuit using minimum number of transistors and to analyze the performance parameters such as power consumption, and area consumption. It's performance will be evaluated using CMOS technology. The proposed full adder will be further compared with several types that is widely used adder with different configuration of transistor and by optimizing the size of transistor the power consumption and area consumption can be minimized. The proposed full adder must have low power consumption, better area efficiency in terms of number of transistor.**

Keywords – XOR, Full Adder, CMOS

I. INTRODUCTION

VLSI is a process of creating integrated circuit by combining thousands of chip which can be called as IC or chip or a processor. Before the introduction of VLSI technology most IC's had limited set of function they could perform like before we had separate ROM, RAM, CPU for an electronic device which consumes of more area, power, current, voltage even take the more time to do the work so that device couldn't afford by everyone, but now due to advantage of VLSI we can add all these elements into a single chip, so that everyone can use the devices. Due to increase in the number of transistor integrated on a chip, power consumption of integrated circuit is also increasing due to the reliability and packaging problem occurring. One of the most important arithmetic operations in computer is addition for implementing any other arithmetic operation such as subtraction, multiplication or logarithmic functions we need efficient adders.2T XOR gate is used as the main building block of the full adder. As we come to know now that full adder is a basic building block of VLSI chip, when the number of transistor increases in a chip the power, area and current also increases so we are trying to reduce the number of transistor and also reducing the parameters like power, power delay product, area etc.

II. METHODOLOGY

2T XOR gate is used as the main building block of the full adder. In this project 2:1 MUX is used as a selector based on the C input carry will be obtained which acts as a selecting pin. Once the completion of 2T XOR gate design the full adder is designed using this XOR gate which uses less power and area. And to design 2T XOR as well as MUX here in this project 1 NMOS and 1 PMOS gate of 4 pin is used which consist of substrate terminal. By connecting substrate terminal to ground and vdd with respect to the MOSFET we can minimize the threshold voltage effect. CMOS is used in this project as they were the simple design, and also its power dissipation is less when compared to other logic families.

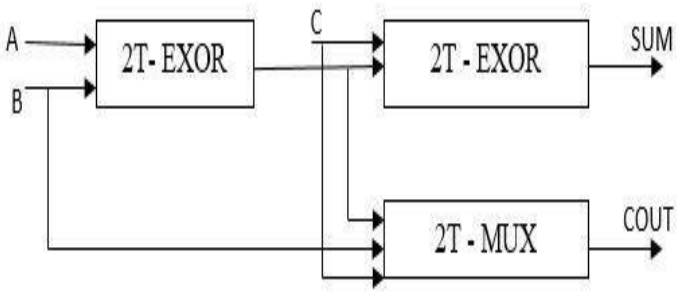


Fig.1Block Diagram of Proposed System

Designing of the full adder is done based on its input and output relation table:

A	B	C_{in}	Sum	C_{out}
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Table.1 Truth Table of full Adder

$$Sum = A \oplus B) \oplus C_{in} \quad \text{..... (1)}$$

$$C_{out} = AB + C_{in}(A \oplus B) \text{ .....(2)}$$

$$C_{out} = (A' . B' + A.B).A + (A'.B+A.B') C_{in} \text{ ...(3)}$$

$$C_{out} = A \oplus X \quad \text{.....(4)}$$

We have implemented XOR gate using different number of transistor to make sure that the power dissipation is less by using less number of transistor.
Fig.2 represents the design of XOR-XNOR logic gate using 8 Transistors, 5 Transistors of PMOS and 3 Transistor of NMOS using cadence.

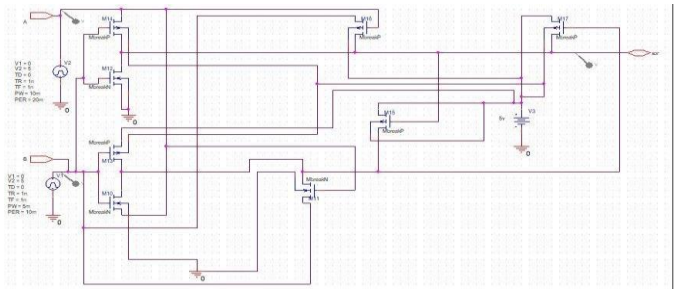


Fig.2 8T EXOR Circuit

Fig.3 represents the design of XOR-XNOR logic gate using 5 Transistors, 3 Transistors of PMOS and 2 Transistor of NMOS using cadence.

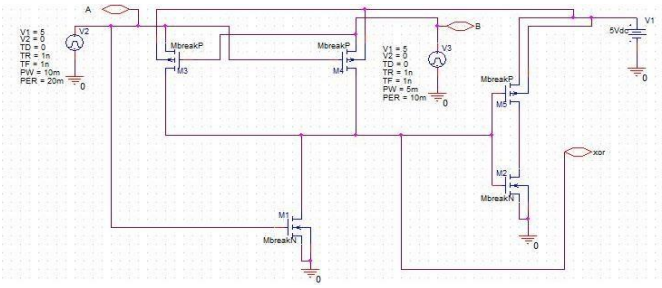


Fig.3 5T EXOR Circuit

Fig.4 represents the first type of design of XOR logic gate using 4 Transistors, 2 Transistors of PMOS and 2 Transistor of NMOS using cadence.

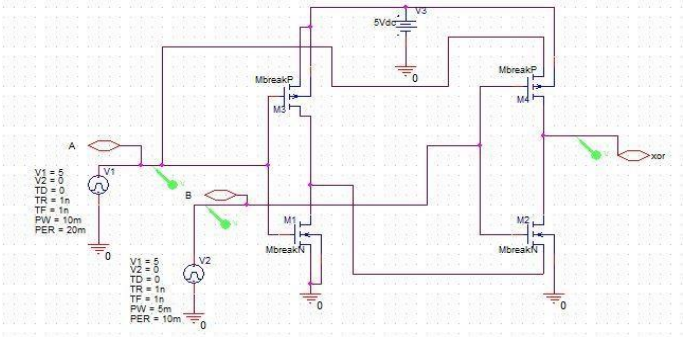


Fig.4 4 T(Type 1) EXOR Circuit

Fig.5 represents the second type of design of XOR logic gate using 4 Transistors, 2 Transistors of PMOS and 2 Transistor of NMOS using cadence.

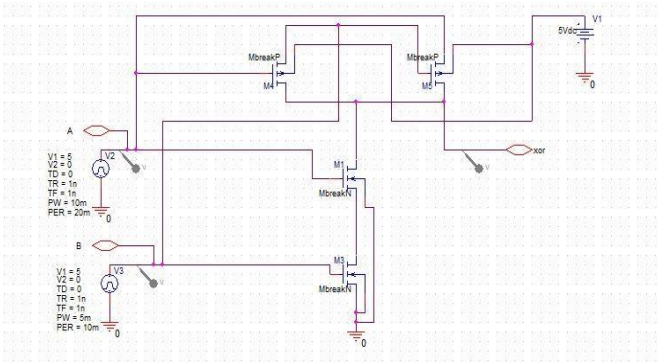


Fig.5 4T (Type 2) EXOR Circuit

Fig.6 represents the third type of design of XOR logic gate using 4 Transistors, 2 Transistors of PMOS and 2 Transistor of NMOS using cadence.

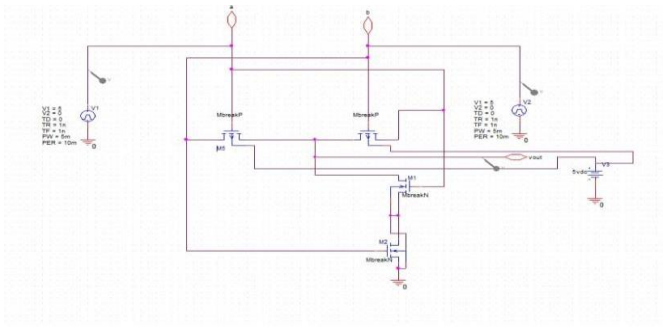


Fig.6 4T (Type 3) EXOR Circuit

Fig.7 represents the fourth type of design of XOR logic gate using 4 Transistors, 2 Transistors of PMOS and 2 Transistor of NMOS using cadence.

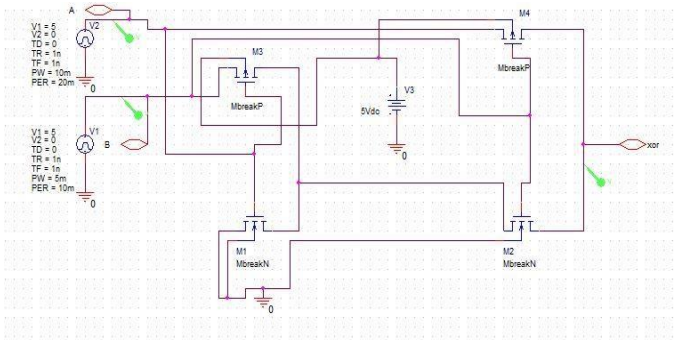


Fig.7 4T(Type 4) EXOR Circuit

Fig.8 represents the design of XOR logic gate using 3 Transistors, 2 Transistors of PMOS and 1 Transistor of NMOS using cadence.

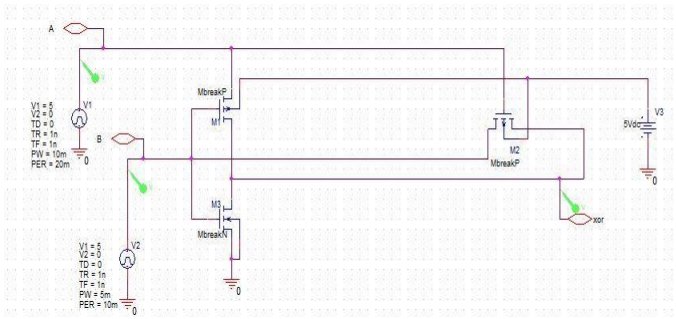


Fig.8 3T EXOR Circuit

Fig.9 represents the design of XOR logic gate using 2 Transistors, 2 Transistors of PMOS using cadence.

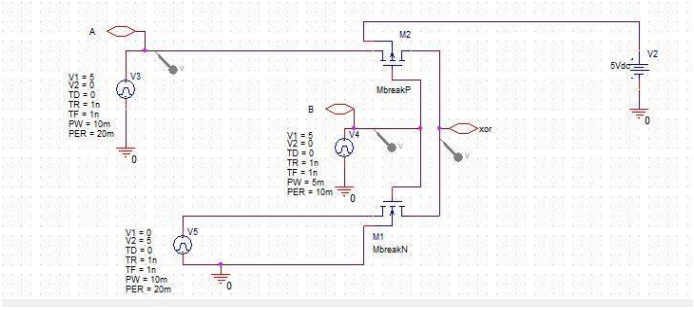


Fig.9 2T EXOR Circuit

From the truth table we know that when both the input is equal the output will be zero meanwhile when both the inputs are different the output will be high. When both input A and B is low the MbreakP(M2) is in ON state but MbreakN (M1) is in OFF so the output is low. When A is high and B is low MbreakP will be in ON state but MbreakN will be OFF so the output will be high. Similarly when A is low and B is high the output will be high only, and when both the inputs A and B are high the output will be low. By using above designed 2T EXOR gate we have designed 1 bit Full Adder. By making use of equation 1 we can make sum output by using 2T EXOR gate.2:1 MUX is used which uses the first EXOR gate output as a select line and B and C as input based on the select line input which will give the output. For MUX transmission gate logic is being used along with the CMOS technology.

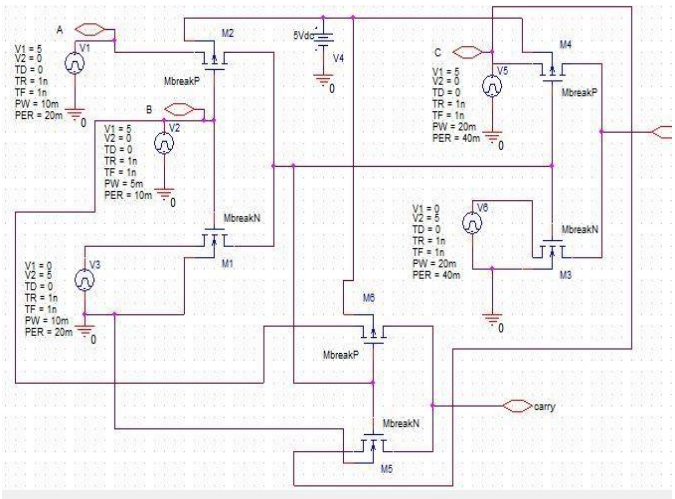


Fig.10 Full Adder Circuit using 2T EXOR

III. RESULTS & DISCUSSIONS

The simulation process has been performed by using Cadence software. The proposed circuit shows good performance in terms of power consumption and area consumption and area optimization as per transistor count. The waveform and output of the circuits of various transistors using XOR's are shown below:

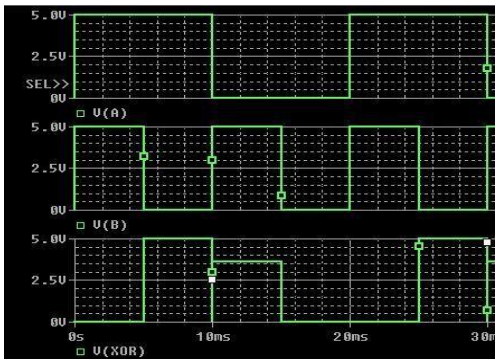


Fig.11 Simulation of XOR-XNOR logic gate using 8 transistor

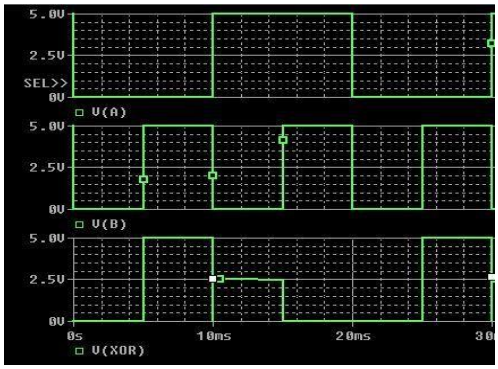


Fig.12 Simulation of XOR-XNOR logic gate using 5 transistor

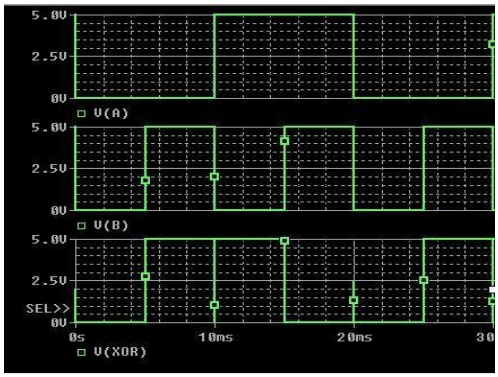


Fig.13 Simulation of XOR logic gate using 4 transistor(Type 1)

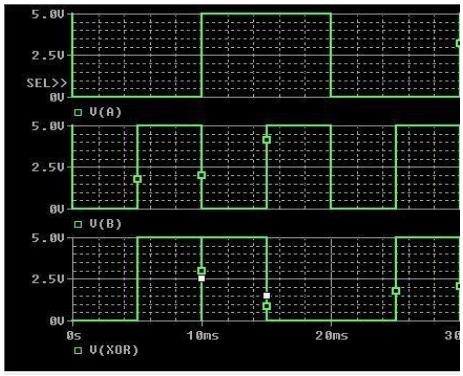


Fig.14 Simulation of XOR logic gate using 4 transistor(Type 2)

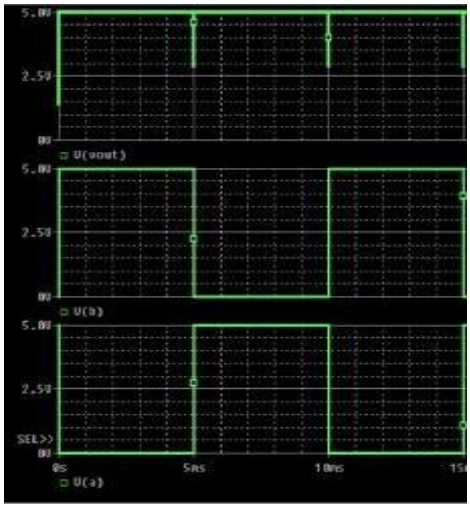


Fig.15 Simulation of XOR logic gate using 4 transistor(Type 3)

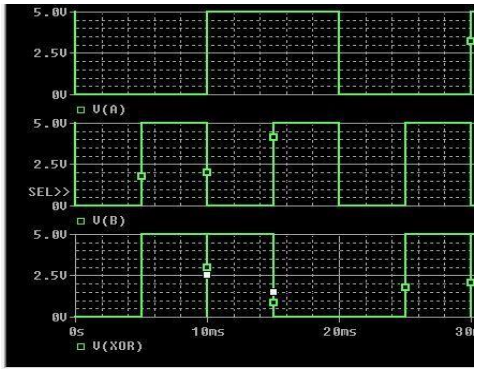


Fig.16 Simulation of XOR logic gate using 4 transistor(Type 4)

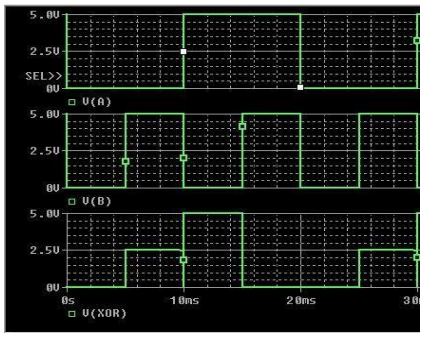


Fig.17 Simulation of XOR logic gate using 3 transistor

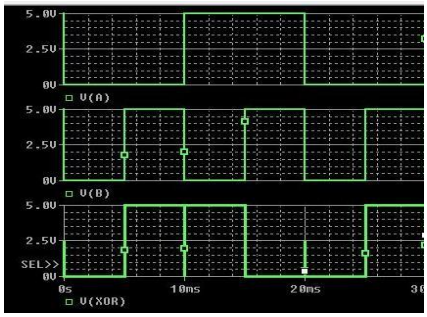


Fig.18 Simulation of XOR logic gate using 2 transistor

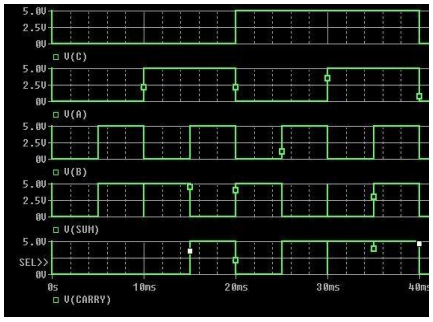


Fig.19Simulation of Full Adder using 2 Transistor

Design	Power Dissipation in Watt	No. of transistor
8T	0.0794*10^-3	8
5T	0.1256*10^-3	5
4 T(Type 1)	0.0836*10^-3	4
4 T(Type 2)	0.0836*10^-3	4
4 T(Type 3)	0.0836*10^-3	4
4 T(Type 4)	0.0836*10^-3	4
3T	0.0836*10^-3	3
2T	0.04192*10^-3	2

Table.3.1 Power Dissipation

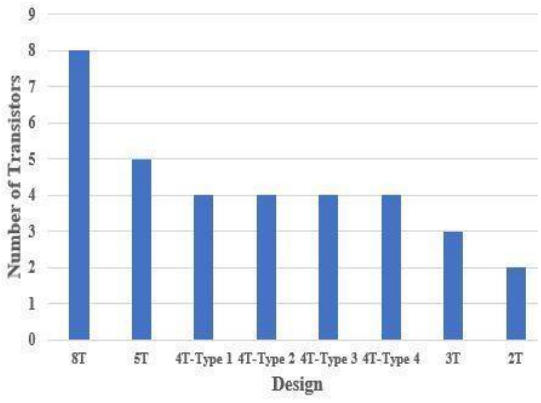


Fig.20 Graph of no. transistor vs PD

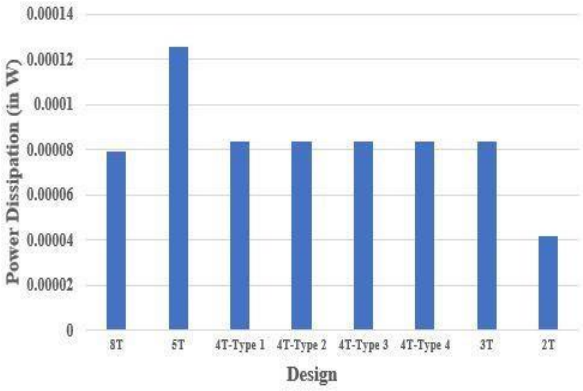


Fig.21 Graph of Power Dissipation vs Number of Transistor

We can say that as number of transistor decreases the power dissipation also decreases by looking into the graph and power dissipation per number of transistor used. By this way we can make use of less area for implementation of any applications such as 2 or more bit adder also where EXOR is used as building block one is full adder other than that is Binary to Gray Converter.

Below table is the comparison of the power dissipation of other full adder along with the number of transistor used.

Design	Power Dissipation (mW)
14T	0.732
6T	0.131
6T	0.127
Present Work	0.0454

Table 3.2 Comparison of Power Dissipation

Design	Number of Transistor
14T	14
6T	6
6T	6
Present Work	6

Table 3.3 Comparison of number of Transistors Used for Full Adder

IV. CONCLUSION

We used lesser transistors for the circuit and designed a xor which contains minimum number of transistor. By making use of this we built the full adder which consumes less power 1.00E-10 Watt which is 0.045*10-3 Watt. The full adder with 6 transistors using proposed 2 transistor XOR gate which uses less area in terms of transistor compared to other Exor gate design which also consumes power of 0.04192*10-3 Watt which is less compared to other Exor gate is designed. Full adder shows the better output signal levels with reduced transistor count. In the future we can make use of this full adder to build a ripple carry adder, carry look ahead adder using Full Adder also binary to gray conversion using XOR gate. In future we can try to reduce more delay.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal of Shri Madhwa Vadiraja Institute Of Technology & Management Bantakal for the facilities provided and their support. Also, we would like to thank the Head of Department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCE

[1] Hamed Naseri Somayeh Timarchi "Low-Power and Fast Full Adder by Exploring New XOR and XNOR Gates" IEEE Transactions on Very Large Scale Integration (VLSI) Systems Volume: 26, Issue: 8, Aug. 2018 .

[2] Nabihah Ahmad and Rezaul Hasan "Topology of 2 input sub nano watt XOR gate in 65nm CMOS technology". IEEE-ICSE2012.Proc, 2012, Kuala Lumpur, Malaysia,2012.

[3] Rajeev Kumar, Vimal Kant Pandey "A NEW 5-TRANSISTOR XOR-XNOR CIRCUIT BASED ON THE PASS TRANSISTOR LOGIC" 2011 World Congress on Information and Communication Technologies.

[4] Hung Tien Bui, Abdul Karim Al-Sheraidah, and Yuke Wang "NEW 4 TRANSISTOR XOR AND XNOR DESIGNS" The Second IEEE Asia Pacific Conference on ASICs / Aug 28-30, 2000.

[5] Tripti Sharma, K.G. Sharma, B.P. Singh and Neha Arora "New Efficient Design for XOR Function on the Transistor Level" AIP Conference Proceedings 1324, 346 (2010); https://doi.org/10.1063/1.3526229 1324, 346 © 2010 American Institute of Physics.

[6] Reto Zimmermann and Wolfgang Fichtner, Fellow "Low-Power Logic Styles: CMOS versus Pass-Transistor Logic" IEEE JOURNAL OF SOLID-STATE CIRCUITS, VOL. 32, NO. 7, JULY 1997.

[8] Ravali. K, Nagapurkar Renuka Vijay, Shrilakshmi jaggavarapu, SakthivelR, "LOW POWER XOR GATE DESIGNITS APPLICATIONS" 2017 4th International Conference on Signal Processing, Communications and Networking (ICSCN -2017), March 16 – 18, 2017, Chennai, INDIA.

[9] Rajesh Parihar1, Nidhi Tiwari2, Aditya Mandloi3, Dr. Binod Kumar. "AN IMPLEMENTATION OF 1- BIT LOW POWER FULL ADDER BASED ON MULTIPLEXER AND PASS TRANSISTOR LOGIC" International Conference on Information Communication & Embedded Systems (ICICES 2014) 03 May 2017.

[10] Jin-Fa Lin, Yin-Tsung Hwang "A Novel High-Speed and Energy Efficient 10-Transistor Full Adder Design" Jin-Fa Lin, Yin-Tsung Hwang, Member, IEEE, Ming-Hwa Sheu, Member, IEEE, and Cheng-Che Ho, MAY 2007.

[11] Yerumbayev Sultan n "Dual Feedback Design Methodology for XORXNOR Circuits", https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.13140%2FRG.2.1.4538.1204 2015

[12] Hanan A. Mahmoud and Magdy.A. Bayoumi "A 10-TRANSISTOR LOW-POWER HIGH-SPEED FULL ADDER CELL"International Symposium on Circuits and Systems (ISCAS 1999), May 30 - June 2, 1999, Orlando, Florida, USA

Design and Implementation of Smart Aqua Machine (SAM) using NodeMCU and Android Application.

Nidish M Suvarna[1], Poorvika[2], Sharanya[3], Sharat Karant[4], Mr. Ranjith Bhat[5]
4th year B.E Electronics and Communication Engineering, SMVITM Bantakal[1,2,3,4]
Senior Assistant Professor, Department of Electronics and Communication Engineering, SMVITM Bantakal[5]
[1]nidishmsuvarna7@gmail.com, [2]poorvikaacharya123@gmail.com, [3]sharanyas29525@gmail.com,
[4]sharatkarant@gmail.com, [5]Ranjithbhat@gmail.com

Abstract: The issues faced by the farmers across the country is paramount in any given state. The lack of labour, interest towards agriculture, poor conditions and so on over the years have seen an exponential drop in the overall crop output. Therefore, we intend to aid them by bringing in SMART AQUA MACHINE (SAM), the smart watering bot that would automatically water the crops on a regular basis. The bot can be switched ON/OFF on the phone using our Android application. Once turned ON the bot collects the data regarding the moisture content in the soil and waters the plants accordingly. Removal from the assigned pattern or the area of work the bot will set the alarm signal ON, it sends a message to the farmer on the same. The use of Node Microcontroller unit (NodeMCU) System-on-a-Chip (SoC), motors and our own Android application will help in accomplishment of that. The technology linked with the bot is made unsophisticated and thus farmers friendly.

Index Terms – Android App, Mobilization, NodeMCU, SMART AQUA MACHINE.

I. INTRODUCTION

Agriculture is the backbone our country but over the years, people have got exhausted with it and are now forgetting the very own source of food we receive. Yet there are some who are quite passionate and work their sweat out to feed the country. Insufficient amount of water may result in poor crop output and hence causing a huge loss to the farmer. In a great nation such as India, where the unorganised sectors, patterns that are inefficient, Irrigation techniques lay the foundation for agriculture often lead to unnecessary wastage of water, thus we have decided to design a machine that will automatically water the plants in the absence of the farmer. We have designed the system in such a way that the machine checks for the moisture content in the respective soil and waters accordingly with the microcontroller being the heart of the machine.

Objectives

- Detecting the moisture content in the soil with the help of sensors and supplying water to the crops accordingly via microcontroller
- Proper amount of water supply to the crop in coordination with the android app and SAM.
- The main Objective of this project is to ensure that the farmer gets a good crop output annually with sufficient amount of water supply.

II. RELATED WORK

Hema N, Reema Aswani, Monisha Malik [1] have proposed an autonomous and a cost-effective system for watering indoor potted plants placed on an even surface. They system comprises of a mobile robot and a temperature-humidity sensing module. The system is fully adaptive to any environment and takes into account the watering needs of the plants using the temperature-humidity sensing module, the hardware architecture of the fully automated watering system which uses wireless communication to communicate between the mobile robot and the sensing module. Their gardening robot is completely portable and is equipped with a Radio Frequency Identification (RFID) module, a microcontroller, an on-board water reservoir and an attached water pump. It is capable of sensing the watering needs of the plants, locating them and finally watering them autonomously without any human intervention. Mobilization of the robot to the potted plant is achieved by using a predefined path. For identification, an RFID tag is attached to each potted plant.

Laxmi Shabadi, Nandini Patil, Nikita. M, Shruti. J, Smitha. P & Swati. C [2] have proposed Automated irrigation system uses valves to turn motor ON and OFF. These valves may be easily automated by using controllers. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labour to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. Automatic irrigation is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a simple, precise method for irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits.

Abhishek Gupta, Shailesh Kumawat and Shubham Garg [3] have implemented sensors which detect the humidity in the soil (agricultural field) and supply water to the field which has water requirement. The project is PIC16F877A microcontroller-based design which controls the water supply and the field to be irrigated. There are sensors present in each field which are not activated till water is present on the field. Once the field gets dry, the moisture sensor sends the signal to the microcontroller which triggers the Water Pump to turn ON and supply the water to respective plant. When the

desired moisture level is reached, the system halts on its own and the Water Pump is turned OFF.

Sanam Pudasaini, Anuj Pathak, Sukirti Dhakal, Milan Paudel [4] a system of an automatic water level controller with SMS notification. The project was carried out to assist user in load shedding-based country like Nepal. SMS notification was added to automatic controller system so that water can be managed by user during load shedding. Two systems work synergistically; automatic level controller system and SMS system. The program was developed in Arduino program developing environment and uploaded to the Microcontroller. Water level in the system is controlled automatically. The controller operates on a battery power. Whenever the system encounters empty level and the status of load shedding, the SMS notification is sent to the user.

Mritunjay Ojha, Sheetal Mohite, Shraddha Kathole & Diksha Tarwar [5] proposed the automatic plant watering system is created. There have a various type using automatic watering system that are by using sprinkler system, tube, nozzles and other. This system uses watering sprinkler system because it can water the plants located in the pots. This project uses Arduino board, which consists of ATmega328 Microcontroller. It is programmed in such a way that it will sense the moisture level of the plants and supply the water when required. This type of system is often used for general plant care, as part of caring for small and large gardens. Normally, the plants need to be watered twice daily, morning and evening. So, the microcontroller has to be coded to water the plants in the garden or farms about two times per day. People enjoy plants, their benefits and the feeling related to nurturing them.

Rudranath Karmakar , Rajashekhar C. Biradar , Sairaj Poojary , Sachin Singh Rawat , Rehan Almaz Ahmad [6] proposed an automated irrigation system with boundary protection using farm-bot was aimed wherein; the user can monitor his field from the remote location. This system makes use of a technology called Internet of Things (IoT). A NodeMCU was utilized which consists of Wi-Fi module that connects the system to internet and an Arduino UNO (microcontroller) for accessing values of the parameters like temperature and soil humidity measurements of the area irrigated and controlling the proposed irrigation system. Robots are assuming to be a critical part in the field of agriculture for making the cultivating process self-governing. They focus on digging and sowing of seeds in the initial stage, pesticides sprinkling based on requirement and cutting of completely grown crops at the final stage by using automated Farm-Bot.

Punitha.K, Shivaraj Sudarshan Gowda, Devarajnayaka R [7] proposed an Automatic watering system using ATmega328 microcontroller. It is programmed to sense moisture level of plants at particular instance of time, if the moisture content is less than specified threshold which is predefined according to particular plant's water need then desired amount of water is supplied till it reaches threshold. Using sprinklers drip emitters, or a combination of both, they have designed a system that is ideal for every plant in the yard. For implementation of automatic plant watering system, they have used combination of sprinkler systems, pipes, and nozzles. System is designed in such a way that it reports its current state as well as remind the user to add water to the tank.

Suruchi Chawla, Amita Kapoor, Shallu Sharma, Bhanvi Shukla, Monica Gupta, Pragya Kaushik, Shreshtha Pushkar [8] proposed an automated irrigation system with the help of an android based garden bot using raspberry pie and capacitive sensors provides a low cost and power consumption solution for automatic irrigation system. The proposed automated irrigation system works on self-made capacitive sensors and a Raspberry pi board (ensuring minimal cost and power consumption) for automatic irrigation using an android app based on sensor input and microcontroller. In this paper they have a design is proposed for automated irrigation system using Raspberry microcontroller and low-cost capacitive sensors. A capacitive sensor is used to measure soil moisture and is inserted at various positions near to the plants. The sensor output is given to raspberry microcontroller. The level of water sensed by sensors is used as input to decide the manual/automatic on or off of motor controlling the supply of water to plants.

III. METHODOLOGY

Analysing the current scenario and considering various criteria involved in the distribution of water to the field. To check the availability of water supply in the given area and to design the bot that would sense the moisture in the soil water accordingly.

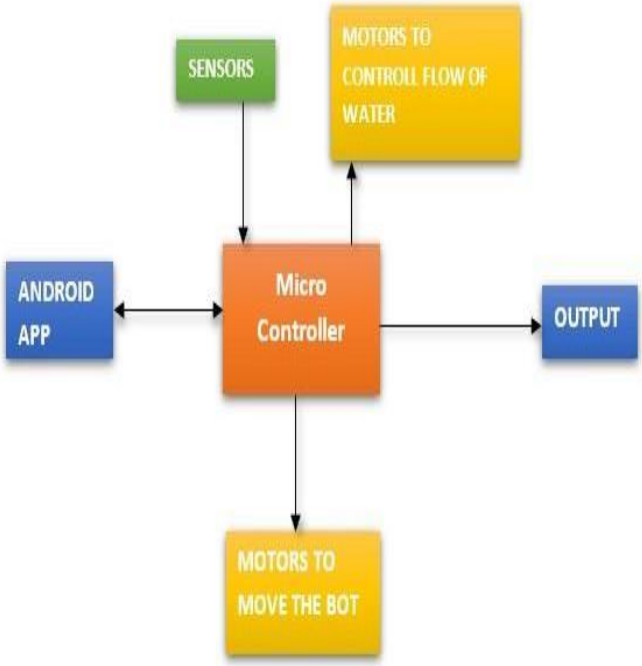


Fig.1: Block diagram of SAM

- The machine first senses the moisture in the soil using a soil moisture sensor.
- If the soil seems dry or below the redefined minimum value then the NodeMCU microcontroller waters the plants with the assistance of the servo motors.
- Once the specified amount of water is released the microcontroller stops the flow of water with the help of relays and motors.
- The microcontroller has a small tank attached to it to hold up water.
- Once the water in the tank is below a certain level that is predefined to it, it will refill automatically.
- The Software application (Android app) has been developed in order to communicate with the microcontroller.
- The instructions related to the movement of the bot have been assigned and tested successfully.
- The complete coordination between the bot and the android app regarding its functioning is yet to be developed in the upcoming days.

Algorithm and Flowchart:

Step 1: Start.
Step 2: Connect with the app by adding ip address in it, goto Step 4.
Step 3: if not connected send message and, goto Step 2.
Step 4 : Take instructions from App.
Step 5: According to App instruction, Microcontroller will functions and sends the signal to the bot parts.
Step 6: Stop.

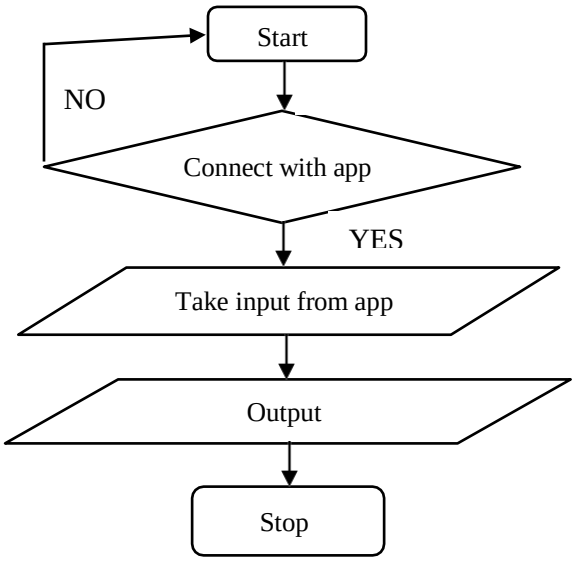


Fig 2: Building Blocks of App

The following are the pictures of the android application,

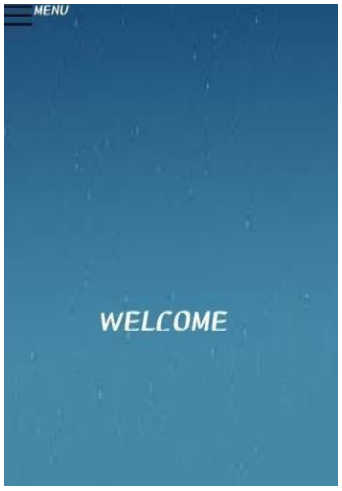


Fig 3.1: The launch Screen

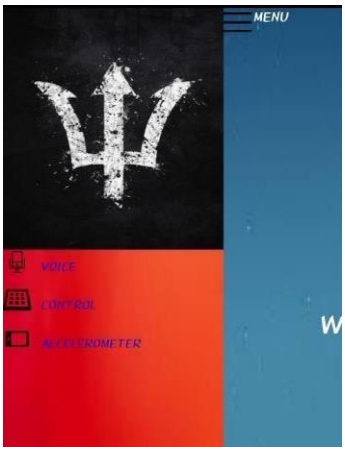
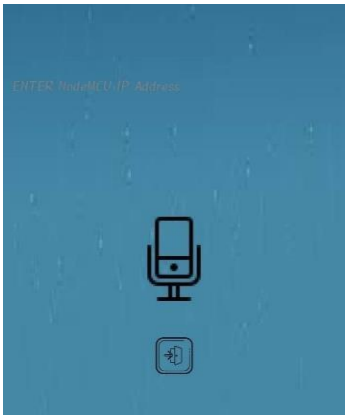


Fig 3.2: The Menu and the listed ways to access the machine.

Fig 3.3: The Speech or Voice access



to SAM

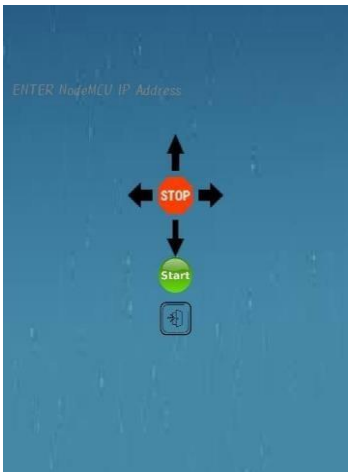


Fig 3.4: The Touch or Remote access to SAM

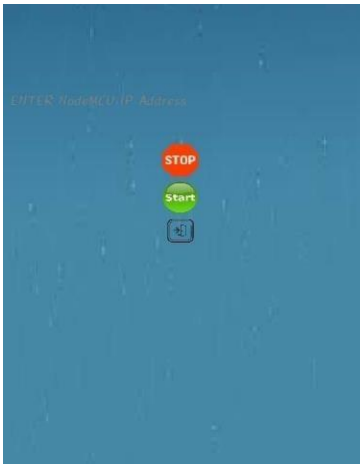


Fig 3.5: Accelerometer access to SAM

IV. RESULTS AND DISCUSSION

The Software application (Android app) has been developed in order to communicate with the microcontroller. The instructions related to the movement of the bot have been assigned and tested successfully. The complete coordination between the bot and the android app regarding its functioning is yet to be developed in the upcoming days.

V. CONCLUSION

In this paper an attempt has been made to aid the farmers in the field of agriculture. A machine that waters the plants in their absence with the help of a software application. The app is developed and the coordination with the bot is verified. The complete functioning and the various field checks in different environments and challenges that show up are to seen in the days to come.

REFERENCES

1: Nagaraja, Hema, Reema Aswani, and Monisha Malik. "Plant watering autonomous mobile robot." *IAES International Journal of Robotics and Automation* 1, no. 3 (2012): 152.

2: Shabadi, Laxmi, Nandini Patil, M. Nikita, J. Shruti, P. Smitha, and C. Swati. "Irrigation control system using Android and GSM for efficient use of water and power." *International Journal of Advanced Research in Computer Science and Software Engineering* 4, no. 7 (2014).

3: Gupta, Abhishek, Shailesh Kumawat, and Shubham Garg. "Automatic Plant Watering System." *Imperial Journal of Interdisciplinary Research* 2, no. 4 (2016).

4: Pudasaini, Sanam, Anuj Pathak, Sukirti Dhakal, and Milan Paudel. "Automatic water level controller with short messaging service (SMS) notification." *International Journal of Scientific and Research Publications* 4, no. 9 (2014): 1-4.

5: Mritunjay ojha, Sheetal Mohite, Shraddha Kathole & Diksha. "Microcontroller Based Automatic plant watering system". *International Journal of Computer Science and Engineering* (IJCSE) vol 5, issue 3 (2016):25-36.

6: Karmakar, Rudranath, Rajashekhar C. Biradar, Sairaj Poojary, Sachin Singh Rawat, and Rehan Almaz Ahmad. "Automated Irrigation System with Boundary Protection using Farm-Bot." *International Journal of Scientific and Research and Review* volume 07, issue 03, (2019)

7: **P**unitha.k, Shivaraj Sudarshan Gowda, Devarajnayaka. "Automatic watering system using ATmega328 microcontroller" *IAES International Journal of Robotics and Automation* 1, no. 3 (2014): 152.

8: Sharma, Shalu, Suruchi Chawla, Shakshi Bachhtey, Bhanvi Veni Gupta, Monica Gupta Shukla, Pragya Kaushik, Shreshtha Pushkar et al. "An Automatic Irrigation System Using Self-Made Soil Moisture Sensors and Android App." *Recent Trend in Instrumentation and electronics* (2016).

Design and Control of Agriculture Robot Using LORA

SPOORTHI A S[1], SUNIL T D[2], M Z KURIAN[3]

Department of Electronics and Communication Engineering, Sri Siddhartha Institute of Technology, Tumkur-572102, India

[1]spoorthias22@gmail.com

[2]sunil.tumkur@gmail.com

[3]mzkurian@yahoo.com

***Abstract*-Agriculture is the primary occupation in most of the developing country like India. In order to decrease the efforts of farmers, agricultural system should be facilitated with advanced techniques. Agriculture has obtained more awareness from researcher. Now a days, robotics in agriculture field with its performance is newly appearing technology. In this work, agriculture robot is specifically designed for seed sowing, grass cutting and pesticide spraying. There is necessary to upgrade the efficiency and agriculture products by put back laborers with intelligent machine-like robots. In recent years, due to the capability to execute agricultural tasks in systematic manner without human intervention, the use of robots in agriculture field has been increased rapidly. In this work, it is presented about the design and development of agriculture robot which is simple in design and also a new technology called LORA is used for long distance communication. The main aim is to design a multipurpose agriculture robot that can run automatically and to increase the speed and accuracy of the work which also reduces manual work by mankind.**

Index Terms-Agriculture, Robot, seed sowing.

I. INRODUCTION

Agriculture plays a major role in development of economy of India. About 70% of Indian population choose agriculture as the primary occupation. But nowadays the number of people involved in agricultural field is reduced due to different reasons. Agricultural production is very much in focus and the demands to the industry is growing. As the population in India is increasing day by day, need for food production is also increasing, where the environmental impact of human activities is decreasing. This is the case in agricultural field. As a result, it is necessary to come up with modern techniques. As earlier methods require a greater number of labors, consume heavy time and a lot of human energy. To overcome the problems that are noticed earlier, use of robot is the best solution. Some of the agricultural operations such as seed sowing, grass cutting and pesticide spraying are very tedious. Though pesticide spraying is compulsory which is a harmful procedure for the farmers. So, use of robots in such cases gives the best solutions for those problems along with required productivity and efficiency. Along with the technology development, there comes a challenge in implementing advanced technology in agricultural sectors. A good and an appropriate strategy has to be developed for handling and processing a very large agriculture land.

II. RELATED WORKS

Ranjitha B and Nikhitha M N [1], Solar powered autonomous multipurpose agriculture robot using Bluetooth/Android application. Operations such as seed sowing, grass cutting, ploughing etc are performed in the agricultural field. This paper mainly aims at design and development of robot where whole system is powered by solar energy. Robot is operated using Bluetooth which send signal for further operation. The main interest of the robot is to reduce the involvement of mankind but using Bluetooth, robot can be operated only for small distance.

S. umarkar and anil karwankar [2], this team developed automated seed sowing agribot using Arduino.
The main aim of this paper is to develop a system that reduces cost and also time for digging and seed sowing operation by using solar energy. High precision pneumatic planting has been developed for various seed sizes for different crops. The receiver used is Wi-Fi. In this system, robot moves only in one direction which is a main disadvantage. Power supply is automatically turned off when there is an obstacle.

S. Kareemulla, and E. Prajwal[3], this team developed a GPS based Autonomous Agriculture Robot. This system is very helpful to farmers in the basic operation of seed sowing. This machine is very simple in the mode of operation. Total yield percentage is increased effectively. There can be reduced labour problem. As compared to seed sowing process by manual method and tractors, time and energy required for this robot is less. Also there is less amount of seed wastage. The main drawback here is, it consists of only single mechanism.

Durga sowjanya [4], this team developed a multipurpose robot that perform operation such as mud closing and leveling, automatic irrigation, ploughing and seed sowing. A new idea of using a stationary robot platform to complement activities like image analysis was proposed by Hector Ivan Tangarife. The root map of the robot is done based on GPS, Wi-Fi and remote-controlled system.

ISBN: 979-85-27243-61-3

III. IMPLEMENTATION OF BLOCK DIAGRAM

Robotic Movement

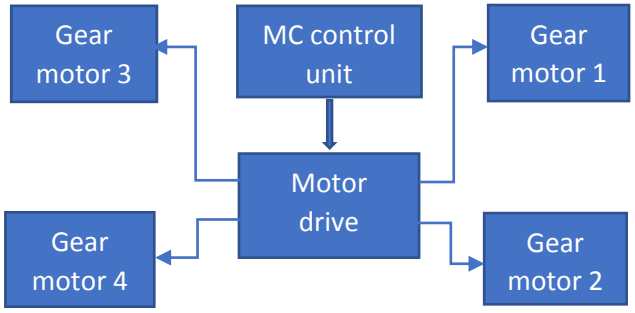


Fig.1. Block diagram of robotic movement

The representation of the robotic movement and control unit is shown in fig.1. Robot has 4 wheels which are driven using john son DC motors with a little higher torque which helps in the movement over rough terrain with a little extra weight. These motors are driven using Motor Driver L298d which is mainly responsible for taking the inputs from the microcontroller at 5v and convert the same into 12v which is supplied to the motors. All four motors are supplied with the same voltage but with different polarities in-order to change the direction of the movement which is either clock-vice or anti clock vice direction. If all the motors rotate in clock-vice direction the robot moves forward, if the same is anti-clock-vice then the robot moves backward. In order to achieve the movement towards right and left directions, a combination of clock-vice and anti-clock vice respectively to achieve the same.

Seed Sowing Mechanism

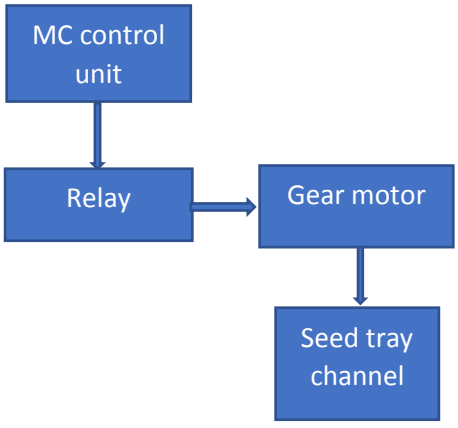


Fig.2. Block diagram of seed sowing mechanism

This mechanism helps in sowing the seeds in the field at prescribed uniform distance from each other. This Involves a Microcontroller, a Relay, a DC motor and tray which can move TO and FRO in the horizontal direction. Depending on the type of the seed the distance between the seeds are pre-decided. In order to achieve the distance, the speed of the Dc motor is varied as per which the horizontal movement of the seed tray is controlled. The signal to initiate the sowing process is issued using the LORA transmitter and the same is received by the Microcontroller and the same is converted into a digital signal which is fed to the relay, where the relay is connected to the DC motor with an input of 12v. A wheel is connected to the DC motor which converts the circular movement into a horizontal movement which in-turn opens and closes the passage to drop the seeds. There by achieving the required task.

Grass Cutting Mechanism

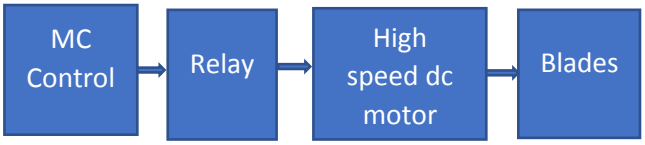


Fig.3. Block diagram of Grass Cutting mechanism

This mechanism helps to cut the unwanted weeds grown in the field; this is achieved by using 3 sharp blades which are connected to a central hub pin which is directly stuck to the high-speed DC motor. The on and off operations are controlled using the relay with an input voltage of 12v. These signals are issued by the Microcontroller to the relay and therefore to the motor as per requirement. Sharp blades spinning at a high speed because of the DC motor will cut the grass and push it to both the sides.

Sprayer Mechanism

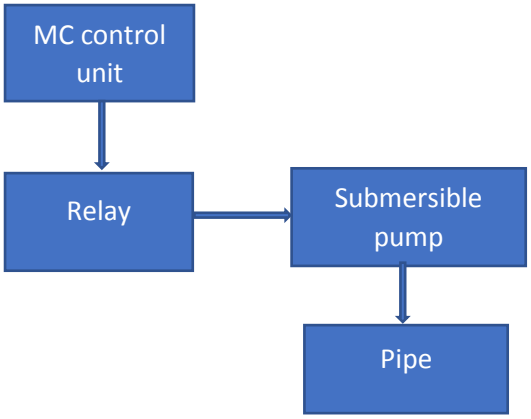


Fig.4. Block diagram of sprayer mechanism

This mechanism is used to spray pesticides or water to a certain distance based on the requirement. This is achieved using a Microcontroller which issues a digital signal to either or start the operation through the relay which is connected to the submersible pump which operates at 12v input signal. This Submersible pump has a pipe connected which sprays on the required direction.

ISBN: 979-85-27243-61-1

IV. CONCLUSION

This paper is more concerned about the problems that are facing in agricultural field and bring about the solution by designing and developing the multipurpose agriculture robot. The availability of the labour is decreasing as the people moved to cities due to the growth of industries and also the demand for stipend will also increase which becomes unaffordable for the land owners. A robot is designed to reduce the man power which makes the work easier for farmers. The proposed robot can replace the human to some extent to perform some operations like seed sowing, grass cutting and pesticide spraying. Seed sowing mechanism is implemented as seed sowing by manual method is not so effective where seed is not sowed with proper distance that may varies in efficiency. The grass mechanism is implemented to remove the weeds on land by using man power require more time and efficiency decreases. Sprayer mechanism implemented since the pesticide is very harmful to spray by the mankind. This project plays an important role in solving the labour problems.

REFRENCES

[1] RanjithaB, nikitha M N,arunaK, afreen,B T Venkatesh murti " Solar Powered Autonomous Multipurpose Agricultural Robot Using Bluetooth/Android App", IEEE 2019

[2] S. Umarkar and A. Karwankar , "Automated Seed Sowing Agribot using Arduino," in IEEE Conference on Communication and Signal Processing, April 2016, pp. 1379-1383.

[3] S. Kareemulla, and E. Prajwal, "GPS based Autonomous Agriculture Robo" IEEE 2018.

[4] k Durga Sowjanya, R Sindhu "Multipurpose agriculture robot" International Conference on Electronics, Communication and Aerospace Technology 2017

[5] Amer, M.Gopinath, S.AjithSundaresh "Multipurpose Autonomous Agricultural Robot", IEEE 2019

[6] Kashiwazaki, K Srikanth1, P Bhargav "Multipurpose Autonomous Agricultural Robot" International Conference on Electronics, Communication and Aerospace Technology ICECA 2017

[7] Jerosheja B R and Mythili C "Solar powered Autonomous multitasking Agricultural Robot" International Conference on Electronics, Communication and Aerospace Technology ICECA 2017

[8] Durmus "Agribot-A multipurpose Agricultural robot," India Conference(INDIACON), 2011 IEEE Annual conference 2134

Transparent way of Dairy Milk Farming

B PRADYUMNA TANTRY, PRADHYUMNA P TANTRY, PRAJWAL, SURAJ JAYARAM,

RAJASHREE NAMBIAR P

Department of Electronics and Communication Engineering, Shri Madhwa Vadiraja Institute of Technology and Management Vishwothama Nagar, Bantakal-574 115.

prajashree.ec@sode-edu.in
pradyutantry10@gmail.com
pradhyumnatantry@gmail.com
prajwals616@gmail.com
surajjayaram78@gmail.com

Abstract **– Dairy farming is a part of agriculture. India is one of the top countries known for production of milk and quality milk production. The main reason to start this project is the milk dairies, which acts as a connecting link between the producers and government/Food industries for trading and financial support. But in Dairy there is a problem with the work procedure as there is no transparency between producers and dairy. To overcome this uncertainty, we are proposing this methodology. Through this procedure both producers and dairies can maintain a transparent and error free working procedure with very minimum manual effort.**

Keywords – Milk, Dairy Farming, Food Industries.

I. INTRODUCTION

In spite of being a basic need, milk and milk products are also a way of financial strength for many families in India. As far as milk farming is concerned, for monetary gains some farmers try to choose wrong methods like adulteration of milk in various forms. In this they mentioned various methods of adulteration of milk and also various methods to check the same. The detection of common adulteration techniques like sugar in milk. To check the adulterated urea content in milk [6], Whereas dairy or industry officials try to exploit consumers by providing false information like inaccurate quality readings, amount of milk purchased etc. So many farmers don't trust dairy officials. But the understanding between them is always very crucial for the development of the milk industry. There are some strength and weakness about organic farming and also practising the same can yield you quality and healthy milk [2]. Even though India has the biggest population of cows and buffalos. Since cattle farms are not adopted to modernization, the produced milk from them lacks in quality and quantity of the milk. Even though there is a high demand in foreign countries, we cannot export due to poor quality. Major reason for poor quality of milk is due to health condition of cattle, quality of food and environment conditions of the farm. There are also chances that some diseases can transmitted to human beings from the animals [7]. A dairy can be connected to cattle health-related issues through IoT technologies. If cattle suffering from any common issues like heat, stress or any viral diseases, the designed methodology will sense it alert the farmers as well as dairy officials to take further actions. This data gives an open gate to realise the work procedure towards maintaining cattle's health as well as milk quality.[3] A IoT based solution i.e., Optical Spectrography, for monitoring milk quantity dairy level. According to the author existing methods are manually operated and all type milk is mixed before the test done.[4] the various methods to check quality of milk. They stated that raw milk is being tested by various methods such as antibiotic test, temperature test, bacteria test, acidity test etc. There are also some procedures to test main milk like water level check, fat and protein content, SNF (Solid Not Fat) etc. They also stated that milk processing assures maintaining the quality, flavour and appearance of milk.[5]

So, to address all these issues or at least reduce them we need to plan a better work flow to bring transparency in between them. Therefore, to resolve the above-mentioned problems, we are trying to find a solution by making use of modern technologies like sensors, IoT techniques etc, so that we can maintain trust in between them.

II. PROPOSED METHODOLOGY

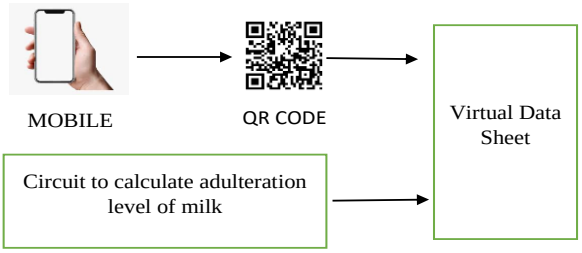


Figure 1: Block Diagram of proposed methodology

- The circuit to check the adulteration level in milk, uses the reflection of the light concept.
- A can number is allocated to each farmer as a QR code and this code is scanned initially and the data gets uploaded to the datasheet.
- A circuit to calcute the adultrents levels of the milk is designed which measeures the milk and gets the value .

- The value gets stored in the data sheet.
- Now the datasheet contains all the data about the milk.

III. RESULTS & DISCUSSIONS

Initially the details of the farmer should be gathered and uploaded to the datasheet. By using the developed android application this procedure can be done. The developed application will use an external scanning application to scan after the scanning the data gets uploaded to the data sheet. A virtual datasheet which contains data about a particular farmer details and also measured values, which can be accessed by both farmer and dairy officials.



Figure 2: Main screen of the application

Figure 2 shows the main screen of the application. By clicking the “Scan Now” button, the dairy officials can scan the details of the individual farmer very easily and it also uploads the data to the datasheet without any error.

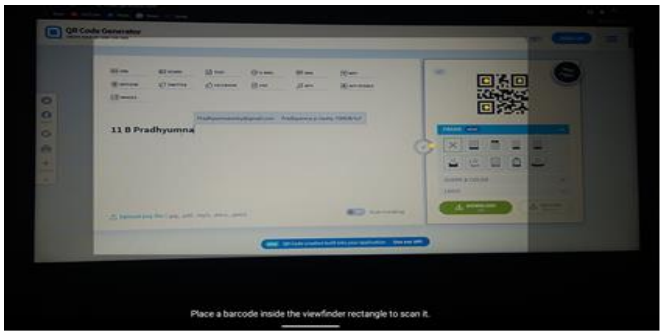


Figure 3: Scanning the QR code using the application

Here the developed application will use an external scanning application to scan the QR code. Now the developed android application collects the data scanned by the external scanner and uploads the same to the datasheet. Figure 3 shows the scanning process.

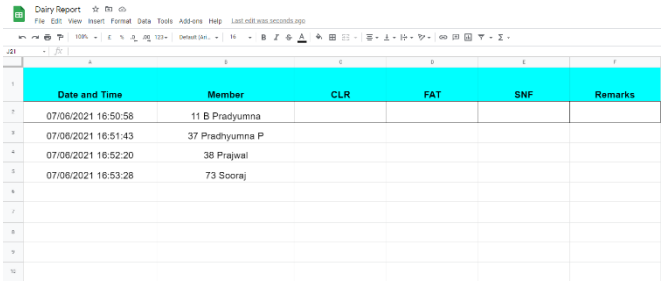


Figure 4: Virtual Datasheet

This datasheet contains all the data about the milk with the date and time stamp. For easy sorting there will be a farmer’s name with the can number. The remaining columns will be filled by the circuit output. The scanned data will be uploaded to the data as shown in Figure 4.

There are some factors like the way of milking, type of cattle food used, surrounding environment of cattle etc. will affect the quality and quantity of the milk. Therefore, this datasheet can help the farmers to analyse these factors properly and rearrange their practices and is also gives a brief idea about the health of the cattle to both farmers and dairy officials.

DEVELOPMENT OF ANDROID APPLICATION:

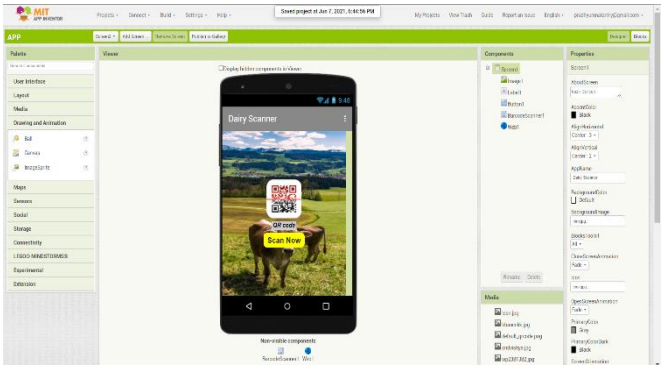


Figure 5: App development

The designed app has very easy and error free scanning methods with minimum interval of time. It is also very easy to learn this interface. Figure 5 shows the design of the developed android application using the MIT app inventor.

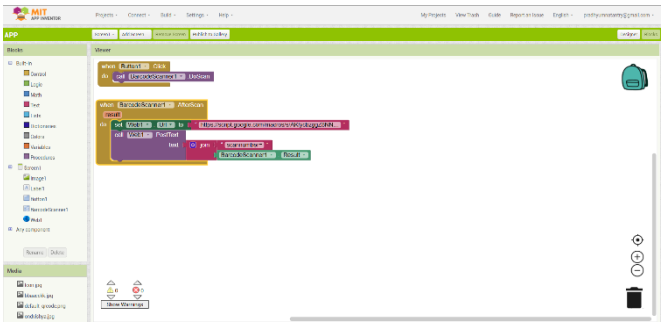


Figure 6: App blocks

The designed application has only two main procedures. Firstly, calls the external scanner application to scan the data and secondly collects the scanned data from the external application and uploads them directly to the datasheet. Figure 6 shows the two main blocks of designed application.

IV. CONCLUSIONS

According to the proposed methodology we have completed the work upon the development of an android application which helps in scanning and upload the scanned data to the virtual datasheet. A virtual datasheet is also created and this datasheet helps in storing the scanned data with the date and the time stamp. Considering the ongoing situation, we have also built a basic circuit with the available components. Therefore, our next priority would be on completion of proposed circuit and also completion of the work related to project evaluation.

As far as proposed methodology goes, we believe the business relationship between farmers and dairies plays an important role in the development of the milk industry. To achieve this, the existing manual methods should be reduced. The above-mentioned methodology uses the modern technologies which can try to achieve a fair and secure business relationship between them.

REFERENCES

[1]. Jai Desai, and Rohit Kadav, *Pramana Research Journal*, vol 9, Issue 2, page no 38-47, 2019.

[2]. Saikat Maji, B. S. Meena, Pampi Paul, and Vishwatej Rudroju. *Journel of dairying, Food& Home Sciences*, vol 36, issue 1, page1-8, 2017.

[3]. Jaya Shankar Vuppalapati, Anitha Ilapakurti *2017 IEEE Third International Conference on Big Data Computing Service and Applications*, page 118-123, 2017.

[4]. Ali Yavari, Dimitrios Georgakopoulos, Himanshu Agrawal, Harindu Korala, Prem Prakash Jayaraman, and Josip Karabotić Milovac. "*International Conference on Information Networking (ICOIN) 2020*", page 342-347, 2020.

[5]. AGATHA POPESCU and ELENA ANGEL *Scientific Papers Animal Science and Biotechnologies*, vol 42, issue 1, page 501-506, 2009.

[6]. The Food Safety and Standards Authority of India (FSSAI), online, page 7-36, 2019.

[7]. Ravi Jadawala and Satish Patel. *Indian Journal of Applied Research* ,vol 7, issue 10, page 516-17,2017.

[8]. Abhishek M Aware and Ujwala A. Kshirsagar *International Journal of Advanced Research in Computer and Communication Engineering*, Vol 6, issue 2, page 298-300, 2017.

[9]. Dr. S Asif Hussain, Chandra Shekar Ramaiah, MN Giri Prasad, and S. Mazhar Hussain. *2016 3rd MEC International Conference on Big Data and Smart City (ICBDSC)*, page 1-6, 2016.

[10]. Dr. B R Sujatha and Swarnadas H V *NCETESFT-2020 conference*, vol 8, issue 14, page 25-29, 2020.

Providing Knee movement Assistance using Android and IOT

Aditya K[1], Gowri M[2], Pranav K R[3],Namana[4]

Department of Electronics and Communication Engineering, Shri Madhwa Vadiraja Institute of Technology and Management,Vishwothama Nagar,Bantakal-5764115,Udupi,Kanataka,India

[1]aditya.17ec003@sode-edu.in

[2]gowri.17ec021@sode-edu.in

[3]pranav.17ec041@sode-edu.in

[4]namana.17ec030@sode-edu.in

Abstract— Aging in living beings is a natural process and with aging one encounters challenges with walking or standing for long hours. Obsolete solutions like walking sticks do not provide satisfactory and effective solutions permanently neither can they be integrated with smart features to help in physical ailments. This paper aims to provide external metallic joints attached to the legs, in particular the knee which will help in effective transfer of the body weight onto the ground thus making it convenient for movement and other actions.This is made possible using the Gear Bearing Drive System with 18000 RPM base motor and 32 Kg/cm holding torque. Lead Screw Mechanism uses the power generated by the motor to facilitate movement. Arduino Uno with the microchip ATmega328P controls the motor. The bluetooth module(HC-05) helps in connecting the microcontroller to a mobile app created using MIT app inventor. The Mobile App is integrated for user convenience, through which the movement is assisted as desired by the user. Elderly people can now move easily without any hassle. This device can be used by people who are severely injured, by relieving the pain and assisting them in a speedy recovery. It can be used as a rehabilitation device. Patient populations with stroke or neurological disorders who have lost their walking capabilities can also walk easily.

Keywords— Knee brace,Lead screw mechanism,MIT app,Bluetooth module, DC motor.

I. INTRODUCTION

The Knee is one of the most complex joints in the human body. Its importance in stabilizing the body is evident in a range of activities, from everyday activities such as standing, walking etc. On aging our elderly encounter challenges in performing the above mentioned activities. Through extensive research and survey it is found that around 25% of people around the world, who are above 50 years of age have serious problems related to knee joints. In India 15% of people are already taking treatments for knee pain, which is about 18 crore people roughly. But a lot of people in India go for domestic medicine ,ayurveda etc hence the above number at minimum and on a rough estimation will be double i.e 30% or about 36 crore people. In addition, it is an important fact that women undergo these pains a lot more frequently than men ,about 10-20% more.An orthosis is defined as a device designed to align, correct or prevent neuromuscular or musculoskeletal dysfunction, disease, injury or deformity.There are various devices that were/are under development and already present for the above mentioned complications. Some of the devices are, passive gravity balancing passive leg orthosis [2],Powered Leg Orthosis [3], Hybrid Assistive Limb (HAL) [4], Rewalk [5] and Ankle Foot Orthosis [6] etc.But these devices are complex, not portable, device is bigger in size, consumes more power, more expensive, hence not affordable. A person is always required to set up the device.

The most efficient way to deal with this problem is by overcoming the previous drawbacks and to inculcated new features is to design a wearable knee brace comprising of outer exoskeleton, Motor which is the driving force, Microcontrolers to actuate the device, bluetooth module as well as wifi module to act as interface between the android app and wearable device.

The body of the exoskeleton used is primarily made of aluminium 7075 alloy as it is lighter in weight and has high strength, toughness, good resistance to fatigue and has significantly better corrosion resistance.Other heavy metals are conventionally used, galvanised iron makes up the base to strengthen the material steel is also employed on the movable part to provide robustness.

The proposed system is a compact rotary series elastic actuator for knee joint assistive system.CRSEA is a system

with torsion spring in a chain of spur gears and worm gears which controls the generated torque.A DC motor is used which contributes to maximum speed and torque of 8200rpm and 0,181Nm. CRSEA system torques upto 10.87Nm.The basic principle used in the system is that the reduced speed reduction ratio obtained by worm gear and worm wheel maximizes the torque.while considering the requirements such as precise and large torque generation, backdrivability, low output impedance,the system gives good performance. but, since the torque amplification ratio of the worm gear is sensitive to the friction coefficient,it introduces an uncertainty to the system model and reduces the overall efficiency.[7] The knee-ankle orthotic device incorporates a low transmission ratio which produces a higher torque output.An AC servo is used to provide with peak torque of 7.2Nm and speed of 80 rpm. since the device weighs around 4.88kg, we can infer that the overall design is not compact.besides ,the system's response time time is too high due to low speed and the feedback mechanism in servo motor trying to correct any drift from the desired position,it results in poor stability of the system.[8].A powered prosthetic leg designed in [9] embodies high density actuators which serves several benefits like free swinging in knee motion and compliance with ground.The motor used is ILM85X26 motor kit with peak torque rating of 8.3Nm and velocity upto 1500 rpm .Additionally it is driven with motor driver which has a rated current of 17.6A. Active knee rehabilitation orthotic device is majorly created to serve as a gait rehabilitation device for patients past stroke.It involves several techniques to prevent hypertension amongst individuals.On comparing the motors in [7]-[9],Gear bearing drive is a novel mechanism is used in the system in [10] GBD is a compact system which integrates a brushless DC and gear bearing.GBD is not a heavy system and its volume is ⅛ of the volume when compared with actuators in[7]-[9]The torque rating of GBD is 3.42Nm with rpm rating of 266.Thus We can infer that GBD proves to be a novel technology that can be utilized in robotic orthosis devices.

The microcontroller employed to actuate the motor is arduino uno equipped with a high level programming facility needed for deciding the degree and time for motor operation, Receiving signals is a bluetooth module or a wifi module independent of one another so as to provide convenience to the user which is a unique attempt made and is absent in other knee braces.

Out of the numerous ways to create an App. An app can be created using android studio to control the RPM and directions of the motor and also to control the motor through voice [9-10]. MIT app inventor is easy to use in comparison with android studio. It has a graphical interface, conventional coding is not required to create the app, instead drag and drop the interface to be performed. This can be used to interface the microcontroller with the motor and control the RPM and directions through the Bluetooth module[11-16].

II. DESIGN

A. *Design Overview:*

We derive the requirements for the knee actuators from the necessary torque, velocity, position, and power requirements Machined components are made of 7075-aluminum, with a few shafts, gears, and bearings made of stainless steel.An aluminium 7075 alloy is moulded in the shape of a typical knee brace providing a 12 inch circumference for the arrangement so as to comfortably accommodate the knee. An adjustable velcro is also tied and can be loosened if the user feels uncomfortable. The thickness of the material will be around 5mm so as to optimise and keep a balance between strength of material without adding unnecessary weight. A micro controller and driver IC will be placed on the side of the mould so as to give signal to the motor.The high torque motor is placed at the sides of the aluminium mould so to facilitate expansion and contraction of knee joints.The jaws of the knee braces can only support movement of the knee upto 90 degrees and not beyond that, higher degrees of freedom can be obtained by using open design knee brace.

B. *Details of components:*

1) *Body Material:*

Aluminium 7075 is an alloy, with zinc as the primary alloying element. It is used in the framework to provide a strong exoskeleton and also provide a suitable structure to help in sharing of weight with the knee joint. Additionally strips of GI are provided as base foundation and support on top of the aluminium alloy this also facilitates movement. The variable length part outer body is made of 0.75 inch breadth and inner steel body also made of steel is 0.5 inch breadth, the inner steel body is welded to the leadscrew.



2) *Gear Bearing Drive System:*

It is a combination of brushless DC motor and gearbox. It generates high torque to assist and support in any kind of movement desired by the user like standing,sitting and any other activities involving knee joint by providing a good degree of freedom.High-torque motors typically used in industrial settings have large masses and volumes due to their robust housings and heat sinks. In addition, these motors are typically fixed in place, leading to minimal consideration of weight in their design. However, for implementation into a powered prosthetic leg, it was necessary for us to select a motor with high torque density, to ensure that our actuator could produce the required torque while remaining as light as possible.So, we have chosen a motor with 30 RPM 12V DC motor with metal gearbox,18000 RPM base motor ,6mm diameter shaft with M3 thread hole Gearbox diameter of 37mm ,Motor diameter of 28.5mm 63mm without shaft,Shaft length 30mm,180g weight,32Kg/cm holding torque,800mA no load current, load current max upto 7.5A.

Current controlled Drive:

This motor comes with a current controlled drive for Industrial grade high torque dc motor with various types of input signals. High-Current DC Constant-Torque motor drive is integrated with the motor. Motor speed control interface via UART, I2C, PPM signal and analog input, Speed control is possible in both directions down to almost 1% of max. speed,Small package and integration allows for easy installation and operation,Speed can be controlled using a terminal or MCU via simple UART commands, I2C master device can control multiple RMCS-210x via simple I2C command structures.An RC receiver or any PPM source can directly control the speed of the motor.An analog signal or fixed analog voltage from a potentiometer can directly control the speed of the motor.

3) ARDUINO:

The Arduino Uno is an open-source microcontroller board based on the microchip ATmega328P microcontroller and developed by Arduino.c.c.The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.The board has 14 Digital I/O pins ,6 analog I/O pins,and is programmable with the Arduino IDE (Integrated Development Environment).

4) Bluetooth module(HC-05):

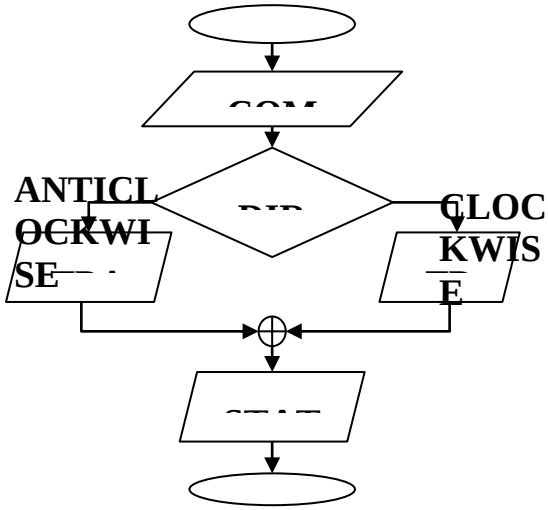
HC-05 is a Bluetooth module is designed for wireless communication .Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.It ranges upto less than 100m which depends on transmitter and receiver ,atmosphere, geographic & urban conditions.It uses serial communication to communicate with devices.It communicates with microcontroller using serial port (USART).

5) MIT app Inventor:

MIT app inventor is used to create an Android app which will be used by the user to provide instructions to the Arduino through bluetooth to carry out the desired motor functions.MIT App Inventor is an intuitive, visual programming environment that allows everyone to build fully functional apps for smartphones and tablets. The MIT App Inventor user interface includes two main editors: the design editor and the blocks editor. The design editor, or designer, is a drag and drop interface to lay out the elements of the application's user interface . The blocks editor is an environment in which app inventors can visually lay out the logic of their apps using color-coded blocks that snap together like puzzle pieces to describe the program. To aid in development and testing, App Inventor provides a mobile app called the App Inventor Companion that developers can use to test and adjust the behavior of their apps in real time.

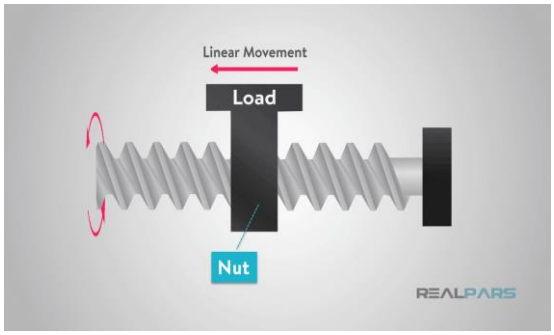
III. METHODOLOGY

A wearable brace is fabricated or moulded in the shape so as to cover the upper and lower regions of the knee joint so as to facilitate free movement but also provide support when required. A velcro or adjustable belt is provided to facilitate any knee size.The major component facilitating the movement of knee and movement assistance are the small yet high torque motors, these motors when rotated in clockwise direction helps in sitting down or actions involving bending the knee, when turned counterclockwise it assists standing up or actions involving stretching of knee joint. The controlling of the motor is done using an user friendly android app which has standard commands to actuate the motor.IOT acts as an interface between the hardware component and the software aspect of android, to efficiently control and manage the entire system. The device is connected to the motor through bluetooth as per the convenience of the user.the nodal center or the operation is initiated by the user when he/she selects the desired operation on their android mobile, the signal is received by the bluetooth module this in turn sends a signal to the microcontroller device installed. The microcontroller then sends a signal to the motor through wires to rotate in the appropriate direction. The rotation of the motor is directly related to movement of the metallic joint attached to the knee brace through a mechanism called "Lead screw mechanism" Additionally the app also provides emergency contact to medical staff and family members in case of any mishap.



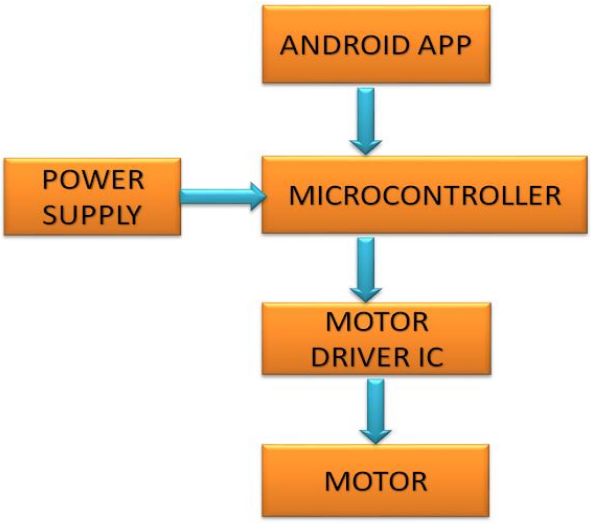
Lead Screw Mechanism:

This is a simple machine that can generate very large forces. The screw can be thought of as a wedge or ramp that has been wrapped around a shaft. Holding a nut and rotating the shaft will allow the nut to slide either up or down the shaft via the key.In this way, a relatively small moment on the shaft can exert very large forces on the nut. Lead screws are commonly used in linear actuators, machine slides such as machine tools, vices, presses, and jacks. Lead Screws are made in the same way as other thread forms. They can be rolled, cut or sanded. A lead screw uses the helix angle of the thread to convert rotary motion into linear motion, combining a screw and nut with the screw thread in direct contact with the nut thread.



The above demonstrated lead screw mechanism is used to obtain the required force to overcome the weight of the person, the arrangement is connected in a linear fashion, diagonally from the upper thigh to the lower thigh, when the motor rotates the length of the lead screw either increases or decreases based on the direction of rotation, the increasing length facilitates the stretching of the leg or in this case the person transiting from sitting posture to standing posture, on the other hand the rotary motion on the opposite direction results in the decrease in length of lead screw which in turn signifies the transit between standing to sitting posture as length between the upper and lower thigh is less in sitting posture.

Block Diagram:



IV. RESULT:

Our wearable smart device assists in sitting and standing using the Lead Screw mechanism.This is achieved by receiving input from the user through an Android app, which has been developed.The app instructs the microcontroller to actuate the motor in desired direction and speed to help in movement.

V. CONCLUSION:

Movement and other normal action involving the knee joint has been a very old problem since the beginning of mankind, especially in old people. This project has provided a better smart, effective and permanent solution to this age old problem.Old people will be able to stand, walk and live normally without the help of caretakers.

VI. REFERENCES

[1] 360 O&P, “360 Orthotics & Prosthetics,” http://www.360oandp.com/360-Dictionary.aspx?l=O, 2009.

[2] S. K. Banala, S. K. Agrawal, A. Fattah, V. Krishnamoorthy, W. L. Hsu, J. Scholz, and K. Rudolph, “Gravity-Balancing Leg Orthosis and Its Performance Evaluation,” Robotics, IEEE Transactions on, vol.22, pp. 1228-1239, 2006.

[3] S. K. Banala, A. Kulpe, and S. K. Agrawal, “A Powered Leg Orthosis for Gait Rehabilitation of Motor-Impaired

Patients," in Robotics and Automation, 2007 IEEE International Conference on, 2007, pp. 4140-4145.

[4] H. Kawamoto, S. Kanbe, and Y. Sankai, "Power assist method for HAL-3 estimating operator's intention based on motion information," in Robot and Human Interactive Communication, 2003.Proceedings. ROMAN 2003. The 12th IEEE International Workshop on, 2003, pp. 67-72.

[5] ReWalk, "Argo Medical Technologies." vol. 2009.

[6] J. Blaya, "Force-controllable ankle foot orthosis (AFO) to assist drop foot gait," in Dept. of Mechanical Engineering. vol. S.M. Cambridge: MIT, 2002.

[7]. Kong, Kyoungchul, Joonbum Bae, and Masayoshi Tomizuka. "A compact rotary series elastic actuator for human assistive systems." IEEE/ASME transactions on mechatronics 17.2: 288-297, (2011).

[8]. Schick, Johannes, Markus Glaser, and Steven Huber. "Design, Realization and Verification of a Novel Knee Joint Actuator for Robotic Exoskeletons." 2019 IEEE International Conference on Mechatronics (ICM). Vol. 1. IEEE, 2019.

[9]A. Khanna and P. Ranjan, "Solar-Powered Android-Based Speed Control of DC Motor via Secure Bluetooth," 2015 Fifth International Conference on Communication Systems and Network Technologies, Gwalior, pp. 1244-1249, doi: 10.1109/CSNT.2015.100, 2015.

[10]Kumar, R., Ushapreethi, P., Kubade, P. R., & Kulkarni, H. B. "Android phone controlled Bluetooth robot", Volume 3,Issue No 4, e-ISSN: 2395 -0056 , p-ISSN: 2395-0072, Apr-2016.

[11]K.S. Varsha , P. Sudharshan Palaniappan , S. Susmithaa , M.Prabhu Raj,Speed and Direction Control of DC Motor using Android Mobile Application ,International Journal of Engineering Science and Computing, Volume 7, Issue No.3,March 2017.

[12]D. Sarb and R. Bogdan, "Wireless motor control in automotive industry," 2016 24th Telecommunications Forum (TELFOR), Belgrade, pp. 1-4, doi: 10.1109/TELFOR.2016.7818790, 2016.

[13]Deepashri K M , Sachidanand P B, Latha.H.S, Industrial Appliances Control Using Android Mobile & Bluetooth technique, Volume 8, International Journal of Engineering and Manufacturing Science, ISSN 2249-3115 , pp. 33-42 ,2018.

[14]Mr. B. N. Patil , Mr. Sandesh Sonar , Mr. Pavankumar Karadiguddi , Mr. Shivanand Banti, Speed Control Single Phase Induction Motor Using Android Phone, Volume 2, Issue No 3, International Journal of Engineering and Techniques , May -June 2016.

[15]J. Nádvorník and P. Smutný, "Remote control robot using Android mobile device," Proceedings of the 2014 15th International Carpathian Control Conference (ICCC), Velke Karlovice, pp. 373-378, doi: 10.1109/CarpathianCC.2014.6843630, 2014.

[16]A. Sivakumar, K. A. Jain and A. I. Maalouf, "Voice Controlled Servo Motor Using an Android Application," 2020 IEEE 6th World Forum on Internet of Things (WF-IoT), New Orleans, LA, USA, 2020, pp. 1-2, doi: 10.1109/WF-IoT48130.2020.9221333.

Interactive Voice Response System For Crop Management in Kannada language

DHANYASHREE N*[1], KAVANA MAHESH HEGDE[2], NAVY D SHETTY[3], POOJA[4], LAXMI SHETTY[5]

Department of Electronics and Communication Engineering, Shri Madhwa Vadiraja Institute of Technology and Management, Bantakal – 574115, Karnataka, India

[1]dhanyashreen66@gmail.com

[2]kavanahegde.26@gmail.com

[3]navyadshetty2017@gmail.com

[4]poojabangera368@gmail.com

[5]laxmishetty.ec@sode-edu.in

Abstract **-**In India, Agriculture plays an important role because of the rapid growth of population and increased demand for food. Therefore the crop yield should be increased. Generally farmers do not have the scientific information about the diseases of crops and their solutions. One major effect on low crop yield is disease caused by bacteria, virus and fungus. Some farmers cannot search in agro websites for their queries related to crops since they have lack of English knowledge or mobile usage literacy. To facilitate the farmer get information regarding the solution for the crop diseases through their phones (mobile), we propose a model with interactive voice response system (IVRS) in Kannada language here input is given by the farmer mentioning the symptom of plants and output obtained is in the voice format where it detects the crop disease and suggestion for pesticides that can be used for the detected disease.

Keywords – Interactive voice response system (IVRS)

I. INTRODUCTION

Agriculture is the main source of food and also contributes to the economic development of a nation. Nearly 66% of the nation's population depends on agriculture directly or indirectly. It serves as the most important part of the society with the cultivation of land, yielding food crops and serving the basic needs of the humans. Agriculture production is inversely affected by pest infestation and plant diseases. Early pest identification and disease detection will help to minimize the loss of production.

India being a diverse country language changes after every 20 kilo meters, So if we want to get any information from internet it is possible if we have knowledge of English language and as majority of Indian farmers are not educated, it becomes difficult for them to get information in English language and also as they do not have the scientific information about the diseases of crops. So it is necessary to have a system which will have farmers to gain knowledge in their native language. The proposed system extracts the knowledge in native language i.e. Kannada. It will help the farmers speaking Kannada language to gain knowledge regarding pesticides.

Disease on plant leads to the significant reduction in both the quality and quantity of agricultural products. In order to facilitate the farmer about disease and solutions of crop disease through their phones the proposed model has interactive voice response in Kannada language. The Interactive Voice response system is well known application of speech processing. Farmer calls on a telephone number, the Voice System answers the call and greets the customer and information is provided based on response made. Responses to the caller are via pre recorded voice on computer.

Human-computer interaction plays a significant role for literate/illiterate and visually challenged users to access information. The mode of human-computer interaction could be speech, text, symbols etc or a combination of these. An interaction could be in the form of a conversation including statements, questions, answers and expressions. Speech is one of the most important types of communication media among the human beings. Speech recognition is one of the marvellous applications of speech processing. Recognizing the word spoken by the speaker is a challenging work, several speech recognition toolkits are used to build robust Automatic Speech Recognition(ASR) system like Google API, kaldhi etc. In proposed project Google API is used for speech recognition. Automatic speech recognition (ASR) system using an interactive voice response system (IVRS) is one of the important applications of speech processing.

The system will be beneficiary for people with visual disabilities, Illiterate farmers, the farmers who have lack of source to get the information. IVRS in Kannada language here mainly focus on speech to Speech conversation in native language so that the gap from already existing project like text to speech and text to text conversation projects can be overcome.

II. LITERATUE REVIEW

Karan Raj Wagh, and three researchers [18] had proposed a system which intends to achieve full home/office control by using a simple phone call. The system is built based on the combination of two technologies that is Embedded Systems and IVRS(Interactive Voice Response System).Initially the user makes a call, if the number is registered then the application auto receives the call and asks for the password If the password is precise, it displays the menu and user can control the devices. If the number is not registered then the call is rejected.

Urvi Sanghavi, Vinit and three researchers [14] proposes a system to control full office using a phone call. One part of automation relates to Embedded system and the other part relates to Interactive voice response system. The structure comprises of medium scale system, this system will have a 3.5mm audio jack. The other end of jack will be linked to a cell phone, this cell phone will have an application installed which verifies if the phone number is registered or not, if the phone number is registered it prompts the user to enter the password, if the entered password is correct it prompts to an IVRS menu where the user need to select which appliance need to be controlled. The input is given through keyboard this becomes a drawback for visually impaired users.

Thimmaraja Yadava G, H S Jayanna [11] had proposed Creating language and acoustic model using Kaldi to build an Automatic speech recognition system for Kannada language. This paper proposes a system to get information regarding prices of commodities and weather information in Kannada language. The Indic level transliteration tool is used to translate high level language to machine level language. The acoustic model and language model are build using kaldi toolkit, the speech data was collected from 1100 people out of that 850 were males and 250 were females out of the total words collected 180 words covered district names, mandis and commodities names, The drawback here is that it becomes difficult for the system to understand what speaker is speaking if there is a noise in background.

Chee Yang Loh [3] and two researchers proposed a speech recognition interactive system to control action of vehicles for vehicle such as open/close doors, switch on/off headlamp and signal indicator of the vehicle. In this speech recognition interactive system, MATLAB is used as the Development software to code the algorithms to receive speech commands from the users, and Mel Frequency Cepstral Coefficients (MFCCs) is used to extract the features of the signal provided by the user. The Drawback here is that automatic speech recognition system will drop dramatically in the presence of background noise unlike the human auditory system which is more adapted at noisy speech recognition.

Soumya Priyadarsini Panda [16] had proposed Automated Speech Recognition system in advancement of human-computer interaction. The automatic speech recognition system to convert the information given in speech to text. A typical ASR system is composed of two parts: DSP (Digital Signal Processing) interface at the frontend and NLP (Natural Language Processing) interface at the back-end. The front-end process the input speech for extracting different features for training or testing purpose. The back-end is often referred to as the recognizer, which converts the extracted features to the respective symbolic linguistic representation or text based on the language model created by the feature extraction phase on a set of training data. The major drawback of this system is that it cannot recognize the voice if the frequency of voice is low.

Mamoon Rashi, Harjeet Singh [4] had proposed a system which converts Punjabi text to Punjabi speech using nourish forwarding algorithm. Here the image of Punjabi text is given as input and output is obtained in the form of speech. The most basic rules used is, at every occurrence of vowels and constant in a word, it is segmented at the position. Thus speech output is obtained. Accuracy and efficiency level achieved is 98% and 94% respectively.

Gangala Ramya, Nenavath Srinivas Naik [20] proposed a system which converts text information into speech. Telugu and English words are considered as input data in this work, for that purpose two applications were used. One application is a dictionary which is an example for monolingual (especially Telugu language), second is HTML page which is the combination of Telugu language and English language that means mixed-lingual. Festival is a text-to-speech system with two modules, one is language modeling, and other is speech synthesis engine. The work of the language module is to analyze text, documents, this software is also used for the Telugu language by providing language processing parameters and speech records.

Pooja Withanage and four researchers [5] had proposed a Voice-based Navigation Systems to provide information regarding route direction here the author proposes a user centric roadmap navigation mobile application called “Direct Me”. Automatic Speech Recognition (ASR) using Pocket Sphinx Library, takes the user input as voice commands in natural language and the identified voice commands are the inputs to the Natural Language Processing component, the extracted navigational related information are the inputs to the Route Processing Middleware component, the sequence of route requests are the inputs to the Google Map API component and mapped down route in an interactive user interface is the final output of the system. This system could achieve 60%-70% recognition accurately.

III. METHODOLOGY

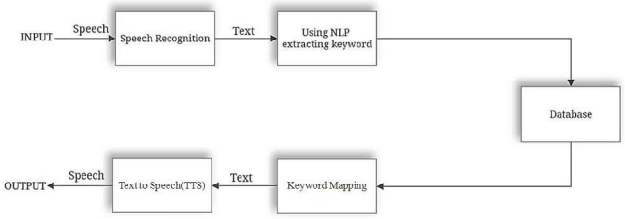


Fig 1. Block diagram of the proposed system

Here input is given in speech format. Speech will be further send to Google API for translating it into text and this text is parsed by NLP module to extract required keyword. If the extracted keyword present in database the required response is provided in text form format by keyword mapping, then the text is converted to speech by Google API as output.

1) Getting input speech and conversion to text
The input speech is converted to text for the machine to understand using speech recognition. Speech must be converted from physical sound to electrical signal with microphone, and then digital data with analog to digital converter. Once digitized, several models such as hidden markov model (hmm) can be used to transcribe audio to text.

2) NLP extracting keyword
NLP is the part of computer science and artificial intelligence that could aid in communicating between the computer (machine) and human by natural language. It lets a computer or machine to be read and understood by replicating the human natural language. There are many libraries that provide the foundation of Natural Language Processing. These libraries have various functions that can be used to make computers understand natural language. Spacy is one of that, open source library for advanced Natural Language Processing in Python.Spacy is designed specifically for production use and helps you build applications that process and "understand" large volumes of text and currently supports tokenization and training for 60+ languages. Spacy comes with the pre trained NLP model that can be perform most common NLP task such as tokenization, parts of speech tagging, named entity recognition, lemmatization, text classification etc

3) Creation of database using MySQL
In the proposed model Database of pesticides are created with the help of MySQL. MySQL is a free-to-use, open-source database that facilitates effective management of databases by connecting them to the software. It is a stable, reliable and powerful solution with advanced features like High Performance, data Security and also flexibility of Open Source.

4) Getting output from text to speech
pyttsx3 is a text-to-speech conversion library in Python. Unlike alternative libraries, it works offline and is compatible with both Python 2 and 3. It is a very easy to use tool which converts the text into speech. The pyttsx3 module supports two voices first is female and the second is male which is provided by "sapi5" for windows.

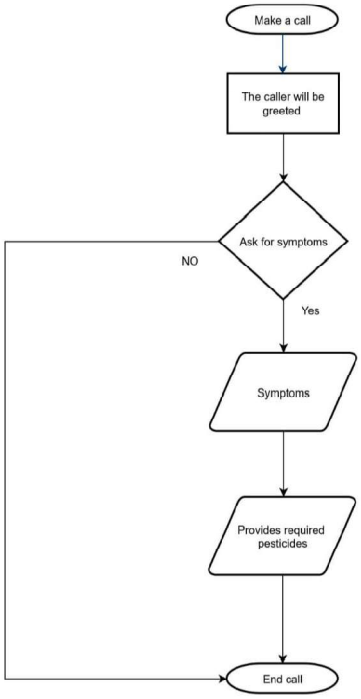


Fig 2. Flow chart of the proposed system

- The call will be connected to IVRS.
- The System will prompt user to tell the name of the crop.
- The System will prompt user to tell the symptoms regarding the crops.
- Depending on the symptoms the database will be searched in IVRS

IV. RESULTS& DISCUSSIONS

We presented an account of creation of Kannada language speech database with respect to agriculture. When tested it is been observed whenever farmers conveys about the disease respective pesticides will be recommended. The process is divided into two parts first parts is identification of keywords from query and second part is recommendation of required pesticides using the keywords. The performance of system in term of recognition is done using word error rate. The recognition performance for accuracy is shown in table 1.

SL. NO	Gender	Sentence Passed	Sentence Recognize	Accuracy
1	Male	20	18	90%
2	Female	60	56	93%

Table 1: Recognition performance for accuracy

The corresponding application should be valuable for training speaker independent, continuous speech recognition systems for Kannada language as well as the IVRS model can further be extended to various sectors related to agriculture. In Karnataka, people can usually speak and understand Kannada in a better way compared to other languages so this system helps them to clarify their queries in an effective manner.

V. CONCLUSIONS

Speech technologies provide a huge set of applications in human computer interactive systems. However, speech recognition is a difficult problem as vocalizations vary in terms of pronunciation, accent, articulation, volume, pitch and speed. Speech may be distorted by a background noise and echoes, electrical characteristics.

In our project we have tried to demonstrate a speech based conversation system for accessing information related to pesticides by farmers Kannada language. Interactive voice response system in Kannada language provide big contribution to agriculture sector. It makes easier for the people with the disabilities that preventing from typing, visually impaired users, lack of source to get information.

The main challenge is that the system should take care of the significant variations in the pronunciation. However the performance of the speech recognition systems depends on the accuracy and speed. Accuracy may vary with the, vocabulary size and depends on the accuracy of the language model. The accuracy of the ASR system can be further increased if we implement efficient noise elimination algorithms more effectively.

ACKNOWLEDGMENT

We express our deepest gratitude and respect to our guide Mrs. Laxmi Shetty, Assistant Professor (Senior), Department of Electronics and Communication Engineering, for her valuable guidance and encouragement

REFERENCES

[1] Thimmaraja G Yadava, H S Jayanna, *"A spoken query system for the agricultural commodity prices and weather information access in Kannada language",* International Journal of Speech Technology, Page no: 635-644, Springer, 2017.

[2] Wageesha Manamperi, Dinesha Karunathilake, Thilini Madhushani, Nimasha Galagedara, and Dileeka Dias, *"Sinhala speech recognition for interactive voice response systems accessed through mobile phones",* Moratuwa Engineering Research Conference (MERCon), Page no: 241-246, IEEE, 2018.

[3] Chee Yang Loh, Kai Lung Boey, Kai Sze Hong, *"Speech recognition interactive system for vehicle",* IEEE 13th International Colloquium on Signal Processing & its Applications (CSPA), Page no: 85-88, IEEE, 2017.

[4] Mamoon Rashi, Harjeet Singh, *"Text to speech conversion in Punjabi language using nourish forwarding algorithm",* International Journal of Information Technology, Page no: 1-10, Springer, 2019

[5] Pooja Withanage, Tharaka Liyanage, Naditha Deeyakaduwe, Eshan Dias, Samantha Thelijjagoda, *"Voice-based Road Navigation System Using Natural Language Processing (NLP)",* IEEE International Conference on Information and Automation for Sustainability (ICIAfS), Page no: 1-6, IEEE, 2018.

[6] Anita B Bhosle, Swati Nadkarni, *"Voice Enabled Information Desk: Farmer to E-Farmer",* Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), Page no: 1-4, IEEE, 2018.

[7] Thimmaraja Yadava G, H S Jayanna, *"Automatic Isolated Kannada Speech Recognition System under Degraded Conditions",* 4th International Conference on Electrical, Electronics, Communication, Computer Technologies and Optimization Techniques (ICEECCOT), Page no: 146-150, IEEE, 2019.

[8] Hamidi, Mohamed, Satori Hassan, Zealouk Ouissam, Satori Khalid, and Laaidi Naouar, *"Interactive voice response server voice network administration using hidden Markov model speech recognition system",* Second World Conference on Smart Trends in Systems, Security and Sustainability (WorldS4), Page no: 16-21, IEEE, 2018.

[9] Partha Mukherjee, Soumen Santra, Subhajit Bhowmick, Ananya Paul, Pubali Chatterjee, and Arpan Deyasi, *"Development of GUI for Text-to-Speech Recognition using Natural Language Processing"* 2nd International Conference on Electronics, Materials Engineering & Nano-Technology (IEMENTech), Page no: 1-4, IEEE, 2018.

[10] Prashant Gupta, Aman Goswami, Sahil Koul Kashinath Sartape, *"IQS-intelligent querying system using natural language processing",* International conference of electronics, communication and aerospace technology (ICECA), Vol 2, Page no: 410-413, IEEE, 2017.

[11] Thimmaraja Yadava G, H S Jayanna, *"Creating language and acoustic models using Kaldi to build an automatic speech recognition system for Kannada language",* 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), Page no: 161-165, IEEE, May 2017.

[12] Hardik B Sailor, Hemant A Patil, Avni Rajpal, *"A Unsupervised filter bank learning for speech-based access system for agricultural commodity",* Ninth International Conference on Advances in Pattern Recognition (ICAPR), Page no: 1-6, IEEE, December 2017.

[13] Mandeep Singh Kandhari, Farhana Zulkernine, Haruna, *"A Voice Controlled E-Commerce Web Application",* IEEE 9th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), Page no: 118-124, IEEE, 2018.

[14] Urvi Sanghavi, Vinit Kubal, Bibuti Koley, Anand Sankhe, *"Full office control using IVRS",* International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), Page no: 1-5, IEEE, 2017.

[15] Yang Zheng, Yongkang Liu, John H L Hansen, *"Navigation-orientated natural spoken language understanding for intelligent vehicle dialogue",* IEEE Intelligent Vehicles Symposium Vol 4, Page no: 559-564, IEEE, 2017

[16] Soumya Priyadarsini Panda, *"Automated speech recognition system in advancement of human computer interaction",* International Conference on Computing Methodologies and Communication (ICCMC), Page no: 302-306, IEEE, July 2017.

[17] Thimmaraja Yadava G, Praveen Kumar P S, & H S Jayanna, *"An End to End Spoken Dialogue System to Access the Agricultural Commodity Price Information in Kannada Language/Dialects",* 2nd International Conference On Emerging Computation and Information Technologies (ICECIT), Page no: 1-6, IEEE, December 2017.

[18] Karan Raj Wagh, Shah Manav Sandeep, Sweety Rajpurohit, Maya Verghese, *"IVRS Based SAM (Smart Automation)",* International Conference on Smart City and Emerging Technology (ICSCET), Page no: 1-6, IEEE, 2018.

[19] Sruti Sruba Bharali, Sanjib Kr Kalita, *"Speech recognition with reference to Assamese language using novel fusion technique",* International Journal of Speech Technology 21.2, Page no: 251-263, Springer, 2018.

[20] Gangala Ramya, Nenavath Srinivas Naik, *"Implementation of telugu speech synthesis system",* International Conference on Advances in Computing, Communications and Informatics (ICACCI), Page no: 1151-1154, IEEE, 2017.

Baby Monitoring System

SHUBRATH MADHYASTHA*[1], VINAYAK ANANT HEGDE[2], SRIHARSHA S BHAT[3], SUDARSHANA K[4], ARUN UPADHYAYA[5]

Department of Electronics and Communication Engineering, Shri Madhwa Vadiraja Institute of Technology and Management Vishwothama Nagar, Bantakal, Karnataka 574115,India

[1]shubhrat.17ec064@sode-edu.in
[2]vinayak.17ec080@sode-edu.in
[3]shriharsha.17ec068@sode-edu.in
[4]sudarshana.17ec070@sode-edu.in
[5]arun_upadhyaya.ec@sode-edu.in

***Abstract* - Nowadays, one of the most significant problems faced by many families is taking care of their Babies. As both parents go to work and no proper care-takers are available, more workload and stress are there in such families. Sudden unexpected infant death (SUID) includes sudden infant death syndrome (SIDS), accidental suffocation in a sleeping environment, and other deaths from unknown causes. One of the main causes of SIDS is rebreathing stresses. When a baby is facedown, air movement around the mouth may be impaired. This can cause the baby to re-breathe carbon dioxide that the baby has just exhaled. Soft bedding and gas-trapping objects, such as blankets, comforters, waterbeds, sofas, chairs, and soft mattresses, as well as stuffed or plush toys, are other types of sleep surfaces that may impair normal air movement around the baby's mouth and nose when positioned facedown. The proposed system would help the parents in monitoring the baby, so parents can live more relaxed concerning their babies. An application is created which provides real-time data regarding the baby.**

Keywords – SIDS, Baby-Monitoring

I. INTRODUCTION

In today's world, female participation in the working force has risen dramatically, altering baby care in many households. Due to the high expense of living, both parents are expected to work. However, they continue to exist, need to look after their children, which add to their responsibilities and anxiety, particularly in the mother. Working parents are unable to provide for their children. They are always concerned about their children. While they are at work, they can either rely on their parents or hire a babysitter. Some parents are concerned about their children's safety while in the care of others. Various methods are available in the literature for baby monitoring. Symon et al [1] presented a baby monitoring system based on Raspberry Pi. The system detects the baby's motion and sound. The video of the baby's present position is also displayed on a monitor in this system. A new approach of an automatic monitoring system for baby's care has been presented in another paper [2] which is a microcontroller based project. The system proposed in [3] is designed using raspberry pi 3, camera, wet sensors, sound sensor, PIR sensor, sound sensor, DC motor, and SMS module. [4] The sudden death system uses real-time data collection from sensors to diagnose, in advance, baby health problems and prevent those are take care for a baby. Ziganshin et al [5] presented a system using a smart wearable device and an android application. Saranyaet [6] presented a child monitoring system based on android phones to detect the safety zone of the baby by using GPS sensors, acceleration sensors, and mobile GIS (Geographic Information System). The system in [7] by Shreelat presented an advanced baby monitor system that monitors baby movements, temperature, and humidity surrounding the baby. Savita P. Patil et al. [8] presented a baby monitoring system based on a GSM network. The system presented in [9] includes a reminder system as an important feature in baby monitoring activity. The framework proposed in [10] deals with developing a smart electronic cradle to convoke all the data to assist the baby and to bridge the gap between the parents and the infant. The prototype model presented in [11] is a configuration of a programmed cradle with the assistance of a PIR sensor and an android app. [12] Presents the design and implementation of a cradle system that swings the baby cradle automatically when the baby cries. However, conventional cradles are manually swung and require manpower. They lack automation and are not electronically equipped. Consequently, conventional cradles should be automated to become more convenient, safe and efficient in monitoring the baby's situation in real time.

II. MATERIALS & METHODS

Tools Used:
Software Used:

- Advanced IP Scanner
- Vnc viewer

- Pycharm
- MIT app inventor
- Firebase
- Google Colab
- Lablellmg

Hardware Used:

- Raspberry Pi 3
- Pi camera
- Sound Microphone (Input)
- Relay
- DC Motor (12V)
- Speaker
- Plastic Gear
- Lithium polymer (2200mAh)

Methodology:

- Interfacing of Raspberry Pi using Python programming
- Detection of Positioning of baby
- Interfacing of Android Mobile Application

Raspberry Pi will be used here as the central controlling unit. Condenser MIC will be associated with this project to detect the baby crying and gives a signal about it to the Raspberry Pi, cradle starts swinging if baby is crying. This system also consist of a Pi Camera which is used to figuring out the baby's position on the bed by implementing machine learning techniques through the Tensorflow library. The speaker in the system is used to output the audio to comfort the baby. The Raspberry Pi module will send data about the baby's well-being to the registered user application. Figure 1 shows the proposed baby monitoring system.

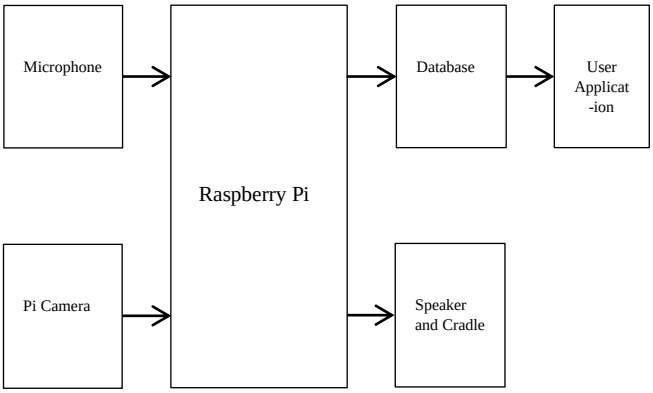


Fig. 1 Block Diagram of the proposed system

Python language is used for the programming of an entire code, which will begin executing on its own as soon as the system is powered up. Pi Camera will be used to figure-out the baby's position on the bed by implementing machine learning techniques through Tensorflow library.

The Raspberry Pi module will send the baby's data as soon as the user requests it or when the baby's positioning in the bed is not proper (the alarm will be activated through the speaker), through a notification to the registered user application, So that they can take the necessary actions to prevent it from risk of harm. The complete flowchart of the proposed system is shown in Fig 2.

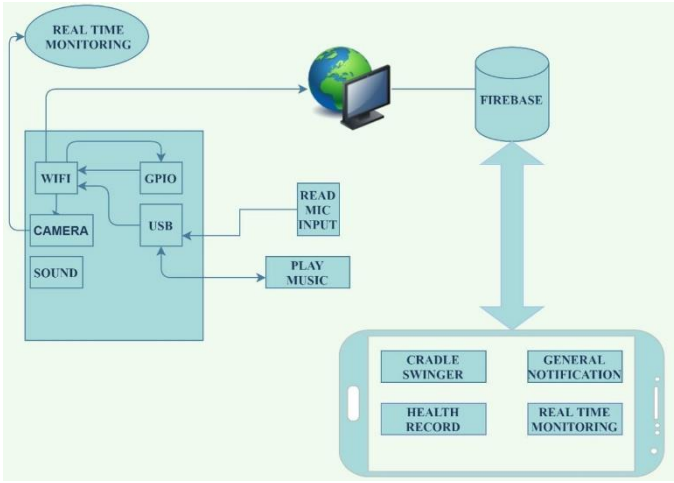


Fig. 2 Figure of the proposed system

For detection of safe positioning of the baby, we used SSD Mobilenet v2. It is an object detector with efficient CNN architecture designed for mobile and embedded vision applications. The main steps include

Pre-process the image.Assign a target label to the object in the image.Predicts the probability of the target label to each frame in the image.

The app is built using MIT app inventor. Figure 4 illustrates the monitoring and control process of the smart cradle by data retrieval from the exploited sensors and actuators. The GUI also shows the ON/OFF toggle switches that provide a command to the Dc motor by the user to control the cradle swing mechanism. The relay switches icons turn green whenever the relays are turned on, whereas the icon turns red to indicate that the motor is off.

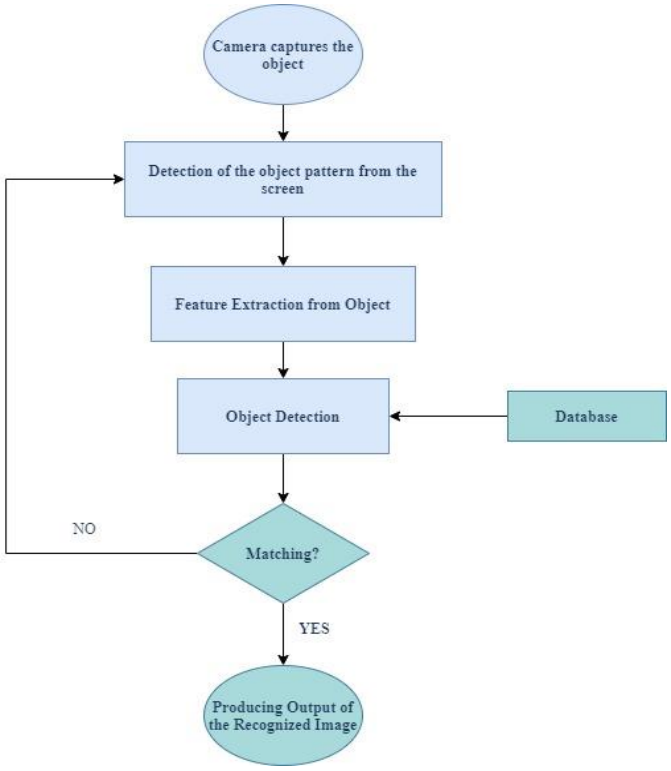


Fig. 3 Flowchart of detection algorithm

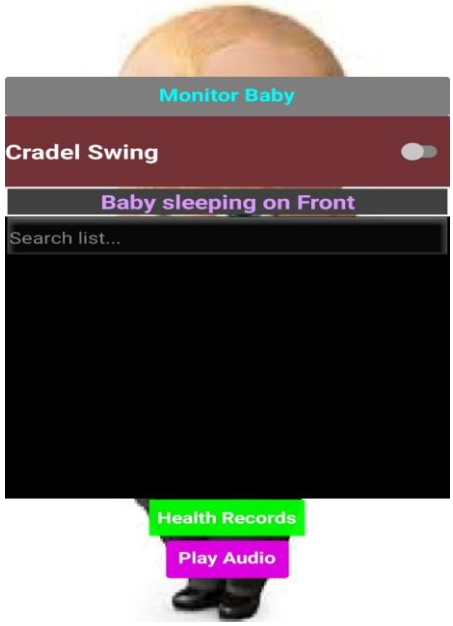


Fig. 4 Mobile application interface

III. RESULTS & DISCUSSIONS

The Raspberry Pi camera is set up in such a way that it can correctly capture the baby's face and body. The CNN model trained being is used to detect the baby's position and updates the position in the application. We also aim to broaden the scope of information transmission over the internet in order to provide remote access. The camera module integrated allows for the display of visual feeds of the baby's whereabouts and keeping an eye on their movements in a limited area. By collecting front and back positioning images, we trained a classifier for the doll shown. The user can also remotely turn the cradle ON and OFF using the mobile app. The labellmg.exe tool is used to create the image dataset. SSD mobilenet V2 is used to train the dataset. This system overcomes the shortcomings of existing systems, which are clumsy, inefficient, and costly.

IV. CONCLUSIONS

An automatic non-contact-based baby monitoring system is proposed in this paper. This system informs the user regarding the positioning of the baby. The main advantage of this is that it is more user-friendly, no harm to the baby as it is a non-contact-based baby monitoring system. It might be used in hospitals by the nurses to monitor the baby or even the covid patients as it is non-contact based. We used the RPi module as it provides more advantages comparatively Arduino and Microcontroller. It can detect whether the baby is sleeping on the front or back. This system will help in decreasing the chances of SIDS and reduces parent's anxiety.

V. ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Shri Madhwa Vadiraja Institute of Technology and Management, Udupi for the facilities provided and their support. Also, we would like to thank the Head of Department Electronics and Communication Engineering and faculties for their encouragement and support.

VI. REFERENCES

[1] Aslam Forhad Symon, Nazia Hassan, Humayun Rashid, Iftekhar Uddin Ahmed, S M Taslim Reza, “Design and Development of a Smart Baby Monitoring System based on Raspberry Pi and Pi Camera”. Proceedings of the 2017 4th International Conference on Advances in Electrical Engineering 28-30 September 2017.

[2] R. Palaskar, S. Pandey, A. Telang, A. Wagh and R. Kagalkar, "An Automatic Monitoring and Swing the Baby Cradle for Infant Care", International Journal of Advanced Research in Computer and Communication Engineering, vol. 4, no. 12, pp. 187-189, 2015.

[3] S.Srikanth, P.Ramya, M.Satheesh, G.Thomas Philip and K.Vineetha ―SmartBaby Cradle System‖,International

Journal of Advances in Scientific Research and Engineering,Volume 4, Issue 3, pp 51-60, March –2018.

[4] Fonseca, A. M., Horta, E. T., Sendra, S., Rodrigues, J. J. P. C., & Moutinho, J. A. F. (2014). A sudden infant death prevention system for babies. 2014 IEEE 16th International Conference on e-Health Networking, Applications and Services.

[5] E. Ziganshin, M. Numerov and S. Vygolov, "UWB Baby Monitor", 2010 5th International Conference on Ultrawideband and Ultrashort Impulse Signals, pp. 159-161, 2010.

[6] A. Saranyaet "Design and implementation of automatic child monitoring (ACM) system using wireless network", International Journal of Computer Science and Mobile Computing, 5(4) April- 2016, pp. 356-363

[7] Advanced Baby Monitor "International Journal of Internet of Things", 2017, 6(2), pp. 51-55, DOI: 10.5923/j.ijit.20170602.09

[8] Savita P. Patil and Manisha R. Mhetre, "Intelligent Baby Monitoring System", ITSI Transactions on Electrical and Electronics Engineering, volume 2, Issue 1, pp.11-16, 2014.

[9] Shreelatha, Shreya Pai, Sonal Cynthia Pereira, Tanya Nicole, Ms Ushadevi A., ― Advanced Baby Monitor‖ International Journal of Internet of Things ,pp 51-55 , June 2017.

[10]I.Natheera,S.Sundaravadivel,N.L.Visakan,S.Viswanatha n and M.Vivekkumar, ―Smart Cradle‖, Asian Journal of Applied Science and Technology (AJAST), Volume 2, Issue 2, Pages 291-300, April-June 2018

[11] P.B. Patel, Sudhir Ticku, Suraj Darunde, ―Automation In Baby Cradle Bed‖,International Journal of Advance Research in Science and Engineering,vol ,issue 4,april 2018.

[12] Misha Goyal,Dilip Kumar, ―Automatic E-Baby Cradle Swing based on Baby Cry‖, International Journal of Computer Applications (0975 –8887) Volume 71–No.21, June 2013.

Implementation of Reversible 24-bit Multiplier Using Operand Decomposition Technique

KRISHNAVENI D*[1], VARSHINI N[2], SUSHMA R[3], SUPRIYA K[4], SUHAS H R[5], GEETHA PRIYA M[6]

Department of Electronics and Communication Engineering, Jyothy Institute of Technology

Tataguni Off Kanakapura Road, Bangalore- 560 082, India

[1]mailkveni@gmail.com
[2]varshinin87@gmail.com
[3]sushma.r1221@gmail.com
[4]supriya.kempaiah@gmail.com
[5]suhashr3@gmail.com
[6]geetha.sri82@gmail.com

***Abstract*— The multipliers play a major role in determining the overall performance of a digital system in applications like Digital signal & image processing, Satellite data processing, Microprocessor's design and many more. In this paper, an advanced multiplication algorithm for reversible 24-bit multiplication using Operand decomposition method is proposed. The reversible logic brands the multiplier circuit to be lossless and the reversible circuits will dissipate very less amount of heat compared to irreversible circuits. Operand decomposition technique decomposes the inputs, multiplier and multiplicand into small operands. The technique of operand decomposition decreases the number of one's, switching activity and logical transitions and parallelly will also coordinate in increasing the speed of the multiplier. Hence, the proposed Reversible multiplier using operand decomposition technique augments the overall performance of the digital system.**

Keywords— Reversible, Multiplier, Operand decomposition, Reversible gates, Quantum cost, Constant inputs, Garbage outputs.

I. INTRODUCTION

Multipliers are the most important building blocks in digital processing and control systems. Multipliers can overcome problems such as overflow and scaling but require multipart hardware and consumes more power. Multipliers are also the key for overall power budget of the system. Hence, maintaining high clock rates, reducing logical transitions and therefore reducing the power dissipation is crucial. The reversible multipliers brand the irreversible multiplier system making it power efficient for the applications demanding exhaustive use of multipliers [1],[2].

Energy conservative devices are in major demand as reducing power dissipation is one of the main requirements of VLSI technology. According to Landauer's research, in an irreversible hardware circuit for every bit of information lost, the circuit will dissipate KTln2 Joules of energy. This principle is based on the second law of thermodynamics it states that information once lost cannot be recovered by any other methods. Reversible computation system encompasses of only reversible logic gates. Reversible circuits being lossless circuits will reduce power dissipation and will reserve information due to their property of one-to-one mapping. One-to-one mapping corresponds to circuits in which inputs and outputs can be uniquely recovered from each other. In recent days reversible logic has gained an excessive attention due to its ability of reducing power dissipation [3].

II. PREVIEW

A. *Existing Reversible Logic Gates*

The reversible Boolean function is defined using the following terms: The number of inputs and outputs should be same and pattern of any output should be having an exclusive mirror image [3]. There are many parameters such as the number of reversible logic gates used, constant inputs (CI), garbage outputs (GO), Quantum cost (QC), Delay, Hardware complexity for determining the complexity and performance of reversible logic circuits [4], [5].

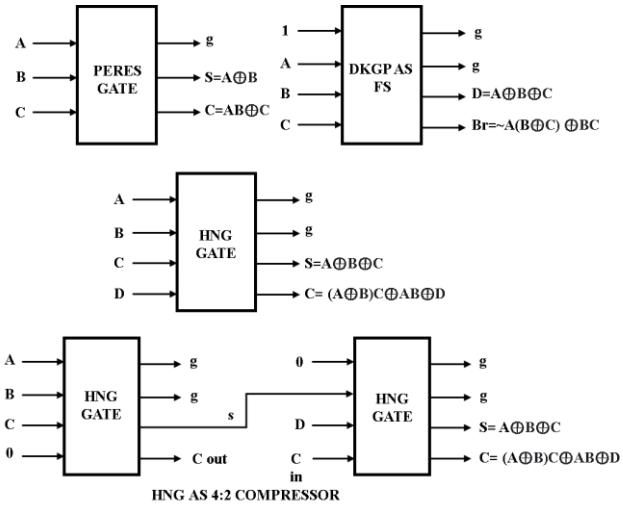


Fig. 1 Existing Reversible logic gates

Reversible logic gates will establish a bijection between the existing set of input and output vectors. The number of primitive reversible gates present in a reversible logic circuit is called as the QC. GO are the extra outputs conserved to preserve the reversibility of the circuit. CI are the number of inputs that are kept constant at either 0 or 1 in view to get the given logical expression. Delay is attained by having the count of reversible logic gates present in the critical path of the circuit. Hardware complexity is decided based on the count of EXOR, AND & NOT gates used in the reversible logic circuit [6], [7], [8].

Fig. 1 shows the reversible logic gates that are used in the proposed work. The Peres gate (PG), HNG gate and DKGP gate are the important reversible logic gates that are used in the proposed work. PG is 3 input - 3 output reversible logic

gate used as reversible half adder. The DKGP gate is 4 input - 4 output reversible logic gate used as a reversible full subtractor. The HNG gate 4 input - 4 output logic gate used as a reversible full adder. The QC of PG, DKGP and HNG gate are 4, 15 and 6 respectively. The 4:2 compressor is constructed using two HNG gates as shown in figure 1. The QC of 4:2 compressor is 12.

B. Operand Decomposition Method

Operand Decomposition is a method used to minimize errors in multiplier system, reduce the number of one's, switching activity and logical transitions in the multipliers. The operand decomposition technique makes the multiplier system more reliable, power efficient and speed efficient [9], [10].

The following steps are involved in the operand decomposition algorithm:

Step-1: The numbers are considered as X & Y and are represented as follows.

X= [x7 x6 x5 x4 x3 x2 x1 x0]

Y= [y7 y6 y5 y4 y3 y2 y1 y0]

8-bit Multiplication is performed on two unsigned 8-bit numbers.

Step-2: Initially, the 8-bit inputs X & Y of the 8*8 multipliers are decomposed into four operand A, B, C & D as given below.

X=B+C, Y=B+D

X=(B+C) * (B+D)

A=-(B+C+D)

X*Y=(C*D) - (A*B)

Here, X and Y are considered as B+C and B+D respectively. To obtain the expression in its simplest form, operand A is modified as –(B+C+D). The deduced expression produces a greater number of zeros in the process of multiplication reducing the number of one's which in turn reduces the switching activity in the process.

The equations to decompose the inputs are given below:

A= ~X ^ ~Y A= [a7 a6 a5 a4 a3 a2 a1 (a0+1)]

B= X ^ Y B= [b7 b6 b5 b4 b3 b2 b1 b0]

C= ~X ^ Y C= [c7 c6 c5 c4 c3 c2 c1 c0]

D= X ^ ~Y D= [d7 d6 d5 d4 d3 d2 d1 d0]

The values of operand A, B, C, D corresponding to inputs X & Y are as given in the Table I.

TABLE I
OPERAND A, B, C, D CORRESPONDING TO INPUTS X & Y

X	Y	A	B	C	D
0	0	1	0	0	0
0	1	0	0	1	0
1	0	0	0	0	1
1	1	0	1	0	0

Step-3: The partial products are generated for both A*B and C*D multipliers

M= A*B= [Mn-1 Mn-2 ……. Mij ……M1, M0]

N= C*D= [Nn-1 Nn-2 ……. Nij ……N1, N0]

The partial products are generated using NAND-NAND logic. The equations used to generate partial products are given as

Mij= (Ai ^ Bj) | (Aj ^ Bi)

Nij= (Ci ^ Dj) | (Cj ^Di)

Step-4: The partial products are added using reversible half adders, full adders and 4:2 compressors to get the products of 8*8 multipliers. The partial product generation stage of 8*8 multiplier is as shown in the fig. 2. (C*D) – (A*B) is performed to get 48-bit product.

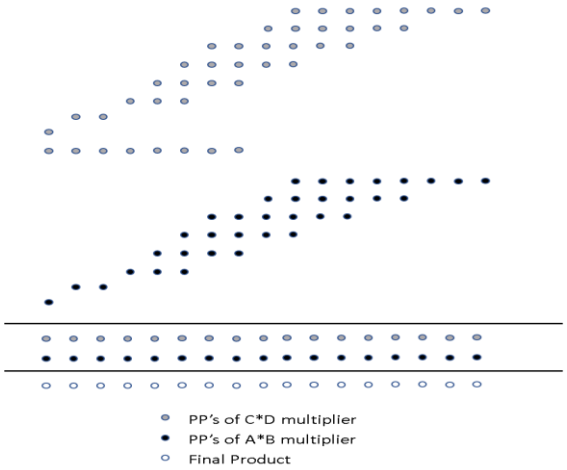


Fig. 2 Partial Product generation stage

III. PROPOSED 24*24 MULTIPLIER USING OPERAND DECOMPOSITION METHOD

The 24*24 reversible multiplier is designed by multiplying two 24-bit numbers. The 24-bit inputs are divided into 3 partitions and are multiplied with each other [2]. Hence, to achieve the reversible 24*24 multiplier nine reversible 8*8 reversible multipliers blocks are required. 8*8 reversible multiplier blocks are designed using the operand decomposition technique.

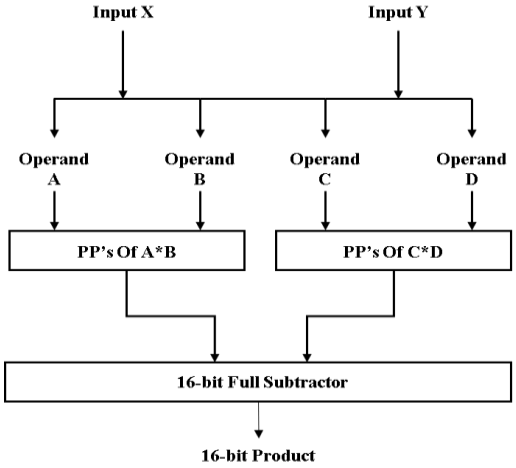


Fig. 3 Proposed Architecture of 8*8 Multiplier

In an 8*8 multiplier initially, partial products of A*B and C*D multipliers are obtained by using reversible NAND Gate i.e., PG gate. By changing the 4th input i.e., the constant input of PG to 1, it can work as NAND gate. The proposed architecture as shown in the fig. 3.

The A*B and C*D multipliers are designed using the reversible PG, HNG and DKGP gates. PG gate functions as a half adder, HNG gate works as a full adder. A combination of two HNG gates were used as the 4:2 Compressors.

The outputs of A*B and C*D multipliers are subtracted using a full subtractor to obtain the final product of 8*8 multiplier. The DKGP gate functions as a full subtractor.

The 24*24 reversible multiplier is designed using nine 8*8 multipliers using PG, HNG gates as half adder and full adder respectively. The proposed architecture of 24*24 reversible multiplier is as shown in the fig. 4.

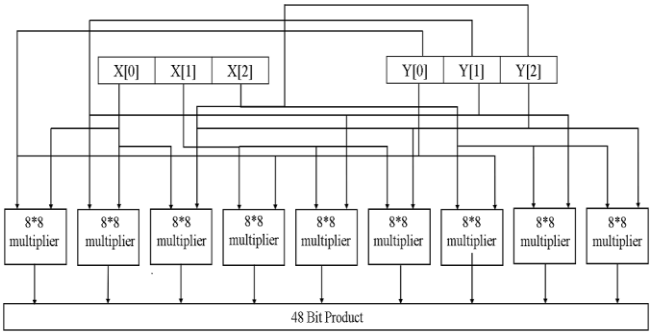


Fig. 4 Proposed architecture od 24*24 reversible multiplier

IV. Results and Discussion

The proposed 24×24 Reversible multiplier using operand decomposition technique is executed using VHDL hardware descriptive language. The tool employed for the process of synthesis, simulation and verification is Xilinx ISE tool. Each and every block in the design is tested and verified functionally. Simulation results to verify the functionality of each reversible block in the proposed 24×24 reversible multiplier using Operand decomposition technique is obtained and verified.

The 8*8 reversible multiplier takes two 8 bits input and performs multiplication using Operand decomposition technique and produces 16 bits product. Simulation results of 8*8 reversible multiplier is shown in fig. 5. In example 1 the inputs are taken as "00110111" and "01000101" so the 16 bits product from the 8*8 reversible multiplier is obtained as "0000111011010011". In example 2 both the inputs are taken as "11111111" so the 16 bits product from the 8*8 reversible multiplier is obtained as "1111111000000001".

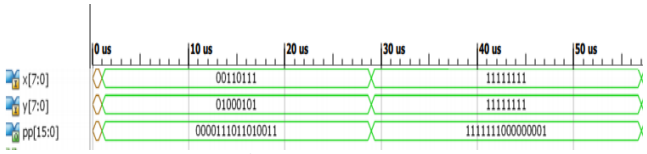


Fig. 5 Simulation results of reversible 8*8 multiplier using operand decomposition method

The 24*24 reversible multiplier takes the 24 bits input and performs multiplication using nine 8*8 reversible multipliers and produces 48 bits product. Simulation results of 24*24 reversible multiplier is shown in fig. 6. Here, both the inputs are taken as "111111111111111111111111" so the 48 bits product obtained from the 24*24 reversible multiplier using operand decomposition method is "111111111111111111111110000000000000000000000001".

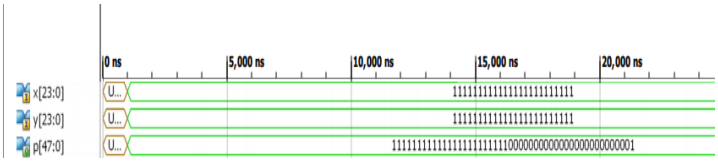


Fig. 6 Simulation results of reversible 24*24 multiplier using operand decomposition method

Table II shows the constraints such as the number of reversible logic gates used, quantum cost, constant inputs and garbage outputs of each unit used in the proposed 24×24 reversible multiplier using operand decomposition.

TABLE II
Analysis of Major Constraints of Proposed 24-bit Reversible Multiplier Using Operand Decomposition Technique

Reversible multiplier	Gates used	QC	CI	GO
8*8	259	1,298	259	478
24*24	2,435	12,276	2,435	4,540

V. Conclusion

Reversible multipliers are nowadays one of the major necessities for mathematical and quantum computations in digital systems. The reversible 24*24 multiplier using operand decomposition technique is an advanced and reliable technique. The proposed 24*24 Reversible multiplier design consists of 2,435 reversible gates and the total quantum cost of the system is 12,276. Xilinx ISE software is used in execution simulation and study of the reversible multiplier design. Conclusively, the proposed reversible multiplier design reduces switching activity, increases speed and also mainly reduces power dissipation.

REFERENCES

[1] B R Rajatha, K S Pooja, G B Sadhvika, and B S Premananda, *"Implementation of operand decomposition in signed logarithmic multipliers"* in 2016 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), 2016, p. 2126-2129.

[2] M Ito, D Chinnery, K Keutzer, *"Low power multiplication algorithm for switching activity reduction through operand decomposition,"* in Proceedings 21st international conference on computer design, 2003, p. 21-26.

[3] Garipelly, Raghava, P Madhu Kiran, and A Santhosh Kumar, *"A review on reversible logic gates and their implementation,"*

International Journal of Emerging Technology and Advanced Engineering, vol 3, no. 3, pp. 417-423, 2013.
[4] B Vijeta, and K Hemalatha, *"Novel reversible gate-based circuit design and simulation using deep submicron technologies,"* Int. J. Emerg. Trends Technol. Comput. Sci.(IJETTCS), vol 2, pp 3-7, 2013.
[5] H R Bhagyalakshmi, and M K Venkatesha. *"An improved design of a multiplier using reversible logic gates,"* International journal of engineering science and technology, vol 2, no. 8, pp 3838-3845, 2010.
[6] M Jenath, and V Nagarajan, *"FPGA implementation on reversible floating-point multiplier,"* International Journal of Soft Computing and Engineering, vol 2, no. 1, pp 438-443, 2012.
[7] M A Menon, and R J Renjith, *"Implementation of 24 Bit high-speed floating-point Vedic multiplier,"* in 2017 International Conference on Networks & Advances in Computational Technologies (NetACT), 2017, p. 453-457.
[8] V Mahalingam, and N Ranganathan, *"An efficient and accurate logarithmic multiplier based on operand decomposition,"* in19th International Conference on VLSI Design held jointly with 5th International Conference on Embedded Systems Design (VLSID'06), 2006, p. 6.
[9] M Nachtigal, H Thapliyal, and N Ranganathan, *"Design of a reversible single precision floating point multiplier based on operand decomposition,"* in10th IEEE International Conference on Nanotechnology, 2010, p. 233-237.
[10] Abid, Zine, A Dalia, El-Dib, and Rizwan Mudassir, *"Modified operand decomposition multiplication for high performance parallel multipliers,"* Journal of Circuits, Systems and Computers, vol 25, no. 12, 2016

PLANT DISEASE DIAGNOSIS USING MACHINE LEARNING

Adarsha Hebbar[1], Jeevan Jagannath Achari[2], K Adith Holla[3], Sourabh Mohan Revankar[4], Mr. Nagaraja Rao[5]
4th year B.E Electronics and Communication Engineering, SMVITM Bantakal[1,2,3,4]
Associate Professor, Department of Electronics and Communication Engineering, SMVITM Bantakal[5]
[1]adarshhebbar77@gmail.com, [2]jeevanja73@gmail.com, [3]adithholla@gmail.com, [4]msourabh3125@gmail.com, [5]nagaraj.bl@gmail.com

Abstract - Sustainable agriculture is a vital discipline in which now no longer tons interest is given aleven though it's miles notably necessary, so one can display the increase of vegetation for increase in maximum nutritious ways. However, the prevalence of sicknesses on plants should degrade the excellent and reduce the amount of yield. Therefore, in advance detection of plant disorder will assist stopping the plants from extreme contamination and heading off crop loss. Our idea makes use of an SVM algorithms to hit upon kind of sicknesses in order that we are able to hit upon signs at early level and required insecticides may be suggested, complete manner is embedded in android app the complete device being cost effective. The device is able to suggesting the right remedy for the disorder in real-time.

Index Terms – Android App, Disease detection, Sustainable agriculture, SVM Algorithm.

I. INTRODUCTION

The agricultural manufacturing value may be drastically accelerated if plant illnesses aren't detected and cured of their early stages. The vegetation should be monitored all of the time which will come across the primary signs of an ailment earlier than it's far unfold to the complete crop. Professional agriculture engineers won't be to be had to constantly screen a crop if for instance the crop is living in a far-off region. Remote tracking through gadget imaginative and prescient can provide an opportunity option. Molecular evaluation might also additionally should be done which will verify if a plant is tormented by a selected ailment.

The development of the signs in time can range drastically relying at the biotic dealers and that they may be categorised as number one or secondary. More than one pathogen can infect simultaneously a plant. The signs that seem in this example might also additionally range from the signs because of the individual pathogens. The signs of a pathogen may be frequently expressed as fungal or bacterial leaf spots. Vein banding, mosaic and ringspot also can seem. The leaves may be distorted or a powdery mould can seem. Spore systems can also be present. The vegetation may be additionally be injured through air pollutants or through soil/air chemicals.

Plant illnesses can growth the value of agricultural manufacturing and can enlarge to general catastrophe of a manufacturer if now no longer cured correctly at early stages. The manufacturers want to screen their vegetation and come across the primary signs which will save you the unfold of a plant ailment, with low value and store the essential a part of the manufacturing. Hiring expert agriculturists won't be lower priced mainly in faraway remoted geographic regions.

Machine imaginative and prescient can provide an opportunity answer in plant tracking and such a method might also additionally besides be managed through an expert to provide his offerings with decrease value. Of course, there are numerous extra checks that should be done which will verify a selected ailment however picture processing can supply a primary clue on what absolutely occurs on the field.

This paper represents the technique for plant leaf ailment detection and class the usage of gadget studying incorporated virtual picture processing strategies. We have proposed a prediction version for plant leaf ailment detection and class that follow one-of-a-kind picture processing strategies for pre-processing, segmentation and feature extraction. Different class strategies are considered that classifies ailment into one of the classes.

A. Problem Approach

Farmer's financial boom relies upon at the quality of the goods that they produce, which is based on the plant's boom and the yield they get. Therefore, in area of agriculture, detection of ailment in flora performs an instrumental role. Plants are distinctly susceptible to illnesses that have an effect on the boom of the plant which in flip impacts the ecology of the farmer. In order to hit upon a plant ailment at very preliminary stage, use of computerized ailment detection method is advantageous. The signs and symptoms of plant illnesses are conspicuous in exceptional components of a plant along with leaves, etc. Manual detection of plant ailment the use of leaf photos is a tedious job. Hence, it's far required to expand computational strategies in an effort to make the system of ailment detection and class the use of leaf photos computerized.

B. Objectives

- Capturing images of different diseases in plants.
- Collecting open-source dataset.
- To come up with ML algorithm to predict the diseased plants.

- Build an android application to capturing and detecting the disease.
- To suggest remedy for the disease that is detected.
- Deploy our project to real time conditions.

II. RELATED WORK

Taohidul Islam et al [1] discusses about the new technique of detecting and classifying disease by directly using the percentage of RGB value of diseased portion. Unlike other techniques which are based on calculation of total area of leaves, this technique is based on percentage calculation. Therefore, it is efficient than other technique as it can detect and classify disease from a small sample of leaf containing diseased portion. Processing the whole leaf in not necessary in this technique and as a result processing becomes lot faster than previously proposed methods. Also, the technique is far simpler due to the use of Naive Bayes classifier to identify the diseases in agricultural field.

Nikos Petrellis et al [2] has described about the mobile application which he built and tested to find out the plant disease through image processing that analyzes the color features of the spots in plant parts. It was evaluated on grape disease with an accuracy that exceed 90% using a small set. But the disadvantage of that concept was he used very small dataset and if we use a greater number of dataset then the accuracy may decrease.

Kurniawati et al [3] proposed system for diagnosing paddy diseases, including Blast Disease, Brown Spot Disease and Narrow Brown Spot Disease mainly based on MATLAB application has been developed in this study. The image processing techniques were used to establish the classification system. Four characteristics of lesion type, boundary color, spot color, and broken paddy leaf color were tested for used to establish the classification system. The ratio of height and width of the lesion spot provided a unique shape characteristic for determining the type of the lesion. Two thresholding methods have been applied to get the best result in diagnosing ninety-four paddy leaf images. The best accuracy of two methods that used local entropy threshold is about 94.7%. Different intensity values and less prone to illumination, thus Otsu method is disabled to perform segmentation task accurately.

Rashedul Islam et al [4] discuss that Image processing technique is very much essential to observe the intensity of disease. As the open eye observation may result poor accuracy and it may vary person to person. So, with the help of K-means clustering, image of paddy leaf can be segmented. And by counting the disease affected pixels and unaffected pixels the percentage of disease affected pixels can be calculated. According the percentage of disease affected pixels the severity of disease can be understood; consequently, appropriate measure can be taken to cure the disease.

Draško et al [5] clarifies that Multiclass classification using SVM can be implemented using one-vs-all or one-vs-one strategies. One-vs-all approach trains N classifiers (N is the number of classes), where each classifier considers examples from one class as positive, and all others as negative. One-vs-one approach trains N(N-1)/2 binary classifiers and determines the winner by max-wins voting. They have experimented with different configurations and found that the best results were obtained by using the radial basis function kernel and regularization parameter C=100. One-vs-all approach was used. The achieved accuracy on the test set is 91.74%.

Abirami Devaraj et al [6] say that, their study deals with Alternaria Alternata, Antracnose, Bacterial Blight and Cercospora Leaf Spot these automatic illness detections using image processing techniques in MATLAB. It involves loading an image, image preprocessing, image segmentation, feature extraction and classification. Development of automatic detection system using advanced technology like image process facilitate to support the farmers within the identification of diseases at an early or initial stage and supply helpful data for its management. we might prefer to extend our work additional on a lot of disease detection.

Shima Ramesh et al [7] proposed a algorithm to recognize abnormalities that occur on plants in their greenhouses or natural environment. The image captured is usually taken with a plain background to eliminate occlusion. The algorithm was contrasted with other machine learning models for accuracy. Using Random Forest classifier, the model was trained using 160 images of papaya leaves. The model could classify with approximate 70 percent accuracy. The accuracy can be increased when trained with vast number of images and by using other local features together with the global features such as SIFT (Scale Invariant Feature Transform), SURF (Speed Up Robust Features) and DENSE along with BOVW (Bag of Visual Word).

Surender et al [8] summaries techniques used in image processing for plant leaf diseases. Very regularly general implemented techniques are SVM, BPNN, SGDM and K means Clustering. With the help from any of these techniques the automation in plant leaf disease detection is achieved. SVM is very difficult to find optimal parameters for training purpose because they are non-linearly separable. Neural network can tolerate noisy inputs. K-means NN have disadvantage of time complexity while making prediction. Having these disadvantages associated with each methodology makes each individual to use for some particular reason. Which makes BPNN is the most easily implemented nonlinear technique for training of neural network-based plant diseases detection.

III. METHEDOLOGY

A. Capturing the picture

First level of plant sickness detection gadget is picture acquisition. High first-class plant pictures may be obtained the use of virtual cameras, scanners or drones.

B. Image Acquisition

It is the system of pictorial photo advent of a bodily view or the inner shape of an object. Image acquisition may be broadly defined because the interest of restoring a photo from a few origins, usually a hardware-based source which can be processed along with processes that need to appear afterwards. Image acquisition is constantly the preliminary circumstance for the paintings glide collection of photo processing due to the fact as processing is feasible most effective with the assist of a

photo. The photo received is completely herbal and is the result of any hardware which changed into treated to supply it.

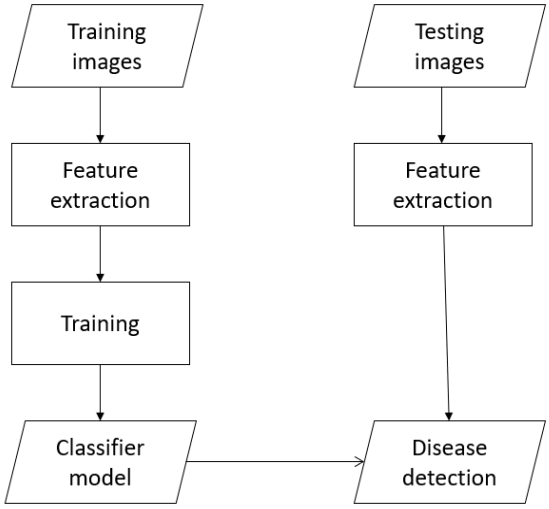


Fig.1 Training of classifier and classification

C. Image Pre-processing

Pre-processing on images is vital to cast off the noise from a picture. Pre-processing involves enhancement of the visual appearance of images, increasing or decreasing the number of pixels of the dataset, resizing images and removing noise from the images. It is likewise had to normalize the depth values from a picture. Image pre-processing is the technique of improving the first-class of picture through casting off history noise and normalizing the depth of the diverse factors of the picture previous to any computational technique implemented on it. Image enhancement and healing may be beneficial to pre-technique a picture. Image Segmentation is the technique of dividing a virtual picture into numerous parts. The number one purpose of segmentation is to understand items or extract the associated records from pix, in order that reading a picture will become easier. Objects and bounding line of pix are placed with the aid of using the usage of picture segmentation. Pixels with comparable label element percentage distinguishing functions for allocating a label to every pixel in a picture. During our test to transform the noisy picture into smooth picture, picture healing strategies are beneficial. We have eliminated the undesirable noise and blur from leaf image the use of special filters like gaussian blur. For overall performance measurement, PSNR and RMSE values are taken into consideration.

D. Feature Selection and Extraction

After making use of suitable pre-processing and segmentation at the sickness affected leaf, diverse characteristic extraction strategies are implemented to reap the centered functions which may be used for the class. Features may be considered as quantifiable houses received from the diverse centered quantities of the picture. For any system mastering primarily based totally software characteristic identity and characteristic extraction is taken into consideration as pioneer step. Overall accuracy of the system mastering algorithms is rather depending on the received functions. Feature choice is taken into consideration because the maximum important step of any pc vision-primarily based totally system mastering task. Feature selection and extraction of our model is based on color and texture.

1) Color features: A fundamental function to examine alternate in diseased plants is color. Color function is normally utilized by many researchers for type of plant illnesses. There are many techniques for color function extraction which includes color histogram, histogram intersection, color correlogram, color co-occurrence matrix, color coherence vector.

2) Texture features: Texture is not anything however a duplicated shape of facts or the association of the shape that happens at uniform intervals. Since each plant ailment has specific shape, texture capabilities are used to discover and classify plant illnesses.

E. Training of classifier and class

It is the technique of inspecting said successions of tokens for the lifestyles of the factors of a few patterns. The assignment of matching set of rules is to evaluate capabilities with index capabilities of the photograph within the database. Classification is a manner of figuring out the class of the determined pattern. Two most important classes of type are supervised and unsupervised. In supervised type, education is needed wherein consumer can pick out pattern pixels to shape a class. Unsupervised type wishes no education and consequences are primarily based totally at the software program evaluation without pattern classes. Classification strategies consisting of support vector machine, neural networks, k- nearest neighbor, fuzzy good judgment etc. are used for plant ailment detection. We use SVM algorithm to train our dataset.

SVM is a supervised mastering set of rules used for class or regression problems. Classification is achieved through defining a keeping apart hyperplane withinside the characteristic area. In the unique form, it plays linear class on classes. By the use of kernels, it may additionally carry out non-linear class. Kernels are used for a green transformation of the unique characteristic area into excessive dimensional or countless dimensional characteristic area, making an allowance for rather non-linear hyperplanes. SVM can match rather complicated datasets and on the equal time show off exact generalization houses. Multiclass class the use of SVM may be applied the use of one-vs-all or one-vs-one strategies. One-vs-all technique trains N classifiers (N is the quantity of classes), wherein every classifier considers examples from one elegance as positive, and all others as negative. One-vs-one technique trains N(N-1)/2 binary classifiers and determines the winner through max-wins voting.

IV. CHALLENGES

There are few challenges in plant disease detection using image processing techniques which are listed below

A. Collection of data set

Basic need of image processing is creating a database of images. To acquire images of plant diseases, one has to travel to different places. Data collection will be a challenging since variety of plant diseases may not be available at some farms and diseases occur only during some seasons.

B. Image background

Image segmentation is important phase of image processing, where we separate most required part of image. Leaf image

segmentation may be a challenge if background contains plants, leaves and some other green elements.

C. Image capture condition

Automatic plant disease detection systems give steady and efficient results, only if all the images are captured under same condition. Capturing images under same condition is possible only inside laboratories. It's a challenge to capture images under same condition in the field because of uncontrollable environment.

D. Symptom segmentation

Most plant disease symptoms have no well-defined edges and they fade on plants slowly because of which there will not be a proper segmentation, which will affect final result.

E. Symptom variations

Symptom depends on environment, disease and plant. Any change in these elements may result in symptom variations. It's a challenge to identify the plant disease with symptom variations.

F. Multiple simultaneous disorders

Many times, automatic plant disease detection systems may wrongly assume that there is only one disorder present in an image. Pests and nutritional deficiencies may occur simultaneously because there is maximum possibility of plant being attacked by other disorders after having infected by some disease.

G. Different disorders with similar symptoms

Many plant disorders have similar symptoms such as diseases, nutritional deficiencies, pests, phytotoxicity, excessive cold or heat. It's a challenge to differentiate and identify the disorders by automatic plant disease detection techniques.

V. EXPERIMENTAL RESULTS

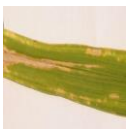
Various steps of intermediate results and the final results obtained during the experiment are discussed in this section:

Here 982 images are taken to train the network, from which 118 of Jasmine Bacterial leaf blight, 136 of Jasmine Brown spot, 114 of Jasmine Healthy, 126 of Bell Pepper Bacterial spot, 138 of Bell Pepper healthy, 141 of Rice Bacterial leaf blight, 101 of Rice Brown spot, 108 of Rice leaf smut samples are considered for training and testing.

The infected leaves are initially identified and captured. Since the captured images are of different size, shapes and also vary in many aspects, all are mapped to a normalized size. The samples images of each disease are shown above in the Table 1. Then the normalized images obtained after applying the pre-processing techniques like resizing the images and gaussian blur filter is done. Feature selection and extraction of preprocessed image is done based on the shape, color and texture. Then the features are trained under SVM classifier. The testing image is captured in mobile application and detected disease is shown.

We have experimented with special configurations and located that the first-class effects had been received through the use of the radial foundation characteristic kernel and regularization parameter C=100. One-vs-all technique turned into used. The carried-out accuracy at the check set is 81.98%.

Table 1. Sample images of each disease

	Jasmine Bacterial leaf blight
	Jasmine Brown spot
	Jasmine Healthy
	Bell Pepper Bacterial spot
	Bell Pepper healthy
	Rice Bacterial leaf blight
	Rice Brown spot
	Rice leaf smut

Snaps of the android application:

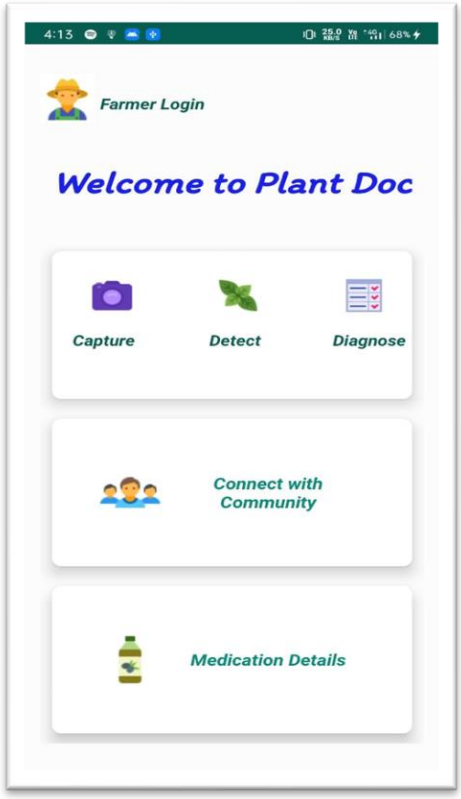


Fig.2 Home page

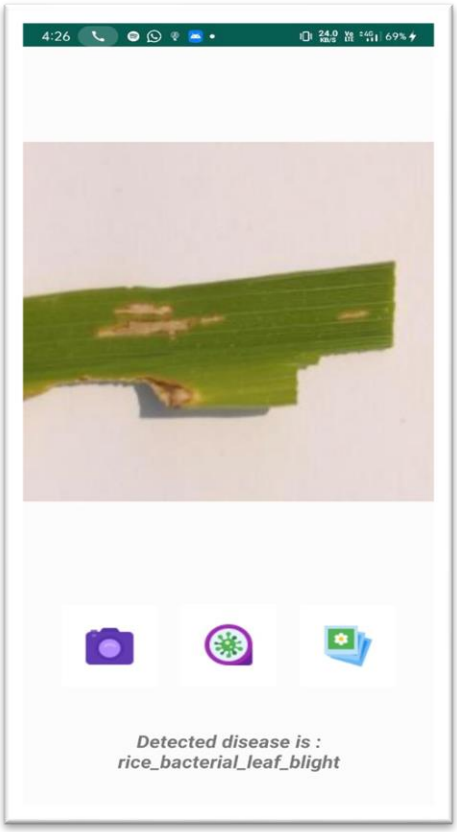


Fig.3 Rice Bacterial leaf blight disease

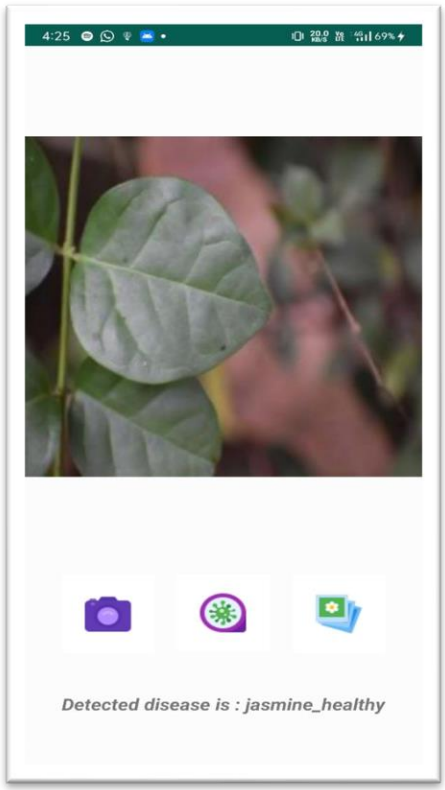


Fig.4 Jasmine healthy plant

VI. CONCLUSION

The paper in particular specializes in the plant disorder detection and through the utility of diverse methodology. Usage of diverse characteristic extraction strategies and a stable, enough facts set have facilitated in acquiring pleasant experimental results. The utilization of classifier “Support Vector Machines (SVM)” have superior the overall performance of the gadget which presents higher results. Development of automated detection gadget the use of superior era like photograph system facilitate to guide the farmers in the identity of sicknesses at an early or preliminary degree and deliver useful facts for its management. we would choose to increase our work on numerous disorder detection.

REFERENCES

[1] Taohidul Islam, Manish Sah, Sudipto Baral, Rudra RoyChoudhury, "A Faster Technique on Rice Disease Detection Using Image Processing of Affected Area in Agro-field ", IEEE ISBN:978-1-5386-1974-2 [2018]

[2] Nikos Petrellis, "A Smart Phone Image Processing Application for Plant Disease Diagnosis" MOCAST [2016].

[3] Nunik Noviana Kurniawati, Siti Norul Huda Sheikh Abdullah, Salwani Abdullah, Saad Abdullah, "Investigation on Image Processing Techniques for Diagnosing Paddy Diseases" International Conference of Soft Computing and Pattern Recognition 2009

[4] Rashedul Islam, Md. Rafiqul Islam, "An Image Processing Technique to Calculate Percentage of Disease Affected Pixels of Paddy Leaf" International Journal of Computer Applications (0975 – 8887) Volume 123 – No.12, August 2015.

[5] Draško Radovanović and Slobodan Đukanović, "Image-Based Plant Disease Detection: A Comparison of Deep

Learning and Classical Machine Learning Algorithms", 24th International Conference on Information Technology (IT) Zabljak, 18 – 22 February 2020.
[6] Abirami Devaraj, Karunya Rathan, Sarvepalli Jaahnavi and K Indira, "Identification of Plant Disease using Image Processing Technique", International Conference on Communication and Signal Processing, April 4-6, 2019, India
[7] Shima Ramesh,Mr. Ramachandra Hebbar,Niveditha M, Pooja R, Prasad Bhat N, Shashank N,Mr. P V Vinod, "Plant Disease Detection Using Machine Learning", International Conference on Design Innovations
[8] Surender Kumar,Rupinder Kaur, "Plant Disease Detection using Image Processing-A Review"International Journal of Computer Applications (0975 – 8887)Volume 124 – No.16, August 2015.
[9] Pooja V, Rahul Das and Kanchana V, "Identification of Plant Leaf Diseases using Image Processing Techniques", IEEE International Conference on Technological Innovation in ICT for Agriculture and Rural Development 2017.
[10] Xin Yang, Tingwei Guo,"Machine learning in plant disease research" European Journal of BioMedical Research, ISSN: 2428-5544, 2017.
[11] Sachin D. Khirade,A. B. Patil, "Plant Disease Detection Using Image Processing"International Conference on Computing Communication Control and Automation-2015.
[12] Utkarsha N. Fulari, Rajveer K. Shastri, Anuj N. Fulari, "Leaf Disease Detection Using Machine Learning" Journal of Seybold Report ISSN NO: 1533-9211
[13] Mohammad Reza, Ezzatollah Askari, Ehsan Kozegar, Reyhaneh Loni, "Evaluation of Image Processing Technique in Identifying Rice Blast Disease in Field Conditions based on KNN Algorithm Improvement by K-means", © 2019 The Authors. Food Science & Nutrition published by Wiley Periodicals, Inc.

THE ROUTER MODULE INTEGRATION AND SIMULATION RESULTS

KHAMER UNNISA H[1], Dr.C.V.RAVISHANKAR[2], Assistant Professor[1], Head Of the Department[2]

Department of Electronics & Communication, Sambhram Institute of Technology
Hesaraghatta Rd, M.S.Palya, Via, Jalahalli East, Bengaluru-560097
[1]khamer199324@gmail.com
[2]echodsait@gmail.com

Abstract **- Router is a networking device that forwards the data packets between the computer networks. Routers perform the traffic directing functions on the Internet. Then, using information in its routing table or routing policy, it directs the packet to the next network on its journey. With the router made up of four submodules, FIFO, Register, Synchroniser and FSM, that helps in directing the packets from source to destination and also maintaining faithful communication among the submodules. It also matches the parity byte of incoming packet to ensure the integrity and stores the packet in the FIFO until is read by the destination.**

Keywords – Router, FIFO, Synchronizer, FSM, Register

I. INTRODUCTION

Router 1*3 follows packet based protocol and receives the network packet from the source LAN on data_in on a byte by byte basis on an active posedge of the clock. Resetn is an active low synchronous reset. The start of a new packet is indicated by asserting a pkt_valid and end of the current packet is indicated by deassertion of pkt_valid. The design stores the incoming packet inside a FIFO. The design has got 3 FIFOs for the respective destination LAN. The Destination LANs will monitor valid_out_x (x can be 0,1 or 2) and then asserts read_enb_x(x can be 0,1 or 2). The packet is read by destination LANs through data_out_x channel (x can 0,1 or 2). The router sends a busy signal to the source LAN indicating the busy state, so that source has to wait to send the next byte of packet. If there is a mismatch between the parity byte send by the source and the internal parity calculated by the router, the error signal will be asserted and the source LAN will resend the packet. The design can receive only 1 packet at a time, but 3 packets can be read simultaneously.

ROUTER PACKET: The packet consists of 3 parts: payload, header and parity. Header: It consists of two parts Address (2 bits) and payload length (6 bits). The router drives to the respective destination based upon the address. (LAN 0[00], [LAN 1[01], LAN 2[10]). Invalid address is 11. The length of data is 6 bits. A packet can have minimum data size of 1 byte(Length=1) and maximum data size of 63 bytes. (Length=6). Payload is data information. Data should be in terms of bytes. Parity is security check of the packet. It is calculated as bitwise parity over header and payload bytes of the packet.

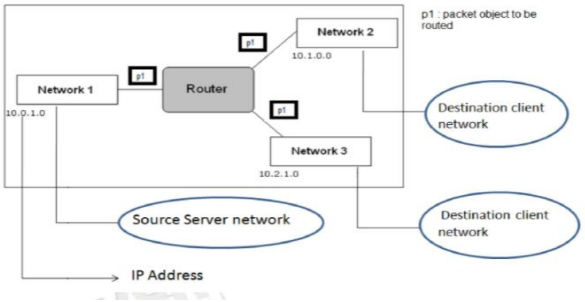


Fig.1 Router

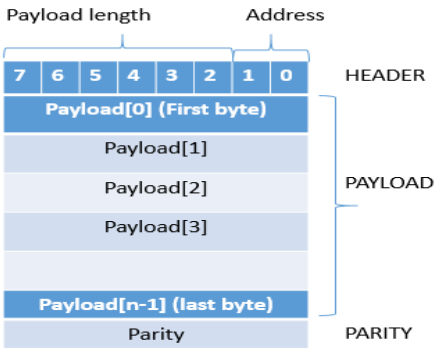


Fig.2 Router packet

All input signals are active high except for active low resetn signal and are synchronized to falling edge of the clock. This ensures adequate setup and hold time. Because DUT router is sensitive to rising edge of the clock.

ROUTER INPUT PROTOCOL:

When header byte is received on the input data bus, pkt_valid goes high. This byte tells the router to which output channel the packet has to be routed. Each subsequent payload byte has to be driven after header byte to the input data bus on the

falling edge of the clock. After the last payload byte is driven, pkt_valid has to be deasserted and packet parity has to be driven. This signals completion of the packet. A busy signal asserted drops any incoming byte of data. Instead it should hold the last driven value. And error signal when asserted signals packet parity mismatch.

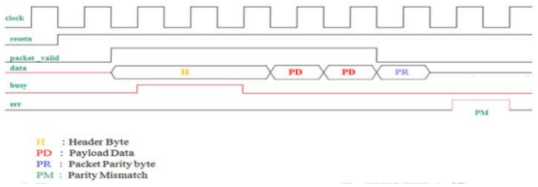


Fig.3 Router input protocol

ROUTER OUTPUT PROTOCOL: All output signals are active high and are synchronized to rising edge of the clock. Each output data_out_x (x is 0,1 or 2) is internally buffered to FIFO of size 16*9. The router asserts valid_out_x signal when there is valid packet byte is present in the FIFO and appears on the output data bus. This is an indication to the destination LAN to enable the read_enb_x. The destination will wait until it has enough space to hold the bytes of packet and then responds with an assertion of read_enb_x. The read_enb_x can be asserted on the falling edge of the clock and the data can be read from data_out_x. The read_enb_x must be asserted within 30 clock cycles of valid_out_x being asserted else timeout occurs and the FIFO will be reset. The data_out_x will be tristated in the condition when the packet byte is lost due to time out condition.

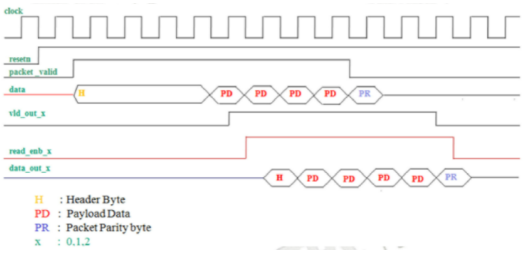


Fig.4 Router output protocol

II ROUTER MAIN DIAGRAM

Router module consists of the following sub-modules like 3 FIFO's, Synchronizer, FSM, Register. There are 3 FIFO's for three destinations LAN1, LAN2, LAN3. The FIFOs are storing the incoming packets from the source LAN to forward to the destination LAN based on the address carried by packet. The FSM consists of control signals and helps in controlling the driving of packets based on the conditions. Synchronizer maintains faithful communication among the submodules and also synchronizes the packet driving to the respective FIFOs. Register is a loadable counter that loads the packets to the respective FIFOs based on the control signals from FSM. It works for 1 source and 3 destinations. The coding for each sub module is written in Verilog and test bench is written to verify the same.

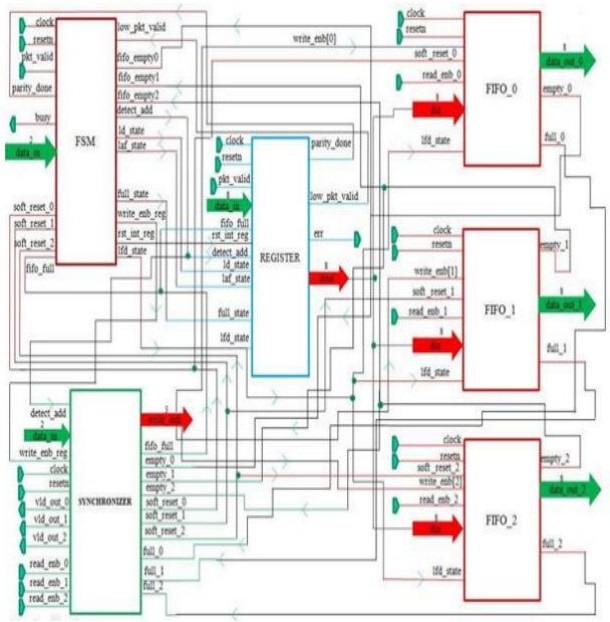


Fig.5 Router main diagram

III ROUTER-FIFO

There are 3 FIFOs in the router design. Each FIFO is 9 bits width and 16 bits as depth. The FIFO works on system clock and is reset with synchronous active low reset. The FIFO is internally reset by an internal reset signal called as soft_reset which is an active high signal generated by synchronizer block during the timeout state of router. If is resetn=low, full=0, empty=1 and data_out=0. The FIFO memory size is 16*9, The extra bit in the data width is appended in order to detect the header byte. The lfd_state detects the header byte of packet. The 9th bit is 1 for header byte and 0 for the remaining bits. Signal data_in is sampled at the rising edge of clock when write_enb is high. Write operation takes place when FIFO is not full to avoid over_run condition. The data is read from data _out at the rising edge of the clock when read_enb is high. Read operation taken place when FIFO is not empty in order to avoid over run condition. During read operation, when header byte is read, an internal counter is loaded with payload length of packet plus "1"(parity byte) and starts decrementing every clock till it reaches 0. The counter holds 0 till is reloaded back with a new packet payload length. During timeout state, full=0, empty=1. Data_out is driven to high impedance in two conditions. When the FIOFO memory is read completely (Header+Payload+Parity) and under the timeout state of router. When the FIFO all location is written, then full signal will be high. When the FIFO all locations are read completely then empty will be high. Read and write operations can be done simultaneously. The FIFO is designed as 16*8. The depth is 16 and width is 8. When all the

locations of FIFO are full, the FIFO is in full state. When all the locations are empty, then FIFO is in empty state.

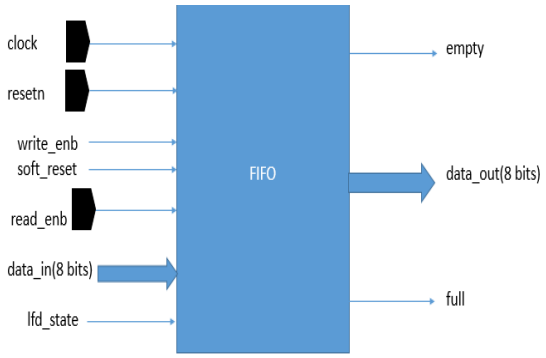


Fig.6 Router FIFO

IV ROUTER-SYNCHRONIZER

This module provides synchronization between router FSM and router FIFO modules. It provides faithful communication between single input port and three output ports. Detect_add and data_in are used to select a FIFO till a packet routing is over for selected FIFO. Signal fifo_full is asserted based on the full status of Fifo_0, fifo_1, fifo_2.

If data_in=2'b00 then fifo_full=full_0

If data_in=2'b01 then fifo_full=full_1

If data_in=2'b10 then fifo_full=full_2

Else fifo_full=0.

The signal valid_out_x is generated based on the empty status of fifo:

Valid_out_0=~empty_0

Valid_out_1=~empty_1

Valid_out_2=~empty_2

Write_enb_reg is used to generate write_enb signal for the write operation of selected fifo. There are 3 internal reset signals (soft_reset_0, soft_reset_1, soft_reset_2) for each FIFO respectively. The respective internal reset signal goes high id read_enb_x (read_enb_0, read_enb_1, read_enb_2)is not asserted within 30 clock cycles of valid_out_x (valid_out_0, valid_out_1, valid_out_2)being asserted respectively.

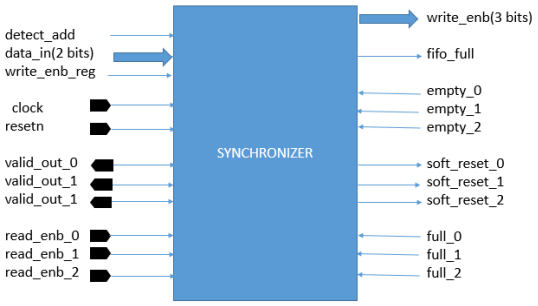


Fig.7 Router Synchronizer

V ROUTER- CONTROLLER

FSM module is the controller of the circuit of the router. This module generates all the control signals when a new packet is received by the router. These control signals are used by other design components in order to transfer the packet to the output packet.

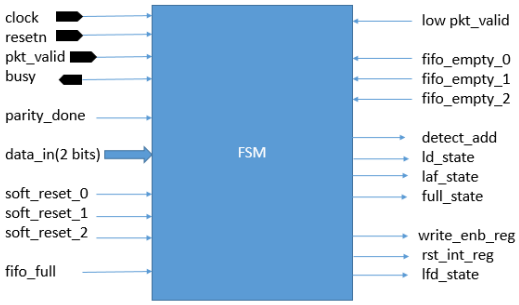


Fig.8 Router FSM

STATE-DECODE ADDRESS: This is initial reset state. Signal detect_add is asserted in this state which is used to detect an incoming packet. It is used to latch the first byte as a header byte.

STATE-LOAD FIRST DATA: Signal lfd_state is asserted in this state which is used to load the first data byte to the FIFO.

Signal busy is also is asserted in this state so that header byte that is already latched doesn't update to a new value from the current packet. This is state is changed to load_data unconditionally in the next cycle.

STATE-LOAD_DATA: In this state ld_state is asserted which is used to load the payload data to the FIFO. Signal busy is deasserted in this state, so that the router can receive a new data from the input source every clock cycle. Signal write_enb_reg is asserted in this state in order to write the packet information (Header+Payload+Parity) to the selected FIFO. This state transits to load_parity state when pkt_valid goes low and goes to fifo_full_state when FIFO is full.

STATE-LOAD_PARITY: In this state the last byte is latched which is parity byte. It goes to check_parity_error state

unconditionally. Signal busy is asserted so that router doesn't accept any new data. Write_enb_reg is made high for latching the parity byte to FIFO

STAE-FIFO_FULL_STATE: busy signal is made high and write_enb_reg is made low. Signal full_state is asserted which detects the fifo_full state.

STATE-LOAD_AFTER_FULL: In this state laf_state signal is asserted which is used to latch the data after fifo_full_state. Signal busy and write_enb_reg is asserted in this state.

It checks for parity_done signal and if it is high, shows that LOAD_PARITY state has been detected and it goes to STATE_DECODE ADDRESS. If low_pkt_valid is high, it goes to LOAD_PARITY state otherwise it goes back to the LOAD_DATA state.

STATE-WAIT TILL EMPTY: Signal busy is made high and write_enb_reg is made low.

STATE-CHECK_PARITY_ERROR: In this rst_int_reg is generated and this will reset the low_pkt_valid. This state changes to DECODE_ADDRESS when FIFO is not full and to fifo_full_state when FIFO is full. Signal busy is asserted in this state.

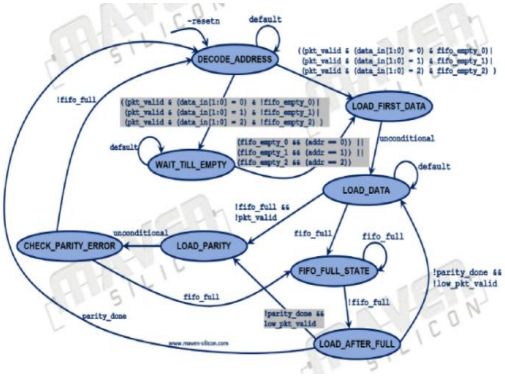


Fig.9 Router State diagram

VI ROUTER-REGISTER

This module implements 4 internal registers in order to hold header byte, FIFO full state byte, internal parity byte, packet parity byte. All the registers in this module are latched on the rising edge of the clock. If resetn is low, then the signals (parity_done, low_pkt_valid, err, dout) are made low. The signal parity_done is high under two conditions: When signal ld_state is high and signals (fifo_full and pkt_valid) are low and when signals laf_state and low_pkt_valid both are high and the previous value of parity_done is low. Signal rst_int_reg is used to reset the low_pkt_valid. Signal detect_add is used to reset parity_done signal. Signal low_pkt_valid is high when ld_state is high and pkt_valid is low. The low_pkt_valid shows that pkt_valid for current packet has been deasserted. First data byte i.e. header is latched inside an internal register when detect_add and pkt_valid signals is high. This data is latched to the output dout when lfd_state goes high. Then signal data_in i.e. payload is latched to dout if ld_state signal is high and the fifo_full is high. Signal data_in is latched to internal register when ld_state and fifo_full are high. This data is latched to the output dout when laf_state goes high. The signal full_state is used to calculate internal parity. Another internal register is used to store internal parity for parity matching. Internal parity is calculated by using the bit wise xor operation between header byte, payload byte and previous parity values as shown below:

Parity_reg=parity_reg_previous^header byte-------t1 clock cycle

Parity_reg=parity_reg_previous^payload byte1-------t2 clock cycle

Parity_reg=parity_reg_previous^payload byte2-------t3 clock cycle

.

.

.

Parity_reg=parity_reg_previous^payload byten-------tn clock cycle (last payload byte).

The err is calculated only after packet parity is loaded and goes high if the packet parity does not match with the internal parity.

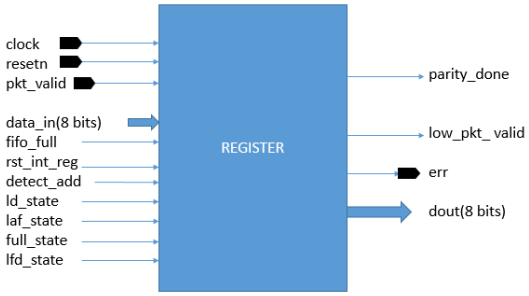


Fig.10 Router Register

VII. RESULTS AND DISCUSSIONS

The coding for FIFO, Synchronizer, FSM, Register are based on Verilog. All the sub module instances are called in the top module. The simulation results are obtained in ModelSim platform. The stimulus in test benches are been driven for each submodule and also verified for the same. Each submodule instance is called in the top module and stimulus is

driven in the test bench. This is integration of router top. The router top clearly shows the packet driven and forwarded to the respective destination and synchronization among all the submodules.

The simulation results for each sub module is as follows:

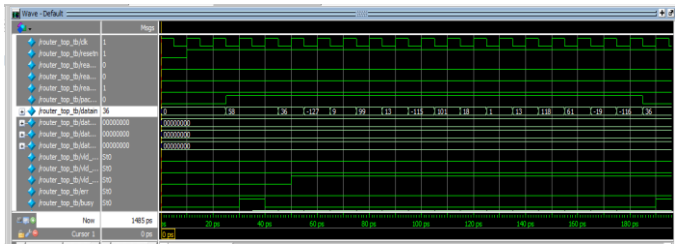


Fig.11 Simulation of Router top

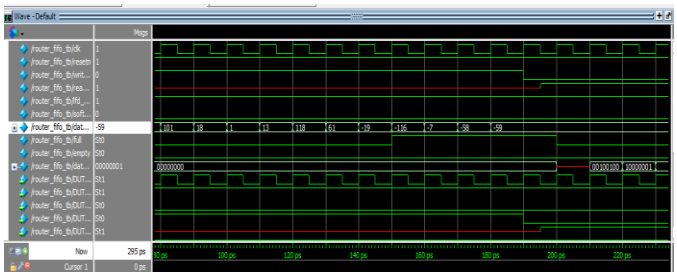


Fig.12 Simulation of Router-FIFO

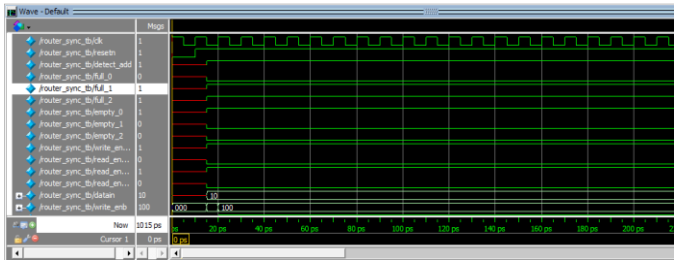


Fig.13 Simulation of Router-Synchronizer

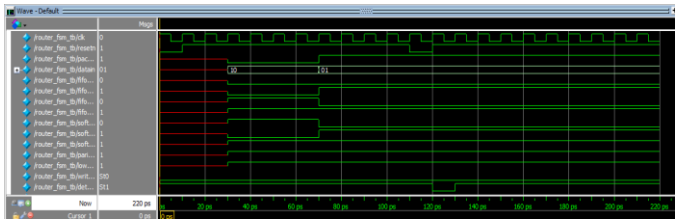


Fig.14 Simulation of Router-FSM

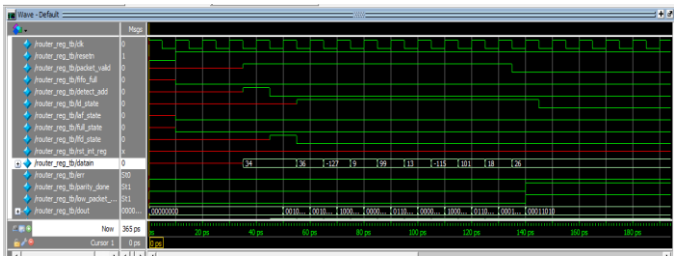


Fig.15 Simulation of Router-Register

VIII. CONCLUSIONS

The packet is driven from the input port and is routed to any one output port, based on the address of the destination network. An error detection technique that tests the integrity of the digital data being transmitted between server and client. This technique ensures that the data transmitted by the server network is received by the client network without getting corrupted. It is an active low synchronous input that resets the router. Under reset condition, the router FIFO's are made empty and the valid out signals are goes low indicating that no packet valid packet is detected on the output data bus. Router input and output protocol to be followed for sending and reading packet.

ACKNOWLEDGEMENT

I would like to extend my sincere gratitude to Megha Patil and Susmita for their help and support.

REFERENCES

[1] R.Deebalakshmi, Dr.V.L.Jyothi, "Intelligent Packet Delivery in Router Using Structure Optimized Neural Network", International Journal of Electrical Engineering and Computer Science, 2502- 4752,2018.

[2] R.Deebalakshmi, Dr.V.L.Jyothi, "Smart routing based on network traffic classification techniques and considerations", International Journal of Public Sector Performance Management, ISSN 1741- 1041Volume 5, Number 2 (2019) pp.222-236.

[3] Y. Yasuda, R. Nakamura, and H. Ohsaki, "A probabilistic Interest packet aggregation for content-centric networking," in Proceedings of the 2nd International Workshop on Future Internet Technologies (IWFIT 2018) (to appear), July 2018.

[4] M. Handley, "Delay is not an option: Low latency routing in space," In ACM HopNet, 2018.

FACIAL AND VOICE RECOGNITION BASED SECURITY SYSTEM TO DOOR

(HARSHINI T, PAVAN K, PRAVEENA B, MOUNIKA S)

Electronics and Communication Engineering, Srinivasa Ramanujan Institute Of Technology, Rotarypuram , Anantapuramu, 515701, Andhra Pradesh, India.

174g1a0425@srit.ac.in

ABSTRACT-The principle topic of our task is to give security to the entryway by utilizing a facial and voice acknowledgment based framework. our framework will catch the essence of the individual who needs to open the entryway and afterward it contrasts the caught face and the beforehand put away face in the information base in the event that it is coordinated, the individual can go to the second step of the check assuming the face isn't coordinated, the picture of the unapproved individual will be shipped off the higher specialists mail id by utilizing IoT. Assuming the face is coordinated, the individual will go into the second step confirmation then the individual needs to provide voice orders through the voice module. If the voice order got by the voice module is coordinated with the recently put away voice orders then the second step check is effective. On the off chance that the voice order isn't coordinated, SMS is shipped off the higher specialists utilizing the GSM module. Then, at that point he needs to enter the secret word this is the last advance of check assuming the entered secret key isn't right, SMS will be shipped off higher specialists in the event that the entered secret word is right, the entryway will open.

Keywords- Face recognition, voice recognition, Keypad, GSM module, Door lock module.

INTRODUCTION

These days, such a lot of are going through crucial safety problems; Thule, they want an incredibly pre- organized now no longer many. Surveillance and safety structures. Nevertheless, this safety machine finally tumbles because of thriller key hacking or encoded or unscrambled information. In this way, to cope with such problems and to make sure the safety of the doorway biometric structures like face confirmation, iris confirmation are used. Among those Face discovery System is greater useful and clean to do moreover, it moreover perceived the unauthenticated character with out their understanding. Already the facial confirmation changed into achieved with the assist of PCA and LDA calculations. However there are numerous limitations to those calculations. The vital difficulty of the PCA calculation is that it's miles much less touchy to distinctive getting prepared information experience and it's miles in like way computationally exorbitant with excessive time complexity.The chief issue of the LDA calculation is just in case there's any selection within the gift or during any condition in a similar image the speech act of bumble rate is extended. A structure may be controlled and detected remotely/subsequently with the assistance of Windows IoT ten. Hence, the system is formed with Windows IoT 10 which may beat the shortcomings of the PCA (Principal half investigation) and LDA (Linear discriminant examination). Direct discriminant examination discourse is that the most worthy limit. changed speaker affirmation (ASR) structures acknowledge folks utilizing the articulations. contingent the chance of the application, speaker recognizing verification or speaker affirmation systems can be shown to figure either in text-ward or text-free modes. The essential objective of this security system is to confirm the prosperity of the access by perceiving unauthenticated folks and exploitation voice affirmation.

LITERATURE SURVEY

[1] Anil k.Jain "Longitudinal Study of Automatic Face Recognition", The two mystery premises of changed face confirmation are uniqueness and lastingness. This paper reviews the perpetual quality property by keeping an eye out for the going with: Does go facing attestation breaking point of top level constructions debase with sneaked past time among picked and question face pictures? Given that this is legitimate, what is the speed of decay w.r.t. the sneaked past time? While past evaluations have revealed defilements assessment, no formal certain assessment of giant degree longitudinal information has been driven. We direct such an assessment on two mugshot enlightening assortments, which are the best facial creating educational assortments thought to date the degree that couple of subjects, pictures per subject, and spent events. Blended impacts break faith models are applied to certified similarity scores from best in class COTS face matches to measure everyone mean the speed of progress in true blue scores over the long haul, subject-express impulse, and the impact develop enough, sex, race, and face picture quality. Longitudinal assessment shows that in spite of diminishing certifiable scores, 99% of subjects can, in any case, be seen at

0.01% FAR up to around 6 years sneaked past time, and that age, sex, and a race just indistinguishably influence these models. The method familiar here ought to with be on occasion repeated to pick age-invariant properties of face insistence as bleeding edge makes to even more plausible region facial creating.

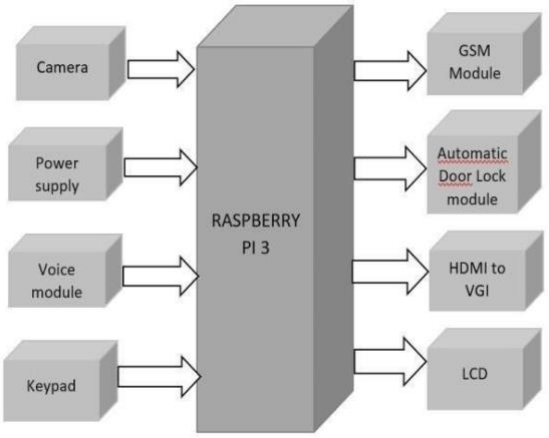
[2] Navaf Yousef almudhahka and Mark S. Nixon, "Programmed Semantic Face Recognition", Ongoing improvement in perception structures has animated exploration in sensitive biometrics that engage the unconstrained affirmation of human appearances. Relative fragile biometrics show common affirmation execution than unmitigated sensitive biometrics and have been the point of convergence of a couple of assessments which have included their ability for affirmation and recuperation in constrained and unconstrained conditions. These assessments, regardless, just would in general defy affirmation for recuperation using human-delivered attributes, offering an ice breaker about the believability of thusly making comparable names from facial pictures. In this paper, we propose a method for the adjusted near naming of facial delicate biometrics. Plus, we research unconstrained human face affirmation using these moderately sensitive biometrics in a human- stamped display (and the opposite way around). Using a subset from the LFW dataset, our investigations show the reasonability of the modified period of close to facial names, highlighting the normal extensibility of the best approach to manage other face affirmation circumstances and greater extents of characteristics.

[3] Hteik Htar Lwin, Aung Soe Khaing, Hla Myo Tun "Programmed Door Access System Using Face Recognition", This paper explains that how self-administering vehicles will act while opening the entrances with the help of face affirmation. There are different ways to deal with open entrances with the most insightful way yet facial affirmation will be generally secure as two people can never have similar appearances. This framework is using PCA (Principal Component Examination) which is used for facial affirmation, to genuine the supported individual for the vehicle.

Proposed system

In the proposed system, we are providing high-security system to the door by three-step verification. When a person wants to open the door of the room then the camera which is integrated with a Raspberry Pi captures the image of the person then the captured image is verified with the previously stored images in a Raspberry Pi SD card if both the images are not matched then the image of an unauthorized person will be sent to the owner mail I D by using SMPT protocol Otherwise he will enter into next step that is voice recognition now the person has to give commandif the given command and voice of the person is matched with the previously stored voice commands in the voice module then he will enter to the final step of verification that is password entering step otherwise SMS will be sent to the owner by using GSM module. Finally, if the password is correct, the door will open, otherwise, a message will be sent to the owner.

Block diagram of proposed system:



Components used in the Proposed System:

1.Camera

A digital digicam is an optical device that's used to get a photograph. At their all matters taken into consideration basic, cameras are constant boxes (the digital digicam body) with pretty opening (the outlet) that awards mild in to get a photograph on a mild-sensitive floor (commonly photographic movie or a well known sensor). Cameras have exclusive structures to manipulate how the mild falls onto the mild-sensitive floor. Focal shines shine the mild getting into the digital digicam, the dimensions of the outlet may be prolonged or restricted to present for all intents and functions mild permission to the digital digicam, and a display screen shape alternatives the quantity of time the photo touchy floor is familiar with the mild. The licensed photograph digital digicam is the imperative device withinside the electricity of pictures and regarded photos is probably imitated up straightaway as a bit of the instance of pictures, automatic imaging, photographic printing. The comparative innovative fields withinside the transferring photograph digital digicam location are movie, videography, and cinematography.

2.Power Supply

Reference to a wellspring of electric force. The framework that provisions electrical energy to yield burden or gathering of burden is called power supply unit. This segment is needed to change over AC signal to DC signal.

3. Voice Recognition Module

Voice Recognition Module is a restricted fundamental control talking insistence board. It's anything but's a speaker-subordinate module and supports up to 80 voice orders. Any strong could be pre-pared as solicitation. Clients need to set up the module first before seeing any voice demand. Voice orders are dealt with in one goliath get-together like a library. Any 7 voiced solicitations in the library could be brought into recognizer. It recommends 7 orders are powerful meanwhile. Particulars of Voice attestation module.

1) Voltage: 4.5-5.5V
2) Current: <40mA
3) Digital Interface: 5 V TTL level UART interface
4) Analog Interface: 3.5 mm mono-channel intensifier connector + collector pin between face
5) Recognition exactness: 99% (under ideal environment)
6) Support most outrageous 80 voice orders, with each voice 1500 ms
7) Maximum 7 voice orders practical at same time
8) Easy Control: UART/GPIO
9) User-control General Pin Output

4. Keypad

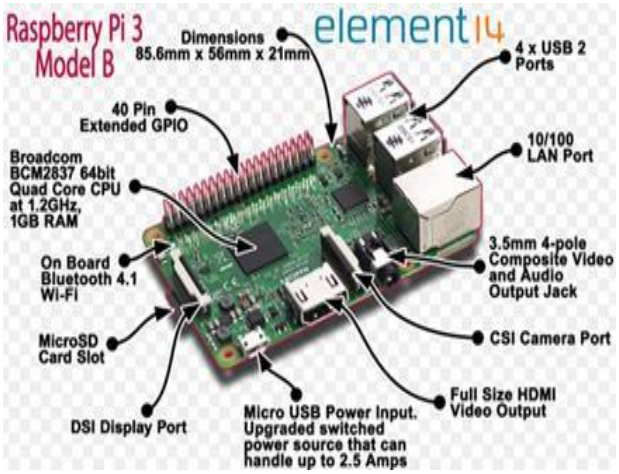
A keypad is a bunch of catches organized in a square that typically bears digits and different images however not a total arrangement of sequential letters.

5. GSM Module

GSM (Global System for Mobile interchanges) is a mobileular organization, which means that mobileular telephones interface with it through seeking out cells withinside the brief area. GSM networks paintings in 4 numerous recurrence ranges. Most GSM networks paintings withinside the 900 MHz or 1800mhz groups.

6. RASPBERRY PI:

The Raspberry Pi three is the contemporary interpretation of Raspberry Pi. It additionally encourages the tough display and Wi-Fi speed. The version has numerous equal specifications as its original, regardless, it brings the rate of the processor as much as 1.4GHz. Not honestly Processor but furthermore the corporation is in addition upheld upon this version. The version furthermore has a Micro USB connection for strength withinside the middle, a full- sized HDMI port, and a valid framework sound and composite video yield at the right.



7. HDMI to VGA:

This HDMI to VGA Adapter permits you to consistently streams content from HDMI gadgets like Apple TV, furthermore, other HDMI-fit gadgets to your projector, old screen, or other VGA show. It likewise incorporates an additional sound link to carry sound to your VGA gadget. VGA associations just convey visual data. The included sound link guarantees your substance shows up complete with sound.

8. Liquid Crystal Display:

LCD is a slim, level presentation gadget. The working voltage of this LCD is 4.7V-5.3V. Comprised of monochrome pixels showed in front of the light source. A Most regular gadget connected to a miniature regulator.

Future Scope:

In the proposed security structure, face assertion with Windows IoT 10 is gotten along with the voice certification framework for thriving reasons. Facial and voice attestation both are making improvements, with the assistance of these advances we can develop different things. Different calculations are made on the embodiment of confirmation, yet they have different weights. Google API is one of the fit frameworks in voice insistence which eats up less an ideal opportunity to change over any message into demand an embraced.

Conclusion:

The proposed system almost gives twofold security because of a mix of face affirmation with Windows IoT 10. Thusly, the face acknowledgment system with the help of windows IoT 10 improves the security of the room without-out permitting unapproved individuals to enter it. Expecting someone endeavors to open the entryway, then, at that point the photograph of the unapproved individual will be shipped off the higher specialists. The voice affirmation is moreover used for the prosperity of secure the room. In this manner, the

proposed structure is particularly valuable, effective for getting the room from unapproved individuals.

References:

[1] Automatic Door Unlocking System UsingFaceRecognition:https://thestempedia.com/project/automatic-door-unlocking-system-using-face recognition/amp/

[2] Face Recognition Door Lock SystemusingRaspberryPi: https://iotdesignpro.com/projects/face-recognition-door-lock-system-using-raspberry-pi

[3] Voice Recognition System and its WorkingOperation: https://www.elprocus.com/voice-recognition-security-system/

[4] Facial and Voice Recognition Based Security and Safety System in Car: https://ieeexplore.ieee.org/document/9197886

[5] Home Security System and Door Access ControlBasedonFaceRecognition:https://www.irjet.net/archives/V4/i3/IRJET-V4I385.pdf

[6] How to build a face detection and recognitionsystem: https://towardsdatascience.com/how-to-build-a-face-detection-and-recognition-system f5c2cdfbeb8c

[7] Facial Recognition TechnologyGuide:https://www.techfunnel.com/information technology/facial-recognition-technology/

[8] Facial Recognition using Deep Learning: https://www.cronj.com/blog/face-recognition-facial-recognition/

[9] 5 Pros and Cons of Face Recognition Technology: https://www.techfunnel.com/information-technology/5-pros-and-cons-of-face-recognition technology/

Waste Water Treatment For Agriculture Purpose

ASHWINI*[1], KAVITHA U[2], MUSKAN[3], SUCHITRA N NAIK[4] ,DR GANESH AITHAL[5]

Department of electronics and communication Engineering, Shri madhwa vadiraja institute technology and management bantakal udupi ,India

[1]ashwini.17ec010@sode-edu.in [2]kavitha.17ec026@sode-edu.in [3]muskan.17ec029@sode-edu.in [4]suchitra.17ec069@sode-edu.in [5]viceprincipal@sode-edu.in

Abstract **- Providing pure & drinking water to the needy is a big challenge. Water pollution is caused by different actions of day to day life. Wastewater from seafood processing operations can be very high in dissolved and suspended organic materials. Unpleasant odor and high temperature are also issues. Firstlty, filtering the waste water by screaning method. Next step is Organic filtering using cotton, sand, activated charcoal, pebbels/gravels. After that storing the water in earthen pot it includes tulsi and curry leaves. Then we are following Reverse Osmosis method. Reverse osmosis technique was used for the treatment of industrial waste water. The use of reverse osmosis (RO) to remove salts and impurities from water had been a recognized technology to improve water quality therefore it had a valuable application in the reuse of waste water. Final method is testing the PH and Temperature level of water.**

Keywords – organic filter, RO technology, quality testing

I. INTRODUCTION

Water conservation is one of the major concern of modern society. Water pollution is caused by different actions of day to day life. Science has always searching for wastewater treatement. As in most processing industries, Wastewater from seafood processing operations can be very high in dissolved and suspended organic materials. This results in high biological oxygen demand (BOD) and chemical oxygen demand (COD). Fats, oil and grease are also present in high amounts. Often suspended solids and nutrients such as nitrogen, amino acids and phosphate can be high. Unpleasant odor and high temperature are also issues.

The major types of waste found in seafood processing wastewater are blood, fish heads, shells, skins.usually waste water from fish industry is let directly into the near by ocean or river, but this water can further recycled to efficient use in agricultural land. Due to direct dispose of waste water to water resources different organs of fish will loose its nutrients so here we are recycling them into to use full fertilizer for agriculture land.

Reverse Osmosis filtration system works by forcing water through a special fine membrane to eliminate impurities that may not be visible to the naked eye. Reverse osmosis technique was used for the treatment of industrial waste water. The use of reverse osmosis (RO) to remove salts and impurities from water had been a recognized technology to improve water quality therefore it had a valuable application in the reuse of waste water streams.RO purifiers use less energy compared to other purifiers, resulting in lower consumption of electricity

II. PROBLEM STATEMENT

The total amount of waste water generated from all industries is about 83,048 mid. Total amount of waste water generated from fish industries is about 14,300 m3 daily. Fish industry out let of waste water is directly released to the environment without any treatment which contains high amount of pollutants and this water also has very high salinity. The waste water from fish industry affects human health and aqua life too. Organs of fish will loose its nutrients and fertility due to direct disposal for oceans

The use of waste water in agriculture has limitations due to the risks associated with the different routes of exposure, exposed groups and concentrations of various physicochemical and microbiological parameters. Thus soil as a means of receiving waste water ,the irrigation method ,the type of irrigated crop, the products consumed, farmers and their families and final consumers ,are exposed throughout the process chain.

III. OBJECTIVES

Recovery of fish sediments to produce fertilizer for agriculture land. Implementing organic filter and reverse osmosis technology to extract salinity, odour and neutralize coarse particles, so that quality of discharged water is improved to reach the permissible level of water to be discharged into for agricultural land. Improving quality and removing salinity of water for the best crop production in agriculture land.

IV. RELAVENCE OF WORK

Waste water use in agriculture is the associated decrease in pressure on fresh water sources. Reuse of fish organs as fertilizer. Providing good healthy environment to both humans and aquatics **.** Clean and adequate amount of water in reasonable time. Many areas of the world simply do not have enough water .All communities, especially are as with water scarcity , need to ensure they have good water treatment processes in place so that treated water can either be reused or returned to the water cycle, but never wasted .To optimize waste water reuse by taking into consideration various parameters such as return to farmers.

V. ISSUES AND CHALLENGES

Variations in water pH and temperature. Disequilibrium of nutrients. Waste water is normally produced continuously throughout the year , where as waste water irrigation is mostly limited to the growing season.

VI. LITERATURE REVIEW

2017, Bestoon M. Faqi-Ahmed , Nisar S. Oar, Karzan A. Omar The contamination of water by heavy metals become one of the most environment concerns worldwide, due to their toxicity and ability to accumulate in the food and human bodies.The two wastewater samples, crude oil wastewater, and desalted wastewater, have been filtrated through the designed nano-filter, the filtration each sample was carried out at roomtemperature,nanotechnology is extensively studied by researchers as an advance technique for waste water treatment as it offers potential advantages like low cost, reuse and highly efficient in removing and recovering the pollutant a novel nano-filter has been designed forthe purification from crude oil and desalted wastewater effluent from toxic heavy elements**.**

2016,Rahul Kumar, Abhishek Sharma, R.K. Malik: decorative a model of investigating the impact of waste water from railway industryrecommend a treatment method of those and to study the effect of the treatment of the industrial waste waters. the wastewaters from the locomotives repair industry and the method of treatment named dissolved air flocculation (DAF) are two ofobject of study. the first objective is toillustrate the affiliation between pollutants and industrial commotion. The second stride of this study was to product alteredhistograms to exhibit the influence of handling of waste waters on changed sticks such total solids adjourned , chemicaldemand in oxygen, pH, heavy metals, minerals, grease and diluents.The analysis of this process was made using Environmental Systems Analysis (ESA) method. ESA is frequentlyused to aid decision making in finding solutions to difficultenvironmental problems. In an ESA there are six steps **.**and the procedure is : problem definition, system definition; identificationof pollutants, model building, model application andevaluation of the methodological approach.illustrates the stages of ESA method(Environmental Systems Analysis method) applied in industrial activity of locomotives repairs to establish its impact on the water.The results of this analysis show that the use of a DAFwastewater treatment plant is appropriate.The evaluation of this solution is realized using the histangrams of most important indicators and solvents in different periods of time before and after implementation of treatment plant.

2019,Rejoice Malisa , Erwin Schwella, and Benjamin Batinge: Projections indicate a high-risk water stress levelin the Western Cape province of South Africa by 2040. reassessment of water management is paramount in ensuring water security for generations to come. Water managementapproach, which recognizes the value of thealternative water sourcessuch as Urban Wastewater recycling (UWWR) amid shrinking surface water supplies is of the critical importance. The installation of amembrane bioreactor wastewater treatment technology was astep in the right direction, favoring the option to recycle the well treated effluent for the agricultural purposes. although there remain challenges pertaining to effluent produced. The agricultural industry is to benefit from mitigated water deficit through UWWR, since the study established that UWWR would maintain a water availability indexgreater than 1, which indicates that the water demand of the townwill be met without having to impose any restrictions on waterallocation to different sectors.

2017,Leo Hsu, M. Jamal Deen, Fellow, P. Ravi Selvaganapathy : Dissolved oxygen (DO) is essential for the aquatic life. But is consumed during the decomposition process of the organicmatter in water. It is used as a primary indicator of waterquality, and itis also crucial for the efficiency of the waste watertreatment process. Allthe electrochemical depositions and characterizations wereperformed using an EMSAT ectrochemical workstation and a standard three electrode setup. The electrochemical system consisted of areference electrode, a stainless steel counter electrode, and working electrode. Two different reference electrodes were used in this work commercial Ag/AgCl (CH instrument, China) used when characterizing the Pd/H electrode andPd/H reference electrode synthesized

in this work was usedto test the oxygen sensor. Control of the electrochemical workstation and data collection wereall performed by PS tracer 3.0. the potentialof this Pd/H reference electrode system can be influenced bythe pH of sample solution, Pd/H is stilla adequate for drinking water sensing since the pH variation is small in drinking water.

2019,**MohammadRezaMohebbian,khana.wahid:**the factors contribute to plant growth and soil quality when the water is re-used for agriculture purpose. controlling system based on the electrical conductivity of the wastewater for use in irrigation plants.salinity and heavy metal saturation in using wastewater for irrigation purposes. consider electrical conductivity of water as a gold standard and predict electrical conductivity to estimate the salinity and heavy metal of water.limitation, is, is the controller parameters based on various kind of plants. It will be useful to add a risk assessment to the system for a different kind of plant and report the risk factor which is the focus of our future activity. The proposed method is accurate and can be used for predicting wastewater quality in several month earlier.

2018,Yudi E. Windarto,Agung b prasetijo: Industrial waste is one of the causes of water pollution these waste requires periodic and continuous surveillance so it can be followed for specific treatments. LORA (Long Range) technology for monitoring waste water based on geographic information system. Sensors used are turbidity, pH, and temperature sensors. Hardware Design The hardware design has temperature sensor, turbidity sensor, PH sensor, a microcontroller (Arduino Uno) and shell (Dragino), and gateway LORA. The reading of the Dragino for the sensor data will be forwarded and stored temporarily on LORA gateway before being forwarded to server through the internet. The data available on the server can be accessed by the clients through web browsers in which it is displayed at the GIS-based application at geographic areas.software design is used to provide a clear step for creating the program which displays data from hardware The system can accurately display waste water data from the factories.. The system works well sending alerts to the factory owner when the waste water conditions exceed thresholds set.

2019,Jabulile Kgomo,AubreyNgobeniwaste Water Treatment Plants (WWTPs) consume a lot of electricity as compared to other municipality buildings. heat generated will be used in the treatment processes, while electricity will complement energy consumption of the plant, reducing operation cost and GHG emission. It is expected that electricity will be reduced .The CHP system is a feasible option for data centers to meet and expand energy demand, reducing energy costs, energy security and ecological concerns. Eco-generation is becoming a preferred method to produce power and energy requirements for the industries. Different co-generator uses different inputs as the source of energy . The bio-gas produced from the sludge and stored at the gas storage needs to be cleaned first, to meet the fuel gas specification of the CHP. The bio-gas needs to meet or comply with the Air Quality Act to prevent damages on the system. CHP is one of the technologies that will assist in solving the above-mentioned challenges by generating electricity from the harmful biogas waste from WWTP to complement the plant's energy consumption.

HeqinXing the rapid development of modern industry, pollution in sewage was including oil and heavy metal ions. liquid and the leakage of tanker and oilcan have become more and more serious issue. Valid reclaim technology and the research and development of decontaminated materials for the waste water have attracted more and more attention .the result of incompatible system of oil and water, are mutually exclusive. the force between oil and water expanded the room of cross-linked network when oil contacted with the water inside the composite. . The expansion of ion-exchange resins by absorption water can also gave an acting force to composite.. The purified water returned to original solution after exchanging ion, and the room space originally occupied by the water was reapportioned by the oil and water which were adsorbed in the composite newly.new sewage treatment material was prepared by melt blending, the composite was a laminated structure. suspension of the interface of diesel oil and water to adsorb diesel oil and heavy metal ion simultaneously. Design of Combined Heat and Power for Waste Water Treatment Plant.

2009,Wang Bing, Han Hongjun ,TianWende, Liu Shuo: the study granule activated carbon was adopted as carrier to speed up cultivation of granular sludge in VASB reactor treating beer waste water. laboratory scale up flow Anaerobic Sludge bed reactor (UASB) was set for experiment. Temperature was controlled by temperature controller and resistance wires enlacing outside of reactor for heat preservation. The influent was pumped into the bottom of the reactor by a peristaltic pump, effluent was withdrawn from the upper outlet and the gas production was calculated by wet type gas meter. Samples withdrawn from the reactor and analyzed the variations. PH was measured SS and VSS concentration were measured by standard weight methods. Sludge particle diameter was measured by wet sieving method. Gas production was calculated by wet type gas meter.. The formative mechanism ofthe granular sludge without activated carbon core accorded with second nuclear theory.

2017,D.Vakula,Yeshwanth Krishna Kolliwaste water treatment plan work optimally under certain parameters ,hence sensors can be used at a different

stagesofwatertreatmentforautomation.Thepaperpresentsimpo rtance and necessity to recycle the waste water and provides solution for automation of waste water treatment plant. There are four stages in treatment of Waste Water Initial Screening, Primary Treatment, Secondary Treatment and Tertiary Treatment. Initial Screening removes all the objects all diameter greater thanthe 20 mm. Primary Treatment solids are made to settle by the sedimentation and are removed from waste water. The secondary Treatment use the biological process to further purify water. In Teritiary Treatment the oxygen levels are increased and foul odourhas removed. The reuse of recycled water decreases the usage of drinking water for these purposes which indirectly helps in decrease of water scarcity. The deployment of sensors in the waste waster treatment plan leads tothe automation of the plant which leads to efficient use of the plant. By smart waste water treatment biggest challenge of water scarcity for smart cities can be solved completely

21 dec 2018,Noudeng vongdala,hoang-dung ran the management of municipal solid waste (MSW) is challenge for urban environment .the MSW landfill is located in a suburban area.thus open dumping and unsanitary waste landfills are pressing issue. Groundwater and soil samples were gathered from inside and outside od land fill. In addition two plant speices aquatic and the grass pennisetumpurpurem (elephant grass) were also collected from the land fill and sourrouing areas frequent monitoring of surface water groundwater and soil quality is necessary to determine the pollution levels and possibly initiate remedial measures.government should pay attention to improving landfill systems such as waste water and leachate treatment systems.

18 oct 2018,Messayemana,mekibibdawitait works in two stages anaerobic sequence batch reactor (ASBR) at mesophilicand thermophilicphase .industrialization has resulted in form of huge amount of waste products which released into environment in form of waste water leading to environment pollution and deterioration.tannery waste water sample is collected using plastic bags .the two reactor in operated in same temperature. Each reactor has total liquid volume of 2.8L. objective of first stage was good sold settlement of composite tannery waste and was stretched up to the bottom of solution to second stage while the second hose was placed above the solution.the two steps collects the unwanted gas from digester and controls temperature.this method has great potential for treating waste water.

2018,ZahoorAhmad,Rubab Khalid every developing countries have a poor waste water management infrastructure. The waste water from various source results in degraded quality of surface water which poses adverse effects on ecosystem and human socio-economic needs in ways.hardware float setup is capable of monitoring various water quality.the details regarding sensor probes except for turbidity probe.all sensor provide data through UART to microcontroller which is analog output.wireless sensor can replicate the conventional method of collecting sample from water bodies then analyzing in labs.fixed sensors it monitors high resolution spatially distributed water quality data in real time

9 May 2019,Pilaiwin phutpattanasilp,sheau-ru tong:the paper introduces the exact use of augmented reality (AR) as the support to iot data visualization called as AR-Iot this system is applied to crop monitoring multi-camera,anon destructive and low cost imaging platform of iot and it is connected to the internet and integrated system to measure the three-dimensional(3D) coordinates of objects.main objective of AR-iot is to implement monitoring tasks using the different angle visualization.a farmer can interact with physical objects as well as iot information virtually attached to them.the proposed ar-iot includes 2 models which is iot and AR. The first is based on sensor technologies and the second is AR module is deployed to provide a 3D visual rrepresenting in physical world.

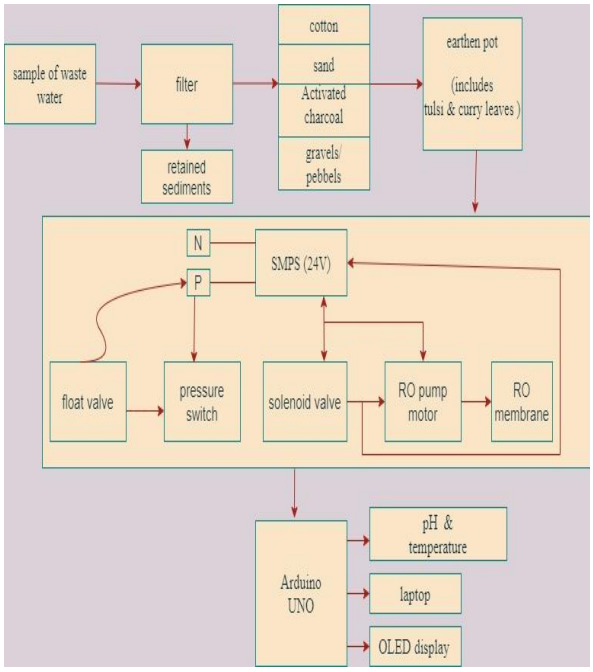
2017,Ravikishorekodali :water being a vital resources for the life on earth is under a serious threat of scarcity with increase in population. The paper depicts the need for waste water treatment and also compares centralized and decentralized way of waste water treartment.to keep the waste water treatment plant running certain parameters must be monitored regulary.hence different sensors at different stages of treatment plant can be used.methodology works on three main steps primary treatment follows screening the removal of coarse solids.secondary treatment follows activated sludge system which produce biomass in presence of oxygen.in this level ponds and lagoons systems also makes a contribution to treatment of waste water.tertiary treatment in which small amount of phosphrous are removed .for continuous running of plant,continuos monitoring is required.

2017,S.shanmugan,c.suresh Remove contamination of new techniques barriers for the ultilization of sullage waste water treatment of produce in processing can be high way service of H2O at the same moving to waste water is for all disposal in solar still. Experimental analysis of solar still have been produced in more energy saving to internal heat transfer to high way service with help to nanoparticle(AL203) to a solar still .the sullage water to the basin area of solar still have been used at least water depth in the nano particle mixed a basin area to induce faster evaporation.

2009,F.M.sanchez,A filgueira: when calculating how much it costs to run and maintain a waste water treatment plant(WWTP) the main expense is only energy, which is

usually 38-40% of the total cost. Therefore essential to save energy in WWTI in order to raise profits, increase production and reduce toxic waste . the audit model proposed makes it possible to get to know plant better and take appropriate steps tp improve its performance in terms of the energy.And also the energy calculation is done in this study firmly supports the use of biogas this model provides the managers at WWTP with a justification for investing in making the most of residues. Another reason for backing this idea goes beyond the plant itself:saving energy in this way is of universal benefit.firstly to encourage to encourage local authorities to exploit the use of anaerobic digestion to produce energy in technical specification .secondly it is time to develop a management plan for residues and biodegradable waste including sludge from treatment plants within regional governments.

VII. PROPOSED METHODLODY



The purification of waste water from fish industries works in four steps

sample of waste water collected from fish industries (consists odour, fins,scales,gills and also different colour from normal water) .

1.Seperation waste and water:Removal of sediments by simple filtering of waste organs of fish(scales,finsetc). These sediments let into a dryer. The dried sediments are recovered and utilized as fertilizer.

2.Ogranic membrane which mainly consists of 4 layers

a. Cotton

b.sand

c.activated charcoal.

d. gravels/pebbels

output water will be dropped in to earthen pot which consist of curry and tulsi leaves this process is followed for better odour. earthen pot acts as a storage and also brings down temperature.

3.Reverse osmosis: which plays a major role in removal of salt concentration. RO not only removes ionic salts but also removes colloidal matter and high molecular weight .

Installation:SMPS(24v): switch mode power supply which transfer DC or AC source to DC loads. It has high power conversion efficiency.

Float switch: it is a type of level sensor used to detect level of liquid wihin a tank.

Pressure switch: form of a switch that operates an electrical contact when a certain set fluid pressure has been reached on its input.

Solenoid valve: the pressure of medium supports the opening of membrane.it is operated without a pressure differential between the inlet and outlet.

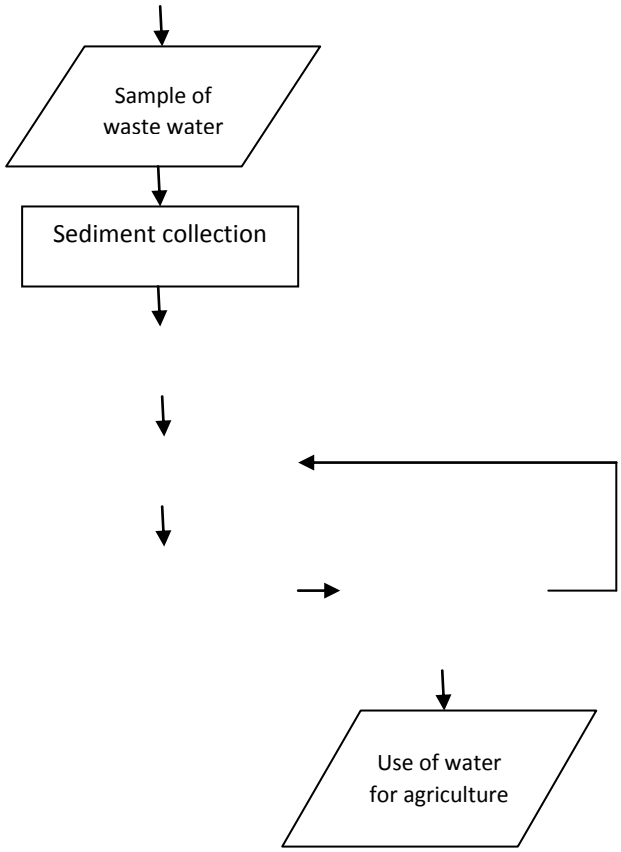
Ro motor pump: process that uses partially permeable membrane to separate ions ,unwanted molecules and larger particles from water.

RO membrane: which uses partially permeable membrane to separate ions,unwanted molecules and larger particles from water

4.Temperature test and ph test: normal pH range for irrigation water is from 6.5 to 8.4.Irrigation of with pH outside the normal range may cause a nutritional imbalance or may contain toxic ion.pH sensor kit and temperature sensor is interfraced with arduino UNO, connecting wire, OLED display.

VIII. FLOW CHART





IX. RESULT AND DISCUSSION

it is hoped that higher efficiencies and effectiveness of the system would allow less waste and better recycling of resources. Production of electricity from purified water. Implementation ultraviolet water disinfection technology for pure drinking water.

COUNCLUSION

- To define water management strategies in fish industries and technical solutions in water treatment and monitoring.
- The efficient recovery of fish sediments to reusable product.
- Reduce challenges faced through waste water from fish industry.

REFERENCES

[1] Bestoon M. Faqi-Ahmed , Nisar S. Oar, Karzan A. Omar design a new nano filter for purification of polluted water,2017.

[2] Francesca m kerton ,Kellyhawboldt renewable resources from the ocean 2014 IEEE.

[3]Song Yajing, XieYuebo "Eco-friendly Domestic Sewage Treatment withBacterial Technology" page no:1294-1297, 2011 IEEE .

[4] HarinarayananNampoothiri M G, Manilal A M, Godwin Anand P S "Artificial Neural Network Based Control ofElectrocoagulation based Automobile Wastewater Treatment Plant" 2018 IEEE.

[5] S. Shanmugan a, C. Sureshb M. V. Bharath, D. S. Akashrajab "Sullage Treatment of Full Solar Energy ProcessHigh way Service of H2O in Nano Particles - Solar Still Waste Water" page no:1914-1919IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI-2017).

[6] F.M. Sánchez, A. Filgueira, M.A. Seijo "Energy Audit Model for a Waste WaterTreatment Plant" page no:5

[7] FayçalGaied, BoulbabaLouhich Mohamed Raza Elect IEEE

[8] Leo Hsu, M. Jamal Deen and P. Ravi Selvaganapathy "Complete Solid State Dissolved OxygenSensor Using HeminElectrocatalyst and Palladium-Reusable Reference Electrode" page no:941-9472018 IEEE

[9] Rejoice Malisa , Erwin Schwella, and Benjamin Batinge "Augmenting Water Supplies Through UrbanWastewater Recycling" 2019 IEEE.

[10]Times Series Prediction used in Treating Municipal Wastewater for Plant IrrigationMohammadReza Mohebbian Electrical and Computer Engineering Department, University of Saskatchewan, Saskatoon, SK, Canada mr.mohebbian@usask.ca Khan A. 2019,IEEE.

[11]Analysis of HV Plasma Corona Reactor Treatment System for Industrial Waste WaterNayab Pervez, Abdur Rashid, AdilHabibAlam Department of Electrical Engineering, COMSATS Institute of Information Technology, Abbottabad, Pakistan.2016,IEEE.

[12]A GIS-based Waste Water Monitoring System Using LoRa Technology Yudi E. Windarto Department of Computer Engineering Diponegoro University Semarang, Indonesia,2018 IEEE.

[13]Design of Combined Heat and Power for Waste Water Treatment PlantJabulileKgomo Department of Electrical Engineering Tshwane University of Technology Pretoria, South Africa .2019,IEEE.

[14]Preparation and Properties of Environmentally Friendly Water Treatment Material HeqinXing College of Quartermaster Technology Jilin University Changchun, China 2009,IEEE.

[15]Waste Water Management for Smart Cities D.Vakula and Yeshwanth Krishna Kolli Department of Electronics and Communication Engineering National Institute of Technology, Warangal Telangana, India – 506004 2017,IEEE.

[16]Study on Anaerobic Granular Sludge in Beer Waste Water Treatment Wang Bing, Han Hongjun*, TianWende, Liu Shuo, Ma Wencheng State Key Laboratory of Urban Water Resources and Environment (SKLUWRE), Harbin Institute of Technology, Harbin 150090, China,2009,IEEE.

[17]Smart Waste Water TreatmentRavi Kishore Kodali Department of Electronics and Communication Engineering National Institute of Technology, Warangal WARANGAL, INDIA 506004.2017,IEEE.

[18] NoudengVongdala 1, Hoang-Dung Tran 2, Tran Dang Xuan "Heavy Metal Accumulation in Water, Soil, and Plantsof Municipal Solid Waste Landfill in Vientiane, Laos" MDPI 2019

[19] PilaiwanPhupattanasilp 1 and Sheau-Ru Tong "Augmented Reality in the Integrative Internet ofThings (AR-IoT): Application for Precision Farming" Sustainability 2019, 11, 2658

[20] Zahoor Ahmad, Rubab Khalid, Abubakr Muhammad "Spatially Distributed Water Quality Monitoringusing Floating Sensors" page no:2833-2838 2018 IEEE

[21] Khin Mar Yee, Kyi Lint Department of Higher Education "Determining Spatial and Temporal Changes of Water Quality in HlaingRiver using Principal Component Analysis" IEEE xplore 2020

[22]Messay Emana1 and MekibibDawita2 "Tannery wastewater treatment using two-stageanaerobic sequence batch reactor (ASBR) atmesophilic and thermophilic phase" 2019

.

Infant Monitoring Through Smart Cradle

[1]Ravi Shankar, [2]Ameeth Ashok Pattanashetti , [3]Hemanth R, [4]Manjunath R
Department of Electronics and Communication, Sapthagiri College of Engineering
ravishankarmn@sapthagiri.edu.in, amithashok125@gmail.com,
hemanthr96@gmail.com, manjunath95gsc@gmail.com

***Abstract*—The number of working mothers has risen significantly. Infant care has subsequently become a daily struggle for many households. Most parents thus send their children to the residence of their grandparents or to nursing homes. However, under normal or exceptional circumstances, parents cannot constantly check the health of their kids. Things-based Infant monitoring system is thus suggested as an efficient and low-cost IoT-based monitoring system in real time. We have also suggested a new algorithm for our system that is essential to better care for Infants when parents are abroad. In the system developed, the Node Micro-Controller Unit Controller Board is used to collect data from the sensors and to be uploaded to the server through Wi-Fi. The system suggested uses sensors to monitor the essential characteristics of infant, such as ambient temperature, wetness and crying. The design of the system consists of a crib that swings automatically when the infant screams. Parents may also watch the status of their infants via an external webcam and switch to the fan and alter the cradle when the Infant weeps. The suggested prototype system was manufactured and tested to show cost-effectiveness and simplicity, and to guarantee safe operation that infant parents may use the network wherever and whenever they are. Finally, the Infant monitoring system has shown the effectiveness of monitoring the situation of the infant and the prototype surroundings.**

***Keywords*—Internet of Things (IoT), Node MCU, IP camera.**

I. INTRODUCTION

Currently, women's involvement in the developed countries has significantly risen, impacting childcare in many households. Both parents have to work because of the high living costs. However, they still have to take care of their kids and increase the burden and stress of the mother in particular. Working parents cannot care for their infants at all times. Either they send their kids to their parents or hire a nurse while they work. Some parents worry about their infants' safety while caring for others. To address these issues, an Infant monitoring system that can check the infant's health in real time is suggested. An Infant monitoring system consisting of a IP camera and a microphone with no coverage restrictions. It may transmit data and inform parents instantly of emergency circumstances, reducing the time required for dealing with such events.

Sudden Infant Death Syndrome (SIDS) is commonly known as crib death, since a large number of children who die from SIDS are discovered in their cot. Infants under 12 months of age are affected. Most fatalities from SIDS occur in children under 6 months of age. The risk of SIDS rises in winter or cold weather, when parents overheat their infants or put them beneath heavier clothes, thereby overheating them. Thus, if the room temperature is pleasant for an adult, it is also suitable for the infant. The Internet of Things (IoT) simply refers to an internet-connected network of things. It allows devices to transmit sensor data over the Internet without intervention. The IoT includes a number of devices and is expanding rapidly, since it is such a wide range. A prediction indicates that about 27.46 billion IoT devices will be active in 2020, while 80 trillion IoT devices will be accessible globally and will be linked wirelessly to the Internet by 2025. Millions of wearable sensors are extensively utilized in healthcare applications among these linked gadgets.

II. LITERATURE REVIEW

There are many systems designed to look after health of humans, particularly adults and aged person. The systems can be used to update health status, sending alerts and various other features. But this system cannot be practically used for Infants, due to some cautious measures. As Infants cannot give information about health condition. Crying is the only discomfort expression given by them. Therefore a particular healthcare system should be designed to take care of Infants.

In paper [1] Authors suggested a method for monitoring a person's heart rate and body temperature. Along with the Raspberry Pi and IoT, dedicated sensors are used to monitor the health state and save the collected data in the Blue mix cloud. The saved data is forwarded to a physician for health analysis and abnormality detection. The heart rate is determined using the KG011 sensor, while the temperature is determined using the DS18B20 sensor. The readings are then graphed on the IBM Watson IoT Platform. The author made an excellent point about employing sensors to communicate data to an IoT platform. This approach, however, is inappropriate for newborns, as their immune systems are weaker than those of adults. This wearable device may produce radiation, which may be harmful to Infants and induce adverse consequences.

[2] Discusses the design of a smart newborn cradle that provides a dependable and cost-effective Infant monitoring system. It contributes significantly by providing superior infant care. Nowadays, everyone is pre occupied with work; women, in particular, must manage domestic and professional responsibilities. After a long day's work, they must look after the home and the Infant. The

ISBN: 979-85-27243-61-1

Purpose of this study is to suggest a smart infant cradle that enables working mothers to watch their infants. This system is an implementation of the Internet of Things and Android. The android application is used to obtain a live image of the infant. A web camera is placed near the cradle to monitor the infant. It will continually take Infant pictures. Parents may monitor or observe their infants using an android application that connects to the internet .It notifies parents through instant message that the infant requires their attention. Parents may communicate with their infants using a specially built Android mobile device. It enables parents to manage many aspects of the cradle, such as playing music, sending voice recordings, and rocking the cradle. [3] developed this cradle to aid in home administration and reduce the intensity of labour for young parents, a new Infant basinet is created. This type of bassinet is capable of adapting to an Infant's state. The system is an automated cradle that assists the mother in providing adequate care to her infant while still handling other household chores. This system is particularly useful for infants, since we utilized a fluid sensor, which helps prevent diseases such as pneumonia and rashes caused by dampness. It assists parents in determining whether the mattress has become moist and the diaper needs to be changed. This may assist in providing adequate attention to the youngster. This article discusses the design and execution of a novel low-cost indigenous infant cradle. [4] designed E-Cradle which swings automatically when it detects crying sound and stops after few minutes i.e. after crying Sound is stopped .It has an buzzer embedded in the system which notifies the user when two conditions is met .First, the buzzer goes off when the mattress is wet, which Indicates the user to change the Mattress. Second, when the Infant cries for a long time, the buzzer notifies parents to have a look at the Infant .It is applicable only when the parents are near the cradle, as it only uses a buzzer alarm. It has drawbacks when the parents are away from home, for example when at work or traveling to other places.

III. METHODOLOGY

The proposed system monitors the various activities of the Infant. System consists of DC motor which will rotate (swing) cradle according to the given angle, considering the safety of the Infant. By checking the crying sound through sound sensor cradle automatically swings and turns off after a threshold time. An IP camera is used to monitor the Infant moments. A humidity sensor used for urine detection. DC fan is turned on automatically if the room temperature exceeds 28 degree Celsius. Node MCU is used to control and monitor the activities of the crib. In order to create communications between the user Smartphone and hardware Blynk server is used.

IV. COMPONENTS USED

The below block diagram represents the components of the cradle and working of each components is explained as follows.

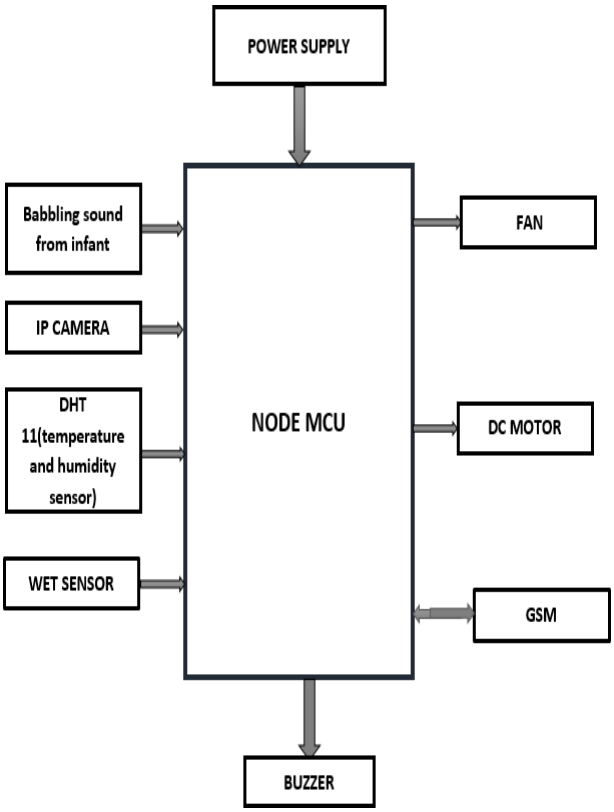


Fig 1. Proposed block diagram

A. Node MCU

It is an open source software and hardware development environment build around an inexpensive system-on-chip (SOC) called ESP8266.It has 17 GPIO pins, 2 UART interfaces (UART0 & UART1), 2 SPI pins and control pins.



Fig 2. Node MCU

B. Buzzer

It is an audio signaling device which consists of positive and Negative terminals. It may be mechanical, electromechanical orpiezo electric .It can be used in alarm devices, timers etc.

ISBN: 979-85-27243-61-1

C. Sound sensor

It is a type of module used to detect the sound. Generally, this model is used to detect the intensity of sound .Employs a microphone picked detector and an amplifier. This sensor is capable of determining noise level between 3-6 kHz frequencies approximately.

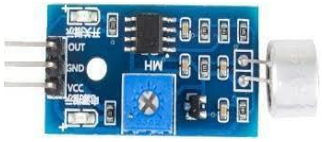


Fig 3. Sound Sensor

D. IP camera

An IP camera or Internet Protocol camera is a type of digital video camera that receives data and sends image data via an IP network. Mostly used IP cameras are webcams.



Fig 4. IP camera

E. DC Fan

DC fans are direct current fans are powered with a fixed value such as the voltage of a battery. Voltage values for DC fans are 5 Volts, 12 Volts, 24 and 48 Volts .It consumes up to 70% less energy to produce the same output as AC fan types.

F. Relay

An electrically operated switch is known as relay .It mainly consists of a set of input terminals and a set of operating contact terminals. These are used where it is necessary to control a circuit by independent low power, or where several circuits must be controlled by one signal.



Fig 5. Relay

G. DC Motor

DC motor converts direct current electrical energy into mechanical energy. It is used in Electrical vehicles, elevator, hoists and in drives for steel rolling mills. They also work well in dynamic braking and reversing applications, which are common in many industrial machines.

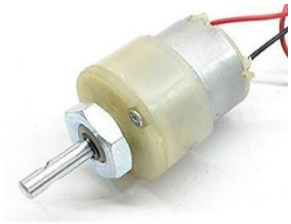


Fig 6. DC motor

H. DHT 11 Sensor

It is most commonly used temperature and humidity sensor, which outputs both temperature and humidity through serial data .It has four pins, namely vcc, data, NC and ground.

Algorithm for smart infant cradle:

Step 1: The cradle starts to swing when sound exceeds the threshold value.

Step 2: A message is notified to the parents that the cradle is on.

Step 3: If urine is detected, MCU again notify parent's that "wetness is detected".

Step 4: A DC, fan is automatically turned on, if room temperature exceeds 28 degrees Celsius.

Step 5: A message can be sent by parents to MCU to "start swinging".

Step 6: To stop swinging, parents can notify the MCU by pressing "stop swing" button over the server or the same motion stops automatically after a set limit.

Step 7: To Remote Monitor:-

1. Open Blynk application
2. Enter credentials to monitor values.
3. Check the values of temperature, humidity, moisture.
4. From Wi-Fi camera live view is possible.

V. RESULT

The live data of temperature, humidity, movement of infant, sound of infant from the cradle is sent to either mobile application or web application. In case if the infant requires a swing the parent can swing the cradle. The cradle can be operated by parent through mobile can monitor their Infant live via IP CAMERA. The app notifies if any of the objectives are found.



Fig. 7. Screen shot of the mobile application

ISBN: 979-85-27243-61-1

VI. Conclusion

This system designed is economical, user friendly and helpful for working class parents. It limits human presence around the cradle. This system can be upgraded with lullabies attached to it. With technology upgradation infant care is been easily carried out and parents can manage their work efficiently.

VII. FUTURE SCOPE

A higher version of sound sensor can be replaced for better noise capturing. Plastic can be used instead of wood in making of cradle;making it lighter material and cheaper. IR sensor can be attached to cradle and check the possibility of infant falling from the cradle. The speed of swinging cradle can be modified to different versions, by making few coding changes. Wearable sensors can be attached to monitor Infants condition.

References

[1] Madhuchandra, Kavitha, Neela R, Harshitha, Soundarya. "Smart Infant Cradle System with an Android Application for Infant Monitoring ".

[2] International Journal of Engineering Science and Computing Volume 9, Issue No. 5 May 2019.

[3] Vedant Krishna Sambhar, Prof. M. B. Tadwalkar.,"Automatic Cradle System for Infant Care."International Journal of Business and Management Invention ||Volume 6 Issue 4 || April. 2017 ||

[4] M. Goyal and D. Kumar, ''Automatic E-baby cradle swing based on baby cry,'' Int. J. Computed. Appl., vol. 975, p. 8887, Jan. 2013.

[5] Aslam Forhad Symon, Nazia Hassan, Humayun Rashid, Iftekhar Uddin Ahmed, 1S M Taslim Reza. "Design and Development of a Smart Baby Monitoring System based on Raspberry Pi and Pi Camera" sept 2017, IEEE paper.

[6] John Georg, Johnson "Radar Applications in Level Measurement, Distance Measurement and Nondestructive Material Testing", 12 sept, IEEE paper.

[7] Yanpeng Wu1, 3, Xiaoqi Peng 1, 2, Jianzhi Zhang1 and Ye Zhang1"A rapid peak detection algorithm", June 2014, Journal of Chemical and Pharmaceutical Research.

[8] Ebenezer, Anritha, and S. Anupreethi. "Automatic cradle movement for infant care." Undergraduate Academic Research Journal (UARJ) 1, no. 1 (2012).

[9] Patil, Aniruddha Rajendra, Nitesh Janardan Patil, Anjali Deepak Mishra, and Yogita Deepak Mane. "Smart Baby cradle." In 2018 International Conference on Smart City and Emerging Technology (ICSCET), pp. 1-5. IEEE, 2018.

[10] Arora, Rajat, Heli Shah, and Rohan Arora. "Smart Cradle Gear to Ensure Safety of baby in Cradle." International Journal of Informative & Futuristic Research ISSN (2017): 2347-1697.

[11] Simik, Mohamed YE, Feng Chi, Abdeldime MS Abdelgader, and Randa SI Saleh. "Automated alarm system for diaper wet using GSM." In 2014 IEEE 17th International Conference on Computational Science and Engineering, pp. 1799-1803. IEEE, 2014.

[12] Sneha, B., V. Bhavana, S. Brunda, T. S. Murali, S. Puneeth, and B. A. Ravikiran. "A wireless based patient monitoring system using Android technology." In 2015 International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT), pp. 39-44. IEEE, 2015.

[13] Binu P K, Akhil V, Vinay Mohan "Smart and Secure IoT based Child Behaviour and Health Monitoring System using Hadoop", 16 Sept. 2017, IEEE paper.

[14] M Nandini Priyanka, S Murugan, K N H Srinivas, T D S Sarveswararao, E Kusuma Kumari,"Smart IOT Device for Child Safety and Tracking"June 2019, Published By: Blue Eyes Intelligence Engineering Retrieval Number & Sciences.

[15] E. Saadatian et al., "Low cost infant monitoring and communication system," in 2011 IEEE Colloquium on Humanities, Science and Engineering, 2011, pp. 503-508: IEEE.

[16] D. N. F. M. Ishak, M. M. A. Jamil, and R. Ambar, "Arduino Based Infant Monitoring System," in IOP Conference Series: Materials Science and Engineering, 2017, vol. 226, no. 1, p. 012095: IOP Publishing.

ISBN: 979-85-27243-61-1

An approach towards reduced switch 7-level multilevel inverter by PWM method

Shilpa V[1], Anish M[2], Geethanjali M.C[3], Kasturi Nandagaon[4]
[1]Assistant professor, Dept. of ECE, Sapthagiri College of Engineering [2, 3, 4] Students, Sapthagiri College of Engineering

ABSTRACT

Multilevel inverters have gained more popularity in various industrial applications due to its advantages in high power and high voltage applications with less Total Harmonic Distortion (THD). In this paper, a new 7-level multi-level DCAC inverter is proposed. The inverter proposed here is suggested in the area of medium or low voltage applications. The circuit consists of less number of switches compared to the other conventional multilevel inverter topologies and generates 7- level AC output voltage. The resulting output waveform is in form of quasi square-wave, which is close to a sinusoid waveform with reduced harmonic distortion. The harmonic content can be reduced by the Pulse Width Modulation (PWM) strategy. Due to the less number of switches the complexity and the cost of the circuit is reduced. This proposed model offers advantages of less component count, reduced switching loss, low cost and less harmonic distortion.

I. INTRODUCTION

Inverters are mainly used for commercial and industrial purposes. Multilevel inverters have been widely accepted for high-power high-voltage applications. Inverters can be broadly classified into two types: (1) Single phase inverters and (2) Three phase inverters. Each type can use controlled turn-on and turn off devices example: bipolar junction transistor [BJTs], metal oxide semiconductor field-effect transistor [MOSFET]. These inverters generally use PWM control signals for producing an ac output voltage. An inverter is called a voltage-fed inverter (VFI) if the input voltage remains constant, a current-fed inverter (CFI) if the input current is maintained constant, and a variable declined inverter if the input voltage is controllable. If the output voltage or current of the inverter is forced to pass through zero by creating an LC resonant circuit, this type of inverter is called resonant pulse inverter and it has wide application in power electronics.

II. MULTI LEVEL INVERTER

A multilevel inverter is a power electronic interface that synthesizes a desired output voltage from several DC voltages as input.

Batteries, fuel cell, solar cell, rectified wind turbines etc, are used as DC voltage sources. A higher number of active semiconductor switches are used to perform the power conversion in small voltage steps is the basic concept of the multilevel inverter.

III.WORKING OF MLI

Consider a simple two-level Inverter, it creates two different voltages for the load i.e. suppose we are providing Vdc as an input to a two level inverter then it will provide +Vdc/2 and –Vdc/2 on output.

ISBN: 979-85-27243-61-1

In order to build an AC voltage, these two newly generated voltages are usually switched. For switching mostly PWM is used as shown in the figure.

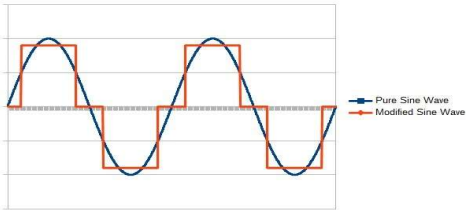


Fig 1: Two level inverter

Although this method of creating AC is effective but it has few drawbacks as it creates harmonic distortions in the output voltage and also has a high dv/dt as compared to that of a multilevel inverter. Normally this method works but in few applications it creates problems particularly those where low distortion in the output voltage is required. The concept of multilevel Inverter (MLI) is improved version of two-level inverter. In multilevel inverters we don't deal with the two level voltage instead in order to create a smoother stepped output waveform, more than two voltage levels are combined together and the output waveform obtained in this case has lower dv/dt and also lower harmonic distortions. Smoothness of the waveform is proportional to the voltage levels, as we increase the voltage level the waveform becomes smoother but the complexity of controller circuit and components also increases along with the increased levels. The waveform for the three, five and seven level inverters is shown in the Figure shown below, where we clearly see that as the levels are increasing, waveform becoming smoother.

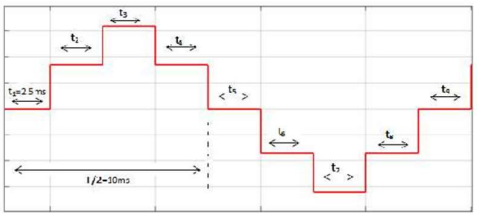


Fig 2: 5-level inverter [2]

III. TYPES OF MULTI LEVEL INVERTER

Multilevel inverters are of three types:

1. Diode clamped multilevel inverter
2. Flying capacitors multilevel inverter
3. Cascaded H- bridge multilevel inverter

1. Diode Clamped Multilevel Inverter

The main concept of this inverter is to use diodes and provides the multiple voltage levels through the different phases to the capacitor banks which are in series. This consists of (m-1) capacitors on the dc bus and produces m-level on the phase voltage. A diode transfers a limited amount of voltage, thereby reducing the stress on other electrical devices. The maximum output voltage is half of the input DC voltage. It is the main drawback of the diode clamped multilevel inverter. This problem can be solved by increasing the switches, diodes and capacitors. Due to the capacitor balancing issues, these are limited to the three levels. This type of inverters provides high efficiency because of the fundamental frequency used for all the switching devices and it is a simple method of the back to back power transfer systems. The 9- level diode clamped multilevel inverter uses switches, diodes, capacitors which are two times more than the 5-level diode clamped inverters. So the output is more than the input.

ISBN: 979-85-27243-61-1

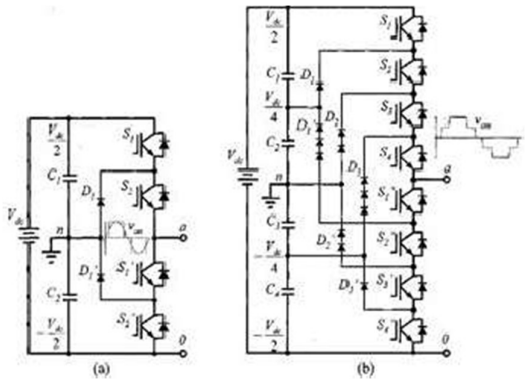


Fig 3: Diode-Clamped Multilevel Inverter Circuit Topologies. (A) Three-Level. (B) Five-level [3]

Applications of Diode Clamped Multilevel Inverters:

1. Static VAR compensation.
2. Variable speed motor drives.
3. DC and AC transmission lines.

2. Flying Capacitors Multilevel Inverter

The main concept of this inverter is to use capacitors. It is of a series connection of capacitor clamped switching cells. The capacitors transfer the limited amount of voltage to electrical devices. In this inverter switching states are like in the diode clamped inverter. Clamping diodes are not required in this type of multilevel inverters. The output is half of the input DC voltage. It is the drawback of flying capacitors multilevel inverter. It also has the switching redundancy within the phase to balance the flying capacitors. It can control both the active and reactive power flow. But due to the high-frequency switching, switching losses will take place.

Ex: 5 level flying capacitors multilevel inverter, 9 level flying capacitors multilevel inverter. This inverter is the same as that diode clamped multilevel inverter. In this inverter, only switches and capacitors are used.

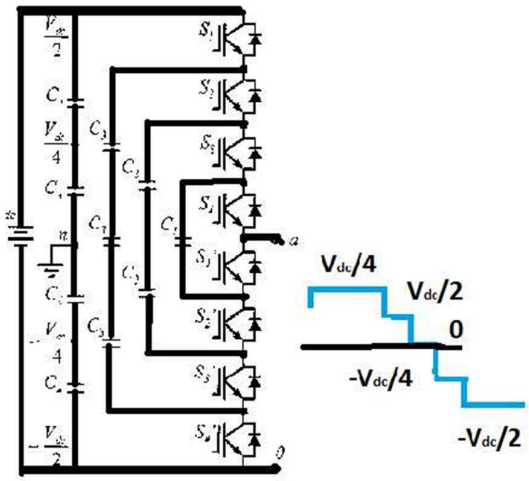


Fig 4: Classical Five Level Flying Capacitor MLI. [4]

Applications of Flying Capacitors Multilevel Inverters:

1. Induction motor control using DTC (Direct Torque Control) circuit.
2. Static VAR generation.
3. Both AC-DC and DC-AC conversion applications.
4. Converters with Harmonic distortion capability.
5. Sinusoidal current rectifiers.

3. Cascaded H-Bridge Multilevel Inverter

The cascaded H-bride multilevel inverter is to use capacitors and switches and requires less number of components in each level. This topology consists of a series of power conversion cells and power can be easily scaled. The combination of capacitors and switches pair is called a H-bridge and gives the separate input DC voltage for each H-bridge. It consists of H bridge cells and each cell can provide

ISBN: 979-85-27243-61-1

three different voltages like zero, positive DC, and negative DC voltages. One of the advantages of this type of multi-level inverter is that it needs less number of components compared with diode clamped and flying capacitor inverters. The price and weight of the inverter are less than those of the two inverters. Soft switching is possible by some of the new switching methods. Reduced switch 7-level multilevel inverter by PWM method Multilevel cascade inverters are used to eliminate the bulky transformer required in case of conventional multi-phase inverters, clamping diodes are required in case of diode clamped inverters and flying capacitors are required in case of flying capacitor inverters. But these require a large number of isolated voltages to supply each cell. Ex: 5- H-bridge multilevel inverter, 9-H-bridge clamped multilevel inverter.

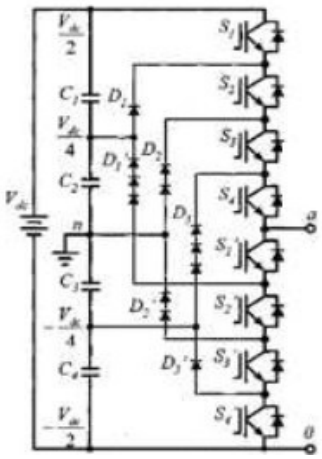


Fig 5: H-Bridge Multilevel Inverter [2]

Applications of Cascaded H-Bridge Multilevel Inverters:

1. Motor drives.
2. Active filters.
3. Electric vehicle drives.
4. DC power source utilization.
5. Power factor compensators.
6. Back to back frequency link systems.

IV. PROPOSED MODEL

A 7- level multi-level inverter is designed in which major feature of the proposed topology is the reduction of power components. The purpose of this topology is to reduce voltage rating of power switch. The inverter proposed here is suggested in the area of medium or low voltage applications. By combining output voltages in multilevel form, it has advantage of low dv/dt, low input current distortion, and lower switching frequency. As a result of advantages of multilevel topology, several topologies have emerged in recent years. IGBT has features of high power rating and high voltage stress but it cannot be operated at high frequency. And the design of IGBT gate drivers is complicated. MOSFET is the appropriate component to operate at high frequency, but power rating is not as good as IGBT. To solve the problem, many different topologies of multilevel use low rating component at high power application.

A comparison between four different seven level inverter component

	Proposed	Diode-clamped	Capacitor clamped	Cascaded multicell
Input sources	1	1	1	3
Input capacitors	3	6	2	3
Clamped capacitors	0	0	5	0
Power switches	8	12	12	12
Diodes	4	10	0	0

Fig 6: Table for comparison between 4 different 7-level inverter components. [8]

ISBN: 979-85-27243-61-1

V. BLOCK DIAGRAM

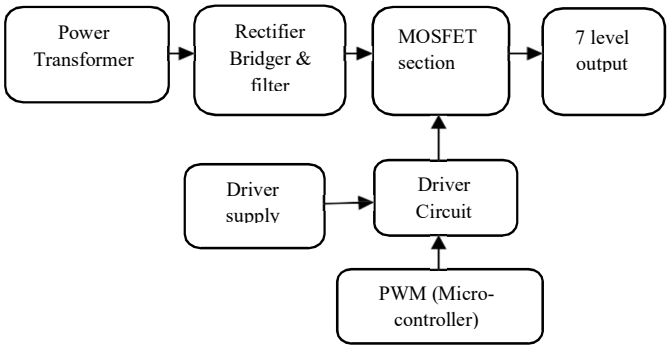


Fig 7: Proposed Seven level inverter block diagram

VII WORKING

The controller is used to generate the PWM pulses for this multilevel inverter circuit. The controller pulses are given to the driver circuit as input. Driver board is mainly used to isolate and amplify the input signals from the controller. The amplified driver output will be connected to the main power circuit devices. And the devices are turned on by using the PWM pulses. The power transformer is directly connected to the bridge rectifier. The bridge rectifier converts the ac voltage into dc voltage. Dc voltage is converted into ac voltage by using novel multilevel inverter circuit.

VIII METHODOLOGY

To achieve reduction in number of switches compared to the existing H-bridge topologies and achieve fast switching the working principle of conventional cascaded seven level inverter is extracted. The process includes converting multiple DC sources into a single DC source and also designing a voltage divider circuit for obtaining the single DC source.

1) During positive cycle, the voltage level Vo = 1/3Vdc is achieved when S1 is on and capacitor C1 provides the energy maintaining the voltage across H-bridge 1/3Vdc. While S5 and S7 are turned on, the load terminal voltage reaches 1/3Vdc.
2) For voltage level Vo = 2/3Vdc, S1 and S4 are turned on while the energy is provided by capacitors C1, C2 maintaining the voltage 2/3Vdc across H-bridge. S5, S8 are turned on while voltage applied to load terminals becomes 2/3Vdc.
3) To achieve voltage level Vo = Vdc, S1 and S2 are turned on. Energy will be provided by Capacitor C1-C3 while the voltage across H- bridge is Vdc. S5 and S8 are in ON state and applied voltage to load terminal becomes Vdc.
4) During negative cycle, Vo = -1/3Vdc while S2 is ON. Capacitor C3 provides the energy and H-bridge voltage is 1/3Vdc. S6 and S7 are in ON state and voltage applied to load terminal is -1/3Vdc.
5) For voltage level Vo = -2/3Vdc, S2 and S3 are in turned ON state. The energy is provided by the capacitor C2 and C3, and the voltage cross the H-bridge is 2/3Vdc. Then S6 and S7 are turned on, while the voltage applied to the load terminals is -2/3Vdc

ISBN: 979-85-27243-61-1

6) For voltage level Vo = -Vdc, S1 and S2 are turned on. The energy is provided by the capacitor C1 to C3, and the voltage cross the H-bridge is Vdc. Then S6 and S7 are turned on, and the voltage applied to the load terminals is -Vdc.
7) For voltage level Vo = 0, S5 and S7 are turned on to short circuit the load. The voltage applied to the load terminals is zero.

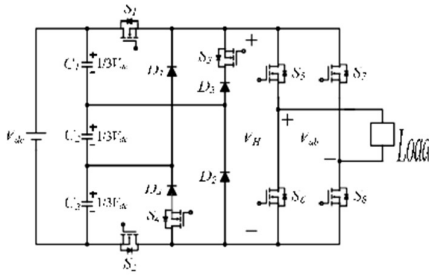


Fig 8: Proposed seven-level inverter topology

Vtg	Switching combinations							
	S1	S2	S3	S4	S5	S6	S7	S8
V_{dc}	On	Off	Off	Off	On	Off	Off	On
$1/3V_{dc}$	On	Off	Off	On	On	Off	Off	On
$2/3V_{dc}$	On	On	Off	Off	On	Off	Off	On
V_{dc}	Off	On	Off	Off	Off	On	On	Off
$-1/3V_{dc}$	Off	On	On	Off	Off	On	On	Off
$-2/3V_{dc}$	On	On	Off	Off	Off	On	On	Off
$-V_{dc}$	Off	Off	Off	Off	On	Off	On	Off
0								

Table 1: Switching combination required to generate 7-level output

IX. CONTROL TECHNIQUE

The MOSFETs are controlled by its gate terminal. The gate is controlled by PWM cycle generated by the microcontroller. 50 Hz has to be maintained in order to have usability in the Indian appliances. The code is written to microcontroller such that 50Hz is obtained. Pulses from microcontroller are obtained from the GPIO pins. The I/O pins from microcontroller provide an output of 5V which is not suitable for driving the gate terminal. Therefore, a driver circuit is needed to boast the pulses in order to drive the gate of MOSFETs.

In order to code the microcontroller steps are as followed:

- Extracting switching table from the proposed 7- level model
- Initialize GPIO pins and configure port pins as either input or output.
- Initialize PWM module as the switching table
- Create a delay between each cycle to obtain 50Hz
- Execute each step in a continuous loop.

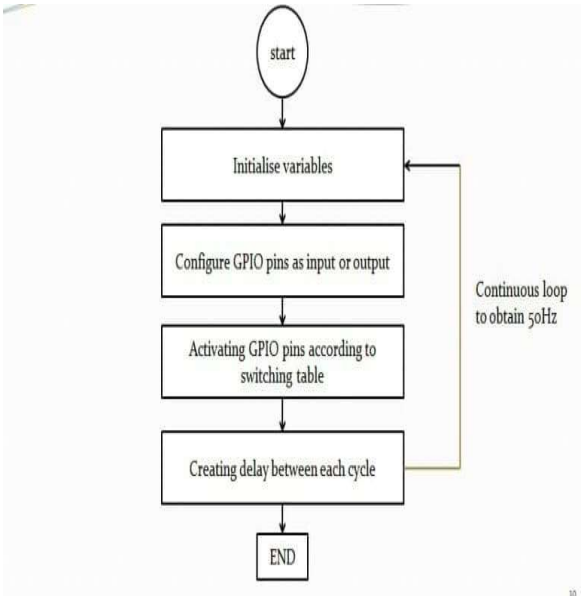


Fig 9: Flow chart of the program

Firstly, to code the microcontroller we need to extract switching table from the circuit path that has to be followed. After extracting the switching table GPIO pins have to be initialized such that 8 pins are configured as output pins.

ISBN: 979-85-27243-61-1

Each of 8 pins represents a MOSFET. Each of the MOSFET are turned on at a particular period as per the switching table. After each cycle a delay is created such that 50Hz is obtained. Each step is in a continuous loop till the inverter is turned off.

X. SIMULATION AND RESULT

In order to get throughput of the inverter, THD of the inverter has to be reduced. THD of the inverter is considered to be the benchmark of the performance of the inverter.

Harmonics are nothing but voltage/current which the integral multiple of the 50Hz which is the fundamental frequency used throughout India. Most of the industries accept THD below 12% as the industry standards. A range of harmonic frequency will be obtained. To attenuate low frequency harmonics a filter can be used at the load of inverter.

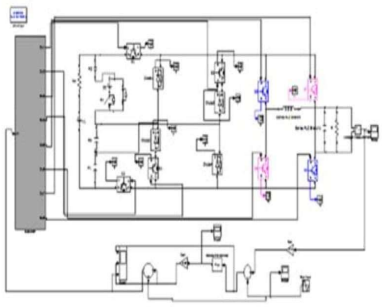


Fig 10: Simulation model of proposed circuit

The harmonic distortion also depends on the modulation index that is going to be used. The parameters of the controller in the simulation are selected with trial and error method. Input DC voltage is supply is taken as 220V and load is taken as resistive load of 50 ohms.

The FFT analysis gives the overview of the performance of the inverter.

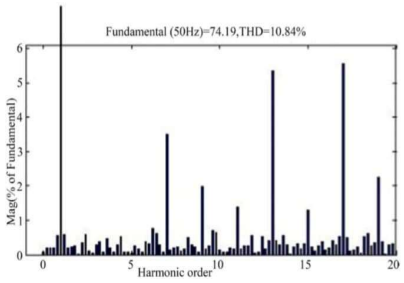


Fig 11: FFT analysis

The FFT analysis is done to measure the THD of the output voltage to explore the individual harmonic content. The THD is found to be less than 12% which better as it is less that of industry standard.

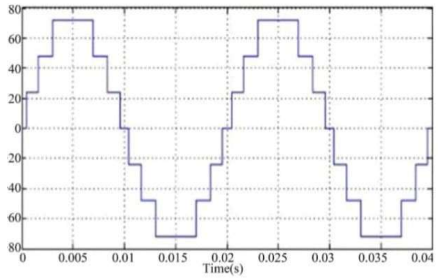


Fig 12: Level of voltage with respect to time

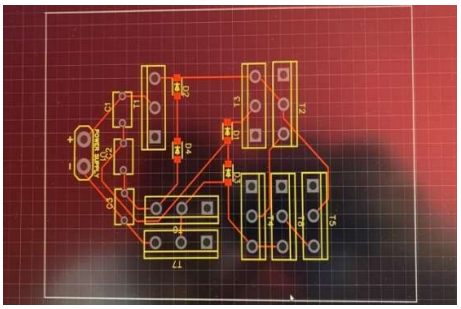


Fig 13: PCB design using EDA tool

The PCB is designed using the easy2EDA software. While designing the PCB it is intended to be economical in space. The proposed model will occupy less space as the number switches are reduced from 12 MOSFETs to 8 MOSETs.

ISBN: 979-85-27243-61-1

XI. Advantages

1. Reduce the switching loss.
2. High efficiency.
3. User friendly
4. Noise less output.
5. Reduced Harmonics.
6. Uses a smaller number of switches.

XII. APPLICATION

1. It is used in induction heating device.
2. It is used in standby power supply.
3. It is used in uninterruptible power supply (UPS).
4. It is used in sound amplifiers.

XIII. CONCLUSION

In this paper, a 7-level multilevel inverter is designed and implemented by PWM strategy. The main purpose of this approach is to reduce the number of components as well as the Total Harmonic Distortion (THD) compared to the conventional topologies. The output voltage is observed in the Cathode Ray Oscilloscope (CRO) which shows all positive and negative levels with reduced harmonics. The circuit provides high efficiency and is low cost. Due to these advantages the proposed inverter finds its applications in various industrial applications

REFERENCE

[1] R. R. Shaikh and J. R. Rana, "Single phase seven level inverter," 2016 International Conference on Energy Efficient Technologies for Sustainability (ICEETS), Nagercoil, 2016

[2] Hajar Chadli, Zakariae Jebroni, Sara Chadli, Mohammed Saber, Khalid Salmi, Abdechafik Derkaoui, Abdelwahed Tahani, Advances in Smart Technologies Applications and Case Studies, vol. 684, pp. 253, 2020.

[3] Varshasharn, DIODE CLAMPED "Multilevel Inverter Switching Topology", International Journal of Industrial Electronics and Electrical Engineering, ISSN: 2347-6982, 2349-204X Volume-5, Issue-11, Nov.- 2017

[4] N. Maheshkumar, V. Maheskumar, M.Divya, "The new topology in Flying Capacitor Multilevel Inverter," 2013, International Conference on Computer Communication and Informatics, Coimbatore, 2013, pp. 1-6, doi: 10.1109/ICCCI.2013.6466268.

[5] M. S. B. Ranjana, N. Sreeramula Reddy and R. K. P. Kumar, "A novel single phase advanced multilevel inverter with adjustable amplitude of voltage levels," 2014 International Conference on Circuits, Power and Computing Technologies [ICCPCT2014], Nagercoil, 2014, pp. 950-957

[6] B. MAHATO, S. MAJUMDAR, S. VATSYAYAN and K. C. JANA, "Realization of novel Single-phase N-level Multilevel Inverter," 2018 8th IEEE India International Conference on Power Electronics (IICPE), JAIPUR, India, 2018, pp. 1-4.

[7] Kamaldeep and J. Kumar, "A new 7-level asymmetrical multilevel inverter with reduced number of sources and switching components," 2016 7th India International Conference on Power Electronics (IICPE), Patiala, 2016, pp. 1-5.

ISBN: 979-85-27243-61-1

[8] C.Hsieh, T. Liang and S. Tsai, "Design and implementation of a novel multilevel DC-AC inverter," 2014 IEEE Energy Conversion Congress and Exposition (ECCE), Pittsburgh, PA, 2014, pp. 5743-5748.

[9] S. Chaitanya, N. R. Patnaik and K. V. S. R. Murthy, "A novel seven level symmetrical multilevel inverter topology" 2017 Third International Conference on Advances in Electrical, Electronics, Information, Communication and Bio-Informatics (AEEICB), Chennai, 2017, pp. 432-435.

ISBN: 979-85-27243-61-1

ECO-FRIENDLY HYBRID ELECTRIC VEHICLE

Rashmi B J*[1], Raksha N K[2], Sonica M Naik[3], Varsha V V[4], Vidhya J H[5]
Department of Electronics and Communication Engineering, Sapthagiri College of Engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]rashmijbadiger@gmail.com
[2]rakshank16@gmail.com
[3]sonicanaik6@gmail.com
[4]varshavijayan0599@gmail.com
[5]vidhyahoogar9598@gmail.com

***Abstract*- A big study field these days is fuel efficiency and low emissions in cars. Solar hybrid vehicles are fetching popularity as they are reasonable in terms of fuel and are able to offer power and speed with less restrictions on charging when required. But their extended charging time is their greatest set back. Hybrid cars based on technology are attracting increased publicity, leading to higher costs. Because of this it is practically impossible for a typical customer to afford it. The study here is about solar operated hybrid electric vehicle**

KEYWORDS-Photovoltaic Panel, LPC 2148 Microcontroller, Relay, DC Motor, Voltage Divider.

I. INTRODUCTION

The use of solar energy is now more universal on a daily basis. In general, for individuals, solar power generation and solar illumination systems are more popular. Battery is charged with help of sunlight during daytime whilst LED module is illuminated during night time. Many charging methods have been widely used and discussed in the past year. Constant current, voltage and reflection charging, for instance, etc. Reflexive charging requires high input power, continuous current charging is easily overcharged, and during the initial charge state, constant voltage charging is incapable to detect the charge current. So, there are still some drawbacks and unsatisfactory while using unique technique of charge. Mutual linear dimming techniques involve constant voltage and constant current dimming scheme on other sides. Motor application is also an immense method on the manufacturing and corporate sides, but solar energy can also be used by the motor energy, since the battery is charged during the motor rotation by back emf, which can be achieved by coupling the motors to charge the battery. Lithium batteries have greater energy efficiency, light weight size among the current power batteries, however it's ideal for lower power applications due to high prices and increase in temperature.

II. LITERATURE SURVEY

This paper proposes a [8] Hybrid Electric Vehicle (HEV) system which solves the major problems of fuel and pollution. The renewable energy is vital for today's world as in near future the nonrenewable sources that we are using are going to get exhausted. The hybrid electric vehicle is a step in saving these nonrenewable sources of energy. The basic principle of solar car is to use energy that is stored in a battery during and after charging it from a solar panel.

This paper presents [5] the Solar-Wind hybrid Power system that harnesses the renewable energies in Sun and Wind to generate electricity. Power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity will be takes place at affordable cost System.

This paper presents brief idea [4] about blocks presents in wind solar hybrid system. Necessary Sensors like Anemometer, wind vane, RTD, pyrometer for monitoring different parameters in wind solar hybrid system such as wind speed, wind direction, temperature, solar intensity respectively. This paper also deals with data logging system or data acquisition system for given model which contain Microcontroller.

This paper Renewable [7] power source innovations offer spotless, copious vitality assembled from self-reestablishing assets, for example, the sun, wind, and so forth. As the power request expands, control disappointment additionally increments. In this way, sustainable power sources can be utilized to give consistent

ISBN: 979-85-27243-61-1

burdens. Another converter topology for hybrid wind/ photovoltaic energy system is proposed. Hybridizing sun oriented and wind control sources provide a sensible type of intensity age.

This paper deals with [3] the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance Basically this system involves the integration of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity.

III. PROPOSED SYSTEM

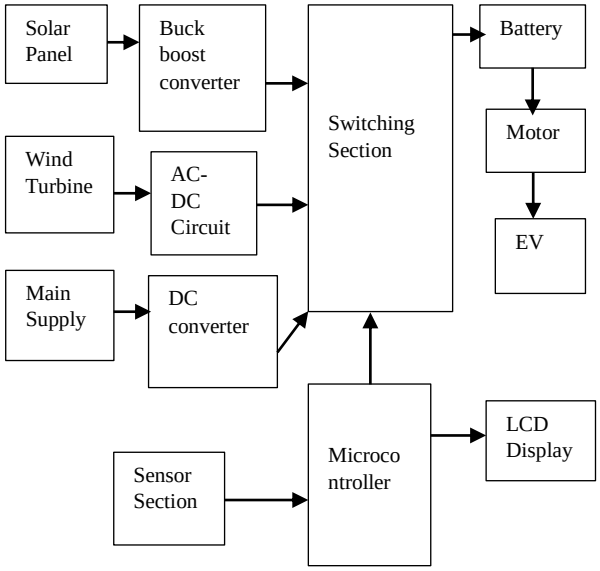


Fig.1 Proposed Block Diagram

The system consists of photovoltaic panels and energy storage batteries. If the total power coming from solar panels and wind turbines is greater than the power required for charging electric vehicles, the battery is fed with extra power. The batteries compensate for the power in discharge mode.

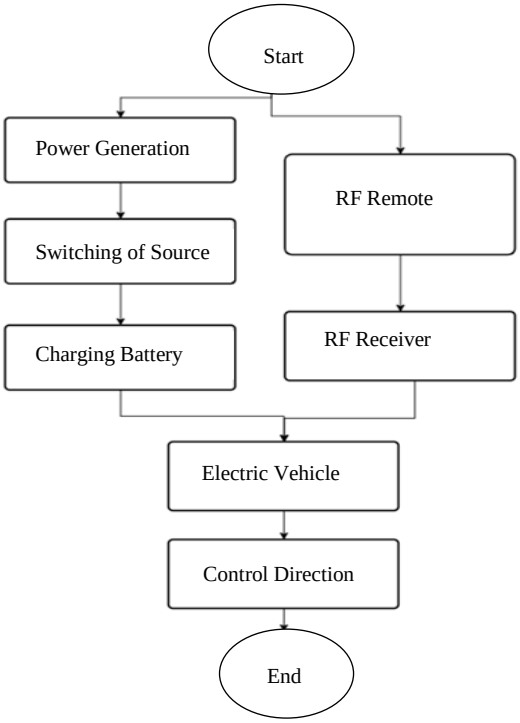


Fig.2 Proposed Flow Chart

IV. OBJECTIVES

i. Converting Solar and wind energy into electrical energy.
ii. Automatic switching between different sources: solar, wind or main supply.
iii. Solar and wind energy is stored in battery.
iv. Giving direction and construction of the vehicle.

V. METHODLOGIES

Solar panels use the photons produced by sunlight to generate direct current (DC) electricity. Wind power generation means getting the electrical energy by converting wind energy into rotating energy of the blades and converting that rotating energy into electrical energy. All available source connected with relay switch. These relays will switch from one source to another source. In this system the changing of the source is based on source availability and as well as based on priority. It uses RF remote to move in front, back and left right directions. RF remote will send four different commands for 4 different directions. This vehicle is capable of turning in any direction at the same place.

ISBN: 979-85-27243-61-1

Algorithm

a) Reading information from LDR and Voltage sensor
b) If LDR sensor value is greater than threshold value the solar panel will connected
c) Else wind will be connected if sun light is not available.
d) Based on first section, the microcontroller will send trigger pulse to relay
e) All common pin of relay connected with battery VCC pin.
f) Based on relay switching the particular source will be connect with battery for charging.
g) Store sensor value in variable in code And Compare value with predefine value.
h) Generate pulse for trigger relay for automatic switching
i) Send 4 different Direction signal from RF remote
j) Receive command in RF Receiver module.
k) Based on received signal, operate L293D Motor Driver Section
l) Motor driver will control the motor direction, based on motor direction vehicle will get control

VI. CONCLUSION

The solar panel, transforms solar energy into electricity, permitting the generation of voltage. The voltage generated at the output of the panel depends on solar light's strength. Since solar light is unstable, the solar panel's production can vary. Battery charging is not required with this difference; hence the panel's output is given to the buck-boost block, this block would provide the battery with constant necessary voltage. The battery drives a load (LED) through the buck-boost circuit if, the battery voltage drops, the supplies to the LED remains the same. And here, motor is operated by a driver, where it is actuated by the controller.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] "Solar based hybrid electric powered wheelchair". Kishor P, Manikandan Ananth, Vivekananda B, IEEE 2013.

[2] Designing a Learning Platform for the Implementation of Serial Standards using ARM Microcontroller LPC2148 Aruna Kommu Raghavendra Rao Kanchi IEEE International Conference on Recent Advances and Innovations in Engineering (ICRAIE-2014), May 09-11, 2014, Jaipur, India.

[3] Ashish S. Ingole, International Journal of Scientific and Research Publications, Volume 5, Issue 3, March 2015 1 ISSN 2250-3153.

[4] Pratik M. Porwal, International Journal of Electronics, Electrical and Computational System IJEECS 2017.

[5] "Solar-Hydrogen Energy based Hybrid Electric Vehicle". Dr. Siva Ganesh Malla, Jayadeepu Dadi, Pavan Kumar Dadi, ICECDS 2017.

[6] "System design and realisation of solar powered electric vehicle charging station" Samir M, Mohammad Saad, IEEE 2019.

[7] R. Devarajan, M. Anand raj, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7, Issue-5S3, February 2019.

[8] Mrs. Saranya, K. Ramya, [International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 07 Issue: 09 | Sep 2020.

[9] Monika M. Dholakia, Barvaliya Aakash, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 07 Issue: 06 | June 2020.

ISBN: 979-85-27243-61-1

IMPLEMENTATION OF AUTOMATIC CHOCOLATE VENDING MACHINE USING IOT

PRAKASH JADHAV[1], UMA MAHESHWARI R[2], SHALINI H[3] ,VIDYASHREE K H[4] , SAMATA G M [5]
Department of Electronics and Communication Engineering, Sapthagiri College of engineering
14/5 Chikkasandra, Hesaraghatta main road, Bangalore-560057, India.

[1]prakashjadhav@sapthagiri.edu.in,
[2]umaamu1999@gmail.com,
[3]shalinih863@gmail.com,
[4]vidyashreekh10@gmail.com,
[5]samatagmunagekar@gmail.com.

***Abstract*: As world is running towards the new technologies, automation becomes one of the new development in this situation. The automation is based on the process of integrating the software and hardware together and making the complex process into simple one. As India is one of the supreme example for developing nation, automation becomes one of the technology to enhance India in to a technically developed nation. To reduce the man- power and time consuming process a Automatic Vending Machine is designed using various methods and techniques. Using RFID, Coin acceptor, Finger identification etc., we can get better results and is user friendly. In this paper we provide various methods or works which uses the above techniques for the vending machine to dispense the required product.**

Keywords: RFID, Coin Acceptor, PLC, Sensors, Razor pay app.

I. INTRODUCTION

Vending machines are one of the best models for automation development. There are different types of automated vending machines such as vertical and horizontal type using money slot/RFID as an input for the machine. This type of chocolate vending machine saves human energy, versatile in time and saving time. A smart card reader is used as an input sensor. It is just a simple machine which works automatically and sell various kinds of chocolates or other product. This machine has a huge market with high annual revenues for both developed and developing countries. Gradually, vending machine became a wide channel with increase in sales and even competition between manufacturers. It does have many benefits, first benefit is in terms of setup, it is easy to setup a vending machine because it occupies less space and is compact in size, it is a low cost driven machine and can provide various product as output.

II. LITERATURE SURVEY

Previously lot of researches have done in the area of automatic vending machine. They all follow various technologies for automatic vending machine. They have lot of drawbacks, to overcome these different methods have been used in this paper.

A. RFID based vending machine

In this paper [1], when the user inserts a coin or swipes RFID card, the IR sensor or the RFID reader detects it and sends a signal to PLC. The PLC switches on the relay, which in turn switches on the motor. Two 12v relays have been used in this work. One relay is used to switch on the motor which in turn rotates the spring mechanism. Another relay is used to switch on the PLC. As the motor rotates the spring mechanism starts to rotate for a present amount of time, during which the napkin is dispensed. Once a napkin is dispensed, the count of napkins available is updated in the PLC. As the count reaches a present value, the

PLC initiates sending a SMS via GSM module.

B. Coin based vending machine

In this paper [2], the main objective is to build an online payment incorporated vending machine they will dispatch product. We design and implemented a vending machine that will accept a variety of coins and supports digital payment option to make purchases. The delivery method is rotary spiral wire mechanism that is attached to dc motors. The vending machine has 3 dc motors that are driven by a motor shield that is mounted on Arduino Mega. The output of the application is dispatching of product by accepting either digital payment or physical payment without the need of any human supervision or intervention. The device can also work without internet connectivity and is thus cost efficient as compared to current IOT based vending machine.

C. Sensor based vending machine

In this paper [3], use of two sensors along with smart phone is done. One sensor for taking environmental temperature, accordingly read value from sensor it generates a notification to the user how much water needs to be consumed in that day. The second sensor is used to measure weight and is send to the raspberry pi. The sensor communicates with the application for raspberries & the database. The application processes smart water bottle data from raspberries application & send processed information to the server, then data will be transferred to local data center and to the cloud accordingly data in the local server will notify the administrator, how much water consumption happened. If the quantity of water bottles is less than given threshold values then a notification is sent to the vendor. The data in the cloud will send a notification to the worker to refill the dispenser. The smart water dispenser can be improved with lot more facilities by attaching an RFID reader to the water dispenser to track the amount of water every person has consumed in a day.

D. PLC based vending machine

In the paper [4], a multi product machine is designed by using Mitsubishi PLC. Programming logic controller (PLC) is used to automate the machine by operating switches, sensors and motors. Put the coin in the coin acceptor, and then select the product by pressing push button. The motor starts rotating along with spring and moves the selected item until it released from spring. The hall effect sensor is used to count the rotation with the help of the magnet to sense. When the product released from the spring motor stop rotating and the released product is ready to dispense. The machine could not detect the fake coins and the consumer cannot refund the money.

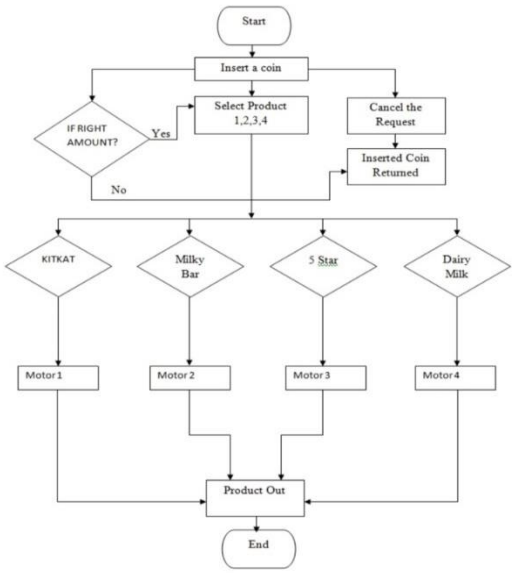


Fig.1. Flowchart of PLC based Multiproduct Machine

E. App based payment vending machine

In this paper [5], a cashless payment vending machine is designed. Separate portal for admin and users has been created, where the admin can edit the details of the products available in the machine. The user after login can view the products available through the website and can purchase the product as his wish and make payment accordingly using Razorpay API. After the payment a unique code has been generated depending upon customer's purchase. Now customer can input the code

received and the products are dispensed according to the count provided by the user. The main problem focused here is delay in purchase and dispatching of product. The system design is in such that the cost and resources required are restricted to a minimal level. The features implemented are online payment and dispensing product with the help of IOT.

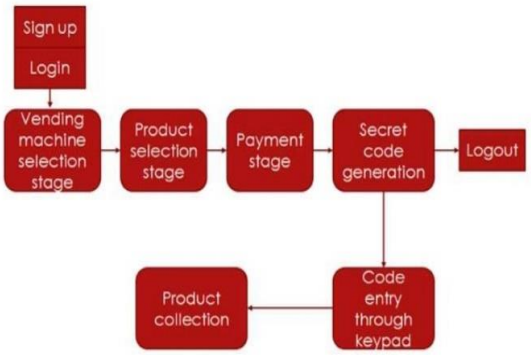


Fig.2. User DFD



Fig.3. Admin DFD

III. OBJECTIVES

- The main objective is to design and development of a automatic chocolate vending machine which will reduce human effort and saves time.
- To develop a vending machine which supports digital payment option to make purchases.
- To improve vending machine smartness by using speech recognition technique.
- To develop a machine which works smartly and alerts condition of machine to the vendor through cloud.

IV. BLOCK DIAGRAM

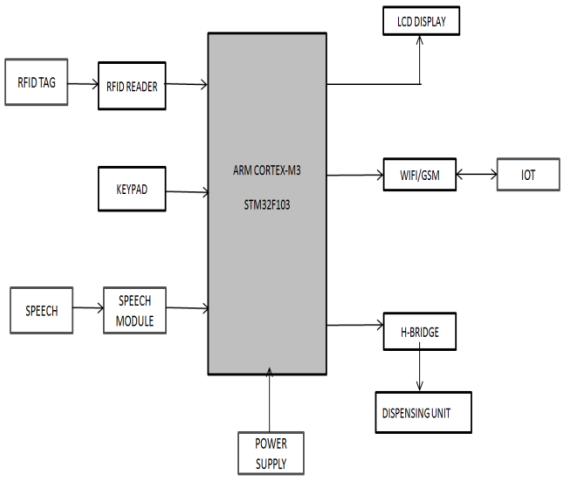


Fig. 4 Block diagram of the proposed system

V. METHODOLOGY

The implementation of IOT based vending machine helps the customer to dispense the chocolate at ease. In this project, we also used RFID cards for cash less payment along with digital payment methods. The details of the user will be stored in the database to distinguish between the users and non-users. Once the power is fed to the vending machine the system activates and starts displaying on the LCD. They just need to select the payment mode and just click on the keypad to select the type of chocolate and the quantity; thus, chocolate gets dispensed. The level of chocolate is continuously monitored and refilled again as they get emptied in the machine. The notification alert is sent to the concerned department to refill the chocolates. The user can provide the input to the system through RFID or voice. Since voice module is also used as an input for helping blind and illiterates. The system verifies with the database and recognizes the provided input. Once payment is done, dispense of the chocolate takes place. Theft of the vending machine can be avoided by using vibration sensors. The updation from machine to the concerned person is done through cloud computing (IoT).

VI. CONCLUSION

This automatic chocolate vending machine offer variety of product as well as many different types of payment option. In the recent time use of digital is increasing day by day due to their accuracy and feasibility. Due to time saving feature people can use vending machine in busy area like airport, bank, office, etc. By using IOT, it is easy to maintain the concerned department and the counts of chocolate. This system is portable, affordable, consumes less power and can be made easily available so that the user can use this system whenever and whatever. There are some problems and drawbacks that have to be considered and rectified. In the above papers, drawbacks like high power consumption, delay in dispatch of product, less-security, etc. can be rectified by using these new technologies.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1]. K. Samba Siva Rao, K. Harish, M. Kavin Kumar, D. Vishnu Harish "Solar Power IOT based Intelligent Sanitary Napkin Dispenser", International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 6 Issue III, Mar 2018.

[2]. Girish Mahajan, Vaibhav Phale, Sanket Mane," Vending Machine with Cash & Cashless Payment Support", International Research Journal of Engineering & Technology (IRJET) Vol 7, July 2020.

[3]. Amali, Janani, "Smart Water Dispenser", International Journal of InnovativeScience & Research Technology Vol.4, (2019).

[4]. Dr.Shridhar, RajaAbhinetri R, T. Vijayan "PLC based Multi-Product Vending Machine", IJEAT Aug 2019.

[5]. Sooraj, Bony Mons, Dr, Jinsa Kuruvilla, "IOT Based Vending Machine with Cashless Payment", International Research Journal of Engineering Research and Technology, Volume-6, June, 2019.

[6]. PrakashJadhav, G.K. Siddesh, "Bandwidth oriented Image Compression using Neural Network with ASAF", International Journal of Neural Networks and Advanced Applications, ISSN: 2313-0563, Vol 5, pp 25-32, 2018.

[7]. PrakashJadhav, G.K. Siddesh,"Neuro-Fuzzy Nod Restitution and Multi-Scale Wavelets for Superiority Video", International Journal of Image, Graphics and Signal Processing, Vol.9, No.9, pp.11-17, 2017.

[8]. Prakash Jadhav, G.K. Siddesh, "Near Lossless Compression of Video Frames using Soft Computing Technologies in Immersive Multimedia" International Journal of Soft Computing and Engineering, ISSN: 2231-2307, Vol-4 Issue-6, pp 16-24, January 2015.

[9]. Prakash Jadhav, Sai Eshwar K R, "Bandwidth Reduction Of Video Compression Using ANN For Virtual Multimedia", International Journal of Management, Technology and Engineering, ISSN NO: 2249-7455, Vol. IX, Issue VI, pp 1830-1840, JUNE/2019.

[10]. Prakash Jadhav, Yeshwanth, "Design and Fabrication of a Multitasking Agricultural Robot with Stairs Climbing Capacity", International Journal Of Current Engineering and Scientific Research **(IJCESR),** Vol. 5, Issue 5, pp 70-73, 2018.

[11]. Prakash Jadhav, Sharath Gowda, "Smart Pulmonary System with Doctor Appointment", International Journal of Research in Engineering, Science and Management, Vol-3, Issue-5, pp 759 – 762, May-2020

[12]. Prakash Jadhav, Chilukuri Madhu, "Facial Recognition Based Attendance Management System Using Raspberry Pi", International Journal of Research in Engineering, Science and Management, Volume-3, Issue-5, pp 654 – 658, May-2020

[13]. Prakash Jadhav, Rima, "Wireless Sensor Networks for Data Acquisition and Remote Actuation", International Journal of Research in Engineering, Science and Management, Volume-3, Issue-5, pp 960 – 964, May-2020

[14]. Prakash Jadhav, G.K. Siddesh, "Codec with Neuro-Fuzzy Motion Compensation & Multi-Scale Wavelets for Quality Video Frames", International Conference on Advanced Computing, Networking, and Informatics 2017, Recent Findings in Intelligent Computing Techniques, Vol 3, pp 599-606, 04 November2018.

SMART SOLAR LAWN MOWER

DARSHAN BANGALORE[1], SUMAN KUMAR S[2] , TEJAS S[3] , THIMMARAJU R [4], MADHU H M[5]

Department of Electronics and Communication Engineering, Sapthagiri College of engineering
14/5 Chikkasandra, Hesaraghatta main road, Bangalore-560057, India.

[1] darshanbangalore99@gmail.com
[2]sumansagar008@gmail.com
[3]tejas.style541@gmail.com
[4]traju.r99@gmail.com
[5]madhuhm@sapthagiri.edu.in

***Abstract*: As world is running towards the new technologies, automation becomes one of the new development in this situation. The automation is based on the process of integrating the software and hardware together and making the complex process into simple one. As India is one of the supreme example for developing nation, automation becomes one of the technology to enhance India in to a technically developed nation. The aim of our project is to build a lawn mower which uses solar power and hence we can save electricity. In our project various operations of lawn mower are controlled by microcontroller. Obstacle detection can also be done with the help of obstacle sensor. Lawn Mower is manually controlled by remote and it does not require any skills and can be operated by a common man.**

Keywords: Solar Panel, Obstacle Detection, Pesticide Sprayer, Moisture Sensor.

I. INTRODUCTION

Now a day's pollution is a major issue for whole world. Pollution is manmade and can be seen in own homes. In case of Gas powered lawn mowers due to the emission of gases it is responsible for pollution. Also the cost of fuel is increasing hence it is not efficient. So the Solar powered grass cutter are introduced. Solar powered lawn mower can be described as the application of solar energy to power an electric motor which in turn rotates a blade which does the mowing of a lawn. But the cost of those grass cutters is high. But our grass cutter consists of rechargeable battery. This design is alternative for environmentally hazardous gas powered grass cutter. The grass-cutters use cordless electric mowers, trimmers, and blowers powered by clean renewable energy generated by solar panels mounted on our trucks and trailers. We also use reel push mowers for smaller hard to access areas like pathways and parks. There's no oil, and no pollution. Just clean air, less noise, and green grass.

II. LITERATURE SURVEY

Previously lot of researches have done in the area of Solar Lawn Mower. They all follow various technologies for Manually controlled Lawn Mower. They have lot of drawbacks, to overcome these different methods have been used in this paper.

[1] In this paper, a manually controlled grass cutter is proposed. The grass cutter convert the solar energy into electrical energy with the help of solar panel which is mounted on the platform of system. If 12v battery is discharged then it can be charged by using AC supply. These battery is then connected to RF module and the RF module is then connected to both DC motor. RF module function is to supply the electricity to motors with the help of relays. RF module receive signal through microcontroller and it supply electricity accordingly to that motor. Then these motor is connected to wheel by gearing mechanism and thus wheel rotates. Due to these rotation of cutter the grass is cut and collected in collecting box.

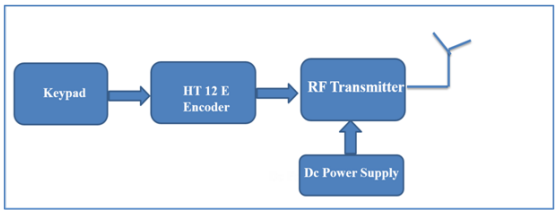


Fig. 1 Block diagram of transmitter

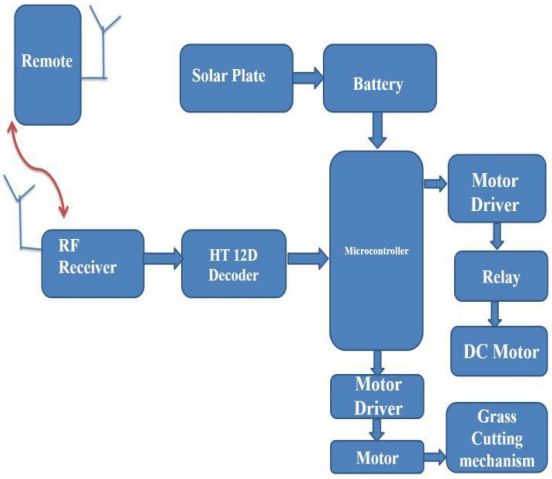


Fig. 2 Remote controlled grass cutter

[2] In this paper, an automatic solar grass cutter is projected. It uses DC 12V 7.5AH battery provide to control whole system. This battery is connected with solar array. therefore solar power is employed to charge this battery. This method has four DC motors to that four wheels square measure connected and also the blades for grass cutting square measure connected at the front facet of this method. To operate this method the affiliation should be established between this system and humanoid sensible phone. each these square measure connected victimization Bluetooth. when the roaring affiliation the user will operate this system victimization humanoid application put in on sensible phone. User will put ON and OFF the grass cutter. Also, he will move this grass cutter in vertical and horizontal direction.

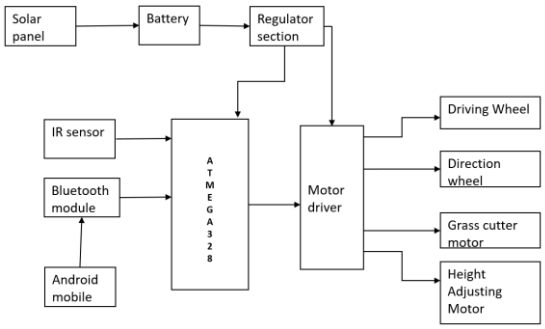


Fig. 3 App controlled grass cutter

[3] In this paper, a mobile operated solar powered mower is proposed. The lawn mower consists of an induction motor, a battery, an alternator, three blades, and a link mechanism. The power and charging system consists of an alternator which charges the battery during operation. The D.C motor provides the driving force for the collapsible blades. This is achieved by the combined effect of the cutting blades and the forward thrust of the mower. The system consists an electrical switch which completes the circuit including the induction motor and the battery. The IR senor is used to avoid the obstacles and machine damage. It provides the advantage of adjusting the height by shaft fitting mechanism. The blade is located in the deck that prevents grass from flying all over the place when struck. There is also a bag connected to the deck that is used to collect cut grasses. It uses solar panel to generate the energy required to power the mower. In remote controlled solar grass cutter we used the mobile to control the movement by installing the android application in the mobile. With the help of Bluetooth we establish a connection between the mobile and the grass cutter.

[4] The structure of this project remote controlled solar grass cutter is like a car consisting of 4 wheels with motors attached to the front on both the sides which are front end type. When the motor starts the front wheels start moving forward and the rear wheels follow the front ones. By the solar energy the motor is switched on. On the top of the vehicle 3 solar panels are arranged in such a way that one panel is placed horizontally and the other 2 panels are placed at 45 degrees angle on both the edges of the first panel, such that it has to receive the sunlight with maximum intensity. 2 batteries to be used in the machine one is to power up the

ISBN: 979-85-27243-61-1

grass cutter motor and the other to power up the vacuum pump. The vehicle starts moving according to the instructions given by the user through the remote. Once it starts to move, the cutter motor is supplied power by the battery and motor is activated and the blade starts to move, cutting the grass on the ground. Meanwhile, on the other side, other battery turns on the vaccum pump. The grass which have been cut by the cutter is collected in the draft tube of the vaccum pump which avoids the grass to be fallen on the ground and it sends the collected grass debris to a dumping bag attached to the vehicle through a centrifugal pump.

[5] The project proposes a robotic vehicle that can be controlled remotely with the help of android based device. The control device is added with a Bluetooth device that helps in capturing and reading the commands given to it. The vehicle may then be operated as required with the help of android device. The vehicle is fitted with a microcontroller which helps to operate the vehicle as per the commands given. Smartphone or Tablet can be used as controlling device. The android controlling system gives a good interactive Graphical User Interface that makes it easy for the person to control the robot. Android application is used for transmitting the data. the commands are read at the receiver end and interprets them into controlling the robotic vehicle. The device sends commands to move the vehicle in all the required directions. The microcontroller then operates the motors after receiving the commands to move the vehicle in all four directions. The communication between input android and receiver end is sent as serial communication data. The microcontroller program is designed to move the motors through a motor driver IC as per the commands sent by android device.

III. OBJECTIVES

- The objective is to make use of the Solar Energy.

-To design and development of a Lawn Mower which will reduce human effort and saves time.

- To Protect Lawn Mower from being damaged by using IR sensor.

- To develop a Lawn Mower which provides water and also to apply pesticide to the lawn.

IV. BLOCK DIAGRAM

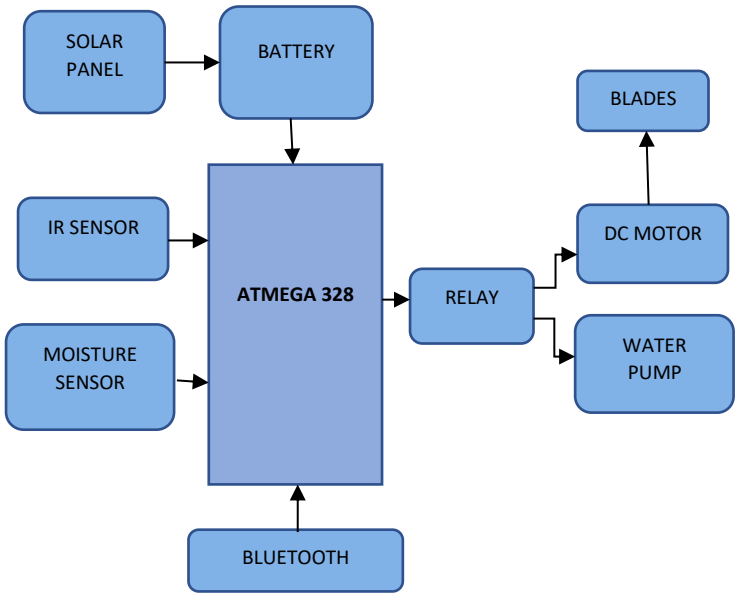


Fig. 4 Block diagram of the proposed system

V. METHODOLOGY

The working principle of the figure 4, it has panels mounted in a particular arrangement at an angle of 45 degrees in such a way that it can receive solar radiation with high intensity easily from the sun. These solar panels convert solar energy into electrical energy. Now this electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the

panels while batteries are charging, it also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging in batteries is low. The motor is connected to the batteries through connecting wires. Between these two mechanical circuit breaker switch is provided. It starts and stops the working of the motor. From this motor, the power transmits to the mechanism and this makes the blades to slide on the fixed blade and this makes to cut the grass.

It consists of a moisture sensor which is used to measure the humidity of the land, when the humidity increases above the particular level the water pump is used to sprinkle the water. IR sensor is used to detect the obstacles in order to prevent the vehicle from being damaged.

VI. CONCLUSION

The smart lawn mower gives least working time, it reduces the cost, decreased energy consumption, and it works on combined operation mode. Robotics is very large field which uses modern technologies and in a combined way to reduce the efforts of humans and provide maximum output and high efficiency. Now a days lot of human efforts are wasted for mowing lawn in different parts of the earth. Command is received by the Bluetooth receiver and does the work of trimming the lawn.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] Praful P. Ulhe, Manish D. Inwate, Fried D. Wankhede, Krushnkumar S. Dhakte "Modification of Solar Grass Cutting Machine" IJIRST -International Journal for Innovative Research in Science & Technology| Volume 2 | Issue 11 | April 2017

[2] M/s. Snehal Popat Jagdale, Prof. Priti Rajput "Android Controlled Solar based Grass Cutter Robot", International Journal of Engineering Research & Technology (IJERT) Vol. 9 Issue 07, July-2020.

[3] S.P.Ganjewar, S.H.Gidde, Pravin Bhusnar "Mobile Operated Solar Powered Lawn Mower" IJRCSIT I ISSN No. : 2319-5010 I Vol. 1 I Issue 3, Dec 2018

[4] K. Sai Kumar, G. Sai Sushrutha, Baltha Manoj Kumar, Sai Vinay Varma. "Design of remote controlled solar grass cutter based on IoT", International journal of innovative research in science, engineering and technology. Vol-6, Issue 12, December 2017

[5] Shekhar Kumar, Anshika Sharma, Rishabh Sharma, Shubha Kesarwani. "A Review paper on grass cutter device using bluetooth", journal of electronics and electromagnetic technology, volume 1 issue 1

ATTENDANCE MONITORING USING REAL TIME FACE RECOGNITION IN IMAGE PROCESSING

SNEHA V[1], SWETA PRAKASH RASTAPUR[2], RAKSHITHA SONU S[3], PURSHOTHAM R[4], SUDHA M S[5]

Department of Electronics and Communication Engineering Sapthagiri College of Engineering
#14/5 Chikkasandra, Hessarghatta main road, Bengaluru-560057
[1]snehav050@gmail.com
[2]swetaprakashrastapur@gmail.com
[3]sonu.raks72@gmail.com
[4]purushothampropurushotham@gmail.com
[5]sudhams@sapthagiri.edu.in

***Abstract*- Student attendance or worker attendance monitoring process is made easier by face recognition tools of Matlab and sending SMS to a person who is absent by using GSM. As beginners can understand the high level of descriptive language Matlab easily. This system is very well-organized and requires very few repairs compared to the old-fashioned methods. There are many methods for face recognition like LDA, ICA, Neural networks, PCA. Among these methods, PCA is the most effective hence we implement the PCA algorithm for face recognition and Viola-Jones for face detection from the video frame in real time. Based on recognized faces, attendance is monitored and the database is updated in Ms Excel and SMS is sent to absentees using GSM.**

***Keywords:* PCA (Principal Component analysis), GSM (Global System for Mobile Communication), Eigen faces.**

I. Introduction

Storing and Maintenance of attendance is very critical in all the educational institutes and companies for observing the overall attendance of a student or an employee. Each organisation follows particular way to mark attendance. Like marking attendance manually on the paper, biometric using fingerprint and computerized methods.

All these methods furthermore waste time because students or employees be required to make a queue to interact with their finger, face, and eyes on the scanning device. This model makes use of the face recognition method for marking the attendance of students in the classroom environment deprived of lectures involvement or the employee. This kind of attendance is recorded and stored with the aid usage of a digital camera connected in the classroom or the working atmosphere i.e. camera constantly shoot photos of students or employees, identifies the faces in pix, and scrutinize the detected faces with the database and mark the attendance in Ms Excel. Face recognition has broad application in security and military.

II. Related work

A. RFID based attendance system

Paper [1],[2] classifies each worker/student based on RFID tag which is included in their ID card with the aid of data science which implement the process for data collection, analysis, data cleaning, and data processing can be easily done.

B. Viola – Jones based attendance system.

Security control system mainly focused on human face detection. Computer authentication with human computer interface is initial human face recognition. In this context popularly used face detecting algorithm is viola – jones. This process uses simple values to classify the images rather than pixel values to avoid the encoding of the data and ad-hoc is very difficult to learn and understand in limited data. Pixel based tools are much slower compared to operating system based. Image processing is also much faster in feature use compared to pixel.

Integral image is obtained by adding the value of pixel above and left by the usage of corner rectangle value. Haar like features are used for face detection this feature is calculated by subtracting the black area pixels with that of white area pixels. The next stage is adaboost it selects a part of the computed feature that helps in constructing a classifier. A large set of images are prepared by comparing the size to that of the detection window. Cascading all the weak classifier together to form the final input is the main feature of the viola jones algorithm..

C. Biometric based attendance system.

Fingerprint based attendance system is more secure to the user by using fingerprint sensor. This includes four keys up, down, enrol, delete. Fingerprint sensor module capture fingers image and convert it into a required form store this memory in selected ID by user interface. LED s and buzzers are for user convenience interfacing. Fingerprint module sensors and keys are input. Outputs are LEDs and LCD. As fingerprints are more secured information of a person it can be hacked and used illegally for multiple purposes, it is more expensive, error rate is high, delay and complexity is high.

ISBN: 979-85-27243-61-1

D. PCA algorithm based attendance system

Principal Component Analysis reduces the large dataset to a smaller one without losing the information. As smaller data set are easier to compute and implementation process is much easier. Creating a boundary to values by standardizing with the aim of computing covariance matrix. Then Eigen values and Eigen vectors are calculated to identify Principal Component this are analysed by continuous calculation of principal component. Feature vector by discarding some values which are not required. The further procedure are provided in the below flow chart. Main advantages are removes identical features, improves algorithm accuracy, oversizing of the process is reduced, requires few components to implement and less expensive.

From the analysis done based on the survey paper we find RFID system is simpler but it is expensive and time consuming to install. The biometric fingerprint is accurate but lacks in efficiency as verification process requires lots of time. Voice recognition takes lesser time but it is inaccurate. In general all these methods take lot of time as student or employee should interact the device individually by forming a line and acquires lot of time. Hence face recognition is recommended for the attendance system. There are many methods to implement this, feature recognition by PCA algorithm is best among them. For face detection Viola – Jones algorithm is chosen as it detects the faces fast in feature selection at located scales in accurate manner at different lighting conditions in real time

III. Proposed Model

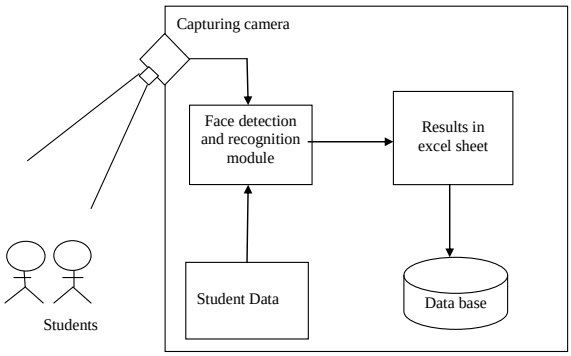


Fig 1.Block Diagram of Proposed Model

The Camera is placed in the classroom that records video of the class in real time. Then snapshot is taken from video frame. Face detection module Viola-Jones algorithm detects the face from the video frame snapshot, identifies face detected by indicating in red rectangle box. The detected face is then compared with the pre-loaded train dataset (Student Data) for further recognition process. PCA (Principal Component Analysis) Algorithm is used for Face Recognition process. Eigen Faces are the Principal Component in this algorithm Eigen faces for train dataset and test image is calculated and compared to obtain equivalent image. Thus attendance is updated in MS Excel sheet and stored in Data base. Further, GSM modem is used to send an alert message to absentees attached mobile number.

IV. Implementation

1. To detect the face segment from the video frame in real time.
2. To extract the features in order to recognize the face detected.
3. To record the attendance of the identified student and store in Microsoft excel sheet.
4. Using GSM Technology sending SMS to the absentees

Viola-Jones for face detection

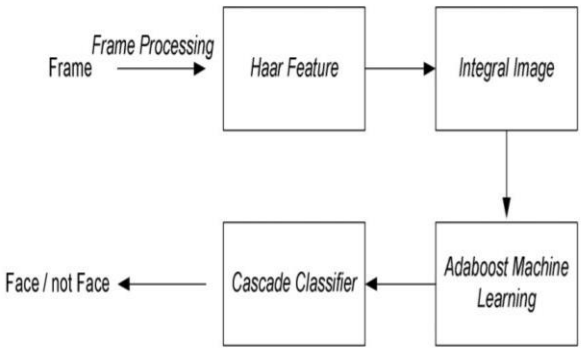


Fig 2.Schematic representation of viola- jones

Viola-Jones algorithm works on grey scale image; hence the captured snapshot from the video frame is converted into grey scale image and given as input for face detection module. Human face share similar features from this Haar features are detected from the video frame. Haar features are nothing but adjacent dark and lighter rectangular regions.

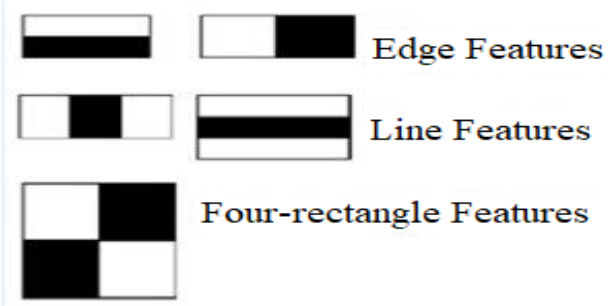


Fig 3.Haar Features Types

There are 3 types of Haar features to interpret the different parts of the face.

1. Edge features
2. Line features
3. Four-sided feature

Calculating a single value for each feature involves lot of computations. To reduce this we calculate a integral image which has the capability to reduce large number of

ISBN: 979-85-27243-61-1

computations to 4. In simple words value of each pixel is sum of the pixels above and left, including the target pixel.

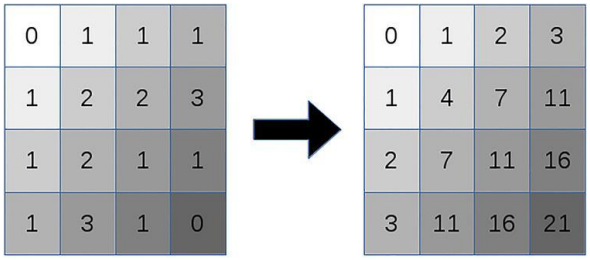


Fig 4. Original image and Integral image

In the next step Machine Learning algorithm known as adaboost training is used. Haar like feature represents a weak learner; adaboost training evaluates the sub regions and checks the performance of all classifier that are used for training. In this strong classifier represent a human face it is the higher performed or high weighted classifier. So, the algorithm decides the feature as useful or not from the training data.

Adoboost training is still time consuming to reduce this constraint a classifier known as cascading classifier is used. It has multiple stages each stage comprising of similar features, stages are placed in the order of importance. When cascading starts sub region passes through the stages having two probabilities accept if it determines face like feature or reject if it is a non-face this process continues till the final stage. Video frame from the webcam is given as input. Output is to show the detected face i.e. a rectangle is drawn over a face.

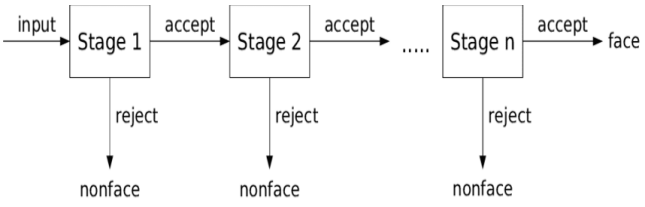


Fig 5.Cascading Classifier

A. PCA for Face Recognition

PCA algorithm also known as Eigen face approach is the simplest method for face recognition. This approach converts faces into essential component called as Eigen faces. Recognition process is projecting a test image on the train Eigen images, later person is recognised by calculating the Euclidian distance in Eigen face space with least value by showing the particular train image is matched with test image

Step 1 : This step it is to create a training data set. Here the 2D Image is converted to the 1D vector by forming a single row . The 1D vector length is L=a×b

$$C=\begin{pmatrix} y_{11} & y_{12} & \cdots & y_{1b} \\ y_{21} & y_{22} & \cdots & y_{2b} \\ \vdots & \vdots & \ddots & \vdots \\ y_{a1} & y_{a2} & \cdots & y_{ab} \end{pmatrix} \xrightarrow{\text{Concatenation}} \begin{pmatrix} y_{11} \\ \vdots \\ y_{1b} \\ \vdots \\ y_{ab} \end{pmatrix} = y \quad (1)$$

To calculate average vector let the yi ranges from (1,2,3 … A) .we calculate the δ(mean vector) and the then this subtracted with y_i.

$$\delta=\frac{1}{A}\sum_{i=1}^{A} y_i \quad (2)$$

$$\alpha i= yi- \delta \quad (3)$$

Now arranging of the Averaged vectors to form a new training matrix(size A×B)

$$D=[\ \alpha1, \alpha2, \alpha3, \alpha4 \ldots.] \quad (4)$$

To find the E vector called Covariance matrix and find the f_i and μ_i eigenvectors and eigenvalues

$$E=D\times D^T \quad (5)$$

$$E*f_i = \mu_i f_i \quad (6)$$

Next is to calculate the F matrix by normalizing the vector values . The Normalized vector Transpose is multiplied with the D .And find the *zi* vectors *Z = [z1, z2, z3....zA]* The matrix Y is given as:

$$Z=F^T D \quad (7)$$

The last step is recognizing the face.The P is the converted image of the person to be recognized from the Training data by subtracting the P with the δ and this is multiplied with the Normalized vector.

$$\emptyset=F^T\ (P- \delta\ ) \quad (8)$$

Distance (εi) is calculated by subtracting $\emptyset$ and $z_i of$ matriz Z . Euclidean distance is the most commonly used .The Eucliddan distance is determined by :

$$\mathcal{E}i = \backslash\ f_i\ - \emptyset\ | \quad (9)$$

$$U=argmin_i[\mathcal{E}i\ ] \quad (10)$$

The minimum distance is considered and attendance is marked.

B. Attendance is marked in MS Excel sheet

MS Excel spreadsheet is used to store the recorded attendance in simple to-utilize output format. which is likewise the product which is recognizable to majority of

ISBN: 979-85-27243-61-1

the institution staffs. If the student is identified, the corresponding cell is refreshed with '1', else a '0'. Using the formatting in the Excel, we can effectively retrieve the information effectively.

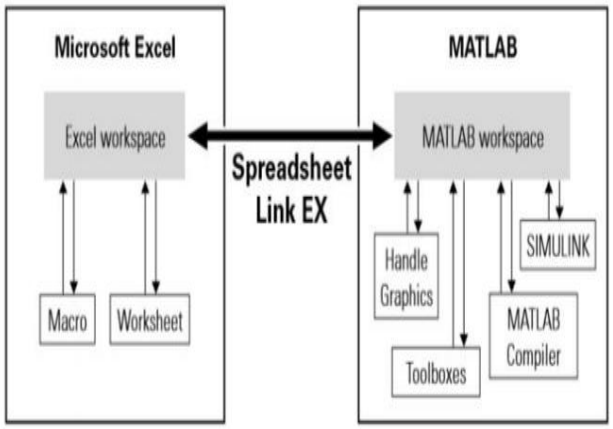


Fig 6.Spreadsheet link EX Toolbox

The MATLAB IDE and the MS Excel sheet is linked using the toolbox Spreadsheet Link Ex. When a recognized face matches with an individual in the database, the worth is refreshed in that specific Excel sheet. This is carried out through the function xlswrite().

- The candidate identity is resolved through the record of the picture with which the distinguished face matches with.
- A spreadsheet of the ideal organization must be drafted already (attendance.xls in our system)
- Utilizing the index values the relating cell in the sheet is refreshed with one along with the time and date of the homeroom.

Output in MS Excel

We get the yield as given underneath. After that we can infer the outcomes in suitable format. Utilizing different function in the spreadsheet as in figure 7-4. We can get the following parameters by utilizing this organization as yield as demonstrated in the figure. This function is performed utilizing the Spreadsheet Link Ex toolbox of the MATLAB.

- If an individual is available, a '1' is given to the specific field of the student.
- The date and time is likewise given to the sheet.

We can incorporate quite a few students' information utilizing this framework and gave we utilize a better quality of an image capturing device.

C. Sending SMS to absentees using GSM

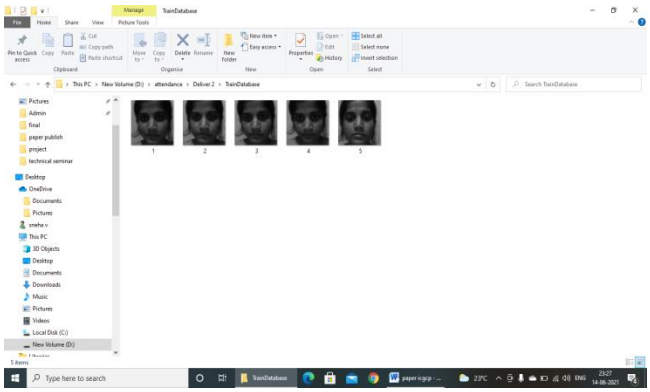
Global System for Mobile (GSM) is a mobile network which is immensely used by cell phone users across the globe to provide services such as data and voice transmission using digital modulation.

The GSM Modem is used to obtain functions like previously warehoused SMS data delivery. SMS is often used where GPRS or GSM data calls are unavailable as it keeps sending SMS at particular time intervals in machines or generally an automated system. Other than sending SMS, this modem is used to make data calls. These data calls are primarily used to either receive or send data streams between two embedded devices. GSM converter is a device embedded within the cable. It acts an extra device to be attached between a terminal and the GSM modem for data transmission.

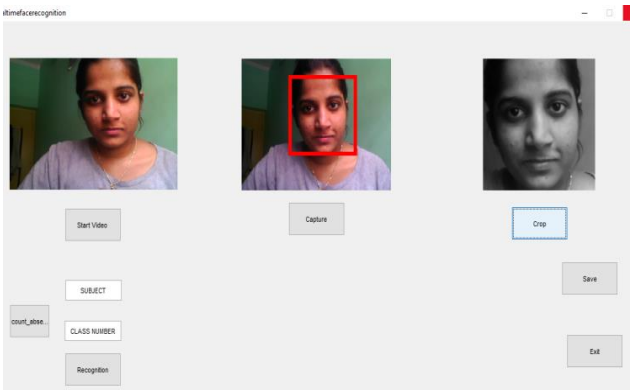
In this project message is sent from a microcontroller using a GSM Modem it is suitable for wireless networks. Valid SIM card need to be placed in the GSM modem and it is connected to microcontroller by RS232 cable. Microcontroller controls the GSM modem in sending the messages by communicating with instructions i.e. commands. Program is executed with appropriate AT commands to control the sending and receiving messages to the students mobile. With the database absentees can be notified with the sms regarding their attendance.

V. Results

A. Train Database

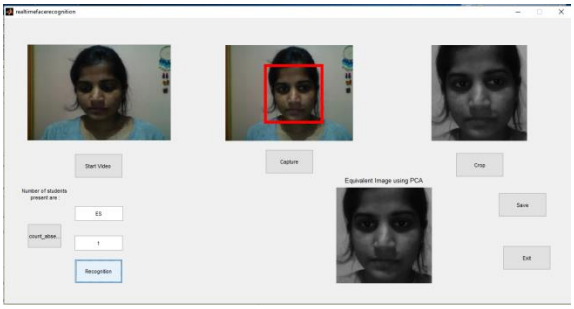


B. Face Detection

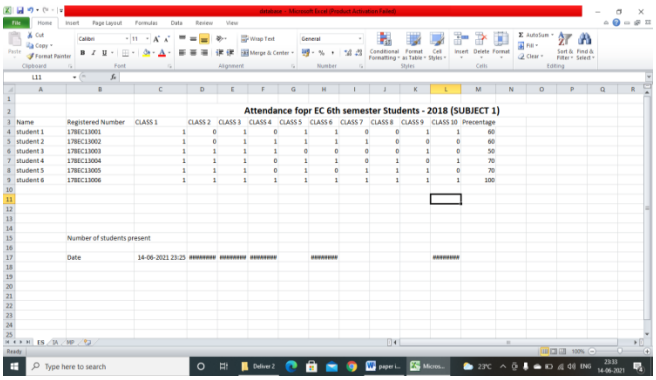


ISBN: 979-85-27243-61-1

C. Face Recognition



D. Result updated in MS Excel sheet



E. GSM Modem to send SMS to Absentees



VI. Conclusion

The device that has been implemented is secure and efficient for maintaining attendance in schools, colleges and work place. This process can be used for higher performance systems by making suitable modifications. Since, the system involve less human intervention the burden of attendance can be easily managed. From the attendance data base obtained from the system can be used for the progress of student and salary calculation of an employee. As the system works in real time it is robust and efficient.

ACKNOWLEDGEMENT

We are thankful for the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilitates provided and their support. Also we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] T.S. Lim, S.C. Sim and M.M. Mansor,"RFID Based Attendance System",Institute of Electrical and Electronics Engineers(IEEE), October 2019

[2] Unnati Koppikar,Shobha Hiremath,Akshata Shiralkar,"IoT based Smart Attendance Monitoring System using RFID"1st International Conference on Advances in Information Technology (ICAIT),July 2019

[3] Priyanka Wagh ,Shweta Patil, Roshani Thakare ,"Attendance System based on Face Recognition using Eigen face and pCA Algorithms",ICGCloT,2015

[4] A. M. Pati!, Dr. Satish R. Kolhe, Dr. Pradeep M. Pati!, "Face Recognition by PCA Technique", ICETET, 2017

[5] Abhishek Jha, "Class Room Attendance System Using Facial Recognition System", IJMSTM, ISSN:2319-8125, Vol. 2, Issue 3.

[6] Ralph Gross, Vladimir Brajovic, "An Image Preprocessing Algorithm for Illumination Invariant Face Recognition.", International Conference on Audio and Video Based Biometric Person Authentication, pp 10-18, June 9-11-2013.

[7]Hong, L, Wan, Y and Jain, A.K."Fingerprint image enhancement: Algorithm and performance evaluation", IEEE transactions on Pattern Analysis and Machine Intelligence 20,8(1998),777-789.

[8]Md. Sajid Akbar,Pronob Sarker,Ahmad Tamim Mansoor,"Face Recognition and RFID Verified Attendance System", 2018 International Conference on Computing, Electronics & Communications Engineering (iCCECE)

[9]C. E. Geoffrey, “Automatic Access Control System using Student’s Identification Card based on RFID Technology,” 2019

ISBN: 979-85-27243-61-1

Design and implementation of FPGA based vending machine for integrated circuits(IC's)

JEEVITHA A[1], JIPHIL P JOSE[2], DEEPIKA R SHARMA[3], PAVITHRA V[4], PRATHIBHA P[5]

Department of Electronics and communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]aruvajeevitha@gmail.com
[2]jiphil1999@gmail.com
[3]deepikadiasharma@gmail.com
[4]vapavithra2000@gmail.com
[5]prathibhap@sapthagiri.edu.in

***Abstract*: Over the years, there has been a drastic evolution in Vending Machines, from a simple "convenient unmanned shop" to a station providing several services in various domains. Among its various advantages, some are listed as follows portability in terms of its set up, being low cost-driven, and offer a wide reach due to less consumption of space. The project, includes IC bifurcation, IC testing and vending out of customer desired IC's. The intended design is implemented on a Spartan 6 FPGA development board using Verilog programming and simulated using Xilinx software. FPGA based devices consume less time, allow rapid prototyping, are flexible, reprogrammable and also reduce hardware, while there are any changes made. Use of such technologies saves time, power and cost. Segregates and does the functional verification of IC's, thereby lending a helping hand to the lab attendees and also ensuring the use of functional IC's by students in experiments**

Keywords – vending machine, Integrated Circuits

I. INTRODUCTION

A vending machine is defined as an automatic machine that provides numerous products such as snacks, cigarettes, beverages and lottery tickets to consumers after an amount is deposited via cash or card, or a specifically designed token is inserted into the vending machine. The major concern of the project is with regard to the manpower, time spent on IC segregation and delay in outputs of experiments due to defective IC's. Based on the literature survey conducted the vital enhancements are segregation and verification of IC's. The utilization of color sensors and FPGA controlled robotic arm facilitates the preferred objectives. Dumped IC's are arranged over a motor-driven conveyer belt, and further segregated using color sensors, on the user's demand each IC is tested and vended out, respective to token inserted, this project also enables user desired cancellation. On mismatch of the token, tokens are returned. Thus making the device user-defined and service-oriented. FPGA based machines are less time consuming, allow rapid prototyping, flexible, programmable and reduces the usage of multiple hardware as it is reprogrammable.

II. LITERATURE SURVEY

A brief overview of the surveyed papers are as follows, different techniques such as PLC, data acquisition and pneumatics, HTML, java script, IOT technology, HS-SPME-GC-MS are used. Migration of the compounds from various types of cardboard-cups used in vending machines for coffee was performed and suggested that printed cardboard -cups can be used but some of the compounds found were not authorized to be utilized in food packaging materials as they may lead to dietary Cramer– threshold exceedance. Various inputs required to make the machine function efficiently was the main focus of the design of a control system for a vending machine by introducing PLC technology which lead way to flexible payment methods. Implementation of the control unit with an additional module for interaction with the user was the main feature of vending machine management based on IOT platform. The design and implementation of a reverse vending machine which had features such as of low weight, small size and pocket-friendly price were developed using data acquisition and pneumatics. Safety and security of the machine are based on fingerprint sensing and the alarm system was a new advancement in the vending machine which paved the way for the design of a high – tech vending machine.

The utilization of CMOS, SED, microcontroller technology although contribute to less power consumption, depicts a limitation in speed and efficiency of the vending machine. This is further evolved through

ISBN: 979-85-27243-61-1

the usage of an FPGA development board. In the projects such as low power implementation of FSM based vending machine on FPGA, design and implementation of automatic beverages vending machine and its performance. Evaluation using Xilinx ISE and cadence, where FPGA is used, the major limitations addressed is a limited lookup table.

Some vending machine uses RFID technology, it is user friendly, affordable, less power consumption but the disadvantage is this vending machine can only read RFID tag. The vending machine can be based on ARDUINO technology it reduces the problem of giving balance amount, consumes less power but the disadvantage is this vending machine cannot differentiate real coin and fake coin. Even vending machine can be developed using HTML, javascript to dispense a variety of products at the same time but this vending machine is not recommended for mass production.

Mainly vending machines are designed to reduce the workload for humans like in coffee shops, it will be difficult for workers to prepare and give coffee for each person and doing billing at a time so for this, unmanned coffee vending machine is designed using technologies like ARDUINO, IDE and IOT to reduce the workload and there is no need for a person all the time to stay near a machine, but the main disadvantage of this type of machine is that it is time consuming, some vending machines are designed using other technologies also like multinomial logic model, UNO, Java to ensure various benefits to future generation some vending machines are also designed based on SMS gateway for easy and safe general transactions but it is not suitable for mass production for less time consumption of monitoring of the people who entered online a java based vending machine monitoring system is designed integrated with the webserver but the main disadvantage of this is it is more costly.

The main disadvantage of vending machine used for sales is that it does not return the balance amount, so to overcome this problem a vending machine is designed using ARDUINO and UNO technology to return the balanced amount after buying products so like this many advanced vending machines are coming into existence FPGA has wide application includes bioinformatics, device controllers, software-defined radio, digital signal processing, computer hardware emulation, random logic, ASIC prototyping, voice recognition, cryptography, filtering and communication encoding, medical imaging and many more.

FPGA based vending machine with mainframe computers. Its algorithm is extremely flexible and also reliable as the vendors can easily enhance the algorithm for a larger number of products and the number of different denominations at cheaper costs when compared to vending machines based on microprocessors.

Some of the paper also specify research on enhancing safety and security of the machine using fingerprint sensing and the alarm system as a new advancement in the vending machine which has paved way for the design of a high-tech vending machine.

Hence the major conclusions from our literature survey are, the utilization of CMOS, SED, microcontroller technology although contribute to less power consumption, depicts a limitation in speed and efficiency of the vending machine.

III. BLOCK DIAGRAM

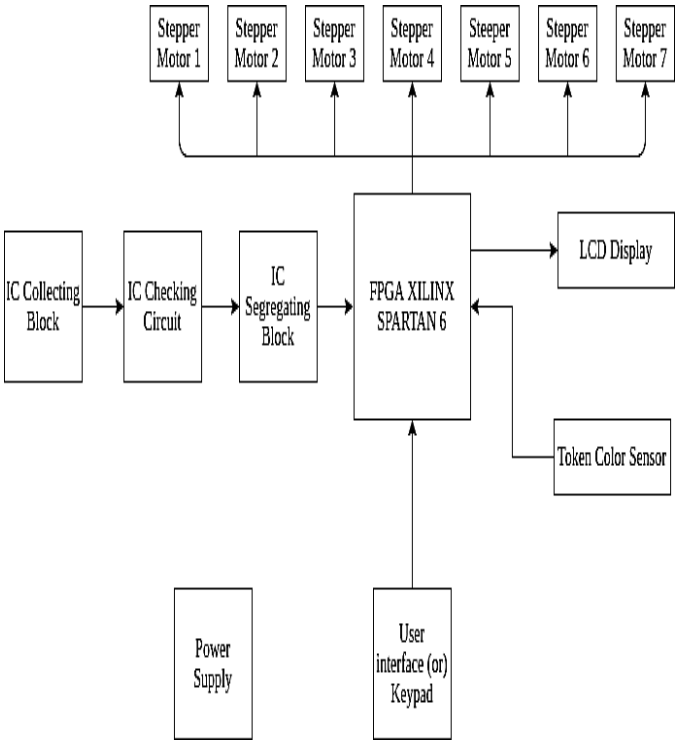


Fig 1: The block diagram of FPGA based vending machine for IC's

.

IV. FLOW CHART

ISBN: 979-85-27243-61-1

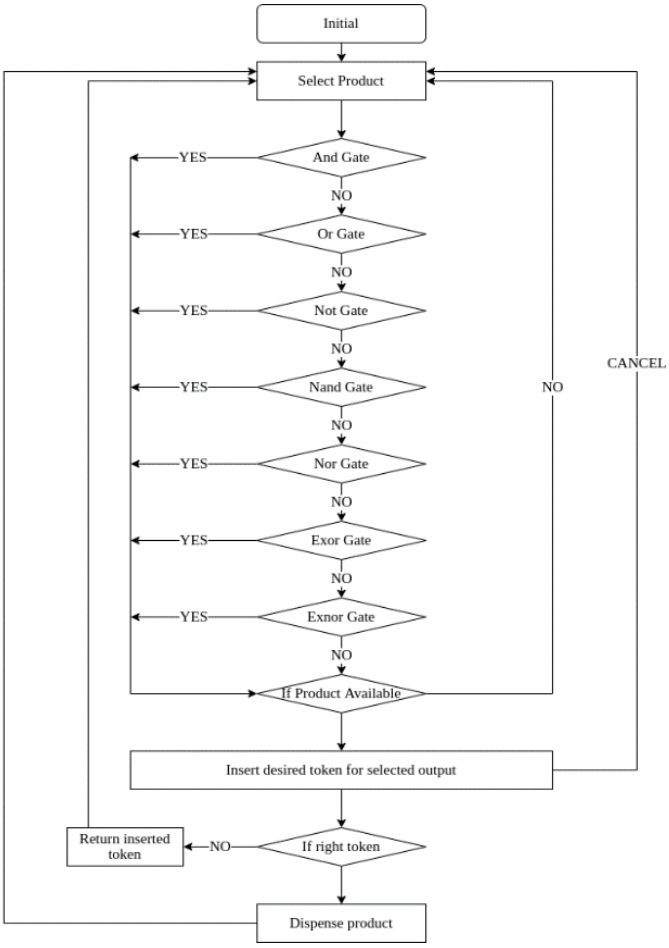


Fig 2: Flow chart of FPGA based vending machine for IC's

V. IMPLEMENTATION

1. IDENTIFICATION OF INTEGRATED CIRCUITS

METHODOLOGY: The first objective of the project deals with the identification of IC'S , based on color coding using the following Algorithm,

a) The IC's once verified with regard to their pins (should not be bent or damaged) are arranged over the DC driven conveyor belt manually. The belt bears the load of 5 Ics at a time arranged each in one marked section
b) They are further illuminated by the 4 LED 'S of the color sensor (TCS3200-Color-Light-to-Frequency-Converter) kept in a closed dark space . Based on the color sensed , the output is provided in terms of frequency to the FPGA Board
c) The frequency is measured with reference to the clock of the FPGA board using the below code
d) Once the frequency is measured , the color is analysed and the IC is identified

RESULT: results of identification of IC's are as shown in Fig 3 and Fig 4.

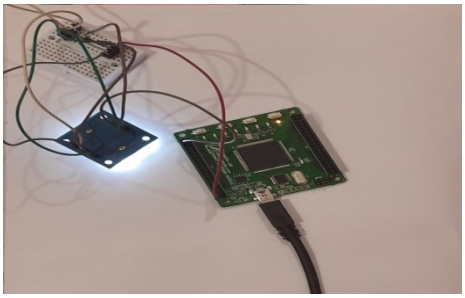


Fig 3: White color coded IC

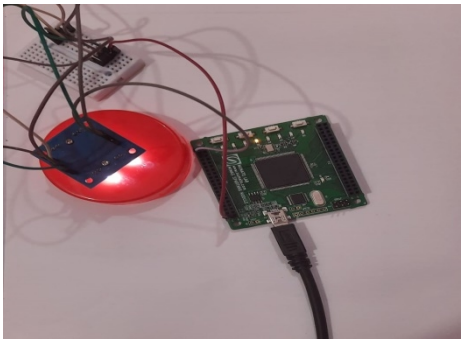


Fig 4: Red color coded IC

2. TESTING OF INTEGRATED CIRCUITS :

METHODOLOGY: The second objective of the project deals with the functional verification of IC's with the help of a ZIF Socket using the following algorithm:

a) Once the FPGA identifies the IC type , the robotic arm is programmed to pick the IC from the conveyor belt and lock it into the ZIF Socket, for which it moves at specified angle.
b) Based on IC identified , in order to provide corresponding inputs and verify the outputs , required code is chosen and executed by the FPGA .
c) If the outputs verified are similar to the desired outputs then the IC is placed into the segregation slots , else dumped into the dustbin .
d) All these operations are carried out using a single robotic arm , programmed using Verilog codes . As a result of which one IC is verified at a time .
e) After the complete verification and segregation of 1 IC is completed , the next IC is picked from the conveyor belt.

ISBN: 979-85-27243-61-1

RESULT: Simulation results of functional verification of IC are shown Fig 5 and Fig 6.

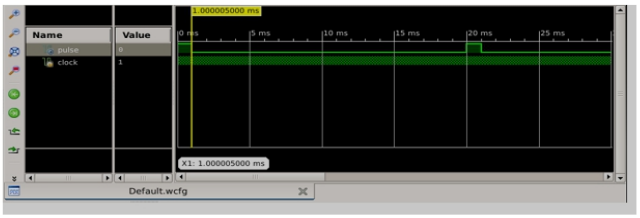


Fig 5: Simulation result of verification of IC

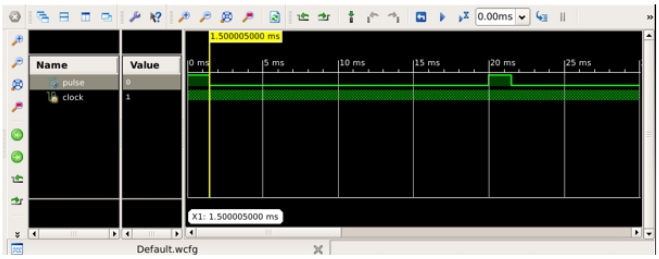


Fig 6: Simulation result of verification of IC.

3. SEGREGATION OF INTEGRATED CIRCUITS:

METHODOLOGY: All the functional IC's , picked by the robotic arm are to be delivered into the specific IC sections thereby completely segregating all the functional IC's, this done by following the below algorithm :

a) The entire IC Section is divided into 7 slots , each of one kind , where one type of IC is to be placed
b) As the tested IC is verified to be functional , the robotic arm is programmed to move at angles , such that the IC is placed into the corresponding recognized IC Section
c) Once the IC is dropped , the robotic arm continues the process of verification and segregation of IC's from objective 2
d) Each slotted section ends with two proximity sensors , a coil and a dc motor , which further function in vending out the IC's on the user's demand

4. VENDING OUT OF DESIRED INTEGRATED CIRCUITS:

METHODOLOGY: The user enters the desired IC number , through a Keypad interface . The required IC is vended out by following the below algorithm:

a) Each slotted section ends with two proximity sensors , a DC motor and a coil . The proximity sensor at the end of the slotted section , senses the entry of the IC just dropped by the Robotic arm .
b) Based on the input received by the FPGA from proximity sensor , the DC Motor rotates the coil , everytime an IC is dropped from the robotic arm .
c) Hence each IC is stored in each turn of the coil . On receiving the input from the user , the corresponding DC motor is rotated and IC is vended out
d) The proximity sensor at the end of the coil , senses absence of IC's , and displays the same on the LED Display on User's demand.

VI. CONCLUSION

The intended design of our vending machine for IC'S based on the FPGA is carried out using Verilog programming and simulation is to be done using Xilinx Software. It is observed through different scenarios, that FPGA based vending machine give a faster response, show low power consumption and can be easily used by any layman. The proposed project, includes IC bifurcation, IC testing and vending out of customer desired ICs. State machine based vending lower the system development cost and escalate productivity. The vending machine gives faster responses and can be effortlessly operated by an ordinary person. The proposed vending machine can be utilized in many applications and the users can very well manipulate the number of selection of product based on their requirements. FPGA has a wide range of application which includes ASIC prototyping, bioinformatics, device controllers, software-defined radio, random logic, digital signal processing, medical imaging, computer hardware emulation, filtering and communication encoding, voice recognition, integrating multiple SPLDs, cryptography and many more.

VII. REFERENCES

[1] Edison Kho and Manoj Kumar "Design and Implementation of FPGA based Vending Machine for Integrated Circuit (IC)", International Conference on Communication and Signal Processing, July 28 - 30, 2020, India.Aye aye nyein, ohnmar win "RFID based vending machine", JTSRD /2019

[2] Longzhang Shen, Changjun Qiu, Xiaoyan Wu, Changxing Han, Liangbin Hu, "Design of removable

ISBN: 979-85-27243-61-1

vending machine and research on the key implementation technology", 19th International Conference of Fluid Power and Mechatronic Control Engineering (2018).

[3] E.Prasanna, Preethi.K, S.Karthick, "Low Cost Anytime Automated Medicine Vending Machine", IJSRD - International Journal for Scientific Research & Development| Vol. 7, Issue 01, 2019.

[4] Chih-Chun Hsu, Yi-Chang Lin, Yeong-Long Shiue, "New Generation Artificial Intelligent Vending Machine System based on LoRaWan IoT Network",2019 IEEE International Conference on Consumer Electronics.

[5] Aye Aye Nyein and Ohnmar Win, "RFID Based Vending Machine", International Journal of Trend in Scientific Research and Development (IJTSRD) Volume 3 Issue 5, August 2019.

[6] Kanagasabapathi V, Naveenraj K, Neelavarnan V and Naveen Raj S, "Automatic chocolate vending machine", 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS).

[7] E. Govinda Kumar, P. Prabhu, L. Yasar Arafeth, S. Aravinth, R. Gopinath, "Design and Development of Automatic Ticket Vending Machine", International Journal of Advanced Science and Technology Vol. 29, No. 7, (2020).

[8] Razali Tomari, Aeslina Abdul Kadirb, Wan Nurshazwani Wan Zakariaa, Mohd Fauzi Zakariaa, Mohd Helmy Abd Wahaba and Mohamad Hairol Jabbara, "Development of Reverse Vending Machine (RVM) Framework for Implementation to a Standard Recycle Bin", 2016 IEEE International Symposium on Robotics and Intelligent Sensors (IRIS 2016).

[9] A.Hariharan, "Unmanned Coffee Vending Machine", 2019 International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN).

ISBN: 979-85-27243-61-1

INTELLIGENT CAR PARKING AND MANAGEMENT SYSTEM

AGALYA P[1], DHANUSH BHARADWAJ H P[2], PRATHIKA V M[3], RIYA ESTHER[4], RUCHITA R SHAH[5]

Department of Electronics and Communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57, India
[1]agalyas@sapthagiri.edu.in
[2]dhanushbharadwaj002@gmail.com
[3]prathikavm@gmail.com
[4]riyaek11@gmail.com
[5]rshahruchita@gmail.com

Abstract **- With the high percentage of vehicle ownership in India, parking has become a conflicting and confusing situation for number of people. Whether at an airport, bus station, shopping center and malls, problems with parking are an everyday occurrence. Lack of accessible parking can hurt local business and decrease the quality of life for residents. Due to the importance of parking, cities study, analyze parking programs and performance on an ongoing basis. The main focus of the work is to develope an intelligent car parking and management system that is efficient and more reliable. The proposed system aims in developing an integrated intelligent parking system to organize parking of vehicles in public spaces. In our work, we have tested to park 6 vehicles in the parking slot which can be expanded to any number of vehicles further.**

Keywords – Parking system, Efficient, Accessible, Integrated, Automation.

I. INTRODUCTION

Over a century automobiles have been in use demonstrating their usefulness as a mode of transportation. However, most drivers confront burdens while trying to locate an empty parking space. The problem faced by drivers in order to park leads to increase in traffic. Increasing volume of vehicular exhaust creates a negative impact on the environment. Certain Systematic complications can be considered to be time-consuming with inherent risks applied such as obstacle collisions. Intelligent parking system is an integrated system to organize parking of vehicles in public spaces.

The system developed can monitor every slot of the parking lot, find an appropriate parking spot, guide the car to the spot, and use the distance information received wirelessly from the car to calculate the self-parking instructions. These instructions are then sent back, and executed by the car. With this system, an owner can simply leave his or her car at the entrance of a parking lot and retrieve it while exiting guaranteeing practicality. The problem faced by drivers in order to park leads to increase in traffic. Increasing volume of vehicular exhaust creates a negative impact on the environment.

Work by [1] Vikas Saxena (2020) proposed a system to efficiently manage the available parking space.[2] Andrav S Agbemence (2016) proposed Number Plate detection system is done using OpenCv and Tesseract Engine. The Edge detection and Feature detection techniques combined with mathematical morphology for locating plate.. In his paper [3] Chen Yuan (2017) proposed a system for residential intelligent parking system which utilizes ZigBee to construct. It monitors whether a parking space has a car by its infrared detector and then automatically calculates the number of remaining free slot within the parking spaces using central management system software. Further [4] BaoTrung Mai (2012) proposed a study describes about an autonomous line tracing car using PID algorithm. The algorithm corrects the position of the line tracing car on the track through feedback signal from infrared sensors.

II. OBJECTIVES AND METHODOLOGY

The main objectives of the intelligent car parking and manage system are stated as follows:

1. To identify the vacant slots and display the number of the vacant slot.
2. To read and store number plate of the car.
3. To assign a slot from the available vacant slots, guide the driverless car to the assigned slot and to the exit gate after billing.
4. To develop an automatic navigation system for a driverless car.

ISBN: 979-85-27243-61-1

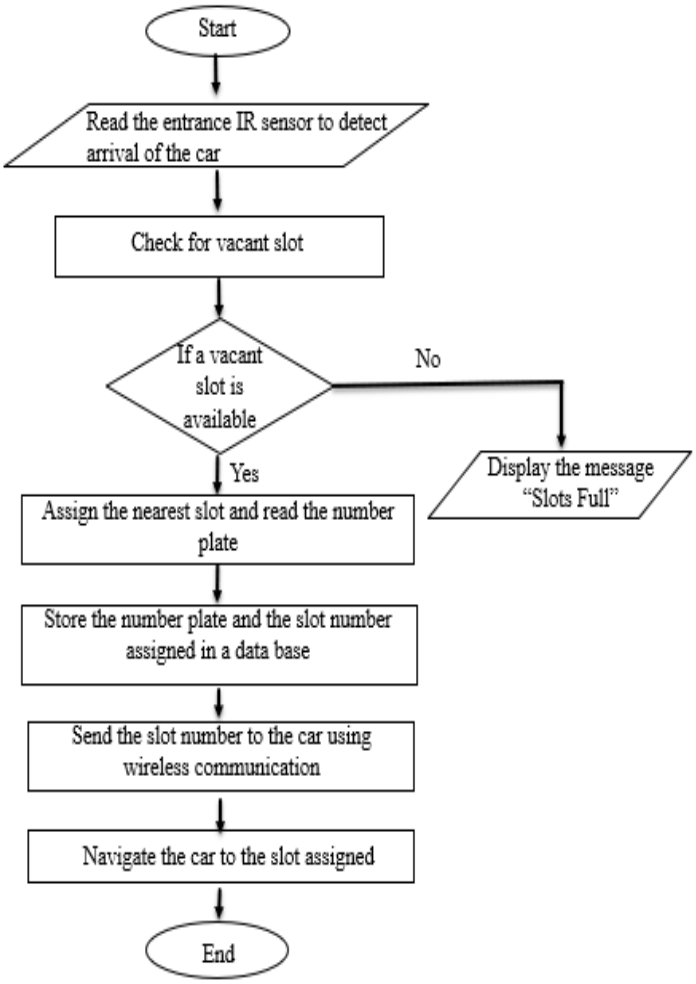


Fig.1 Flow Chart of the system.

Methodology:

When a car arrives at the entrance of the parking lot, the IR sensor detects it. The slots are numbered as 1, 2, 3, 4, 5 and 6 and the slots which are vacant are listed in the vacant slot list. The nearest vacant parking slot is identified from the vacant slot list and is displayed. At equal time intervals the slots are monitored by using the IR sensors to check if the particular car has retrieved or not. When all the slots are occupied, "Slots Full" is displayed. The number plate of the car is captured using Camera. The colour image is converted to gray image. Pre-processors are used on gray image to reduce noise. The edge detection is done using Canny Algorithm. The information of the slot is delivered as a command to the car. The command is communicated through wireless RF module.

An automatic parking navigation system is developed using a Line-follower and obstacle detecting robot. Line Follower follows a visual line embedded on the floor. Usually, the visual line is the path in which the line follower robot moves and is a black line on a white surface. IR Sensor Module is used as the line detecting sensor. Obstacle Avoider uses ultrasonic sensors to automatically sense the obstacle in front of it and wait till the path is cleared. At the exit time the billing is done accordingly. After the billing is done a command is sent to the car to return to the exit gate.

III. HARDWARE DESIGN AND IMPLEMENTATION

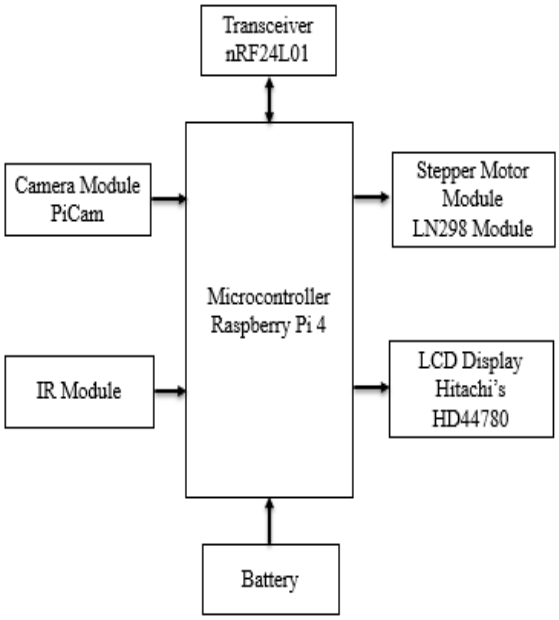


Fig.2 Block Diagram of Main Control System

The main control system comprises the blocks shown in Figure 2. The camera module captures the number plate of the car. The color image is converted to gray image for reducing the computational complexity. Pre-processer filters such as bilateral filter is used for reducing the noise keeping the edges of the image untouched. Canny edge detection algorithm is used for plate detection and the segmented image is passed to the Tesseract OCR engine for character recognition. The garbage texts are then filtered and sent to the database for further process. The LCD Display is used to display the numbers of available vacant parking slots.

The stepper motor module is used as the entry and exit barricades for the parking lot. The battery module powers the main control system of the parking lot. The Transceiver nRF-24L01 module transmits commands to

ISBN: 979-85-27243-61-1

the driverless car about the vacant slot, the path of the car towards it and receives the information about the vacant slots from the IR module. The Raspberry Pi is the brain of the control system making decisions and controlling all the components of the parking system. The IR sensors are used for detecting the vacant slots in the parking lot. The numbers of the available slots are saved in the database and the nearest slot is allocated. The database is updated accordingly and the next slot is kept ready for the next allocation.

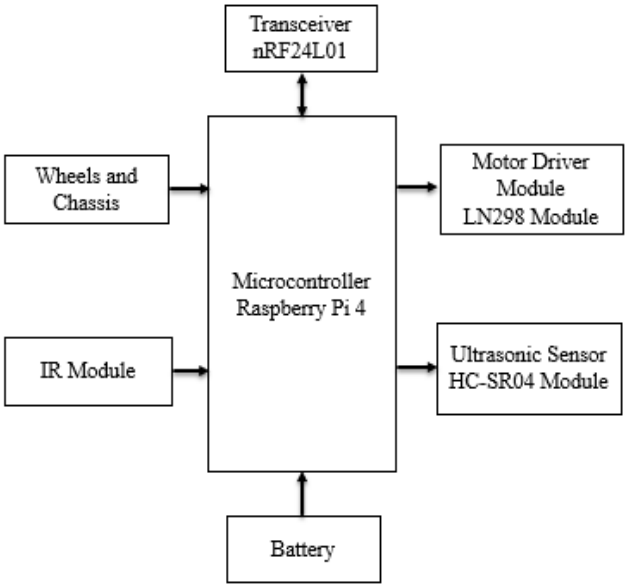


Fig. 3 Block Diagram of Autonomous Robot

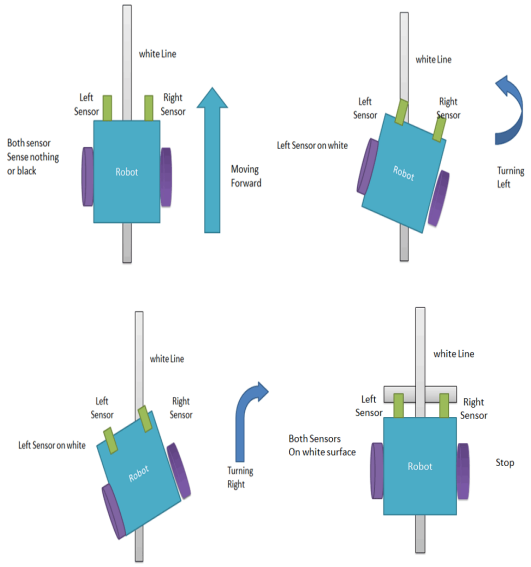


Fig. 4 Working of Line Follower

The figure 3, shows the block diagram of the Autonomous Robot. The driverless car consists of IR sensors for line following action and ultrasonic sensors for obstacle detection. If an obstacle is detected, the car waits till the path ahead is cleared. The motor driver module is used to drive the motors according to the output signal from the microcontroller. The transceiver module receives the information about the vacant slot from the main control system as well as the pre-defined path for the exit. The task of the microcontroller is to control the left and right motors according to the feedback signals from the sensors so that the driverless car stays on the right path.

IV. RESULT

The vacant slots are identified and displayed as shown in Fig.5. When all the slots are occupied,"SlotsFull" message is displayed as shown in Fig.6 .The number plate of the car is detected and captured as shown in Fig.7.

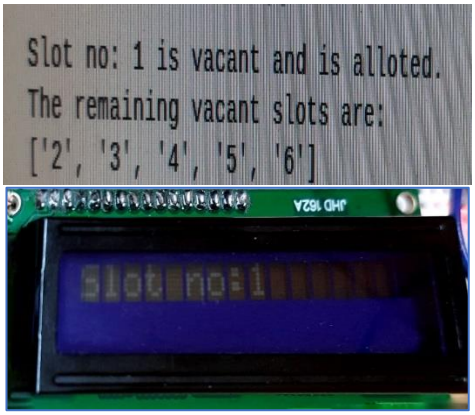


Fig. 5 The number of the vacant slot is displayed and the vacant slot list is displayed on the console

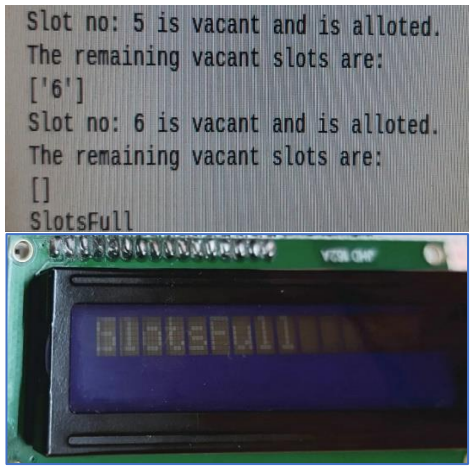


Fig. 6 When all the slots are occupied, "Slots Full" is displayed.

ISBN: 979-85-27243-61-1

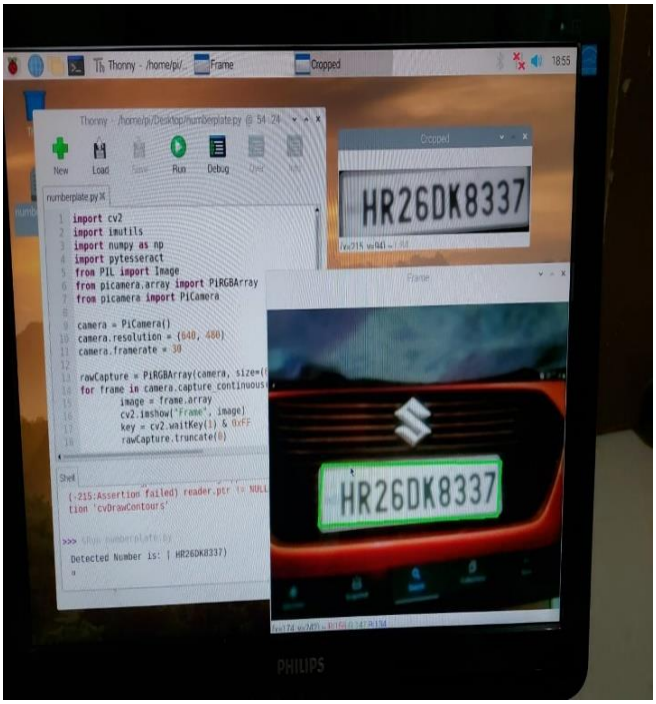


Fig. 7 The number plate of the car is detected and captured.

V. CONCLUSIONS

The parking solution will integrate the entire user experience into a unified action. The system provides the spot available there by saving time, resources and effort. The parking lot fills up efficiently and space can be utilized properly by commercial and corporate entities. Searching for parking burns around one million barrels of oil a day. An optimal parking solution will significantly decrease driving time, thus lowering the amount of daily vehicle emissions and ultimately reducing the global environmental footprint. Such kind of intelligent car parking system is really the need of hour.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal, Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1]. Vikas Saxena et al. *A parking slot allocation: Framework based on virtual voting and adaptive pricing algorithm- transactions on intelligent transportation system*. IEEE 2020

[2]. Andrav S Agbemence: *Automatic Number Plate Recognition System using OpenCV and tesseract OCR Engine*. International Journal of Computer Application 2018.

[3]. Chen Yuan: *Design of Intelligent Parking Lot System Based on Wireless Network*. CCDC 2017.

[4]. BaoTrung Mai et al. *Building an Autonomous Line Tracing Car with PID Algorithm.* World Congress on Intelligent Control and Automation 2012

[5]. Chuan Pham, et al. *Parking assignment: Minimising parking expenses and balancing parking demand among multiple parking lots.* IEEE 2020

[6]. Ruliang Zhang: *Car Number Plate Detection using Multi-Layer weak Filter*. IEEE 2017.

[7]. Jiameng Wang et al. *IPLMS: An Intelligent Parking Lot Management System*. Applications and Technology 2015.

ISBN: 979-85-27243-61-1

SMART HOME USING SMART MIRROR

Vidya V[1], Sushma G[2], Priyanka G[3], Nayana C S[4], Veena N[5]

Department of Electronics and Communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India
[1]Vidyavidhu2309@gmail.com
[2] sushmag743@gmail.com
[3]priyanka.g0702@gmail.com
[4]nayanasnaidu@gmail.com
[5] Veenan@sapthagiri.edu.in

***Abstract*— Home security and automation system have been gaining extreme popularity because of the enhancement in the field of science. This paper envisions a smart home based on four independent and emerging technologies which is face recognition, emotion recognition, smart mirror, home automation. A face recognition system includes several parts, such as face detection, skin color detection, image processing, and so on. In emotion recognition the main components of face (left eyebrow, right eyebrow, left eye, right eye, between eyebrows, nose and mouth) are extracted using facial landmarks. In smart mirror the contents are displayed on an LED monitor which is enclosed in a wooden frame and covered with a sheet of reflective mirror. It provides basic amenities like weather, date, time, news headlines and many more.**

Keywords— ARM7LPC2148, CNN, LBP, face recognition, emotion recognition

I. INTRODUCTION

In the previous few years, innovation has become significant and unavoidable piece of our every day schedules. With innovation advancing at quick movement, individuals are additionally expected to be more profitable and efficient in their every day exercises. The utilization of advanced mobile phones, tablets, workstations and other comparative gadgets has given individuals devices that assist them with remaining gainful and time-efficient. In any case, as much as the utilization of such gadgets is time-efficient, it is likewise tedious as it has become one more errand on ones day by day plan for the day. Also, time requests (cutoff times) are regularly the primary driver of an individual being feeling the squeeze. Along these lines, great time the board is the way to completing things. This doesn't just apply to ones expert life, yet to their private life also. A Smart mirror is a two-path reflect with an electronic showcase behind the glass. The presentation can show the watcher various types of data as gadgets, for example, climate, time, date, and news refreshes. A Facial recognition framework utilizes biometrics to plan facial highlights from a photo or video. It contrasts the data and an information base of realized appearances to discover a match. That is on the grounds that facial acknowledgment has a wide range of business applications. It very well may be utilized for everything from observation to showcasing. Home automation is the programmed control of electronic gadgets in your home. These gadgets are associated with the Internet, which permits them to be controlled distantly. With home computerization, gadgets can trigger each other so you don't need to control them physically**.** Facial emotion recognition is the process of detecting human emotions from facial expressions. The human brain recognizes emotions automatically, and software has now been developed that can recognize emotions as well.

II. LITERATURE SURVEY

A. Smart Mirror

Paper [1], the two main objectives are human monitoring and intrusion detection, the two modes of smart mirror are Normal mode and Triggered mode, in Normal mode the mirror just reflects the object in front of it . In Trigger mode the mirror acts like smart mirror, for triggering action the authentication has to be done, authentication involves to enter username and password once authentication is done the mirror displays temperature, weather, time, date and it also notifies depending on weather to wear jacket or to carry umbrella while going out. Voice command is accepted using microphone, physical touch using GUI and mobile control commands through internet are the three ways through which user can interact. The camera module is fixed on smart mirror if, PIR sensor detects the motion the smart mirror activates Raspberry pi to trigger the camera which starts to record video and converts it into frames. For detecting human the yolo technique with openCV is used. The frames are converted into S*S size grid and further to boundary boxes and class probability map is drawn to identify different objects. Once the intrusion is confirmed or person under monitoring moves out of the site, the alert message will be sent to administrator with registered mobile number. This system reduces time wastage and provides security.

.

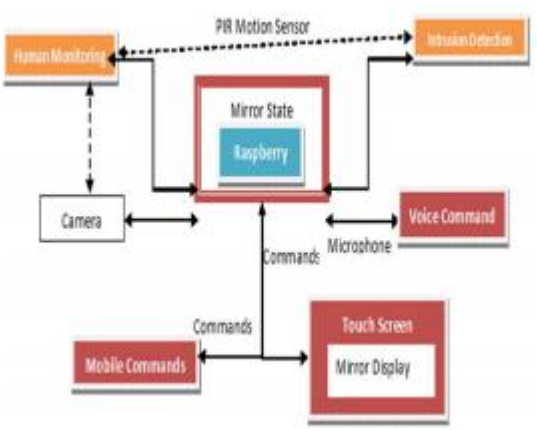


Fig. 1 : Block diagram of smart mirror

B. Face Recognition

In paper [2], facial recognition applications plays a significant function in numerous territories, for example, security, camera observation ,personality check in current electronic gadget, information base administration framework and brilliant card applications and so forth The principle target of facial acknowledgment is to validate and distinguish the facial highlights. There are three unique stages ,where in the principal stage human face is distinguished from the camera, second stage caught input is dissected dependent on the highlights and information base .In the third stage the feelings of human are perceived .Here the PC vision on advancements is utilized for face location and feeling characterization .This application is generally utilized in numerous territories, for example, training, industry, clinical and gadgets and so on, VGG16 and KDEF data set is worked to accomplish face order and acknowledgment. This investigation is chiefly build up a continuous framework to distinguish, perceive and characterize human face.

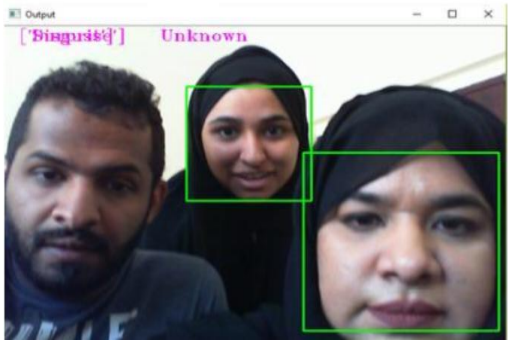


Fig. 2 : Face detection

C. Emotion Recognition

In Paper [3], The first model is the simple implementation of CNN on FER dataset and includes the removing of two classes with their labels i.e. Fear and Disgust since they consist of least number of tuples. The codes of the first proposed model are written in Python3. Later, the model has been used for generating outputs for input images to find the emotion of the person. This model has used 75% of the tuples for training and 25% for testing. The various applications of this project can be the security threats posses by normal public, receiving feedback from customer at hotels, restaurants, and other profitable businesses. The model generated through this module uses keras for pre-processing and TensorFlow uses deep neural networks algorithm to enhance the model. After several iteration the model reaches accuracy for 95% for training tuples and approx. 56% for testing tuples. The face is detected in the real time through the webcam using HaarCascade Classifier. The captured face is then converted into a grayscale in 48x48 pixels frame. The model then predicts the expressions. Model is saved in a json file and then it will be imported the OpenCV module to recognize the real time images in the videos taken from the user.



Fig. 3 : Examples of different facial expressions from the CK database
(a) neutral (b) happiness (c) sadness (d) surprise (e) anger (f) fear (g) disgust

In paper [4], the student's facial expression is detected. There are 7 emotions that are considered in this paper happy disgust, fear, sad, anger, neutral, surprise these emotions are recognized which can be helpful for teachers to know student's comprehension towards his/her presentation. openCV library is used to capture live frames from web camera. For student face detection based on Haar cascades method uses Adaboost learning algorithm. The convolution neural network architecture is used, firstly face detection is done from the input image, the face is then cropped and normalized to 48*48 pixels.

ISBN: 979-85-27243-61-1

This face is used as input to CNN, the output could be happy, sad, fear, disgust, anger, neutral and surprise. CNN mode has three layers convolution, pooling and fully connected. Convolution layer extracts features from the input image and perform dot product between image and kernel. Pooling layer reduces the size of input representation. Fully connected layer is used to classify the image into various classes depending on training dataset. For training CNN architecture, FER2013 database is used, the database is spitted into 80% training and 20% test data.



Fig. 4 : The structure of our facial expression recognition system

D. Home Automation

In this paper[5] the problem focused is time wastage, people spend lot of their time standing in front of the mirror this time can be utilized to get information like time, date, weather, report within a short period of time. This mirror behaves normal for unauthorized person. The authentication is done in two Steps, firstly face is scanned by camera module and then the fingerprint is verified. Now the mirror is activated, the home appliances like TV, mixi, switch and water level management are controlled using Raspberry Pi and it also controls music system through wireless medium. Normal temperature and humidity are stored in firebase when the temperature and humidity reaches abnormal values the sensor will detect immediately and send the alert message to user mobile. Authorized user can control the appliances with home assistant or WhatsApp chatboat, the commands are received through microphone and are processed using Raspberry Pi according to the command given by the user the relay switches the appliances. Hence this smart mirror provides the home automation services, Hi-Tech Security and notifies during emergency condition.

III. OBJECTIVES

- To provide home security using Face recognition.
- Identifying human emotion from facial expressions.
- Implementation of home automation using ARM7LPC2148.
- To create interactive environment using Smart mirror.

IV. BLOCK DIAGRAM

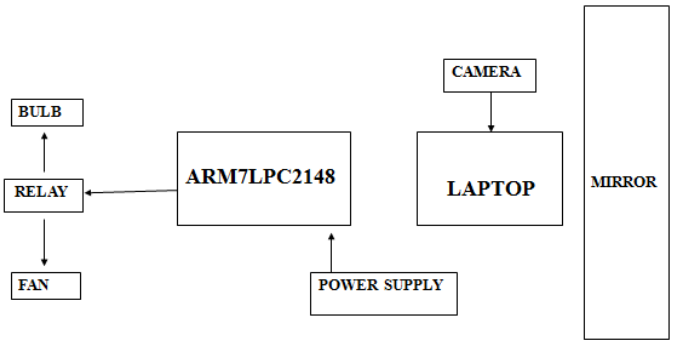


Fig 5 : Block diagram of the proposed system

V. METHODOLOGY

Automation is the new oil in IT industry, so we are trying to build a prototype for Smart Mirror based on ARM7LPC2148. Here we are using different modules of date-time, calendar, news headlines and complimentary text to give real time updates on mirror. The first and most important of our design phase was to decide the dimensions of our mirror. Next, it became necessary to design a frame to contain both the mirror and the suite of electronics behind it. A wood frame being standard for most mirrors, we looked to one way reflective mirror for a design solution. Face Recognition is add on to the project. Here we are going to use a surveillance camera so that it identifies the person and if that person is detected in the memory, it displays given command. Else it just greets and sends the image to the authorized user to take further actions. CNN is architecture is used for facial expression. Firstly the image is captured and then it is given as input. The obtained image is cropped and then normalised, final image is given as input to CNN after the process the output is obtained. The main advantage is the interaction of the build prototype mirror with the user. The system as

ISBN: 979-85-27243-61-1

in the name itself indicates, SMART [to make the work easier and self initiative] it access the "Voice based home automation" it involves in planning the control of home applications through voice commands and ARM7LPC2148 as server system. By using voice control access we can control the on and off of lights and fan control.

VI. CONCLUSION

The project based on smart mirror is set out to have mirror that could display dynamic date, time, weather report and headlines which utilize the time we spend in front of mirror every morning. Home Automation helps elderly and paralyzed people to control the electrical devices through mobile and voice commands. Suitable face detection techniques are used to identify theft and alert the authorized person, the face recognition techniques are cost-effective, reliable and accurate which provides the High-Tech Security and the implementation of facial emotion recognition is helpful for sentimental analysis. In future the project based on this may have high potential for marketing.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] Vasudha M. Bonal, Sujata P, Rubina M, Raju A. Nadaf Department of Computer Science (Autonomous) Basaveshwar Engineering College Bagalkot, India "Smart Mirror Using Raspberry Pi for Human Monitoring and Intrusion Detection" 1st International Conference on Advances in Information Technology 2019.

[2] Ken Nozaki, Farid Gharen Mohammadi ,Mohammed Saniee, chhikara ,Bin Li, "A real time face emotion classification and recognition using deep learning model",2020

[3] Saransh and Dr.Muthamil Selvan T,"Human Facial Expression Recognition Using TensorFlow and OpenCV", August 2020.

[4] Imane Lasri, Anouar Riad Solh, Mourad El Belkacemi Laboratory of Conception and Systems Faculty of Sciences Rabat, Mohammed V University "Facial Emotion Recognition of Students using Convolutional Neural Network" 978-1-7281-0003-6/19/$31.00 ©2019 IEEE

[5] Mr. P. Mathivanan (Assistant Professor), Sakthivel A (B.Tech) , Anbarasan G (B.Tech), Selvam G (B.Tech) Department of Information Technology ManakulaVinayagar Institute of Technology Puducherry, India "Home automation using smart mirror" Proceeding of international conference on systems computation automation and networking 2019.

ISBN: 979-85-27243-61-1

8-bit, 16-bit AND 32-bit MULTIPLICATION USING VEDIC MATHEMATICS

Sachin T S[1], Sagar S[2], Vikyath Kamalesh[3], Yeshwanth A[4], Suma V Shetty[5]
Department of Electronics & Communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]sachints1999@gmail.com
[2]sagarshahid7@gmail.com
[3]vikyath099@gmail.com
[4]yeshuarul17@gmail.com
[5]sumashetty@sapthagiri.edu.in

***Abstract*— The important arithmetic operation used in major processor is multiplication. Hence, the proposed paper concentrate on increasing the speed of multiplication using the vedic multiplication algorithm. Vedic Mathematics mainly consists of 16 sutras; this multiplication algorithm is designed by using Urdhava Tiryakbhyam sutra. The Multiplier Architecture is based on the Vertical and Crosswise algorithm of ancient Indian Vedic Mathematics. Vedic technique eliminates the unwanted multiplication steps. This reduces the propagation delay in processor and hence reducing the hardware complexity in terms of area and memory requirement. In this proposed multiplication algorithm, time delay will be less compared to other algorithms. Vedic multiplier is coded in VHDL and synthesized and simulated by using Xilinx ISE.**

Keywords*— Urdhava Tiryakbhyam; Vedic Mathematics; VHDL; Xilinx ISE

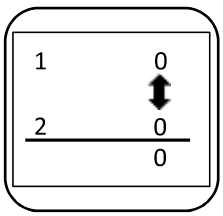
I. INTRODUCTION

Multiplication is a very essential arithmetic operation and extensively used in microprocessors, microcontrollers and digital signal processors. It is a time consuming operation because it takes more time and clock cycles as compared to other arithmetic operations. There are number of multiplication algorithms proposed in literature which include array, booth and Vedic algorithms. It is found from the various proposed architectures in literature that Vedic multipliers are faster than non-Vedic multiplier architectures. Different architectures have been proposed in literature to improve the efficiency of multiplication using Vedic mathematics. These architectures are based on conventional Vedic, Vedic using ripple carry adders (RCA), Vedic using addition tree structure and Vedic using carry save adder (CSA). Gupta et al proposed architecture for conventional Vedic multiplier. The drawback of conventional Vedic architecture is that it works fine at 2-bit level but when the order of multiplier is increased, it becomes more complex. Pushpalata and Mehta proposed an enhanced architecture for Vedic multiplier. The drawback of this architecture is that it uses three stage ripple carry adders that increases combination path delay. Ganesh and Chrishma recently proposed a new architecture for Vedic multiplier using CSA. It uses carry save adders instead of ripple carry adders. The drawback of Vedic using CSA architecture is that it uses 2 carry save adders for adding partial products and second adder is not fully utilized. Hence, here a new architecture for Vedic multiplier is proposed which is more efficient in terms of both cost and speed.

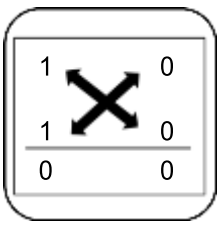
II. OVERVIEW OF VEDIC MULTIPLIER

Vedic multipliers are based on Vedic mathematics. Vedic mathematics has number of multiplication methods. The Urdhav-Triyakbhyam method is one of them. Urdhav-Triyakbhyam means "vertically and crosswise". The steps are as below.

STEP 1: Start from right and multiply vertically from right only and save the results

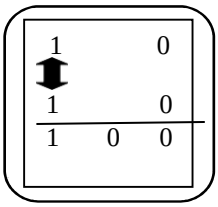


STEP 2: Multiply crosswise only and add them and save carry and sum



ISBN: 979-85-27243-61-1

STEP 3: Finally, multiply vertical from lefty only and add previous carry



III. Proposed Architecture

Proposed design uses only one carry save adder (CSA) instead of two, which results in reduced combinational path delay. The partial products are rearranged smartly so they can be added using one CSA. First a 2x2 multiplier is designed using conventional method due to minimal delay at this level.

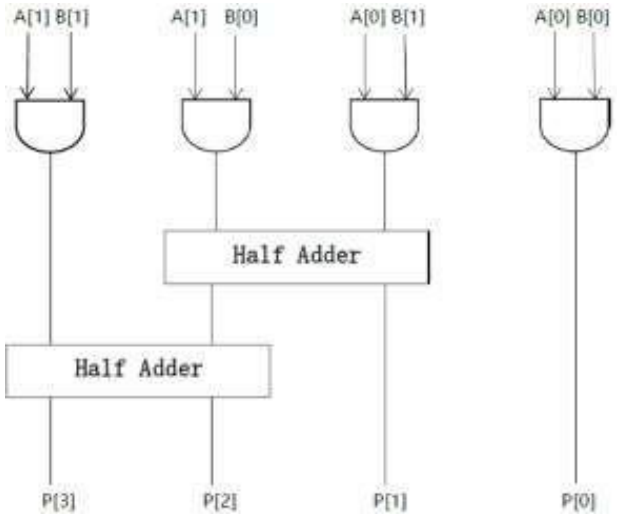


Fig. 1. 2-bit Conventional Vedic Multiplier

Using 2x2 multiplier, a 4x4 multiplier is designed in which 4 blocks of 2-bit multiplier and one 6bit Carry save adder is used. Using the same hierarchy 8x8 multiplier is designed in which 4 blocks of 4bit multiplier and one 12- bit Carry save adder is used. Using 8x8 a 16x16 multiplier has been designed which is used in 32x32 multiplier.

IV. Design Of 8-Bit Multiplier

In fig. 2, there are two inputs A and B each 8-bit wide which are arranged into four blocks each of 4-bit: A [3:0], A [7:4], B [3:0], B [7:4]. These four blocks are multiplied with each other using 4x4 multipliers. The lower 4-bits of first 4-bit multiplier is directly taken as output and higher 4-bit is added with output of second and third 4-bit multiplier using 8-bit CSA. The lower 4-bit of first 8-bit CSA is directly taken as output and the higher 8-bit is added with product of the final 4-bit multiplier and the product of the 8-bit multiplier is concatenation of obtained results.

$$SUM1 = Xi \oplus Yi \oplus Zi$$

$$CARRY1 = (Xi.Yi) + (Xi.Zi) + (Yi.Zi)$$

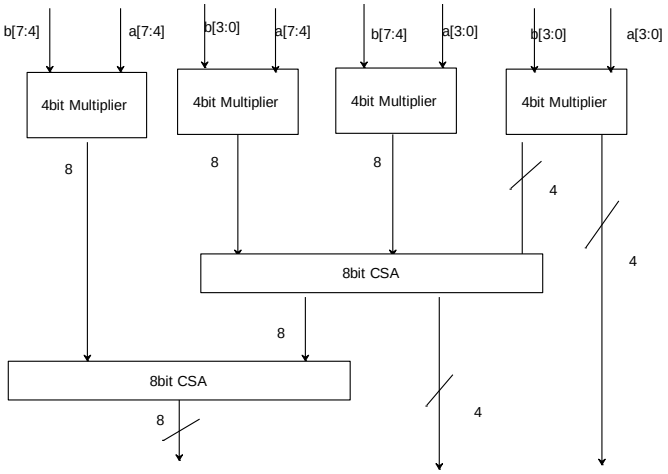


Fig. 2.Architecture for 8-bit Vedic Multiplier

V. Design of 16-bit Multiplier

In fig. 3, there are two inputs A and B each 16-bit wide which are arranged into four blocks each of 8- bit: A [7:0], A [16:8], B [7:0], B [16:8]. These four blocks are multiplied with each other using 8x8 multipliers. The lower 8 bits of first 8-bit multiplier is directly taken as output and higher 8-bit is added with output of second and third 4-bit multiplier using 8-bit CSA. The lower 8-bit of first 8-bit CSA is directly taken as output and the higher 8-bit is added with product of the final 8-bit multiplier and the product of the 8-bit multiplier is concatenation of obtained results.

$$SUM1 = Xi \oplus Yi \oplus Zi$$

$$CARRY1 = (Xi \cdot Yi) + (Xi \cdot Zi) + (Yi \cdot Zi)$$

ISBN: 979-85-27243-61-1

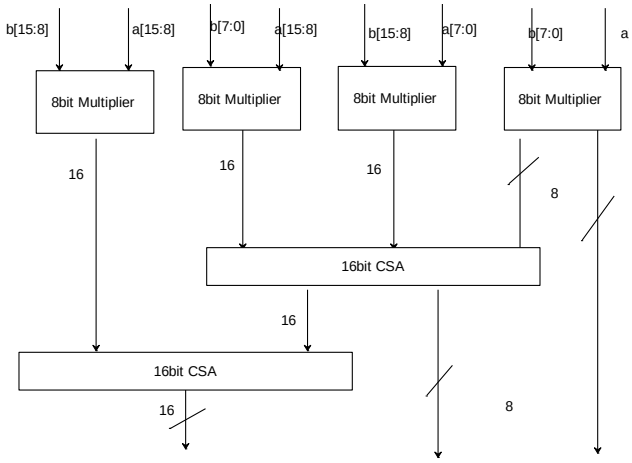


Fig 3. Architecture for 16-bit Vedic Multiplier

VI. DESIGN OF 32-BIT MULTIPLIER

In fig. 3, there are two inputs A and B each 32-bit wide which are arranged into four blocks each of 8- bit: A [15:0], A [32:16], B [15:0], B [32:16]. These four blocks are multiplied with each other using 16x16 multipliers. The lower 8 bits of first 8-bit multiplier is directly taken as output and higher 8-bit is added with output of second and third 4-bit multiplier using 8-bit CSA. The lower 8-bit of first 8-bit CSA is directly taken as output and the higher 8-bit is added with product of the final 8-bit multiplier and the product of the 8-bit multiplier is concatenation of obtained results.

$$SUM1 = Xi \oplus Yi \oplus Zi$$

$$CARRY1 = (Xi \cdot Yi) + (Xi \cdot Zi) + (Yi \cdot Zi)$$

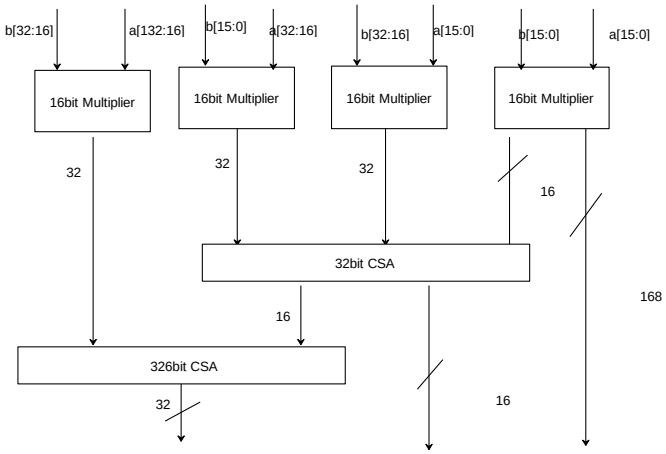


Fig. 4. Architecture for 32-bit Vedic Multiplier

VII. REQUIREMETS

SOFTWARE

Software used in this project were Xilinx 12.1 and Model Sim as as synthesis tool.

HARDWARE

Spartan 3E kit

VIII. RESULT

The codes developed were simulated using Xilinx and verified, using Model Sim graphs are obtained as per user inputs.
The verified codes are then dumped onto the Spartan 3E kit and operation of multiplication is done using matrix keyboard.

Following images shown are the verified outputs of 8-bit and 16-bit multiplication using Vedic mathematic techniques.

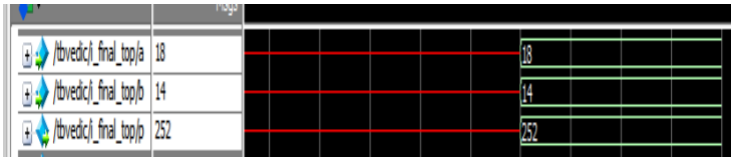


Fig 5. 8bit Multiplier output waveform.

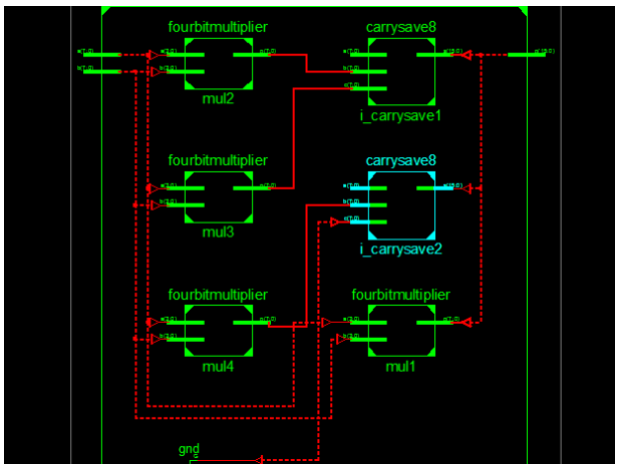


Fig 6. 8 bit Multiplier FPGA schematic.

ISBN: 979-85-27243-61-1

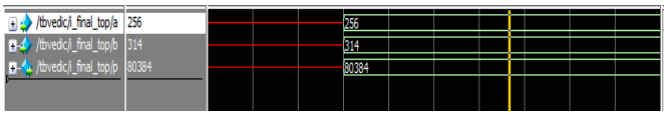


Fig 7. 16 Bit Multiplier output

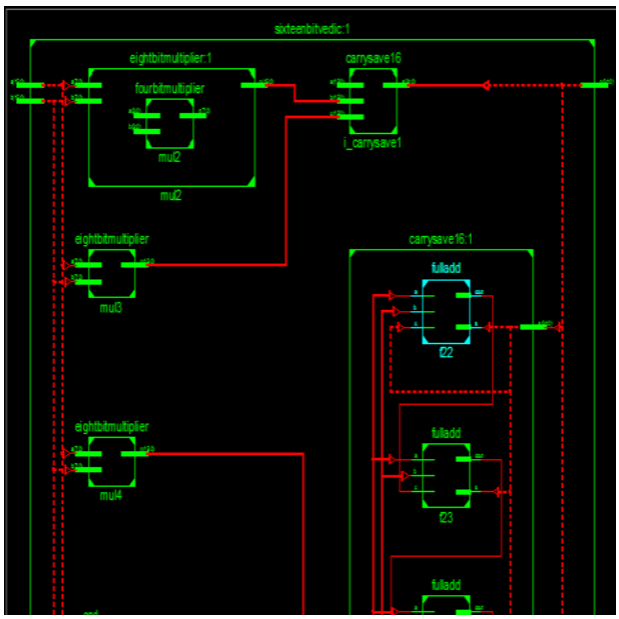


Fig 8. 16 Bit Multiplier FPGA Schematic

IX. Conclusion

Through this project, 8x8,16x16,32x32 multipliers using vedic architectures is developed and their Area and delay values are compared.

Mode	Area (in LUTs)	Delay
Array Multiplier	253	31.6
Vedic multiplier	191	31.5
Pipelined vedic Multiplier	192	7.6

For future work, the delay constraint can be worked upon , also can work on the higher bit widths to support for multiplication.

References

[1] Dravik KishorBhai Kahar: “High Speed Vedic Multiplier Used Vedic Mathematics” ICICCS 2017.

[2] Syed Shahzad Hussain: “Design and Implementation of 32-bit Vedic Multiplier On FPGA” MCCT 2016.

[3] Shamim Akhter and Saurabh Chatuvedi: “Modified Binary Multiplier Circuit Based On Vedic Mathematics” IEEE 2019.

[4] Gupta, A., Malviya, U., Kapse, V: “A Novel Approach to Design a High Speed Airthematic Logic Unit Based On Ancient Vedic Multiplication Technique”, International Journal of Modern Engineering Research (IJMER), Vol. 2, Issue 4, pp. 2695-2698, July- Aug 2012.

[5] Verma, P., Mehta, K. K.: “Implementation of an Efficient Multiplier Based on Vedic Mathematics Using EDA Tool”, International Journal of Engineering and Advanced Technology, Vol. 1, Issue 5, pp. 75-79, June 2012.

[6] Kumar, G., Charisma, V.: “Design of a High Speed Vedic Multiplier Using Vedic Mathematics Techniques”, International Journal of Scientific and Research Publications, Vol. 2, Issue 3, March 2012.

[7] Verma, P.: “Design of 4x4 Bit Vedic Multiplier Using EDA Tool”, International Journal of Computer Applications, Vol. 48, Issue 5, pp. 32-35, June 2012.

[8] Ramachandran, S., Pande, K.S.: “Design, Implementation and Performance Analysis of an Integrated Vedic Multiplier Architecture”, International Journal of Computational Engineering Research, Vol. 2, Issue 3, pp. 697- 703, May-June 2012.

ISBN: 979-85-27243-61-1

A NOVEL SECURED ELECTRONIC VOTING MACHINE

PRIYANKA R[1], RANJEETA DAS[2], SHRADDHA S GOWDA[3], VAISHNAVI K S[4] , SUMA C[5]

Department of Electronics and Communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India
[1]priyankaravindrakumar@gmail.com
[2]dasranjeeta00@gmail.com
[3]shraddhasreenivas06@gmail.com
[4]ksvaishnavi99@gmail.com
[5]sumac@sapthagiri.edu.in

Abstract **– In India, voting system plays a major rule during elections. Traditionally, India used ballot paper-based voting system, and now over the recent years we are voting through electronic voting machine popularly known as EVM, which also has some problems like time-consuming, rigging, requires more man -power and less trust-worthy. In order to overcome all these issues, there are lot of techniques or methods being proposed. But one such method, to overcome the above issues is the bio-metrics which is a unique trait or feature of each individual which mainly avoids the illegal voting(rigging). In this paper we propose the concept of bio-metrics based voting system, which gets the bio-metric details of an individual/voter which is entered as input to the system and then compared with the existing data, if match found, the person is eligible to vote and the result is displayed once the election process is complete.**

Keywords—EVM(electronic voting machine), Global system for mobile comunication(GSM), Internet of things(IOT), Election Commission of India(ECI), Liquid crystal display(LCD)

I. INTRODUCTION

India being the democratic country, Elections began to be held from the year 1952, which was ballot-paper based. Since 2000, the Election Commission of India (ECI) has deployed the use of Electronic Voting Machines, which mainly overcame the disadvantages associated with the traditional methods, such as storing, counting and recording of votes. Even though this machine is highly secure and reliable, it requires man-power and is also time-consuming process. To increase the accuracy, security and reliability, many techniques are been developed, one such method is the use of bio-metrics. This is the best and cheapest way of identification and verification. Since the Government of India has already issued Aadhar to each and every individual, we can easily verify and make the voters cast their votes without any difficulty, ensuring free and fair elections in the country.

II. LITERATURE SURVEY

In this paper [1] a democratic framework is planned which is safer, efficient and gives two degrees of verification by electronic methods, dependent on individual bio-metric attributes of the electors. This framework utilizes the bio-decimal standard for measuring the citizen as confirmation by which at the hour of election whenever checked bio-metric information of the elector, matches with that of stored in the database at that point and afterward, he will be permitted to cast a ballot else he will be dismissed. Bio-metric properties of any individual are one of a kind generally, which can't be coordinated with anyone like unique mark.

The paper [2] person has to give the fingerprint impression twice. One is for enrolling the details of the person before voting and next is required during the voting time. At the time of voting the person has to give the fingerprint impression then it is compared with enrolled data and check whether that person has voted or not. If the person has not voted than the person is allowed to vote and if the person has already voted than the buzzer is initiated to alert the security guards and take action on that person. All the warning instructions and the instruction required to cast a vote is displayed on the LCD. Finally, the result will be announced after completion of voting through IOT. Then the result will

ISBN: 979-85-27243-61-1

be sent as a link through Global System for mobile (GSM) to the registered authorized person mobile number.

This paper [3] manages the web-based voting framework that will impact the voting structure to smart, more secure and easy to vote. This paper shows a system which can be is connected with Aadhaar card. In the entire nation Aadhaar card Number is Unique for each individual and it contains biometric data of every subject. So, it will be useful in disposing of fake Voting. The proposed show has a more noteworthy security as in voter high security secret word is affirmed before the vote is acknowledged in the fundamental database of Election Commission of India. Subsequent to voting client need to cross check their vote then they can affirm with reference of remarkable id, which was created by ECI. In this model a man can likewise vote from outside of his/her allocated Constituency or from his/her favored area. This framework like-wise encourages the live spilling of vote tallies subsequently sparing a colossal time by giving on time result.

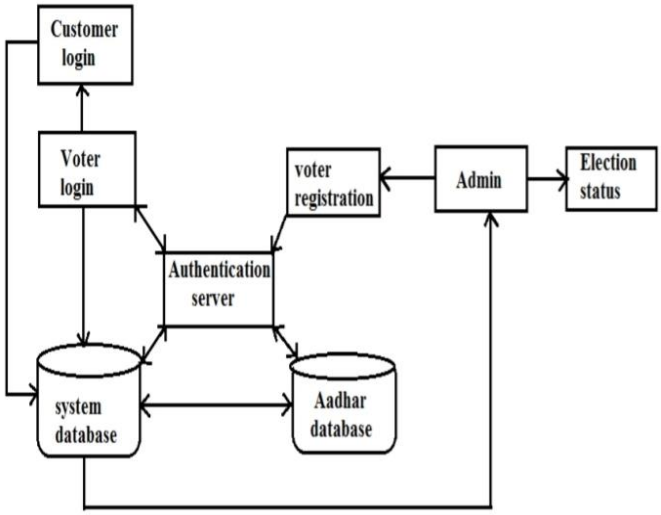


Fig. 1: Flowchart of Secured online voting system with Aadhar linking

In this system [4], two verification steps done. First step is Aadhar verification. If the data is wrong compared to the pre-recorded data, then that person will not be allowed to cast his vote. If the data is correct, then he will be allowed to cast his vote. Next, face verification is done. If the face matches, the person can select the voting button. Then the data is saved automatically by using Raspberry concept. So that the same person cannot cast his vote for the second time. After voting is done, the LCD displays that the voting process is successfully completed.

In this paper [5], an Aadhar database is created first, which has all the details of the voter. During the voting process, the voter places his Aadhar card on the scanner to verify the ID. After scanning with no issues, 'Begin to vote' is displayed. Then voter's fingerprint is verified and the voter is allowed to poll for the candidate. The candidate's symbols are visible through LCD display. After polling, the keys will be deactivated for a certain period until the other elector is permitted to poll. Votes are calculated and transmitted to the database of Election commission.

Here [6], when the person comes to vote he gives his thumb impression and if it isn't coordinated in the biometric machine, he will be considered as an unapproved person for voting, and if it matches, he will be sent to the polling station. If the system approves his age is greater than or equal to 18 then the person is considered as eligible for voting. The person makes their choice utilizing the touch panel which is taken care of by a man in the surveying station and the information will be put away in that tab just and these will be held in the offline system. By actualizing this they can attempt to stay away from the phony voters amid the election and to maintain a strategic distance from spams and also a lot of time can be saved.

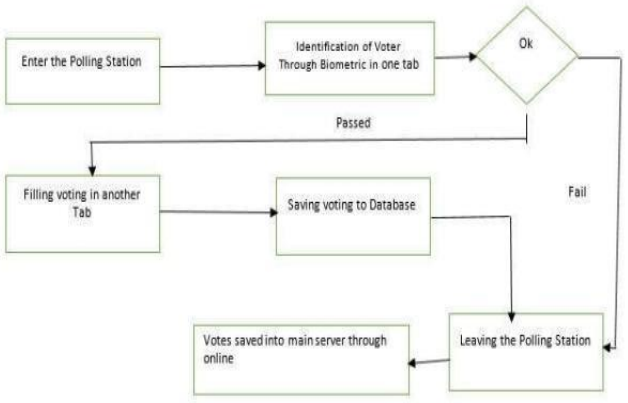


Fig.2: Flowchart of online voting system using Aadhar card as UID

ISBN: 979-85-27243-61-1

In the proposed casting a ballot strategy [7], utilizes a biometric framework that utilizes different wellsprings of biometric conduct. This should be possible by consolidating different highlights of an individual or various bio-extraction and coordinating calculations running on similar biometrics. This framework improves the precision of coordinating the information for the biometric framework in the democratic cycle. Since its absolutely impossible for any possibility to incite officially sanctioned biometric records before the political race measure, we use iris acknowledgment and unique mark checking for precision and sensible democratic outcome.

(A) Iris Acknowledgment: Iris recognizable proof uses design acknowledgment strategies dependent on high goal and repulsive pictures of iris in the natural eye. Iris is a steady organ for the duration of its life. Subsequently, it fills in as a decent biometric for setting up one's character. Because of margin for mistakes and speed, iris acknowledgment is currently the most dependable approach to confirm an individual's character.

(B) Fingerprints Acknowledgment: The human unique mark is exceptional to every person and is viewed as a sort of mark and checks the personality of the person. It is one of the most seasoned and most broadly utilized types of biometric distinguishing proof. A slope is characterized as a solitary curved segment, and a valley is the territory between two contiguous edges.

III. PROPOSED SYSTEM

Firstly, we will interface all the modules (fingerprint module, EVM, 16*2 LCD display, GSM module, fire and metal detector sensors and buzzer) with LPC2148 development board as shown in the fig 4.1. During the polling process, the voter places his/her finger on the fingerprint sensor, the sensor/module captures the fingerprint of the voter and is verified with the pre-recorded database. If the data is matched, the voter is allowed to cast his/her vote through EVM. If data is not matched with the stored data, the buzzer beeps and hence the person is not allowed to cast his/her vote. All the instructions of the voting process are displayed on 16*2 LCD display. Once the voting is completed, the number of votes is updated on the cloud platform and also the voter receives a confirmation message to their registered mobile number. For the security of EVM, we will be using fire and metal detector sensors, this helps in preventing the destruction of EVM when stored in strong room.

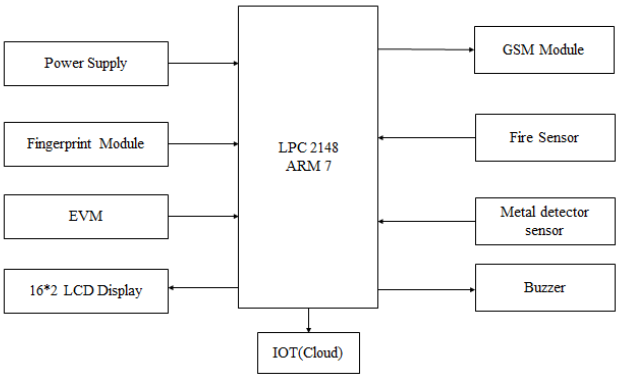


Fig.3: Block diagram of Proposed system

(A) LPC2148

The LPC2148 microcontroller is designed by Philips (NXP Semiconductor) with several in-built features & peripherals. Due to these reasons, it will make more reliable as well as the efficient option for an application developer. LPC2148 is a 16-bit or 32-bit microcontroller based on ARM7 family. LPC2148 microcontroller consists of 64 pins and the group of these pins is called a port. It consists of two ports and registers. These ports could be used as input or output ports therefore the pins of these ports are called GPIO (general purposes input-output) pins. The LPC2148 microcontroller has 512-kB on-chip FLASH memory as well as 32-kB on-chip SRAM. Also, this microcontroller includes inherent support up to 2kB finish point USB RAM. This memory is well matched for all the microcontroller applications.

(B) Fingerprint Module

The fingerprint module is the input module to the microcontroller, used for registering and verifying the voter's details. The functioning guideline of the finger impression sensor mostly relies upon the preparing. The unique finger impression preparing essentially incorporates two components in particular enrolment and coordinating. In unique finger impression selecting, each client needs to put the finger twice. With the goal that the framework will check the finger pictures to measure just as to produce an example of the finger and it will be put away. While coordinating, a client puts the finger utilizing an optical sensor then the framework will create an example of the finger and contrasts it and the finger library formats.

(C) EVM (Switches)

Switches are used by the voters to cast the vote. A total of 4 switches will be used (3 switches belongs

ISBN: 979-85-27243-61-1

to respective pollical party and 1 being NOTA). During voting process, the voter needs to choose the candidate of his/her choice.

(D) LCD Display

Liquid Crystal Display (LCD). It is one sort of electronic presentation module utilized in a broad scope of utilizations like different circuits and gadgets like cell phones, mini-computers, PCs, TV sets, and so on These showcases are for the most part liked for multi-portion light-producing diodes and seven sections. The fundamental advantages of utilizing this module are cheap; essentially programmable, liveliness, and there are no restrictions for showing custom characters, unique and even activities, and so on

(E) IoT Cloud

Cloud platform Thingspeak is used to view the polling results. A person needs to create an account to see the polling results. This is done by connecting the microcontroller to the internet through ESP8266. Thingspeak can store, retrieve and analyze the data.

(F) GSM Module

A GSM modem or GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. From the view of the mobile phone network, they are essentially identical to an ordinary mobile phone, including the need for a SIM to identify themselves to the network.

(G) Fire sensor

A fire detector works by detecting smoke and/or heat. These devices respond to the presence of smoke or extremely high temperatures that are present with a fire. After the device has been activated, it will send a signal to the microcontroller, which in turn, makes the buzzer beep and a message is sent to the polling officer.

(H) Metal detector Sensor

Metal detectors work by transmitting an electromagnetic field from the search coil into the ground. Any metal objects (targets) within the electromagnetic field will become energized and retransmit an electromagnetic field of their own.This in turn makes the buzzer beep ensuring the safety and security of the EVM.

(I) Buzzer

A buzzer is an audio-signaling output device, which is used to alert, when any person tries to damage the machine or comes for repeated voting.

ISBN: 979-85-27243-61-1

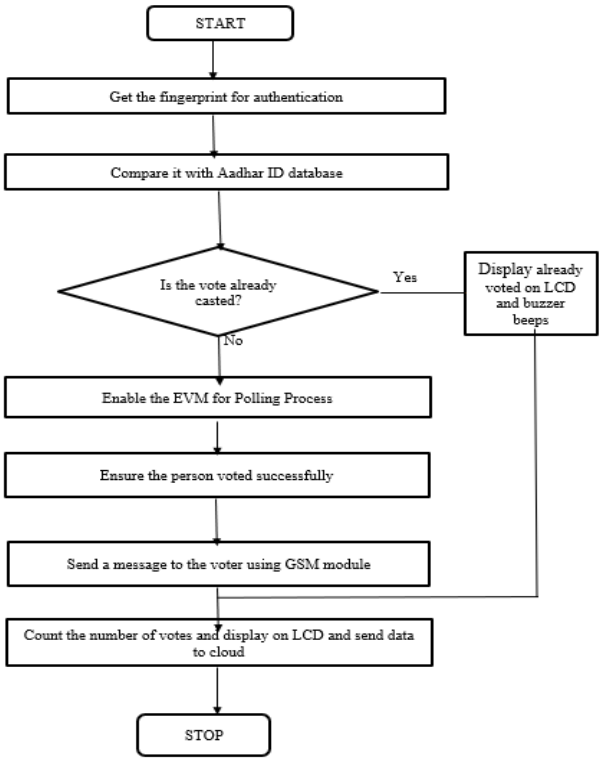


Fig.4: Flowchart of Proposed System

IV. OBJECTIVES AND METHODOLOGY

Objective-1: To provide transparency in voting using fingerprint recognition and Aadhar details.

R305 Fingerprint module is interfaced with LPC2148 using USB Serial converter, then start up the software and register the fingerprints of the voter and store it in database.

Once the voter places the finger on the scanner, it will scan and controller matches with the stored data and gives authentication.



Fig.5: Fingerprint module

Objective-2: To enable the person to cast his/her vote by displaying the instructions on LCD throughout the polling process.

Once the voter is verified, with the data stored in the database, a 16*2 LCD display is used to display all the necessary instructions required for the polling process as shown in Fig. below

Voter can cast his/her vote to the candidate of their choice using switches, as depicted in figure as soon as the voter casts the vote, the buzzer beeps, giving an alert that the vote is casted.



Fig.6: Display of instructions on 16*2 LCD

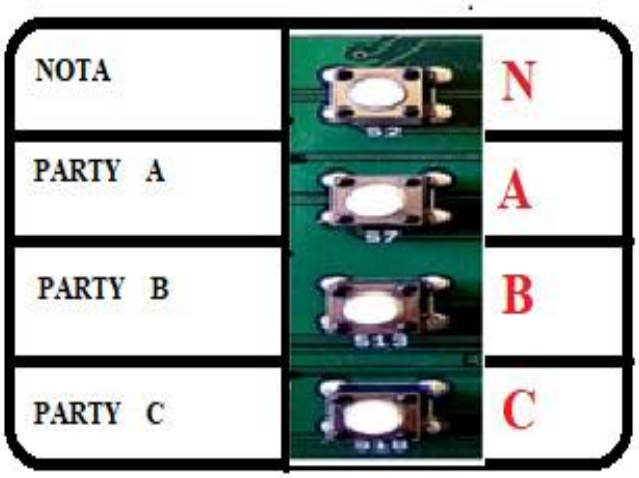


Fig.7: Voting using switches

ISBN: 979-85-27243-61-1

V. CONCLUSIONS

The research work carried out has generated useful conclusions. Our Proposed architecture provides safe and secure voting system with accurate and fast results. It will definitely overcome drawbacks of traditional methods. As each and every person has unique fingerprint impression so it makes our project more secure because fingerprint impression of a person cannot be hacked or misplaced. So, the person need not carry his ID card during the time of voting. Hence it also reduces the chances of repeated voting. Thus, with bio-metric voting system would enable hosting fair elections in India. The citizens can choose their candidate of their choice thus exercising their power through democracy.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal of Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] Kiran Chavan, Kashinath Raut, Ashish Bhingardive, Yogesh Kolape , D. M. Ujalambkar "Implementation of Aadhaar Based EVM", International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 6 Issue V, May 2018

[2] Tabassum Fatima, H M Preeti, Dr. Baswaraj Gadgay "Fingerprint Based Voting Machine using ARM7", International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 6 Issue VII, July 2018

[3] Akshay Agarwal, Janardan Jadhav, Snehal Gavande, Bhairavi Sawant, Sonali Sawant, "Secured Online Voting System with Aadhaar Linking", International Journal for Research in Engineering Application & Management (IJREAM) ISSN: 2454-9150, April-2018

[4] Kone Srikrishnaswetha, Sandeep Kumar and Md. Rashid Mahmood, "A Study on Smart Electronics Voting Machine Using Face Recognition and Aadhar Verification with IOT", Springer Nature Singapore Pte Ltd. 2019

[5] Naveenraj M, Arun AC, Gowtham A, Laleth TR, Naveen Kumar G, "Biometric based Electronic Voting System using Aadhar", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-6S, April 2019

[6] Praveen Kumar K, Sitesh Kumar Sinha," fingerprint based online voting system using Aadhaar card as UID", Mukt Shabd Journal Volume IX Issue VI, JUNE/2020 ISSN No: 2347-3150

[7] Aman Jatain, Yojna Arora, Jitendra Prasad, Sachin Yadav, Konark Shivam, "Design and Development of Biometric Enabled Advanced Voting System", International Journal of Innovative Research in Computer Science & Technology (IJIRCST) ISSN: 2347-5552, Volume-8, Issue-3, May 2020

ISBN: 979-85-27243-61-1

SMART ROAD DIVIDER FOR TRAFFIC CONTROL

[1]Varshini K, [2]Prajwal R, [3]Vasanth Kumar G V, [4]Vishwas M, [5]Vivek H M

[1]Assistant Professor, Department of Electronics and Communication Engineering, Sapthagiri College of Engineering, Bengaluru
[1]varshinik@sapthagiri.edu.in

[2,3,4,5]Students, Department of Electronics and Communication Engineering, Sapthagiri College of Engineering,Bengaluru
[2]prajwalr365@gmail.com, [3]vasanthkumargv108@gmail.com, [4]vishwasm1599@gmail.com, [5]vivekhm112@gmail.com

***Abstract*— Static Road Dividers are used to isolate on-going and incoming traffic on roads. This in turn aids in maintaining the traffic flow. The major drawback with Traditional Road Dividers is that the number of paths or lanes on either aspect of the road is static. During peak hours, emergency vehicles stumble in traffic failing to reach the destination in time resulting in fatal consequences. The collective impact of the fuel and time that may probably be saved by adding a minimum of one further lane to the direction of the rush is significant. Here, a methodology is put forth that formulates an automated road divider mechanism that shifts lanes, so that the number of lanes with in the direction of the rush can be increased.**

Keywords*— *Static Road Divider; traffic flow; peak hours; emergency vehicles; automated road divider

I. INTRODUCTION

A lot of Countries all over the World are going through the difficulties of Traffic Congestion owing to an increase in automobiles. Regardless of the quantity of vehicles, the Road infrastructure is nearly unchanged that isn't ready to cope up with the changes like uncertain travel delays, blockage of busy roads and accidents. The major issue with traditional Road Divider is that the quantity of lanes on either aspect of the road is static. There's a notable increase within the variety of cars on road as population at the side of the quantity of cars per family is increasing and additionally the resources are restricted. Managing the road traffic has emerged as a severe downside in trendy situation. There are plentiful situations where an Nursing automobile gets stuck in traffic and needs to watch for few minutes to hours to flee from the traffic jam which could conjointly place the patient's life in danger. Widening the surface of road and increasing traffic jam has harsh environmental problems like traffic jams, traffic jam, serious pollution and connected health issues. Congestion in traffic in due course ends up in slow speeds, that will increase the time of travel and stands out collectively of the main problems in metropolitan cities.

According to 13 hours inspection made on traffic conjunction at Maharashtra's Wester Express road, to gather the information on vehicle movement, we came to know that the traffic will be high in any one of the tracks and another track will either be free or very few vehicles. Speed of vehicles will always be more during that road rage (rush hours). We came to know that during that rush hour the clearance of traffic for emergency vehicle is very less as everyone is rushing to reach their destination in respective time without any time lag. To reduce this vehicle rush we can use our project, so that we could move the medial strip to any one of tracks depending on intensity of conjunctions, if any vehicle is detected during the movement of strip there will be buzzer which will create an alarming sound, indicating that driver should clear his vehicle so that the divider could continue its movement.

The major concern of the project work is to upgrade the traditional traffic congestion problems to new era by solving the problems faced, to manage density traffic and to scale back the time of travel throughout peak hours for a far better and smarter answer for the aforesaid traffic issues.

II. RELATED WORK

[1] In this paper, a demo model of 'Controlling of traffic using Ultrasonic sensors' is designed and developed. The problem focused in this paper is to implement moveable traffic divider, as a congestion release strategy for metropolitan areas in place of traditional solution of widening the roads. The moveable traffic divider helps in the regulating the road capacity, so as to attain optimum benefit by using on the existing road itself. The chances of occurrence of traffic will be more with static divider Fig. 1. In the existing system for the free flow of traffic heavy machines like zipper machines,

ISBN: 979-85-27243-61-1

barrier transfer machines are used for the movement of road dividers, Using these machines a whole stretch of dividers is used to move either left or right based upon the traffic density, as shown in Fig. 2. Since it is a demo model, it is only shown it through one way of traffic using ultrasonic sensors. The traffic congestion data from the sensors is given to the nearest traffic control room using a Wi-Fi module. The data from the sensors is updated automatically. But in real time traffic congestion can be in more than one direction, this module can be used then by using image processing rather than the basic sensors. The main disadvantage of this project is it is time consuming process and not flexible.

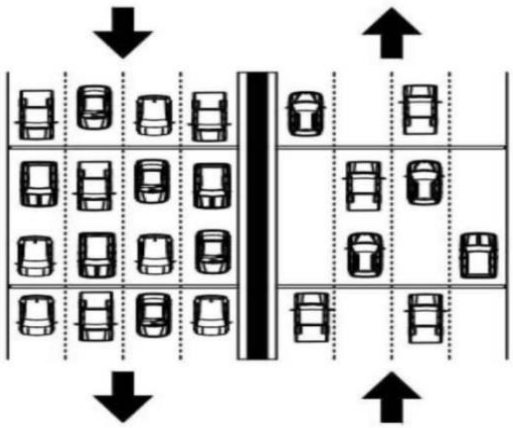


Fig.1 Road with Static Divider

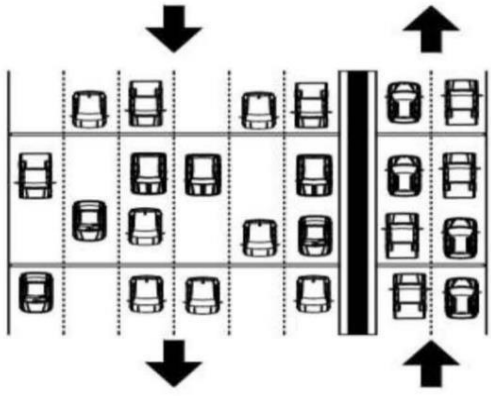


Fig. 2 Road with Movable Divider

[2] In this Paper, the info directions for the Proceedings of the intelligent control system for motorcar is conferred. The intelligent control system provides an traffic free lane only for emergency automobile although stuck in traffic. Green corridor passageway system is employed to produce clearance to any emergency vehicle by turning all the red lights to green on the trail of the emergency vehicle, hence providing the clear passageway to the required vehicle. Additionally to the green corridor path, the system conjointly tracks emergency vehicles like ambulance and fire brigade once passing through traffic light. The GPS inside emergency automobile doesn't require any power, which is advantageous to this system. The main drawback of this method is that, once the wave is disturbed, the disturbance will cause traffic drawback which will be exaggerated by the readjustment of disturbance. Here a mobile application is made for the ambulance. Through that application the ambulance driver will register the case of emergency, this method is beneficial for sensible dominant of ambulance. It also provides a platform for the death tolls to decrease.

[3] Here, a ZIGBEE module is employed to spot the presence of emergency automobile. The ZIGBEE module is placed in the emergency automobiles and therefore at the signals. The signal transmitted from the automobile is received to part of the traffic signal through ZIGBEE module. This system works in low power hence it can work with the power of the vehicle's battery. This system finds a lot of applications like ambulance path clearance, Traffic police surveillance, public transport accident location etc. The cost of implementation of this system is low and easy to use. The process involves in checking the original signal present in the traffic signal when the code is received by ZIGBEE module. If the signal is green it does not make any changes and leaves the signal as it is. If the signal is red it changes to green while the other signals are turned red. Thus it clears the path of ambulance in that direction. During this paper, a completely unique plan is planned to dominant the traffic signals in favor of ambulances. The look and implementation of this method is directly targeted to manage the traffic in order that the emergency automobiles on the road gets clear path to reach their destination.

[4] The system here aims at reducing traffic by neatly sensing the traffic flows on either aspect of the divider and moving the divider consequently, thereby saving the time and fuel. This method additionally works on safety measures by intimating the drivers regarding the movement of the divider. A module has been developed on supported microcontroller that's Arduino Mega that consists of IR Sensors that is employed for measuring the density of the traffic. Once the signal turns red, the traffic

ISBN: 979-85-27243-61-1

density is measured and therefore the action ought to manifest itself before the signals turns into green. If the traffic density is high then the divider can move to the other direction and a message is displayed on the digital display or LCD stating "High Traffic". If the traffic density is casual then no action is taken and therefore the divider can stay at the middle of the road. Just in case of casual traffic density, a message is showed on digital display stating "Less Traffic" and it display as "Medium Traffic" just in case of medium traffic. This additionally permits the Traffic Police to manually manage the divider position with supported necessities and to produce a free path for ambulance that ensures the auto to achieve the hospital with no delay.

[5] In this paper, the ultrasonic sensor is placed on one side of the road to detect any traffic congestion. If there's a congestion, then the extended divider raises up and traditional divider is ready to ground level, else the conventional divider is raised up and extended divider is ready to ground level. And just in case of congestion a message is shipped to the near control police stating that congestion has occurred, the diagram of this paper is shown in Fig. 3. During this planned system, a module has been developed on supported microcontroller that consists of IR detector that is employed for measuring the traffic density and consist of 2 dividers traditional and extended. Once the traffic is high a message is shown on digital display stating "Left side or Right-side traffic is high, extended divider is up" to the nearest traffic control room. This model is applicable in the cross road and traffic zone. Using this system more organized traffic flow can be achieved, reducing traffic jams and based on the traffic density the time allotted for the passing of traffic is decided automatically.

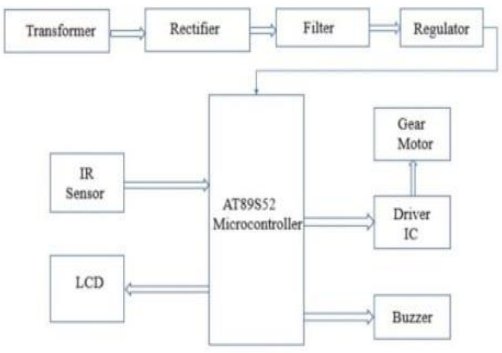


Fig. 3 Road Divider with two dividers

[6] This paper proposes a movement management frame work and consequently clears the road clog for Emergency vehicle. Here Sound coordinative mechanism is employed to identify the emergency vehicle. RFID is employed to acknowledge the emergency vehicle once it involves about to the flag region. Here the concept is planned to dominant the traffic signals in favor of ambulances throughout the emergency. With this technique the ambulance will be reached to the hospital without any interruption by choosing the mechanism of shortest path and congestion details of all potential routes.

III. OBJECTIVES AND METHODOLOGY

***Objective*-1**: To reduce traffic congestion by using Movable Road Divider.

Calculating the traffic on both the lanes using IR sensors

On the designed road divider, IR sensors are set on both the sides facing towards the road. The primarily function of this sensor is to take readings of traffic density and to calculate them in terms of percentages. The IR radiations from the sensor are reflected back whenever an obstacle is in its proximity. It records the time for which the radiations are reflected and this analysis of the sensor is taken for a fixed time (20 sec).These two percentages are then compared with each other to decide the highest density relative to each other. Then the divider automatically moves towards the lower density side of the road divider giving an extra path to higher density side. The direction and movement of the divider on either side of the road is intimated to the vehicles in advance by showing in the LCD display so there wouldn't be any uncertainty in clearing the lane or path of the divider movement.

Movement of Road Divider

Depending on the traffic densities obtained from the sensors, we follow up on the below actions:

- No Movement of the divider (ideal).
- Movement of the divider to the left direction.
- Movement of the divider to the right direction.

The first action is the ideal situation where no action is done. Whenever there is an equal proportion of traffic densities on either side then this action is followed. Then the next two actions are followed/ observed depending on the comparison of traffic densities on both the sides

ISBN: 979-85-27243-61-1

whether the movement should be right or left directions. These activities are repeated. This mechanism shouldn't be exaggerated and hence the divider movement should be minimum.

Detecting any obstacles while moving the road divider using Ultrasonic Sensor

It is important to check if there are any obstacles in the direction of the divider movement. The obstacles can be anything from vehicles moving close to the lane or things which obstruct the barrier movement. We have considered the vehicles moving close to the divider as the obstacles in the project. Ultrasonic sensors are fixed on both the sides, its function is to determine the distance at which there is an obstruction to the divider movement. We would pre-set distance of 2cm for the ultrasonic sensing. A sounding system is deployed whenever any vehicles passes the proximity range of the sensor set to 2cm. Buzzer is used as the beep sounding system. The divider will continue its movement only after the obstacle is cleared from its way.

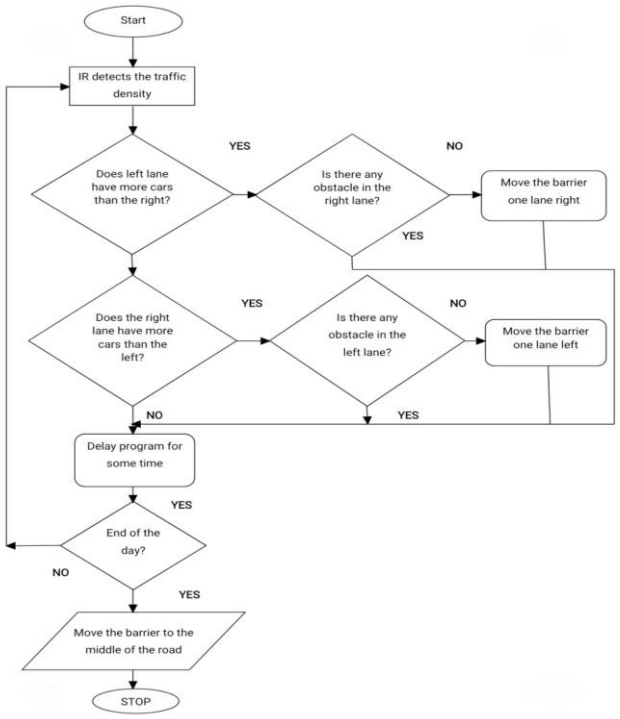


Fig. 4 Flowchart for Movable Road Divider

***Objective*-2:** To use every second efficiently to save human life by providing free lane for Ambulance.

(1) RGB LED deployed on two sides of the road.

(2) Divider moves to one side and provides free lane for Ambulance.

(3) Whenever divider receives signal from Ambulance RGB LED's connected on road side will start glowing.

(4) Ambulance will be detected 100m away from the divider, so the traffic signal changes accordingly and make traffic lane for Ambulance.

Detection and Clearance of Emergency Vehicles

We have added an extra application for clearance of emergency vehicles in traffic congestion. The traffic signal is in RED state. The driver sends signal through transmitter and the message is received at the receiver end. Then the traffic signal changes from red to green state. According to the destination path of the emergency vehicle, LEDs deployed on the lanes, will glow on either side of divider or at the extreme ends. When the LED's glow at any one of the sides whether towards the divider or on the lane, it specifies that other vehicles have to make clearance for the emergency vehicle to leave the traffic.

Whenever the emergency vehicle is in traffic, the other vehicles which are near to it should leave way in giving a path for the vehicle to pass.. During this time the signal would be in red state. Till the time at which the emergency vehicle is in the congestion the traffic signal will be in green signal. After the movement of emergency vehicle depending on the driver destination paths, the signal will turn to its initial state (red).

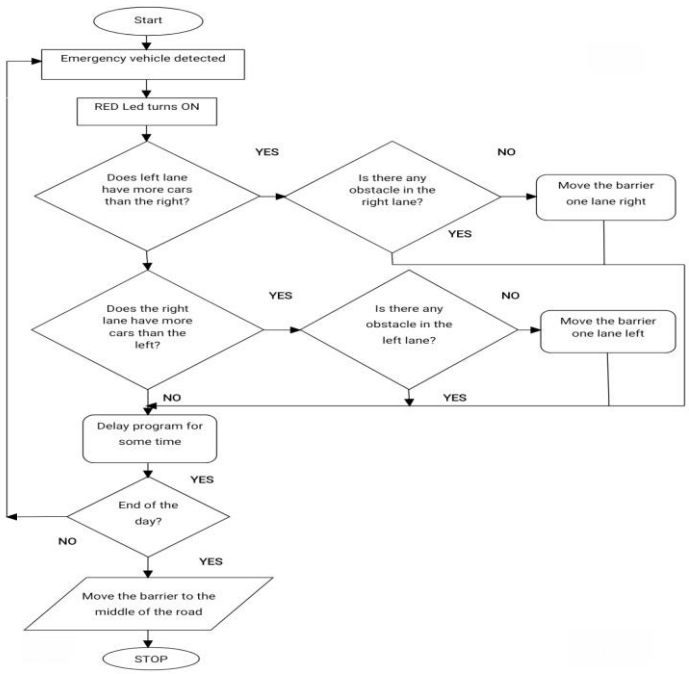


Fig. 5 Flowchart for free lane for Emergency vehicle

ISBN: 979-85-27243-61-1

IV. CONCLUSION

There are several problems and issues which are most important and have to be cleared and verified. In the papers reviewed so far, there are notable issues like traffic congestion emergency, vehicle movement in busy roads, over speeding and difficulty in identifying vehicles violating traffic rules. Traffic signal jump can be detected using RFID tag are going to be a good fix in bringing down the cases of traffic signal jump and then traffic violators can be easily obligated by the police.

V. RESULT

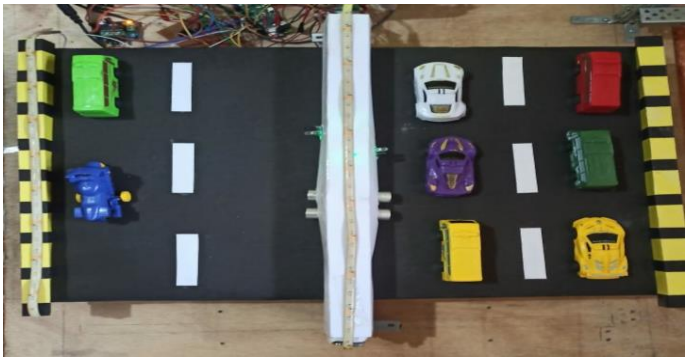


Fig. 6 Right side of the lane has more vehicles compare to left



Fig. 7 Density of traffic displayed on LCD



Fig. 8 Moving direction of Divider

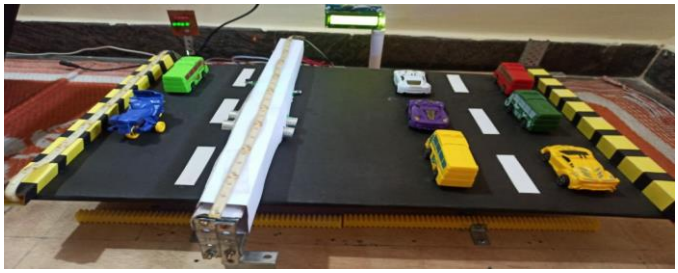


Fig. 9 Movement of the divider based on traffic density



Fig. 10 Free lane for Ambulance

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal of Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] S Jyothirmayee, G Vamshi Krishna, J Nanditha, B Shashank Yadav "Controlling of traffic using movable road dividers" International Journal of Advance Engineering and Research Development (IJAERD) Volume 5, Issue 04, April 2018.

[2] Bhairavi Karale, Nikita Wasnik, Mansi Singh, Renuka Jawase, Apurva Bondade and Amruta Chopade "Survey Paper for Intelligent Traffic Control System for Ambulance" International Journal of Trend in Research and Development (IJTRD) Volume 5, Issue 1, Jan - Feb 2018.

[3] P Eswari, D Sabeetha, W Sneha "An Efficient Traffic Clearance System For Life Saving Vehicle" International Journal of Advanced Research Trends in Engineering and Technology (IJARTET) Volume 3, Issue 4, April 2016.

[4] Satya Srikanth Palle, Sriraksha B M, Vibha H B, Yeshashwini A "Implementation of Smart Movable Road Divider and Ambulance Clearance using IoT" International Conference on Recent Trends on Electronics, Information, Communication & Technology (RTEICT) May 2019.

[5] G Manasa, M Kalpana, J Pranathi, A Vaishnavi, K Tejaswini, Prabhakara RaoKapula "Movable Smart Road Divider to Avoid Traffic Problems" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) Volume 15, Issue 2, Mar-Apr 2020.

[6] N Shalini, Mr A Subash Chandar "Auto Clearance of Traffic for Emergency Vehicle" International Research Journal of Engineering and Technology (IRJET) Volume 4, Issue 5, May 2017.

ISBN: 979-85-27243-61-1

FINGERPRINT ATTENDANCE SYSTEM USING IoT

ABHAY GAGAN B.S*[1], ASHOK .L[2], N.SHUSHANTH[3]

Department of Electronics and Communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]abhaygagan5@gmail.com
[2]ashok.1999.gowda@gmail.com
[3]shushanth27@gmail.com

Abstract - Our project aims at building a biometrics based attendance registry system for educational institutions such as colleges and schools. We have tried to bring together concepts of hardware and software engineering to give an end consumer product which can replace the current manner of attendance marking. This project also utilizes the fundamentals of Internet of Things (IoT) for data transfer, storage and display. The system can be interpreted based on it's hardware and software aspects. The hardware section consists of a pod, which is a portable device that can be circulated among students in the classroom. It features an LCD screen that displays various functional options and a, which can scan, store and identify student fingerprints. The identified fingerprint ID is then stored in memory and is made ready for transfer.

Keywords – Biometric Attendance System, identified fingerprint ID, fingerprint sensor, Database Management System

I. INTRODUCTION

Attendance marking is a regular activity that happens in every educational institute. The current system of checking attendance in a majority of the colleges involves a professor conducting a roll call or passing an attendance sheet among the students. The professor then proceeds to upload the data onto an excel file or an on-line database manually. While this method has being used for a long time, it still faces a number of fundamental problems which can be easily eliminated with the help of technology. Primarily, the pen and paper method involuntarily urges students to mark proxies. Secondly, the human involvement in the form of professors opens up an avenue for human error. Thirdly, it takes up a considerable time of the professors which could be used towards other productive tasks. Thus we propose a system where the entire attendance marking and maintenance procedure is done by a smart device instead of relying on the old, pen and paper technique. This system makes efficient use of hardware and software principles and also features connectivity using IoT. The end result is a system which identifies the students, maintains an on-line attendance register in the form of a database and provides the professors with a detailed attendance record of any pupil, on demand.

Attendance plays a major role in educational institutions. The most common means of taking attendance in the classroom is by calling out the roll numbers of students or asking the students to manually sign the attendance sheet, which is passed around during the lecture. The process of manually taking and maintaining the attendance records becomes highly cumbersome.

Biometric systems have reached a sufficiently advanced stage wherein they can now be deployed in systems without hampering portability. With the recent development of various cloud based computing and storage systems, data can be securely stored and retrieved whenever required. Primarily, fingerprints and iris images are considered to be the most reliable for use in biometric 5 systems. A system that records the attendance making use of biometric scanners and stores them securely over cloud in the form of Google Spread sheet can help resolve issues. The system consists of a fingerprint scanner which is used for ascertaining a student's identity. If the fingerprint scanned matches with records present in the database, attendance is granted to the student by updating to the.Google.Spreadsheet

.

ISBN: 979-85-27243-61-1

II. LITERATURE REVIEW

A number of different methods have been introduced to reduce the burden of attendance monitoring and storage. However, they have had their own advantages and disadvantages. Some of the papers that we drew inspiration from while developing this cost-effective and portable version of the attendance monitoring system are given below along with their merits and demerits. The authors of [1] have provided a great idea for collection and storage of attendance data however they have not provided great implementation for their system. There is also no mention of how they about what happens to the received data in case the Wi-Fi module does not receive a good internet connection. Another aspect that needs to be mentioned is the static nature of the entire system.

The authors of [2] were very thorough in their database design and fingerprint enrollment, check-in/out system and web-based report monitoring system. This system also provided functionality for attendance checking during normal lectures and during examinations. Another excellent feature in this implementation is being able to check teacher attendance as well. However, a disadvantage of the system is its bulky nature and a large amount of time required for registering the students. The authors have addressed this issue by stating the usage of a modular fingerprint system.

The authors of [3] have explored the usage of an arm7 based processor which is coupled along with an LCD screen and a fingerprint sensor which is interfaced along with a PC using a JAVA API. Although this system may be good for representing data it makes the entire system bulky. Also, the fingerprint data is stored on a database this is a security hazard and according to current standards, fingerprint data is stored locally on the fingerprint sensor to prevent data leakage.

In the paper, [4] the main aim of this method is to develop a transparent attendance system and keep real-time data and display online data for parents and other academic use. The authors have successfully created a system using an 8051 micro controller, a fingerprint scanner and a graphic user interface that stores user fingerprint data into a database and compares it to received fingerprints during the time of attendance. The stored attendance and other details like student present, absent can be accessed on a web page. However similar to [3] storing the fingerprint data on a database is a security hazard. Another disadvantage is that this system also requires a direct connection to a computer for transferring data from fingerprint to the database and this direct connection to PC is also required during operation.

III. COMPONENTS REQUIRED

NODE MCU:



NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

Node mcu pin out diagram

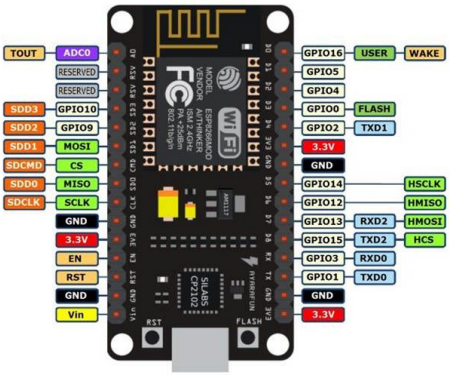


Fig.1 Node MCU pin out diagram

NodeMCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16

ISBN: 979-85-27243-61-1

- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT projects

Applications of Node MCU

- Prototyping of IoT devices
- Low power battery operated applications
- Network projects
- Projects requiring multiple I/O interfaces with Wi-Fi and Bluetooth functionalities

FINGERPRINT SENSOR



Fig.2 Finger print sensor

SPECIFICATIONS

- Voltage supply: DC 3.6 to 6.0V
- Current supply: <120mA
- Backlight color: green
- Interface: UART
- Bad rate: 9600
- Safety level: five (from low to high: 1,2,3,4,5)
- False Accept Rate (FAR): <0.001% (security level 3)
- False Reject Rate (FRR): <1.0% (security level 3)
- Able to store 127 different fingerprints

SOFTWARE COMPONENTS USED:

ARDUINO IDE

Introduction to Arduino IDE

Where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.
In this post, I'll take you through the brief Introduction of the Software, how you can install it, and make it ready for your required Arduino module. Let's dive in and get down to the nitty-gritty of this Software.

- Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- This environment supports both C and C++ languages.

ISBN: 979-85-27243-61-1

- You can download the Software from Arduino main website. As I said earlier, the software is available for common operating systems like Linux, Windows, and MAX, so make sure you are downloading the correct software version that is easily compatible with your operating system.
- If you aim to download Windows app version, make sure you have Windows 8.1 or Windows 10, as app version is not compatible with Windows 7 or older version of this operating system.
- You can download the latest version of Arduino IDE for Windows (Non-Admin standalone version)

IV. METHODOLOGY & OBJECTIVES

Objective--1. Enrolling & verifying the fingerprint data .

Objective--2. Sending & receiving the data from WI-FI module to cloud.

METHODOLOGY FOR OBJECTIVE 1:

There are two separate stages involved in using a system like this. First you have to go through a process called enrollment, where the system learns about all the people it will have to recognize each day. During enrollment, each person's fingerprints are scanned, analyzed, and then stored in a coded form on a secure database. Typically it takes less than a half second to store a person's prints and the system works for over 99 percent of typical users (the failure rate is higher for manual workers than for office workers).

Once enrollment is complete, the system is ready to use—and this is the second stage, known as verification. Anyone who wants to gain access has to put their finger on a scanner. The scanner takes their fingerprint, checks it against all the prints in the database stored during enrollment, and decides whether the person is entitled to gain access or not. Sophisticated fingerprint systems can verify and match up to 40,000 prints per second!

When a computer checks your fingerprints, there obviously isn't a little person with a magnifying glass sitting inside, comparing your fingerprints with all the hundreds or thousands stored in the database! So how can a computer compare prints? During enrollment or verification, each print is analyzed for very specific features called minutiae, where the lines in your fingerprint terminate or split in two. The computer measures the distances and angles between these features—a bit like drawing lines between them—and then uses an algorithm (mathematical process) to turn this information into a unique numeric code. Comparing fingerprints is then simply a matter of comparing their unique codes. If the codes match, the prints match, and the person gains access.

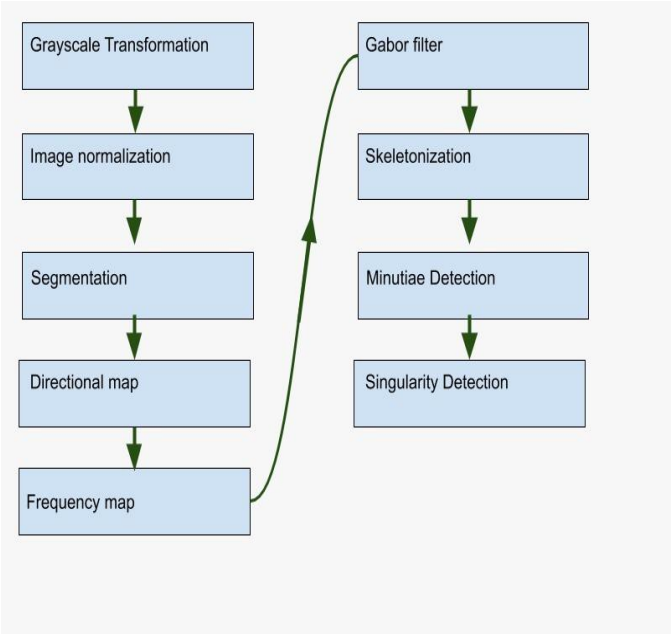


Fig.3 Block diagram for data transmission

ISBN: 979-85-27243-61-1

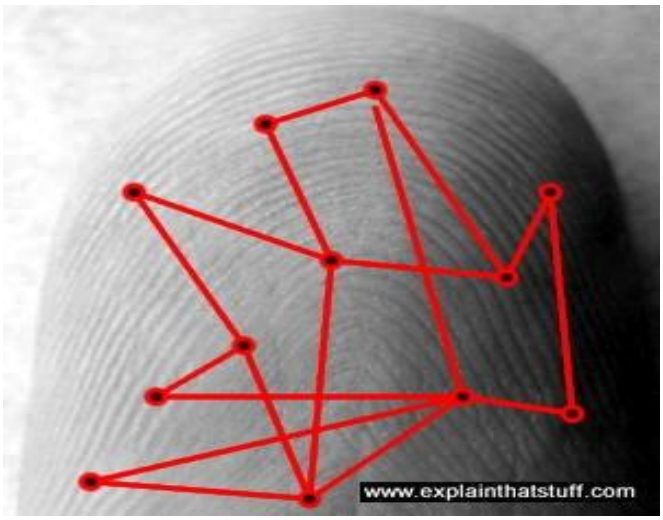


Fig.3 Finger print pattern recognition

METHODOLOGY FOR OBJECTIVE 2:

There are so many methods and IDEs available to with ESP modules, but the most commonly used on is the Arduino IDE. So let us discuss only about that further below.

The ESP8266 module works with 3.3V only, anything more than 3.7V would kill the module hence be cautions with your circuits. The best way to program an ESP-01 is by using the FTDI board that supports 3.3V programming. If you don't have one it is recommended to buy one or for time being you can also use an Arduino board. One commonly problem that every one faces with ESP-01 is the powering up problem. The module is a bit power hungry while programming and hence you can power it with a 3.3V pin on Arduino or just use a potential divider. So it is important to make a small voltage regulator for 3.31v that could supply a minimum of 500mA. One recommended regulator is the LM317 which could handle the job easily.

The WI-FI Module connects to wireless network as HTTPS client, and then push data to web server every N seconds .You need to fill the following in code before sending data :

- Your WIFI SSID and password.
- The URL link of web server.
- If needed, the time period between two successive data updates.

ISBN: 979-85-27243-61-1

V. CONCLUSIONS

Attendance management has got another face to be handled. Creating an advanced version always has a better advantage. Recording attendance biometrically and obtaining data from database is very easy and a new way to have a secure system. It has better advantages and it also reduces paper work. Connecting the components and creating a portable system gives simplicity. Portable system is always preferable and this system can be carried anywhere when needed. An IOT based Biometric Attendance System which is compact, portable, fast, consumes less power is created. The hardware works very efficiently. There are no issues with the hardware. The connection between hardware and software is established.

The size can be brought down to allow easier usage. A mobile phone application for the students could be developed which would allow them to track their attendance easily. The system could possibly be made more secure by using other forms of bio-metric data such as retinal scans, facial or voice recognition, etc. Informing the involved parties if a student's attendance falls below the threshold. Use of a touch screen instead of LCD and buttons to reduce space. Inclusion of a wireless charging mechanism

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also we would like to thank the Head of departmentElectronicsand Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1]"FINGERPRINT SENSOR BASED ATTENDANCE SYSTEM USING ATMEGA 328 AND ESP8266" Upasana Ghosh Dastidar1 ,NikhitaJogi2 , Milan Bansod3 ,PayalMadamwar4 and Prof Priyanka Jalan5 . International Journal of Research In Science & Engineering, Volume:3 Issue:2, [471-475],March-April 2017, e-ISSN:2394-8299

p-ISSN:2394-8280.

[2] K. A, LazUzoechi, Opara F.K."Biometric-based Attendance System with Remote Real-time Monitoring system."Department Of Elec-trical/Electronic Engineering. November 2013,DOI: 10.1109/NIGER-CON.2013.6715633 Conference:2013 IEEE International Conference on Emerging & Sustainable Technologies for Power & ICT in a Developing Society (NIGERCON).

[3] Vishal Suryawanshi1 ,Kiran Puri2 ,Prashant Devkar3 , Dr.K.S.Tiwari4 , Attendance Monitoring System-Automation-Using-Fingerprint-Module ISSN (Online): 2347-2820, Volume -5, Issue-1, [44-47], 2017.

[4] "Attendance System Using Fingerprint Identification with GUI", Prof. Vinay Suryawanshi1 , Swapnil Aundhakar2 , Nitin Mane3 , Rohit Kamble4 , Department of Electronics & Telecommunication Engineering, Shivaji University Kolhapur, Maharashtra.International Journal of Engineering Development and Research, Volume 5, Issue 2 — ISSN: 2321-9939, 2017.

[5] "Fingerprint Based Attendance System Using Microcontroller and Lab-View", Devendra Kumar Yadav , Sumit Singh , Prof. Shashank Pujari , Pragyan Mishra . International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 6, June 2015.

[6] "Smart Attendance Management System":SanjayBadhe,Kunal Chaud-hari, Tejaswi Mane ,Sneha Kale. International Journal of Computer Applications (0975 8887) ,National Conference on Advancements in Computer & Information Technology (NCACIT 2016).

[7] Zhang Yongqiang, Liu Ji, 'The Design of Wireless Fingerprint Attendance System', IEEE-2010.

[8] Sri Madhu B.M, KavyaKanagotagi, Devansh. 'IOT based Automatic Attendance Management System', ICCTCEEC-2017.

[9] Ignace. Toudjeu, Prosper Z. Sotenga. 'Design and implementation of an RFID based smart attendance register', IEEE-2017.

ISBN: 979-85-27243-61-1

ATTENDANCE MONITORING USING REAL TIME FACE RECOGNITION IN IMAGE PROCESSING

SNEHA V[1], SWETA PRAKASH RASTAPUR[2], RAKSHITHA SONU S[3], PURSHOTHAM R[4]

Department of Electronics and Communication Engineering Sapthagiri College of Engineering
#14/5 Chikkasandra, Hessarghatta main road, Bengaluru-560057
[1]snehav050@gmail.com
[2]swetaprakashrastapur@gmail.com
[3]sonu.raks72@gmail.com
[4]purushothampropurushotham@gmail.com

***Abstract*- Student attendance or worker attendance monitoring process is made easier by face recognition tools of Matlab and sending SMS to a person who is absent by using GSM. As beginners can understand the high level of descriptive language Matlab easily. This system is very well-organized and requires very few repairs compared to the old-fashioned methods. There are many methods for face recognition like LDA, ICA, Neural networks, PCA. Among these methods, PCA is the most effective hence we implement the PCA algorithm for face recognition and Viola-Jones for face detection from the video frame in real time. Based on recognized faces, attendance is monitored and the database is updated in Ms Excel and SMS is sent to absentees using GSM.**

***Keywords:* PCA (Principal Component analysis), GSM (Global System for Mobile Communication), Eigen faces.**

I. Introduction

Storing and Maintenance of attendance is very critical in all the educational institutes and companies for observing the overall attendance of a student or an employee. Each organisation follows particular way to mark attendance. Like marking attendance manually on the paper, biometric using fingerprint and computerized methods.

All these methods furthermore waste time because students or employees be required to make a queue to interact with their finger, face, and eyes on the scanning device. This model makes use of the face recognition method for marking the attendance of students in the classroom environment deprived of lectures involvement or the employee. This kind of attendance is recorded and stored with the aid usage of a digital camera connected in the classroom or the working atmosphere i.e. camera constantly shoot photos of students or employees, identifies the faces in pix, and scrutinize the detected faces with the database and mark the attendance in Ms Excel. Face recognition has broad application in security and military.

II. Related work

A. RFID based attendance system

Paper [1],[2] classifies each worker/student based on RFID tag which is included in their ID card with the aid of data science which implement the process for data collection, analysis, data cleaning, and data processing can be easily done.

B. Viola – Jones based attendance system.

Security control system mainly focused on human face detection. Computer authentication with human computer interface is initial human face recognition. In this context popularly used face detecting algorithm is viola – jones. This process uses simple values to classify the images rather than pixel values to avoid the encoding of the data and ad-hoc is very difficult to learn and understand in limited data. Pixel based tools are much slower compared to operating system based. Image processing is also much faster in feature use compared to pixel.

Integral image is obtained by adding the value of pixel above and left by the usage of corner rectangle value. Haar like features are used for face detection this feature is calculated by subtracting the black area pixels with that of white area pixels. The next stage is adaboost it selects a part of the computed feature that helps in constructing a classifier. A large set of images are prepared by comparing the size to that of the detection window. Cascading all the weak classifier together to form the final input is the main feature of the viola jones algorithm..

C. Biometric based attendance system.

Fingerprint based attendance system is more secure to the user by using fingerprint sensor. This includes four keys up, down, enrol, delete. Fingerprint sensor module capture fingers image and convert it into a required form store this memory in selected ID by user interface. LED s and buzzers are for user convenience interfacing. Fingerprint module sensors and keys are input. Outputs are LEDs and LCD. As fingerprints are more secured information of a person it can be hacked and used illegally for multiple purposes, it is more expensive, error rate is high, delay and complexity is high.

ISBN: 979-85-27243-61-1

D. PCA algorithm based attendance system

Principal Component Analysis reduces the large dataset to a smaller one without losing the information. As smaller data set are easier to compute and implementation process is much easier. Creating a boundary to values by standardizing with the aim of computing covariance matrix. Then Eigen values and Eigen vectors are calculated to identify Principal Component this are analysed by continuous calculation of principal component. Feature vector by discarding some values which are not required. The further procedure are provided in the below flow chart. Main advantages are removes identical features, improves algorithm accuracy, oversizing of the process is reduced, requires few components to implement and less expensive.

From the analysis done based on the survey paper we find RFID system is simpler but it is expensive and time consuming to install. The biometric fingerprint is accurate but lacks in efficiency as verification process requires lots of time. Voice recognition takes lesser time but it is inaccurate. In general all these methods take lot of time as student or employee should interact the device individually by forming a line and acquires lot of time. Hence face recognition is recommended for the attendance system. There are many methods to implement this, feature recognition by PCA algorithm is best among them. For face detection Viola – Jones algorithm is chosen as it detects the faces fast in feature selection at located scales in accurate manner at different lighting conditions in real time

III. Proposed Model

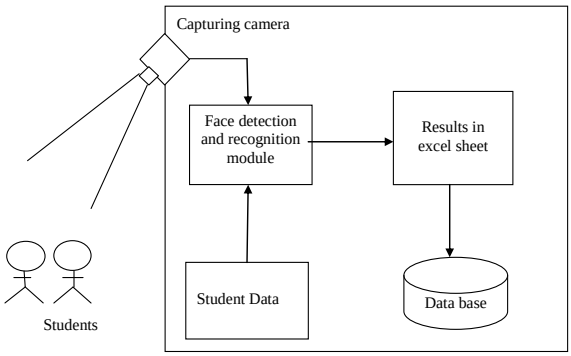


Fig 1.Block Diagram of Proposed Model

The Camera is placed in the classroom that records video of the class in real time. Then snapshot is taken from video frame. Face detection module Viola-Jones algorithm detects the face from the video frame snapshot, identifies face detected by indicating in red rectangle box. The detected face is then compared with the pre-loaded train dataset (Student Data) for further recognition process. PCA (Principal Component Analysis) Algorithm is used for Face Recognition process. Eigen Faces are the Principal Component in this algorithm Eigen faces for train dataset and test image is calculated and compared to obtain equivalent image. Thus attendance is updated in MS Excel sheet and stored in Data base. Further, GSM modem is used to send an alert message to absentees attached mobile number.

IV. Implementation

1. To detect the face segment from the video frame in real time.
2. To extract the features in order to recognize the face detected.
3. To record the attendance of the identified student and store in Microsoft excel sheet.
4. Using GSM Technology sending SMS to the absentees

Viola-Jones for face detection

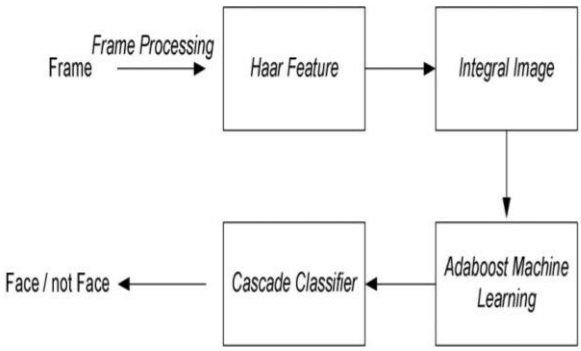


Fig 2.Schematic representation of viola- jones

Viola-Jones algorithm works on grey scale image; hence the captured snapshot from the video frame is converted into grey scale image and given as input for face detection module. Human face share similar features from this Haar features are detected from the video frame. Haar features are nothing but adjacent dark and lighter rectangular regions.

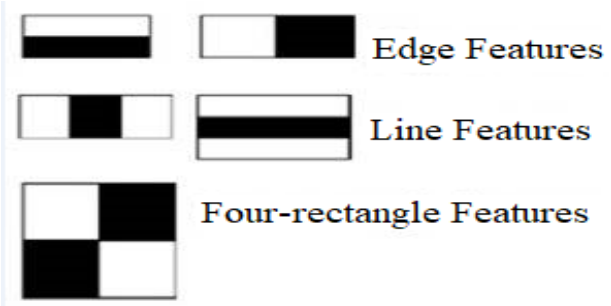


Fig 3.Haar Features Types

There are 3 types of Haar features to interpret the different parts of the face.

1. Edge features
2. Line features
3. Four-sided feature

Calculating a single value for each feature involves lot of computations. To reduce this we calculate a integral image which has the capability to reduce large number of

ISBN: 979-85-27243-61-1

computations to 4. In simple words value of each pixel is sum of the pixels above and left, including the target pixel.

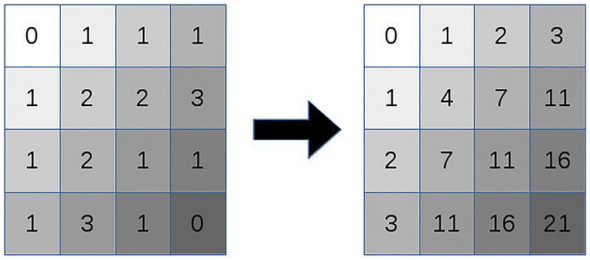


Fig 4. Original image and Integral image

In the next step Machine Learning algorithm known as adaboost training is used. Haar like feature represents a weak learner; adaboost training evaluates the sub regions and checks the performance of all classifier that are used for training. In this strong classifier represent a human face it is the higher performed or high weighted classifier. So, the algorithm decides the feature as useful or not from the training data.

Adoboost training is still time consuming to reduce this constraint a classifier known as cascading classifier is used. It has multiple stages each stage comprising of similar features, stages are placed in the order of importance. When cascading starts sub region passes through the stages having two probabilities accept if it determines face like feature or reject if it is a non-face this process continues till the final stage. Video frame from the webcam is given as input. Output is to show the detected face i.e. a rectangle is drawn over a face.

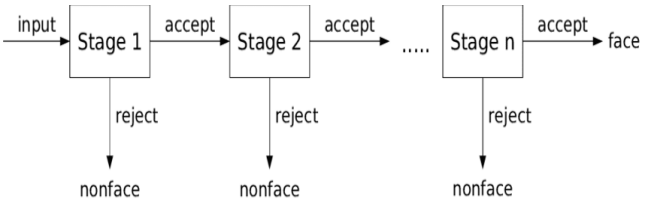


Fig 5.Cascading Classifier

A. PCA for Face Recognition

PCA algorithm also known as Eigen face approach is the simplest method for face recognition. This approach converts faces into essential component called as Eigen faces. Recognition process is projecting a test image on the train Eigen images, later person is recognised by calculating the Euclidian distance in Eigen face space with least value by showing the particular train image is matched with test image

Step 1 : This step it is to create a training data set. Here the 2D Image is converted to the 1D vector by forming a single row . The 1D vector length is L=a×b

$$C=\begin{pmatrix} y_{11} & y_{12} & \cdots & y_{1b} \\ y_{21} & y_{22} & \cdots & y_{2b} \\ \vdots & \vdots & \ddots & \vdots \\ y_{a1} & y_{a2} & \cdots & y_{ab} \end{pmatrix} \xrightarrow{\text{Concatenation}} \begin{pmatrix} y_{11} \\ \vdots \\ y_{1b} \\ \vdots \\ y_{ab} \end{pmatrix} = y \quad (1)$$

To calculate average vector let the yi ranges from (1,2,3 … A) .we calculate the δ(mean vector) and the then this subtracted with y_i.

$$\delta=\frac{1}{A}\sum_{i=1}^{A} y_i \quad (2)$$

$$\alpha i= yi- \delta \quad (3)$$

Now arranging of the Averaged vectors to form a new training matrix(size A×B)

$$D=[\ \alpha1, \alpha2, \alpha3, \alpha4 \ldots.] \quad (4)$$

To find the E vector called Covariance matrix and find the f_i and μ_i eigenvectors and eigenvalues

$$E=D\times D^T \quad (5)$$

$$E*f_i = \mu_i f_i \quad (6)$$

Next is to calculate the F matrix by normalizing the vector values . The Normalized vector Transpose is multiplied with the D .And find the *zi* vectors *Z = [z1, z2, z3....zA]* The matrix Y is given as:

$$Z=F^T D \quad (7)$$

The last step is recognizing the face.The P is the converted image of the person to be recognized from the Training data by subtracting the P with the δ and this is multiplied with the Normalized vector.

$$\emptyset=F^T\ (P- \delta\ ) \quad (8)$$

Distance (εi) is calculated by subtracting $\emptyset$ and $z_i of$ matriz Z . Euclidean distance is the most commonly used .The Eucliddan distance is determined by :

$$\mathcal{E}i = \backslash\ f_i\ - \emptyset\ | \quad (9)$$

$$U=argmin_i[\mathcal{E}i\ ] \quad (10)$$

The minimum distance is considered and attendance is marked.

B. Attendance is marked in MS Excel sheet

MS Excel spreadsheet is used to store the recorded attendance in simple to-utilize output format. which is likewise the product which is recognizable to majority of

ISBN: 979-85-27243-61-1

the institution staffs. If the student is identified, the corresponding cell is refreshed with '1', else a '0'. Using the formatting in the Excel, we can effectively retrieve the information effectively.

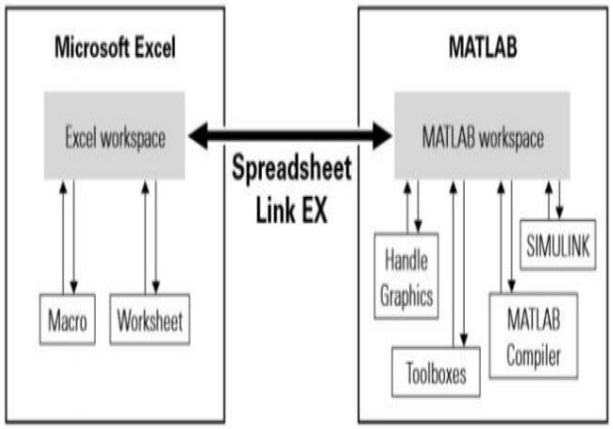


Fig 6.Spreadsheet link EX Toolbox

The MATLAB IDE and the MS Excel sheet is linked using the toolbox Spreadsheet Link Ex. When a recognized face matches with an individual in the database, the worth is refreshed in that specific Excel sheet. This is carried out through the function xlswrite().

- The candidate identity is resolved through the record of the picture with which the distinguished face matches with.
- A spreadsheet of the ideal organization must be drafted already (attendance.xls in our system)
- Utilizing the index values the relating cell in the sheet is refreshed with one along with the time and date of the homeroom.

Output in MS Excel

We get the yield as given underneath. After that we can infer the outcomes in suitable format. Utilizing different function in the spreadsheet as in figure 7-4. We can get the following parameters by utilizing this organization as yield as demonstrated in the figure. This function is performed utilizing the Spreadsheet Link Ex toolbox of the MATLAB.

- If an individual is available, a '1' is given to the specific field of the student.
- The date and time is likewise given to the sheet.

We can incorporate quite a few students' information utilizing this framework and gave we utilize a better quality of an image capturing device.

C. Sending SMS to absentees using GSM

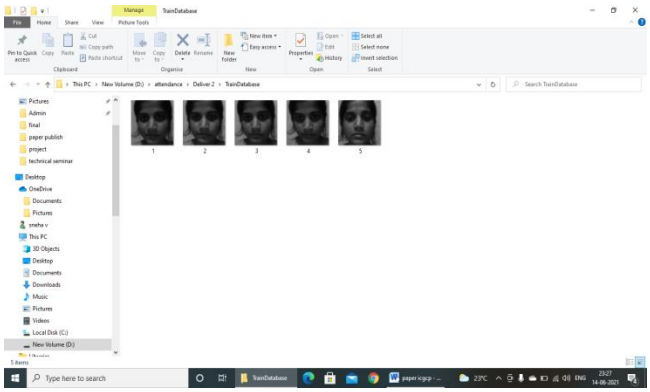
Global System for Mobile (GSM) is a mobile network which is immensely used by cell phone users across the globe to provide services such as data and voice transmission using digital modulation.

The GSM Modem is used to obtain functions like previously warehoused SMS data delivery. SMS is often used where GPRS or GSM data calls are unavailable as it keeps sending SMS at particular time intervals in machines or generally an automated system. Other than sending SMS, this modem is used to make data calls. These data calls are primarily used to either receive or send data streams between two embedded devices. GSM converter is a device embedded within the cable. It acts an extra device to be attached between a terminal and the GSM modem for data transmission.

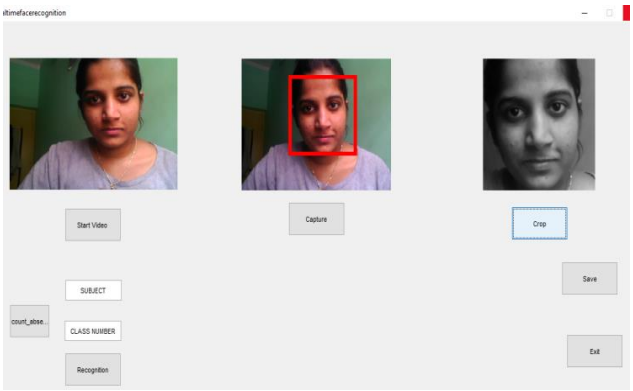
In this project message is sent from a microcontroller using a GSM Modem it is suitable for wireless networks. Valid SIM card need to be placed in the GSM modem and it is connected to microcontroller by RS232 cable. Microcontroller controls the GSM modem in sending the messages by communicating with instructions i.e. commands. Program is executed with appropriate AT commands to control the sending and receiving messages to the students mobile. With the database absentees can be notified with the sms regarding their attendance.

V. Results

A. Train Database

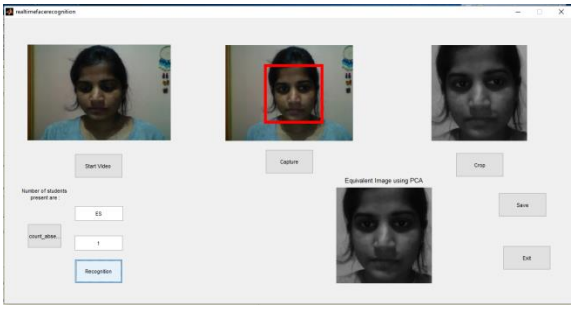


B. Face Detection

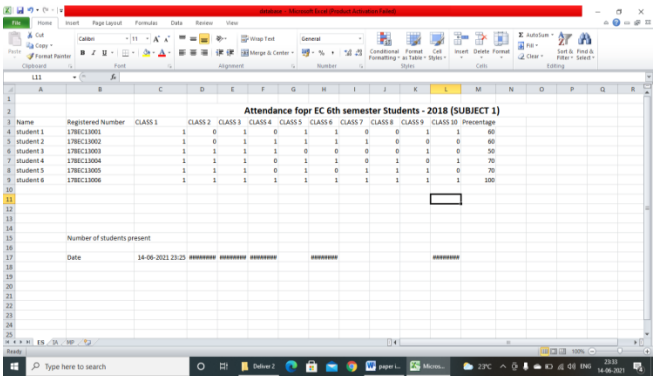


ISBN: 979-85-27243-61-1

C. Face Recognition



D. Result updated in MS Excel sheet



E. GSM Modem to send SMS to Absentees



VI. Conclusion

The device that has been implemented is secure and efficient for maintaining attendance in schools, colleges and work place. This process can be used for higher performance systems by making suitable modifications. Since, the system involve less human intervention the burden of attendance can be easily managed. From the attendance data base obtained from the system can be used for the progress of student and salary calculation of an employee. As the system works in real time it is robust and efficient.

ACKNOWLEDGEMENT

We are thankful for the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilitates provided and their support. Also we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] T.S. Lim, S.C. Sim and M.M. Mansor,"RFID Based Attendance System",Institute of Electrical and Electronics Engineers(IEEE), October 2019

[2] Unnati Koppikar,Shobha Hiremath,Akshata Shiralkar,"IoT based Smart Attendance Monitoring System using RFID"1st International Conference on Advances in Information Technology (ICAIT),July 2019

[3] Priyanka Wagh ,Shweta Patil, Roshani Thakare ,"Attendance System based on Face Recognition using Eigen face and pCA Algorithms",ICGCloT,2015

[4] A. M. Pati!, Dr. Satish R. Kolhe, Dr. Pradeep M. Pati!, "Face Recognition by PCA Technique", ICETET, 2017

[5] Abhishek Jha, "Class Room Attendance System Using Facial Recognition System", IJMSTM, ISSN:2319-8125, Vol. 2, Issue 3.

[6] Ralph Gross, Vladimir Brajovic, "An Image Preprocessing Algorithm for Illumination Invariant Face Recognition.", International Conference on Audio and Video Based Biometric Person Authentication, pp 10-18, June 9-11-2013.

[7]Hong, L, Wan, Y and Jain, A.K."Fingerprint image enhancement: Algorithm and performance evaluation", IEEE transactions on Pattern Analysis and Machine Intelligence 20,8(1998),777-789.

[8]Md. Sajid Akbar,Pronob Sarker,Ahmad Tamim Mansoor,"Face Recognition and RFID Verified Attendance System", 2018 International Conference on Computing, Electronics & Communications Engineering (iCCECE)

[9]C. E. Geoffrey, “Automatic Access Control System using Student’s Identification Card based on RFID Technology,” 2019

ISBN: 979-85-27243-61-1

CHILD RESCUE SYSTEM in OPEN BOREWELLS

Ms. Rakshitha Raju R.[1], Ms. Shirin M. Thomas [2], Ms. Sophia A.[3], Ms. Sushma N.[4]
Department of Electronics and Communication Engineering,
Sri Srinivasa Educational and Charitable Trust
Sapthagiri College of Engineering,
NAAC 'A' Accredited
(Affiliated to Visvesvaraya Technological University, Belagavi.
Approved by AICTE, New Delhi.)
ISO 9001-2015 and 14001-2015 certified Institute
14/5, Hesararghatta main road, Chikkasandra, Jalahalli West, Bengaluru-560057,India.

[1]rakshitha2641999@gmail.com [2]shrnthms53@gmail.com [3]sophiaanil3@gmail.com [4]sushman180@gmail.com

Mrs. Kavitha R.J.,
Asst. Prof., Sapthagiri College of Engineering,
14/5, Hesararghatta main road, Chikkasandra, Jalahalli West, Bengaluru-560057, India.
kavitharj@sapthagiri.edu.in

***Abstract*--This paper proposes a system for rescuing children fromborewell accidents. Children often fall into borewells which have been uncovered and get trapped. In such cases, existing operations of child rescue from borewells is a very complicated process with big machines and huge man power. This paper proposes a new design which has a sensor kept at the top of the borewell hole which helps to sense the fall of the child.Once the system senses the fall of the child, the automatic horizontal closure placed at some distance below the top of the bore, prevents the child from falling beneath. It has the facility to monitor the trapped child, and provides a supporting platform which is driven by DC motor to lift the child up.**

Keywords-- LPC2148 ARM Controller, DC motor, GSM module, IR sensor.

I. INTRODUCTION

Many accidents of children falling into open borewells have been reported in the past years. Very few victims have been saved in such accidents. Even if rescued, most victims were reportedly injured. To overcome such problems of rescue operation, we have an alternative feasible proposal. We are developing a design system the can rescue the child in a systematic way. It also includes necessary life support system such as oxygen supply.

II.LITERATURE SURVEY

In [1], a wheeled leg mechanism is designed to go inside the pipe and the legs are circumferentially and systematically spaced out apart. It consists of power supply, switch pad and gear motor. The child's position is captured with the USB camera and monitored on the PC. The LM35 temperature sensor and 16*2 LCD are interfaced with PIC 16F877A microcontroller to sense and display on LCD. It also consists of Gas sensor, Oxygen tube, web camera and clipper. These sensors are under the control of Atmel microcontroller and are attached with the clipper. The clipper is controlled by the DC motor.

In [2], the manipulator parts are assembled and the fixed system is connected to a rope which runs inside a narrow hole through pulleys. The entire set up is supported by a tripod stand on the ground with an oxygen concentrator aside. The system is slowly sent inside the borehole through controls by watching the virtual images in PC or mobile. After detecting the human body, the system will stop just above the child and give the information of depth from the ground, the position of the child. Then the system is stabilized with a stabilizing mechanism, at the top of the first plate whichreleases the stabilizing fork mechanism. The position images of the child can be viewed in the mobile or PC, which is connected to the Wi-Fi camera. At the same time, the protective casing is extended to the borewell side walls. Then the motor helps the lifting rod to screw its way through the gap towards the bottom of the borehole.

In [3],a rescue machine is designed to save the child by supplying oxygen, food and water. The machine is fabricated in such a way that the trained operator opens the stand, fixes over the bore well and gives input regarding depth and diameter of the borewell. The self operating system starts with the given input into the well. The IR sensor along with camera on the bottom will detect the distance of the victim from the ground.Oxygen supply is provided through a special pipe arranged by the rescue machine. The rescue machine senses the position of the child and it is sends a long assisting pipe so that the child can mount on them. The assembly of machine is such a way that it has three degrees of freedom and can adjust its position according to safety and comfort of child.

In [4], the mechanical support structure with four legs is first placed over the borewell opening. This support structure has a motor fixed on it with a pulley assembly, then the robotic arm setup is tied up to a cable or a rope with desired length and is then coupled to the pulley of the up down motion control motor. When the power in turned on the equipment present in the arm turns on along with this a high brightness LED, which is also placed in it for illumination purpose. Now the depth of the victim's location is displayed on the control panel and the video is seen in a laptop monitor. By operating the appropriate buttons on the control panel the arm is lowered into the well, as it moves deeper and deeper, the depth on the LCD screen decreases and as the arm reaches the victim the value becomes zero indicating that the arm has reached victim.

In[5], the project uses RFID technology, embedded systems and a mechanical unit for the rescue. Special graspers are used to lift the child from the pits or bore-well. Pulling of child is made possible by special graspers, which can grasp the shoulder or the wrist or the ankle of the child. These have been specially designed and fabricated to provide open and close control at one end and facility to extend it by adding additional pipes. A safety rope is provided which acts as a support for the grasper. It is possible to lower the grasper up to 40 feet inside the bore well and the depth of reach can be increased by adding pipe. Microcontroller controls two dc motors. Microcontroller controls LED. Wireless camera records child status and these records are sent back to controller unit through RF Transceiver. With the aid of CCD camera the position of the child is determined. Using blower, fresh air is supplied to the child through hoses. With the help of the mechanical unit the child is lifted.Wireless controlling of Robot through PC. Live Audio and video can be seen on TV.

III.OBJECTIVES

- To detect the fall using IR sensor.
- To analyse the condition of the child trapped inside the borewell.
- To convey the message regarding the condition of the child to the nearby hospital/police station.
- To initiate the rescue process by automatic lifting technique.

IV.BLOCK DIAGRAM

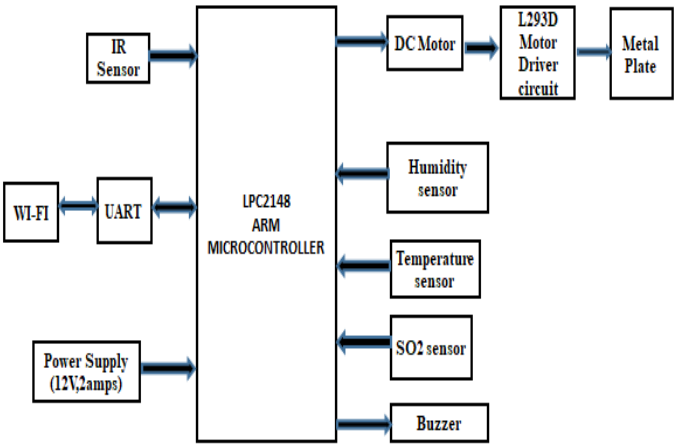


Fig. 1 Block diagram of the proposed system

V.METHODOLOGY

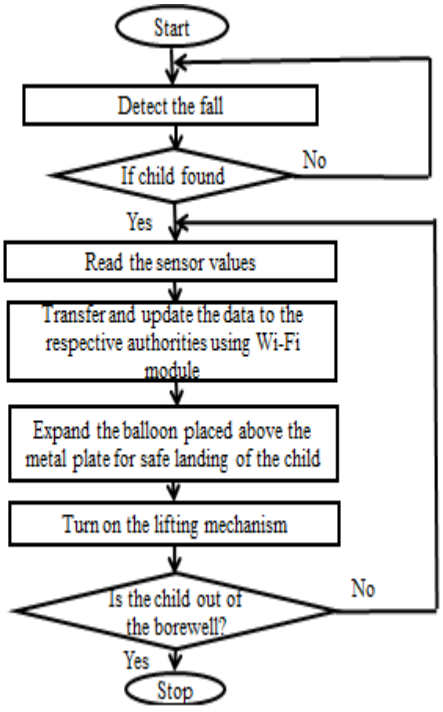


Fig. 2 Flow chart

VI. RESULT

All the objectives had been fulfilled successfully and thus we were able to build a child rescue system to save lives. With the help of ESP cam, the position of the child could also be viewed. Thus, this system is helpful in saving the child trapped inside the bore-well with ease, safely and in less time.



Fig.3 Image of the project model

VII.APPLICATIONS

- It can be used in mining industries.
- It can be used in deep dug pits.

VIII. ADVANTAGES

- It can be easily operated and does not require any extra professional skills.
- It is cost effective and less time consuming process.
- It performs various life saving operations like detecting toxic gases and providing immediate oxygen supply.
- There is no requirement of digging a parallel hole to the borewell.
- It can used in mining industries where a bore-hole is dug for mineral exploration and hence this system can be used as a safety measure.

IX.CONCLUSION

A great deal of lives have been lost because of borewell accidents. The existing methodologies are tedious and risky processes.The proposed framework is to conquer each of these problems by executing safe and easy technique to rescue the child from the borewell. This system performs secure activities in less time when contrasted with customary techniques. By actualizing this technique, we can save the lives of many.

ACKNOWLEDGEMENT

We express our deep sense of gratitude to the Management, Principal of Sapthagiri College of Engineering, Bengaluru, for the support and constant encouragement. We are grateful to the Head of Department, Electronics and Communication Engineering, our guide and all the faculty for their analytical suggestions and guidance throughout.

REFERENCES

[1]P.Sumathy, A.Monica, R.Dhanushree “Smart and safe child rescue system” International Journal of pure and applied mathematicsVolume 119 No. 15 2018

[2] Aravind N Kaimal, Bijith P B, Midhun C Baiju, Muhammed Suhail K S “Borewell Rescue system” International Research Journal of Engineering and Technology(IRJET)Volume 07 Issue 09 Sep 2020

[3] Shah Vrunda R, Chirag S Dalal, Rajeev Dubey “Automate machine for rescue operation for child” International Research Journal of Engineering and Technology(IRJET)Volume 04 Issue 02 | Feb-2015

[4] Ramesh S, Nandhini D “Real Time Implementation of Borewell Rescue System using Arduino” International Journal of Modern Trends inEngineerin-gandResearch(IJMTER)DOI:10.21884/IJMTER.2018.5221.WLJFER

[5] Navya, Supriya.S.N, Salma Begum, Sreelakshmi.K, Shwetha.G “Rescue Device for lifting infants stuck in pits” IIT17th May 2015, ISBN: 978-93-85465-13-0

Real Time Object Recognition Using CNN

[1]SHOBHA S, [2]A K PAVEEN POONACHA, [3]B K HARSHIT, [4]NAINISHA K KUMAR, [5] NITIN B S
DEPARTMENT OF ELECTRONICS AND COMMUNICATION, SAPTHAGIRI COLLEGE OF ENGINEERING
shobhas@sapthagiri.edu.in, poonachapaveen2000@gmail.com, bkharshit27@gmail.com, nnainisha17@gmail.com, mangalashankar15@gmail.com

ABSTRACT
Achieving new heights in object detection and image classification was made possible because of Convolution Neural Network (CNN). However, compared to image classification the object detection tasks are more difficult to analyze, more energy consuming and computation intensive. To overcome these challenges, a novel approach is developed for real time object detection applications to improve the accuracy and energy efficiency of the detection process. This is achieved by Convolution Neural Networks (CNN). CNN has an excellent performance in machine learning problems as it can handle and process huge amount of data. As the resources like RAM, graphic card, ROM, etc. are limited we propose a pipelined implementation on an aggregate Central Processing Unit (CPU) and Graphical Processing Unit (GPU) platform.

KEY WORDS
CNN, Object Recognition, Deep learning.

I. INTRODUCTION
Human computer interaction is an important application of object recognition using CNN which is a challenging and an interesting problem. It can be used to build more smatter and accurate robots with an ability of better understanding the objects. There are many other real-life applications of this paper such as surveillance cameras used at highways to prevent over speeding, interactive game development and driverless cars. Object detection which includes location detection and detecting the categories of various objects present in one single image, nearly two thousand regions are proposed to contain an object in the image which are called the proposed regions. Several machine learning and feature extraction algorithms have been developed for object detection tasks. Numerous handcrafted feature extraction techniques for object detection such as Support Vector Machines, Stochastic Gradient Descent, Convolutional Neural Support Vector Machines or an integration of multiple features have been proposed. Due to the success of Convolutional Neural Network in image classification tasks it has also been used in object detection tasks. Contrasting to conventional Computer Vision systems and other machine learning tasks where each feature must be defined beforehand manually, here in CNN, in automatically learns to extract features from the predefined database of features.

II.BLOCK DIAGRAM

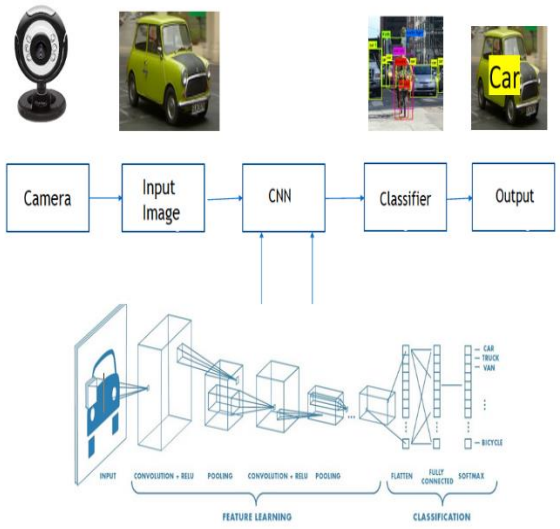


Fig 1: Block Diagram of Object Recognition using CNN

An image will be captured from the webcam and will be given as the input for image acquisition to a CNN aggregator for feature extraction as shown in figure 1.

CNN uses the information that are already present in the pre-trained network to recognise the object. CNN consists of several layers such as Convolution layer, Activation layer and fully connected layer which are all interconnected so that CNN can process perceive data to classify objects. The first layer learns basic feature detection filters such as edges and corners. The middle layer filters, detects and extracts maximum elements from the region and parts of the object, consider a face it responds detecting eyes, nose etc. The last layer has higher representations that tends to learn and recognize full objects in different shapes and positions. In order to perceive the output as we humans do, CNN have digital color images that have RGB encoding.

ISBN: 979-85-27243-61-1

III. LITERATURE SURVEY

In the paper [11] proposed a technique for Automatic segmentation of MR brain images with a convolutional neural network. The presented CNN method shows accurate segmentation results in images acquired at different ages and with different acquisition protocols. This method automatically segments brain images in MRI images for quantitative assessment of the brain in large scale studies. The method is not dependent on explicit features, but learns to recognize the information that is important for the classification based on training data. This method could include more data objects for training which can possibly improve accuracy of the model. [04] proposed a Multi-Perspective Object Detection for Remote Criminal Analysis Using Drones. When a crime is committed, the associated site must be preserved and reviewed by a criminal expert. An intelligent system that remotely recognizes and localizes objects considered as important evidences at a crime scene is designed. Starting from a general viewpoint of the scene, a drone system defines trajectories through which the aerial vehicle performs a detailed search to record evidences. A multi-perspective detection approach is introduced by analyzing several images of the same object in order to improve the reliability of the object recognition.[12] proposed New Object Detection, Tracking and Recognition Approaches for Video Surveillance over Camera Network which tracks, detects and recognizes videos. This proposed method uses MS, BKF with simplified Gaussian mixture. The major merit is efficient algorithm with around 0.08secs to process an object. It is practical to be used in real-time video surveillance systems, after appropriate acceleration using multiple thread processing or GPU. [10] proposed Vehicle Detection and Counting in High-Resolution Aerial Images Using Convolutional Regression Neural Network which locates and counts the number of vehicles. This paper has effectively calculated performance of the classifier using accuracy, sensitivity, specificity, IoU and F1 score of the proposed system and gained high results.[01] proposed a method on Face Detection Based on Receptive Field Enhanced Multi-Task Cascaded Convolutional Neural Networks. This proposed paper has used embedded systems, artificial intelligence, Multi-Task Cascaded CNN, Deep- CNN, Inception-V2 block. The major advantages in this paper is that this method can improve the accuracy of face detection, it enhances the feature discriminability and robustness for small targets. The limitations of MTCNN includes poor performance in detecting tiny targets and also it is only applicable for fixed size of input. [09] proposed a Convolutional Neural Networks Based Fire Detection in Surveillance Videos which focuses on developing early fire detection system. This proposed method uses image processing technique, Alex Net, SVM classifier. The major advantages of this model are high accuracy, cost effective, improves the flame detection but the number of false alarms is still high and further research is required.

IV. FLOW CHART

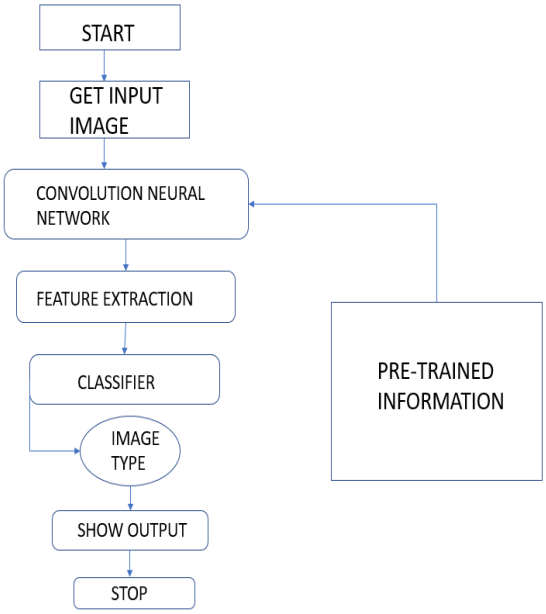


Fig 2: Flow Chart

V. OBJECTIVES AND METHODOLOGY

OBJECTIVE 1

To Train the Object Recognition Model

Methodology:

Annotation of images and training the model using the data set created.

- Collect images of the objects to be detected.
- For simpler objects collect around 20-30 images of each object and resize the photos to uniform size (this would make the training faster).
- Perform pre-processing and image augmentation on some of the images for the dataset.
- Data augmentation helps preventing the network from overfitting or over-training and help memorizing the exact details of the training images.
- Annotate the bounding boxes of the object in the respective images.
- Split the images into 2 sets, the training set and the testing set.

ISBN: 979-85-27243-61-1

- For detecting the objects from the input, images stored in training set/directory are used.
- To improve the detection accuracy of the model, transfer learning from a pre trained existing model is used.
- Transfer learning requires less training data as compared to training from scratch.
- Train the network using the training data with GPU and CPU along with some cloud computing features available on Google Collab.
- Classify the images from the trained network and evaluate the network using test images and calculate the accuracy of the model.

OBJECTIVE 2

To Pre-Process the Image

Methodology: Four steps are undertaken to complete this objective.

- Step 1: Read the Image

In this step, we store the path to our image dataset into a variable then we created a function to load folders containing images into arrays.

- Step 2: Resize the Image

Some images captured by a camera and fed to CNN algorithm vary in size, therefore, we should establish a base size for all images fed into CNN algorithms.

- Step 3: Remove Noise (Denoise)

Still, inside the function Processing() we add this code to smooth our image to remove unwanted noise. We do this using gaussian blur.

- Step 4: Segmentation & Morphology

In this step, we step we are going to segment the image, separating the background from foreground objects and we are going to further improve our segmentation with more noise removal.

OBJECTIVE 3

To Build Classifier

Methodology: The layers implemented are

- **Convolution layer:** Applies convolution operation, it extracts features from the input image.
- **ReLu (Rectified Linear Unit):** Applies an activation function to increase non linearity.
- **Pooling layers:** Progressively reduces the size of input representation and helps to detect objects in the image no matter where they are located.
- **Flattening layer:** Flattens the pooled feature map into sequential column of numbers, it becomes the input layer of Artificial Neural Networks for further processing.
- **Fully connected layer:** Combines features into more attributes and predicts classes with greater accuracy. Trains through forward and backward propagation for many epochs, this repeats until deep neural deep neutral network model created.

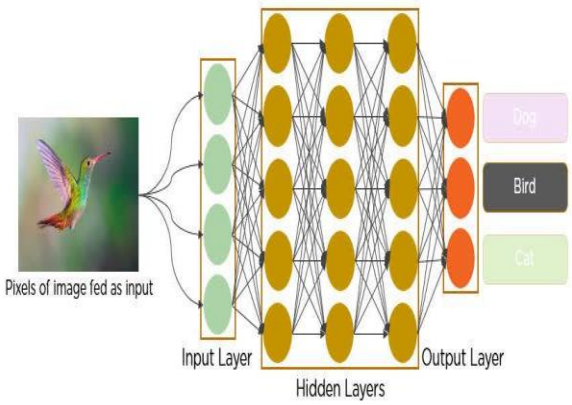


Fig 3: Convolution Neural Network

OBJECTIVE 4

To Evaluate the Performance of the classifier.

Methodology: Performance of the classifier is calculated using various parameters with the help of confusion matrix.

		Predicted class	
		Class = Yes	Class = No
Actual Class	Class = Yes	True Positive	False Negative
	Class = No	False Positive	True Negative

Fig 4: Confusion Matrix

- Accuracy = (TP + TN) / (TP + FP + FN + TN)
- Specificity = TP / (TP + FP)
- Sensitivity TP / (TP + FN)
- F1 Score = 2 * (Sensitivity * Specificity) / (Sensitivity + Specificity)

VI. RESULT

- The Image Data Set is created for various objects.
- Each object comprises of multiple images based on the complexity of the object or the image the number of images to be collected for each object is decided.

ISBN: 979-85-27243-61-1

- For the images collected splitting is been done as Training and Testing dataset, where the training dataset will be used to train the CNN algorithm and the testing dataset will be used to determine the performance of the model built using various parameters.
- The file will be externally extracted by the classifier by the help of Google Collab.

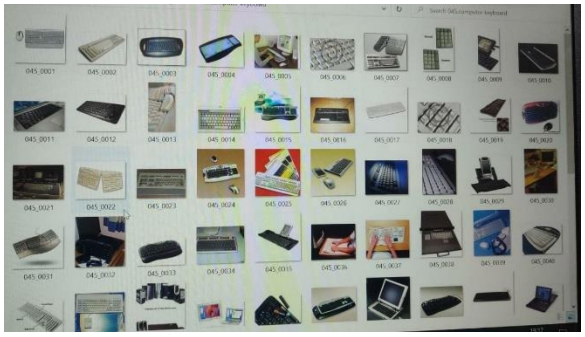


Fig 5: Example of a Object data set

The input image is read, resized and the noise is removed (de-noise).

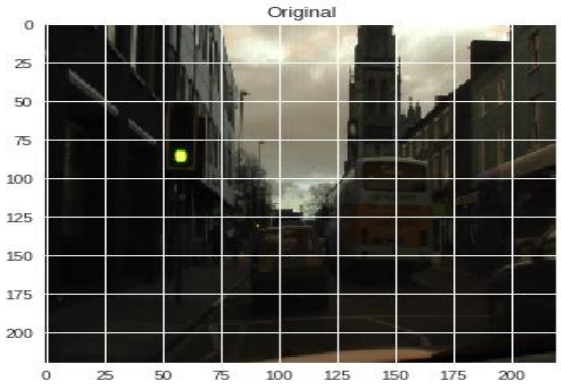


Fig 6: Image after resized

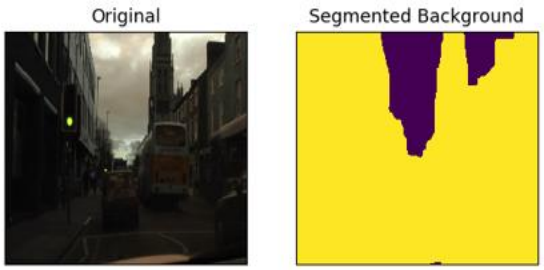


Fig 7: Denoised image

The resultant image that is obtained after preprocessing the image is fed into the CNN algorithm for recognition. This preprocessed image will reduce the computational time as the size and image format will be optimized for the network.



Fig 8: Object Recognition output

Once the preprocessed image is fed into the CNN network the network trained will extract and compare the features with pretrained dataset and the output will be displayed.

VII. CONCLUSION

- Deep learning (CNN) is largely responsible for today's growth in the use of AI, whose solutions can solve everyday problems, can optimize processes, automate them in a smart way, it can automatically understand how to perform time consuming task that steal time from human from doing what they excel.
- With the help of Convolution Neural Network (CNN) and deep learning a cost efficient, less processing time and an efficient CNN object recognition model is being built and the performance of the model over various parameters is verified for its accuracy.
- A CNN model with 89.26 train accuracy percentage and 80.20 test accuracy percentage has been built. To increase the accuracy percentage more images can be trained and more hidden layers can be implemented.

REFERENCES

[1] Xiaochao li, Zhenjie Yang 1 and Hongwei wu, "Face Detection Based on Receptive Field Enhanced Multi-Task Cascaded

ISBN: 979-85-27243-61-1

Convolutional Neural Networks", IEEE September 14,2020.

[2] Hua Zhou, Pengwei Song, Hongyu Si, Rui Yuan, Enqing Chen Zhendong Zhang, "Feature Extraction and Target Recognition of Moving Image Sequences", IEEE August 10,2020.

[3] Ali Azarmi Gilan, Mohammad Emad, and Bijan Alizadeh, "FPGA-Based Implementation of a Real-Time Object Recognition System Using Convolutional Neural Network", IEEE transactions on circuits and systems, vol. 67, no. 4, April 2020.

[4] Pompílio Araújo, Jefferson Fontinele and Luciano Oliveira, "Multi-Perspective Object Detection for Remote Criminal Analysis Using Drones", IEEE 2020.

[5] Mohana and HV Ravish Aradhya, "Object Detection and Tracking using Deep Learning and Artificial Intelligence for Video Surveillance", Vol 10, Nov 12,2019.

[6] Jia Li, Zengfu Wang, "Real-Time Traffic Sign Recognition Based on Efficient CNNs in the Wild", IEEE April 24, 2019.

[7] BANGQUAN AND WENG XIAO XIONG, "Real-Time Embedded Traffic Sign Recognition Using Efficient Convolutional Neural Network", IEEE April 24, 2019.

[8] Jian-Gang Wang, Lu-Bing Zhou, "Traffic Light Recognition with High Dynamic Range Imaging and Deep Learning", IEEE Volume 20, April 4, 2019.

[9] KHAN MUHAMMAD, JAMIL AHMAD1, IRFAN MEHMOOD, SEUNGMIN RHO AND SUNG WOOK BAIK1, "Convolutional Neural Networks Based Fire Detection in Surveillance Videos", IEEE March 6,2018.

[10] HILAL TAYARA, KIM GIL SOO, KIL TO CHONG," Vehicle Detection and Counting in High-Resolution Aerial Images Using Convolutional Regression Neural Network", IEEE December 11,2017.

[11] Pim Moeskops, Max A. Viergever, Adrienne M. Mendrik, Linda S. de Vries, Manon J.N.L. Benders Ivana Isgum, "Automatic segmentation of MR brain images with a convolutional neural network", IEEE, Volume 35, 4, May 2016.

[12] Shuai Zhang, Chong Wang, S. C. Chan, X. G. Wei and C. H. Ho., "New Object Detection, Tracking and Recognition Approaches for Video Surveillance over Camera Network", IEEE 10 November, 2011.

ISBN: 979-85-27243-61-1

APPLICATION OF DEEP LEARNING TECHNIQUES FOR THE STUDY AND ANALYSIS OF CARDIOVASCULAR DISEASES

Padmavathi C*1, Keshava B R*2, Santrupti P*3, Yathin B S*4, Hanumantha N*5
Department of Electronics and Communication Engineering, Sapthagiri College of engineering
14/5 Chikkasandra, Hesaraghatta main road, Bangalore-560057, India.
[1]keshavbr98@gmail.com
[2]danagaudsantrupti@gmail.com
[3]hanumanthan4@gmail.com
[4]bsyathinreddy@gmail.com
[5]padmavathi@sapthagiri.edu.in

***Abstract*- Cardiovascular diseases are the leading cause of death in the world. Myocardial infarction and congestive heart failure are the most common cardiovascular diseases (CVD), which usually cause heart attacks and represent 30% and 40% of the affected population, respectively. It causes millions of deaths and billions of dollars in economic loss around the world each year. People with cardiovascular disease or high cardiovascular risk (due to one or more risk factors, such as hypertension, diabetes, hyperlipidemia, or a confirmed disease) should be diagnosed and treated early with counseling and medication as appropriate. This project uses deep learning to identify diseases from ECG signals. Machine learning techniques for ECG classification have been widely used in the literature as a fast, inexpensive, and non-invasive method for ECG detection. Using CNN to model and detect CVD is a relatively new method. Before training a neural network with ECG data, proper pre-processing must be performed. Before performing feature analysis and classification, noise removal is the first step in processing the ECG signal. The frequency of the noise can be similar to that of the ECG function, so frequency-based noise removal methods cannot be used. The project uses an advanced adaptive method of empirical mode decomposition as an efficient method to remove high and low frequency noise components. Disease data obtained from different sources have different sampling frequencies. In this project, data sets from different sources are sampled at a common frequency to create a unified database. A single beat is segmented and provided as input to the neural network, which classifies the signal. Rhythm segmentation is achieved by identifying the R peaks based on the wavelet transform. A unified database was created for ECG signals from atrial fibrillation, congestive heart failure, myocardial infarction, and normal heartbeat samples, where each sample is a heartbeat. The model described in this project has an accuracy rate of 86% for the classification test of CHF and MI diseases, and an accuracy rate of 81% for the CHF classification of a normal heartbeat. The model can be further expanded to identify more diseases.**

INTRODUCTION

Cardiovascular disease is a group of human circulatory disorders that prevent the structure and function of the heart, and is one of the many of the heart deaths around the world. Heart conditions, structural problems, myocardial problems, disorder valves and irregular rhythms characterized by blocked blood stenosis or blood vessels are called cardiovascular disease. Cardiovascular disease includes coronary disease, septic arterial disease of cerebrovascular disease and rheumatic heart disease, congenital heart disease, deep vein thrombosis, pulmonary embolism, myocardial infarction, stroke, congestive heart failure, etc. And It is becoming one of the main cause of death around the world. This high mortality rate can be reduced to a degree by detecting several heart diseases in a rapid step to provide timely treatment to the patient. A total of 17.5 million deaths from cardiovascular disease were reported throughout the world, according to

the coverage of the 2012 World Health Organization, which represent 31% of global death. By 2030, it is expected that annual mortality due to cardiovascular disease will 20.3 million by 2030. Among the CVD, 7.4 million deaths are due to coronary artery disease (CAD). This multi-source report reveals the importance of early detection and the diagnosis of CVD that can save most of life. Arrythmia, myocardial infarction (MI) and congestive heart failure (CHF) for these survey reports (CHF) are early compared to other cardiac anomalies that can save most life reveal the importance of discovery and diagnosis. The automatic characterization and classification of the electrocardiogram (ECG) signals to detect these main diseases of the heart are difficult tasks of decades. People with cardiovascular cardio vascular disease or high cardiovascular risk (due to hypertension, diabetes, hyperlipidemia and the existence of one or more risk factors, such as an already established disease), advice and pharmaceutical products as necessary, the early detection and management used . 3444 The heart anomalies are reflected in the morphological characteristics of 12 signals of clinical ECG lead with low amplitude, which show great variations in it. Clinically registered ECGs are continuously monitored by cardiac experts to identify cardiac problems, and experts find great records of ECG and find small fluctuations in the form of ECG signal in less time, it is very problematic. CAD progresses and makes me bring my, and I can affect the left ventricular function. If CAD and MI are not collected by ECG, you can take CHF. This work is intended to develop models in uncooked environments that are automatically classified automatically in all anomalies in all anomalies using a single ECG beat. You will do it. A multiple vascular disease (ECG) class signal (ECG) of electrocardiograms for efficient and rapid patient treatment is required. This project aims to develop a computer-assisted heart diagnostic automation method using deep learning techniques to improve the performance of conventional machine learning methods used to detect multiple heart disease. The diseases discussed in this project include coronary artery disease, myocardial infarction and cardiomyopathy. This work presents a domain, the frequency conversion domain and the Wavelet transform, cannot accurately reach 2.2 million people. In 2010, CVD's global direct medical expenses approach $ 863 billion. These expenses continued to increase by CVD, which can reach $ universal way of classifying between multiple heart disease. Certain ECG data recover from a different open access database, including the PTB diagnostic ECG database, St. Petersburg Cortiology Institute of Cardiocric Institute Cortiocric TechniCric Technigi Technigi Database of Arrythmia, and Database of MIT-BIH Arrythmia. The RAW ECG signal is disassembled using non-linear techniques, acquiring correction data provided by a wider range of hidden information, and improves noise removal performance. Deep learning algorithms are supposed to learn better ECG data functions more than unprocessed ECG data.The data obtained for diseases from different sources have different sampling frequencies. In this project, the data sets of different sources are shown at a common frequency to create uniform databases. Individual heartbeats are segmented and are administered as input to appropriate neuronal networks that classify signals. The beating segmentation is carried out by identifying r peco by appropriate segmentation method.

RELATED WORK:

A monitoring of electrocardiogram is an integral role of a medical engineer, and is particularly important for exercise, pharmacological stress and patients with critical treatment. Although interpretation is generally beyond the scope of the technician, the potentially problematic or fatal arrhythmic (1] recognizes and allows the preservation of life.

Subtitle changes in the potential pattern of elimination of the Repolarization and polarization show diseases suffering from the patient. The characteristics of these clinical time domains of the ECG waveform can be used in the control of heart health. Because there are noises and values of thorough morphological parameters, it is very difficult to identify the electrocardiogram with the naked eye. The methods developed for the time frequency domain analysis, such as time

represent the unique identification functions [3]. Therefore, the non-linear method can

capture small fluctuations from the ECG signal and improve accuracy. However, ECG signs are very chaotic and not stationary in their behaviors. It is problematic and requires experience [4] to interpret these signals visually.

Precise QRS detection is a first important step for almost all automatic electrocardiogram analysis systems (ECG). However, QRS detection is not only for several ECG waveforms, but also for interference caused by different types of noise. This study proposes an improved QRS complex detection algorithm based on the four-way Bi-Orthogonal Wavelet Spline transformation [5]. It has been proposed that it has been proposed to quantify the noise assessment method and select a low noise Wavelet detail signal instead of eliminating the high-frequency components in the pretreatment stage. The QRS peak can be detected by the selected Wavelet detail signal and the pair of proposed decision rules.

DATA BASE:

The proposed method is used in "PTB diagnostic electrocardiogram database" [23], "MITBIH arrhythmia database" [22], "12-lead arrhythmia database of St. Petersburg Heart Technology Institute" [21] in PhysioNet [25] Evaluation. Each database has a different number of data record classes and standards. The PTB database contains 549 records, digitized at a frequency of 1000 Hz. The MITBIH database contains 48 records, each with duration of 30 minutes and is digitized at a frequency of 36 Hz. The St. Petersburg database contains 75 annotated records sampled at 257 Hz. Table 1 shows the complete description of the database and the labels of the diseases considered and the corresponding number of segmented data. The CNN architecture requires a 1000 × 1 shape sequence as the input of the first layer. Therefore, a sequence of 1000 data points was sampled from the modified ECG signal to feed the neural network model. There is overlap between two consecutive sequences to preserve inter-sequence and intra-sequence characteristics. Overwriting is done randomly on different registers. This serves two purposes. First, complete the data enhancement task. Second, the training process does not rely on a specific sampling method covering the entire database. A single segment sequence contains four to five periodic rhythms (depending on the sampling rate of the database), so any sequence that enters the network can learn period and inter-period characteristics.

PROPOSED METHOD:

This section first provides a brief overview of our proposed method to classify multiple cardiac diseases of ECG signals, and consecutive sections indicate details of any step. A block diagram of the method proposed in FIG.1 is shown. The ECG signals are processed by noise removal filters. In this document, instead of processing an unprocessed ECG signal, a modified ECG signal is formed using a deionized filter. CNN networks were very successful in recent time for two-dimensional or multidimensional signals, but we use a CNN model of a dimension for the classification of heart disease depending on the modified ECG signal.

Proposed block diagram:

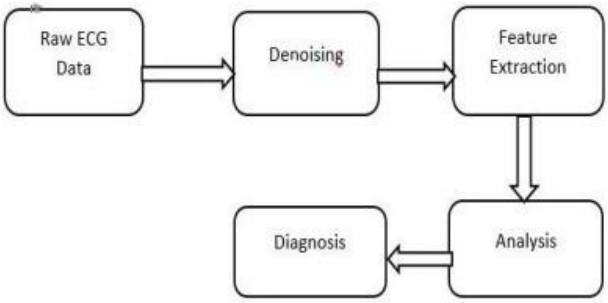


Fig.1 proposed block diagram

PREPROCESSING:

Base line correction:

The perfect curve shape of the two-dimensional analysis data object includes a constant reference value in which no signal is observed. This basic level is called the baseline of the 2D data object. Due to changes in experimental conditions, temperature effects or any other interference during the measurement process, the baseline sometimes deviates from its original baseline level. In this case, the baseline of the 2D data object can be

corrected after the measurement is completed using the baseline correction function of the software. It can be applied, as long as consecutive operations are required to find the peak value.

Wavelet filter:

The basic idea behind denoising or wavelet thresholding is that wavelet transformation leads to poor representation of many real world signals and images. This means that the wavelet transform concentrates the signal and image characteristics into a few large wavelet coefficients.

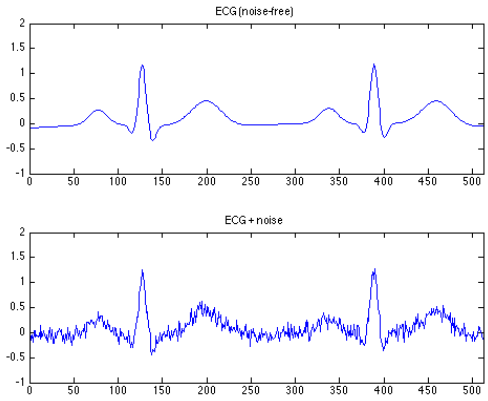


Fig.2 ECG with noise and without noise

Band stop filter:

A bandpass filter passes a set of frequencies and rejects all other frequencies. The role of the band stop filter is just the opposite. It rejects one frequency band and passes all other frequency bands at the same time. This is also called a notch filter or notch filter.

Low pass filter:

A low-pass filter is a circuit that can be designed to modify, reshape, or reject all unwanted high frequencies of electrical signals, and only accept or pass those signals required by the circuit designer.

Smoothing filter:

During the smoothing process, the data points of the signal are modified, thereby reducing individual points higher than neighboring points (possibly due to noise), and increasing points lower than neighboring points, resulting in a softer signal.

Common frequency sampling:

Upsampling is the process of inserting zero-valued samples between the original samples to increase the sampling rate. This is sometimes referred to as "zero padding." This type of upsampling adds unwanted spectral images to the original signal, which are centered at multiples of the original sampling rate. Interpolation is the process of upsampling and then filtering. (Filtering to remove unwanted spectral images.) This is done to create an "intermediate" sample from the original sample. The result is as if you had initially sampled the signal at a higher rate.

1.Cubic interpolation:

With cubic interpolation the connection between two symbols is done using a curve rather than a line. This preserves the behavior of the signal and gives smoother more reliable results from processing.

$$f(x) = ax^3 + bx^2 + cx + d$$

2. Linear Interpolation:

Straight addition is the strategy for associating two images with the methods for a line. As image amplitudes may fluctuate, the odds of exceptional conduct changes are there.

$$y = y_1 + (x - x_1)\frac{y_2 - y_1}{x_2 - x_1}$$

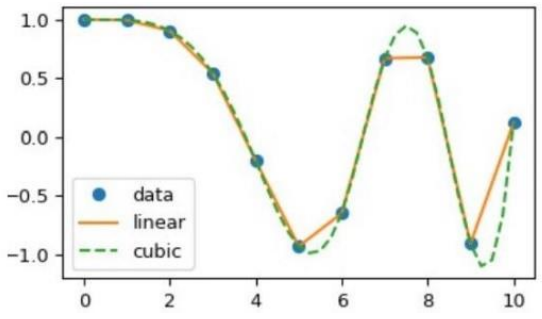


Fig.3 Cubic vs linear interpolation

Time frequency scalogram via CWT:

Since the ECG signal consists of different frequency components, in this study we transform the ECG signal into the time-frequency domain in order to facilitate the extraction of features. CWT is the most widely used time-frequency analysis tool that uses a family of wave functions to decompose a signal in the time-frequency domain. It inherits and develops the idea of localization from STFT, but unlike STFT, CWT can provide high time resolution and low frequency resolution at high frequencies and high frequency resolution and low time resolution at low frequencies by adjusting the scale and translation parameters [11]. given a signal x (t), the CWT is defined as

$$C_a(b) = \frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} x(t).\varphi\left(\frac{t-b}{a}\right) dt \qquad (1)$$

where a is a scale parameter, b is a translation parameter, and j (t) is the wavelet function (also known as the parent wavelet). The scale can be converted into frequency

$$F = \frac{F_C * F_S}{a} \qquad (2)$$

Where Fc is the center frequency of the parent wavelet, fs is the sampling frequency of the signal x (t) [26]. Among these, the choice of the mother wavelet is often decisive for the effect of the time-frequency analysis. (mexh) is used as the parent wavelet because it is close to the shape of QRS waves and is widely used in ECG signal analysis which is defined as

$$\varphi(t) = \frac{2}{\sqrt{3}\sqrt[4]{\pi}} exp\left(-\frac{t^2}{2}\right)(1-t^2) \qquad (3)$$

By using different CWT scaling factors, the wavelet coefficients of the signal are obtained at different scales. These wavelet coefficients can be viewed as a 2D scalogram of the ECG signal in the time-frequency domain. Ventricular contraction heartbeat (PVC) Both signals have 200 sampling points and are sampled at a frequency of 360 Hz, broken down by the Mexican hat wavelet. You can see from the scalogram that the PVC heartbeat is evident different from the normal heartbeat.

Convolution neural network:

The complete network architecture for the modified ECG signal classification is shown in Fig. 4. The convolutional neural network (CNN) architecture is designed to handle one-dimensional data, and all the convolution operations in the convolutional layers are performed on the 1D sequence. The size of the core in each layer is changed to apply to the 1D sequence. The first five layers of the network are composite layers and the next three are fully connected layers. The final output of the network has a softmax regressor with a specific class number that varies between different databases. The first convolutional layer is loaded by a 1000 × 1 sequence, and the input sequence modifier layer with 96 cores has a size of 11 × 1 with a wavelength of 4. Thus, a feature space of size 248 × 96 is created. Then a Maxpooling layer converts the vector space of the features to a 124 × 96 space. The second convolution layer converts the feature space to a 124 × 256 shape with 256 cores of 5 × 1 shape and a distance from the first one. . The third, fourth, and fifth convolutional layers convert the input feature vector space, respectively, into a shape of 61 × 256, 61 × 384, 61 × 256, respectively. Number of cores, core shape, and corresponding stride. The response is illustrated in detail in Figure 4. The third, fourth, and fifth convolutional layers do not have any intermediate or normalized pooling layers between them. After the first and second convolutional layers, batch normalization layers are included. Throughout the architecture, ReLU acts as a nonlinear activation function. The final composite layer transforms the feature space of the final convolutional layer into a 30 × 256 shape, which is then flattened to power the first fully connected layer containing 4096 neurons. The fully connected second layer also contains 4,096 neurons. Finally, a "softmax" activation function classifies the signal into the desired classes. The transformation classes use a bias vector and are initialized to zero. Kernels are initialized uniformly. No nuclear regulator, bias regulator or active regulator was used in the separate complex layers. Also, the kernel and bias have no binding functionality applied to them. The batch normalized classes have a moving average and a dynamic variance of 0.99. In addition, the beta weight and the

moving average are initialized to zero while the gamma weight and the dynamic variance are initialized to one. No beta or gamma modifier was used separately in each separate batch normalization class. In addition, beta and gamma weights have no constraints. Additionally, the weights are scaled by the gamma initializer. The slope of the negative part of the activation function ReLU is set to 0 and the threshold activation threshold value is also set to 0. The activation function returns the maximum value per element with respect to the value 0, i.e. (max (x, 0); here x = output data of the previous layer). Bundle layers with different number of steps and bundle sizes in different layers are indicated in Figure 4. The dense layers use a bias vector and are zero-initialized. Also, kernels are initialized uniformly. No regulator (ie. Moreover, biases and kernels are not linked by any type of linked function. The last two densely connected layers are followed by hopping layers with a hopping rate equal to 50% of the nodes coming from the previous layer.

RESULT AND DISCUSSION:

The CNN model described in the previous chapter was trained with 900 training samples and tested with 250 samples for each disease. This chapter deals with the testing accuracy of the model when different diseases are tested against given heartbeat samples.

DENOISING OUTPUT:

Denoising of a given ECG signal has been performed using different methods discussed in the above methods. The output obtained is shown in Fig.4. It can be seen that the PQRST features are not disturbed when filters is used.

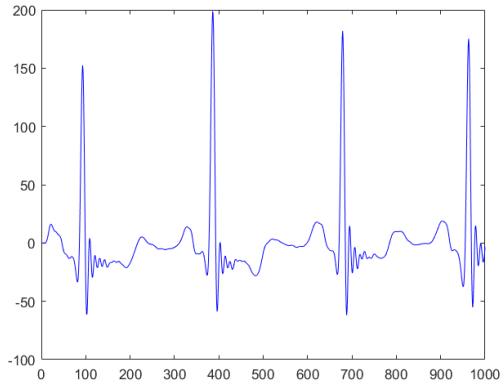


Fig.4 Denoising output

Beat segmentation:

All the ECG signals are at 1200Hz hence, an input size of 1000 corresponds to single heartbeat duration. The signals used are shown in Fig 5.

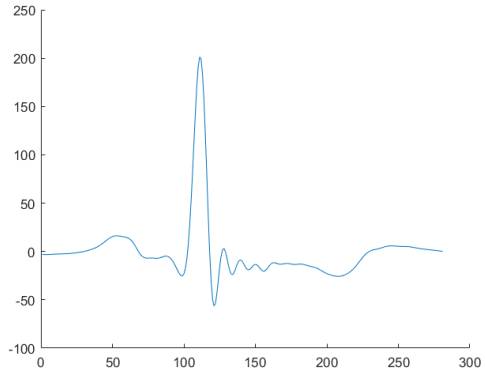


Fig.5 beat segmentation output

TESTING THE CNN:

The training data set is used to construct a predictive relationship for all machine learning models. Most approaches that search through training data for empirical relationships tend to over fit the data, meaning that they can identify relationships in the training data that do not hold in general. A test set is a set of data that is independent of the training data. If a model fit to the training set also fits the test set well, minimal overfitting has taken place.

This CNN model was initially developed to detect single CVD diseases as opposed to the normal heartbeat. This helped in understanding of the feature extraction process and important preprocessing tasks. Accuracy of our project is 93.3%.

REFERENCES:

[1]- C. Tso, D. Gilmore, H. Kiat. Electrocardiography: A Technologist's Guide to Interpretation, The Journal of Nuclear Medicine Technology, October 14, 2015.

[2] - James McNames, Mateo Aboy, "Medical and Biological Engineering and Computing", 2006, Volume 44, Number 9, pp.747.

[3]- R. J. Martis, U. R. Acharya, H. Adeli, Current methods in electrocardiogram characterization, Computers in Biology and Medicine 48,2014 , pp.133–149

[4]- Acharya UR, et al. Entropies for automated detection of coronary artery disease using ECG signals: A review. Biocybern Biomed Eng, 2018.

[5]- Chun-Cheng Lin, Hung-Yu Chang, Yan-Hua Huang and Cheng-Yu Yeh 1, A Novel Wavelet-Based Algorithm for Detection of QRS Complex. Appl. Sci, 2019.

[6] Marco V. Gualsaquí Miranda, Iván P. Vizcaíno Espinosa, Marco J. Flores Calero, "ECG signal features extraction", Ecuador Technical Chapters Meeting (ETCM) IEEE, 2016, pp. 1- 6.

[7]- Joshi, S. L., Vatti, R. A., & Tornekar, R. V. A Survey on ECG Signal Denoising Techniques. 2013 IEEE International Conference on Communication Systems and Network Technologies, 2013.

[8]- Blanco-Velasco, M., Weng, B., & Barner, K. E. ECG signal denoising and baseline wander correction based on the empirical mode decomposition. Computers in Biology and Medicine, 38(1), 2008, pp.1–13.

[9] T.J. Jun, H.J. Park, N.H. Minh, D. Kim, Y.-H. Kim, Premature ventricular contraction beat detection with deep neural networks, in: 2016 15th IEEE International Conference on Machine Learning and Applications (ICMLA), IEEE, 2016, pp. 859–864.

[10] C. Zhang, G. Wang, J. Zhao, P. Gao, J. Lin, H. Yang, Patient-specific ECG classification based on recurrent neural networks and clustering technique in 2017 13th IASTED International Conference on Nationwide population-based study. PLoS ONE, 2008.

Biomedical Engineering(BioMed), IEEE, 2017, pp. 63–67.

[11]- R. Alizadehsani, M. Abdar, M. Roshanzamir, A. Khosravi, P.M. Kebria, F. Khozeimeh, S. Nahavandi, N. Sarrafzadegan, U.R. Acharya, Machine learning-based coronary artery disease diagnosis: A comprehensive review, Computers in Biology and Medicine, 2019.

[12]- O. Faust, Y. Hagiwara, T. J. Hong, O. S. Lih, U. R. Acharya, Deep learning for healthcare applications based on physiological signals: A review, Computer Methods and Programs in Biomedicine 161, 2018, pp. 1–13.

[13] L. Zhou, Y. Yan, X. Qin, C. Yuan, D. Que, L. Wang, Deep learning-based classification of massive electrocardiography data, in: 2016 IEEE Advanced Information Management, Communicates, Electronic and Automation Control Conference (IMCEC), IEEE, 2016, pp. 780–785.

[14] Y. Yan, X. Qin, Y. Wu, N. Zhang, J. Fan, L. Wang, A restricted Boltzmann machine based two-lead electrocardiography classification, BSN, 2015, pp. 1–9.

[15] C. Yuan, Y. Yan, L. Zhou, J. Bai, L. Wang, Automated atrial fibrillation detection based on deep learning network, in 2016 IEEE International Conference on Information and Automation (ICIA), IEEE, 2016, pp. 1159–1164.

[16]-Cardiovascular diseases (CVDs), https://www.who.int/newsroom/factsheets/detail/cardiovascular-diseases-(cvds), May 17, 2017.

[17] - A Maziar Zafari, MD, PhD, FACC, FAHA, emedicine.medscape.com, https://emedicine.medscape.com/article/155919-overview#a7 , May 07, 2019.

[18] - Ibadete Bytyçi, Gani Bajraktari, Anatol J Cardiol, "Mortality in heart failure patients", 2015, pp. 66-68.

[19] - Lee E, Choi E-K, Han K-D, Lee H, Choe W-S, Lee S-R, et al. Mortality and causes of death in patients with atrial fibrillation:

[20] - Joshi, S. L., Vatti, R. A., &Tornekar, R. V. A Survey on ECG Signal Denoising

Techniques. 2013 IEEE International Conference on Communication Systems and Network Technologies, 2013.

[21]-T. Viktor, A. Khaustov, St.-Petersburg Institute of Cardiological Technics 12 –lead arrhythmia database, Circulation-Electronic 101 (i23) (2000) e215–e220,URL https://www.physionet.org/physiobank/database/incartdb/ (database).

[22]- George B. Moody, R.G. Mark, The impact of the MIT-BIH arrhythmia database, IEEE Eng. Med. Biol. Mag. 20 (3) (2001) 45–50, http://dx.doi.org/10.1109/51.932724 (database),URLhttps://www.physionet.org/physiobank/database/mitdb/.

[23]- R. Bousseljot, D. Kreiseler, A. Schnabel, Nutzung der ekg-signaldatenbankcardiodat der ptb über das internet, Biomed. Techn./Bimed. Eng.40(s1)(1995)318,http://dx.doi.org/10.1515/bmte.1995.40.s1.317[database.https://www.physionet.org/physiobank/database/ptbdb/

ULTRA-VIOLET STERILIZATION ROBOT FOR DISINFECTION

PREETHI T S *[1], AISHWARYA C[2], DIVYASHREE R A[3], DEEPA B PATIL[4], DIVYA K[5]

Department of Electronics and Communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India
[1]preethits@sapthagiri.edu.in
[2]aishwaryac363@gmail.com
[3]drangblr@gmail.com
[4]deepapatil1714@gmail.com
[5]divyagowda563@gmail.com

Abstract **- There is an extreme need to protect our self from deadly virus and bacteria in present situation. Here personal and environmental sanitization is important. In our lives we come across various contact surfaces which have great possibility of containing harmful virus and bacteria. To minimize the hazard of causing infection from virus and bacteria a robot is proposed which sanitize a room by emitting UV-C light and spraying the room, the air quality of particular room is checked through MQ135 air quality sensor to know whether sanitization is required or not.**

Keywords **– UV-C light, Air Quality Sensor, IR Sensor and Sanitizer Sprayer.**

I. INTRODUCTION

A standard cleaning procedure via cleaning solutions by human alone cannot reduce the number of microorganisms as there are many blind spot or unreachable areas such as walls and ceiling. Recently a type of ultra-violet (UV) could aid hospitals in ongoing battle to keep microorganisms from lingering in patient rooms and causing new infections. This robot results and low-budget and effective measure in avoiding the infection of bacteria.

The particular wavelength range which can eradicate micro-organisms is in the range of 200-280 nm .This wavelength range is effective in inhibiting bacteria, viruses and fungi. In addition it can be used to sterilize in air and very effective when using disinfection.

II. LITERATURE SURVEY

A. Automatic door knob / handle sanitization using UV-C light

In this paper [1], the focus is on sanitization of contact surface that is door knob which has great possibility of containing harmful bacteria. As shown in fig. 1, to sanitize the door knobs, UV-C light is emitted after each usage which is sensed by IR sensors and the process of sanitization takes place for one minute which is based on distance between light source and surface to be sterilized.

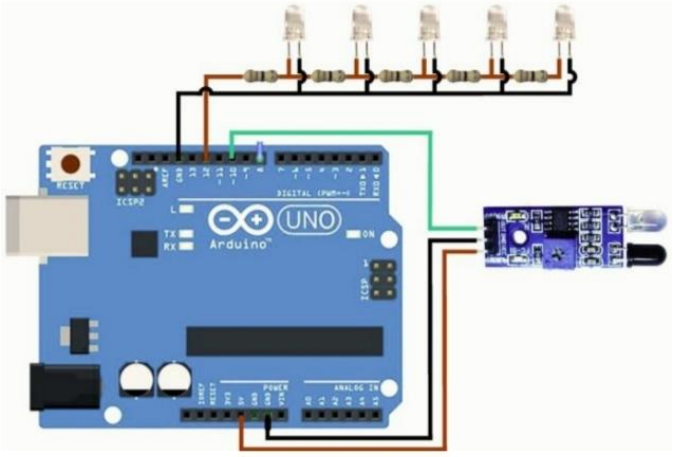


Fig. 1 : Circuit diagram for door knob sanitization

B. Sanitization Robot

In this paper [2] robot is programmed to accept inputs, once the robot starts moving it sense the obstacles in the path if any obstacle is found then the robot changes its direction and continues to move to the required destination. Once it reaches the room it checks the quality of air which is important to know before sanitizing the room since it gives information whether sanitizing is required or not. If sanitization is required then UV radiation is emitted to disinfect the room.

C. Smart office cleaning robot

The paper [6], presents the development and fabrication of a robot which can clean office area. This robot works in both ways that is in autonomous as well as manual mode with features like dry cleaning, wet mopping, UV sanitization, terrain mapping and Smartphone connectivity. Fig. 2 shows the working flowchart of this robot and fig. 3 represents the circuit diagram.

ISBN: 979-85-27243-61-1

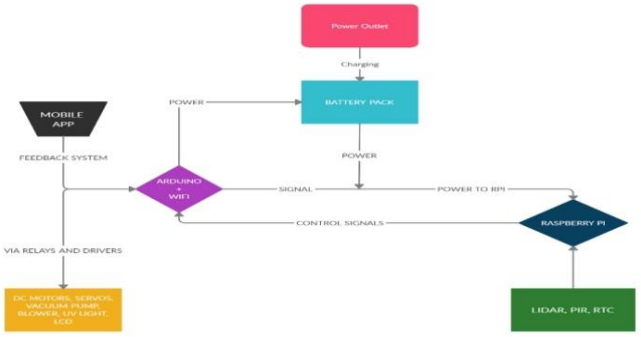


Fig. 2 : Flowchart for smart office cleaner robot

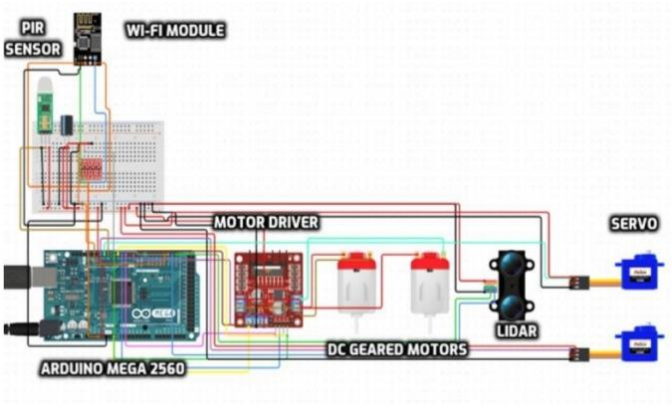


Fig. 3 : Circuit diagram for smart office cleaner robot.

D. Table Cleaning Robert Using GSM & Sensors

In this paper [7], the purpose is to develop time saving robot which helps to clean table surface easily without any help from the user. This device work in two different modes, it can be controlled by using sound and other by mobile phone. At-mega 8 development boards is used to control the robot and codes written in C program in AVR studio, the boot loader is used to install the program into the microcontroller.

E. Surface disinfection by exposure to germicidal UV light

In this paper [4], the aim was to plan simple model to look over efficiency of germicidal tube. To standardize the position, distance and time for UV light and it also detect its efficiency against medically important bacteria and the bacteria spore and fungi. Coil suspension put through to viable count using 10 log dilutions. To prove the count reduction in the viable validate was expressed as ratio of initial applicable count to workable count after to UV light.

F. Disinfection activity of a portable Ultra-Violet C equipment

The aim in paper [5] was to estimate the disinfection ability of a portable UV, the equipment developed to disinfect different objects. Some bacteria are present in hospitals which are infected by the hands of patients and doctors when they come in contact. Scan process to environment colonizing surfaces like door knob, equipment's and electronic devices. All of these inanimate surface hardly ever are disinfected to avoid this microbial colonization and persistent on surfaces and physical decontamination method have been established. Ethanol and other alcohols are used in hospitals and labs to sterilize surface and prevent infection. The layout of the equipment is shown in fig. 4 whereas image of UV sanitizer robot is shown in fig. 5.

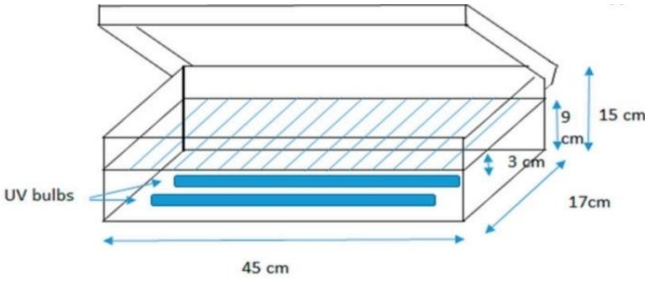


Fig. 4 :Layout of UV Sanitizer equipment.



Fig. 5 :Image of UV Sanitizer equipment.

III. EXPLANATION

Our robot is programmed to accept inputs to sense obstacles around it and navigate the robot around the room to avoid any collisions. The microcontroller controls the wheels of the robot by a motor driver to avoid collisions. It has a potential to sense the quality of air whose feedback triggers the robot to ON bulb which emits UV-C light whose wavelength will be 100nm-280nm which covers the germicidal wavelength range (200nm-280nm) and destroy the microorganisms present in operating room. Later a sprayer is used to reach the microorganisms which were hidden from UV-C light (i.e. under table) under the shadow of object. Fig. 6 shows the block diagram of UV robot where fig. 7 shows the working flowchart of UV robot.

ISBN: 979-85-27243-61-1

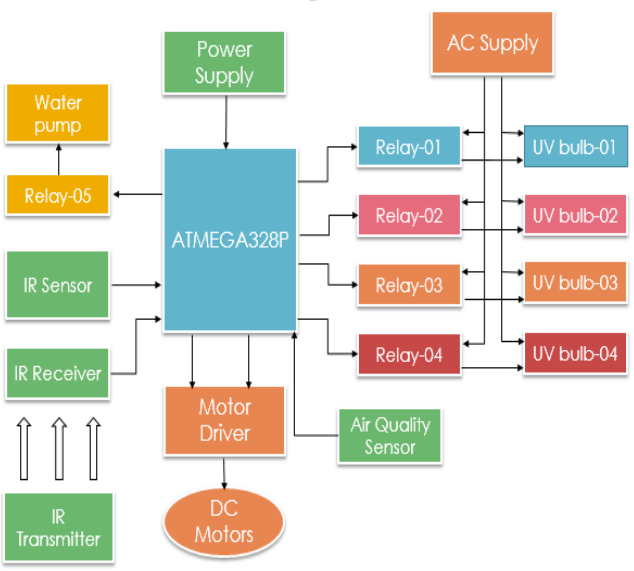


Fig.6 Block diagram of UV robot

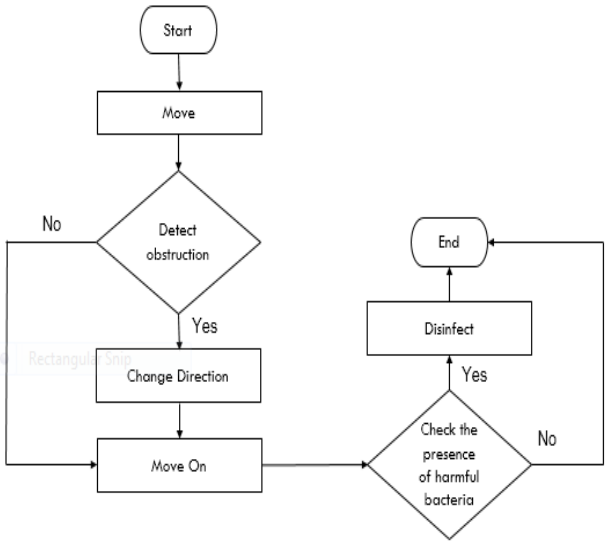


Fig.7 Flowchart of UV robot

IV. OBJECTIVES

A. To control the robot through IR transmitter

Methodology:

Robot is controlled by IR remote. This is achieved by interfacing ATMEGA328P with IR receiver. IR receiver receives the signal from IR transmitter and the leads the robot according to that. Motor Driver is also interfaced with the controller which controls the motor in order to move the robot.

B. To avoid the obstacle in the path of robot using IR sensor.

Methodology:

In next stage IR sensor is interfaced with ATMEGA328P and motor driver. The sensor has built in IR transmitter and receiver. Transmitter transmits IR radiation, if any obstacle is encountered in the path of robot the IR radiation are reflected back and received by the receiver in the sensor. Then the sensor gives high input to the controller which in turn directs the motor driver to change the direction likewise. Fig. 8 shows the working flowchart of avoiding obstacle.

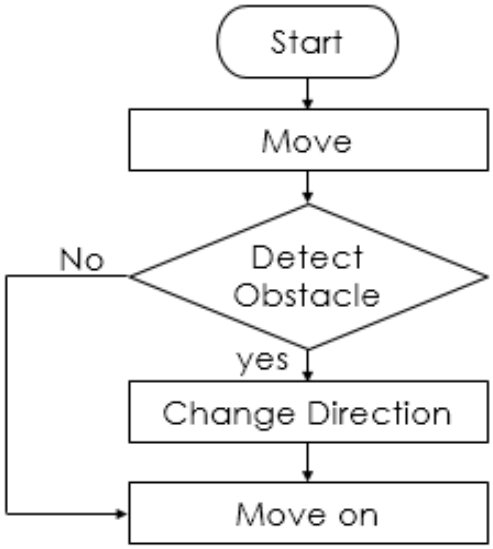


Fig.8 Proposed flowchart to avoid obstacle

V. RESULT

When the user gives instruction to the robot through IR transmitter, the signals are received by IR receiver fixed in robot and moves (Forward, Backward, Left and Right) according to that. Whenever there is an object encountered in the path of robot it changes direction accordingly.

VI. CONCLUSION

Our UV robot will demonstrate a great potential by sterilizing an operating room in two ways. Uniqueness of this project design is that the necessity of disinfection of operating room is checked before sanitizing the room. UV technique is efficient in minimizing bacterial count and comparatively more effective than disinfecting manually.

VII. ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also we

ISBN: 979-85-27243-61-1

would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCE

[1] Rajat Vyawhere, Parth Gagpalliwar, Aryan Shirke, "*Automatic Door Knob/Handle Sanitization Using UV-C Light*", in International Reseacrh Journal of Engineering and Technology, Vol.07, ISO 9001:2008 Certified Journal, pp.2778-2781, July 2020.

[2] Apeksha Wadibhasme, Yadhubooshan M M, Kaushik Moolya, Shireen Farhath, Dipti Darade and Sumana Hati, "*Sanitization Robot*", in International research Journal of Engineering and Technology, Vol.07, ISO 9001:2008 Certified Journal, pp.3010-3014, Aug 2020.

[3] A.M. Spagnolo, G.Ottria D.Amicizia, F. Perdelli, and M.L.Cristin, "*Operating theater quality and prevention of surgical site infection*". Journal of preventive Medicine and hygiene, 54 (3), 2013, pp.131-137.

[4] Rajath and Parth Gagpalliwar, "*Programmable and low cost Ultra-Violet room disinfection device*". Journal of Engineering and Technology, 2020.

[5] Moez Guettari and Samir Hamza, "*UV-C disinfection robot"*. Journal of Engineering and Technology, 2020.

[6] Karanja, Uppalapati Bindu Sri Sai, Abhinav Patil, Ajay dev Parmar and Sanchit Kumar, "*Smart Office Robot*". Journal of Engineering and Technology, 2020.

[7] Dr.Venkadesh P, Gokul G S, "*Table Cleaning Robot Using GSM Sensors*", in International Reseacrh Journal of Engineering and Technology, Vol.05, ISO 9001:2008 Certified Journal, pp.865-870, May 2018.

[8] Girish P Kynbhar, Sanmajit R. Jadhav, Ajit M Kole, Mahantesh P Mttada, "*Home Robot*", in International Reseacrh Journal of Engineering and Technology, Vol.04, ISO 9001:2008 Certified Journal, pp.542-545, May 2017.

[9] Reshma J, "*Analysis and Prediction of Air Quality*", in International research Journal of Engineering and Technology, Vol.07, ISO 9001:2008 Certified Journal, pp.266-270, Jan 2020.

[10] Manmeswar Patnaik, Yashwardhan Kaushik, Natasha Karanjia, Uppalapati Bindu Sri Sai, Abhinav Patil, Ajay dev Parmar, Sanchit Kumar, "*Smart Office Cleaner Robot*", in International Reseacrh Journal of Engineering and Technology, Vol.07, ISO 9001:2008 Certified Journal, pp.3452-,3455, Aug 2020.

[11] S. Senthil Kumar, R. Nithya, P. Vaishali, R. Valli, G. Vanitha, L. Ramachanndran, "*Autonomous Navigation Robot*", in International Reseacrh Journal of Engineering and Technology, Vol.04, ISO 900:2008 Certified Journal, pp.1660-1663, Feb 2017.

[12] Andrea Guridi, Elena Sevillano, Inigo de la Fuente, Estibaliz Mateo, Elena Eraso and Guillermo Quindos, "Disinfectant Activity Of A Portable Ultra-Violet C Equipment", in Interntionl Journal Of Environmental Research And Public Health, Nov 2019.

[13] G. Katara, N Hemvani, S Chitnis, V Chitnis, *DS Chitnis, "Surface Disinfection By Exposure To Germicidial UV Light", in Indian Journal Of Medical Microbiology,vol.26, no. 3, pp. 241-242, 2008.

[14] Aladin Begie, "Aplication of Service Robot for Disinfection in Medical Institution", Springer International Publishing AG 2018.

[15] K. Shimizu, M. Blajan and S. Tatematsu, "*Basic study of remote disinfection and sterilization effect by using atmospheric microplasma*," 2011 IEEE Industry Applications Society Annual Meeting, Orlando, FL, 2011.

[16] S. -W. D. Tsen et al., "*Selective Photonic Disinfection of Cell Culture Using a Visible Ultrashort Pulsed Laser*", in IEEE Journal of Selected Topics in Quantum Electronics, vol. 22, no. 3, pp. 371-378, May-June 2016.

[17] K. Kelly-Wintenberg et al., "*Air filter sterilization using a one atmosphere uniform glow discharge plasma (the volfilter)*", in IEEE Transactions on Plasma Science, vol. 28, no. 1, pp. 64-71, Feb. 2000.

[18] H. -. Cha, H. -. Yoon, K. Y. Jung, B. -. Yi, S. Lee and J. Y. Won, "*A robotic system for percutaneous coronary intervention equipped with a steerable catheter and force feedback function*", 2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, 2016.

[19] Y. Cao, W. Chen, M. Li, B. Xu, J. Fan and G. Zhang, "*Simulation Based Design of Deep Ultraviolet LED Array Module Used in Virus Disinfection*", 2020 21st International Conference on Electronic Packaging Technology (ICEPT), Guangzhou, China, 2020.

[20] S. Horikawa et al., "Direct Detection of Bacterial Pathogens on Fresh Fruits and Vegetables", 2018 IEEE SENSORS, New Delhi, 2018.

[21] B. Luo et al., "*Fast detection for newcastle disease virus by using 81° tilted fiber grating immunosensor*", 2017 16th International Conference on Optical Communications and Networks (ICOCN), Wuzhen, 2017.

[22] J. Hong and M. Otaki, "*Studies on Liposome-encapsulated-chemical Actinometer in UV-disinfection by Low Pressure UV Lamp: Bio-chemical Actinometer in UV-Disinfection*", 2012 International Conference on Biomedical Engineering and Biotechnology, Macao, 2012.

[23] M. Maclean, J. G. Anderson, S. J. MacGregor and J. W. Mackersie, "*The development of a pulsed UV-light air disinfection system and its application in university lecture theatres*", Conference Record of the Twenty-Sixth

ISBN: 979-85-27243-61-1

DESIGN AND IMPLEMENTATION OF HIGH SPEED MULTIPLIER BASED ON SYMMETRIC STACKING COUNTER

[1]Shobha.H, [2]Sampritha.H.S, [3]Shree vidya, [4]Sindhushree.G.P
[1]Assistant professor, Dept of Electronics and Communication,Sapthagiri College of Engineering, Bengaluru
[2,3,4]B.E Student,Dept of Electronics and Communication,Sapthagiri College of Engineering, Bengaluru

shobhahugar@sapthagiri.edu.in, sampritha.1219@gmail.com, vidyashekar07@gmail.com, sindhusinni055@gmail.com

Abstract*—Applications of High-speed multipliers in all computational units include Arithmetic Logic Unit (ALU), Digital Signal Processing (DSP) and Multiply Accumulate Unit. At current scenario, there is high demand in creating speed and power efficient multiplier algorithm. Examples of some existing multipliers are Booth multiplier, Dadda multiplier, and Reversible multiplier. Booth multiplier is used to lower down the number of partial product, thus used in multiplier with long operands (>16bits). Dadda multiplier is more usual, uncomplicated and bring down more number of bits at outset of summand reduction. Reversible multiplier is a computing device which is used to multiply two binary numbers by the use of reversible adders. This project propose the designing of high speed multiplier based on symmetric stacking counter. Further, the performance parameter such as delay, area and power are compared with conventional 16-bit Wallace tree multiplier. The proposed prototype model is implemented in Verilog. Simulation and circuit synthesis is performed using Model-Sim or ICARUS tool and the Xilinx ISE Design Suite respectively.

Keywords*—Stacking, Counter, ALU, DSP, ICARUS, ISE.

I. INTRODUCTION

The basic role in Digital Signal Processing application such as filtering and convolution is multiplication. Providing a physically compact size with high speed in addition low power consumption unit is the main purpose of an effective multiplier. The overall performance of microprocessors includes power efficiency, speed of multiplier circuits. Reducing the number of operations is necessary in order to decrease power consumption and area of multiplier design. Partial products are obtained by the multiplication of binary numbers which are added to generate final result. Partial products summation can be performed through different methods, but the choice depend on factors such as area, design complexity, and latency and power. Some methods such as Wallace and Dadda multiplier are used in order to optimize the partial product summation. Bit stacking is presented based on Counting. A 6:3 and 7:3 counters based on symmetric bit stacking method are utilizes in Wallace tree multiplier. Absence of XOR gates in 6:3 counters which is built using this method. Hence these multipliers are faster than the present counter based multipliers. On comparing, a stacking based counter are quicker than the conventional counter design as well as use less power.

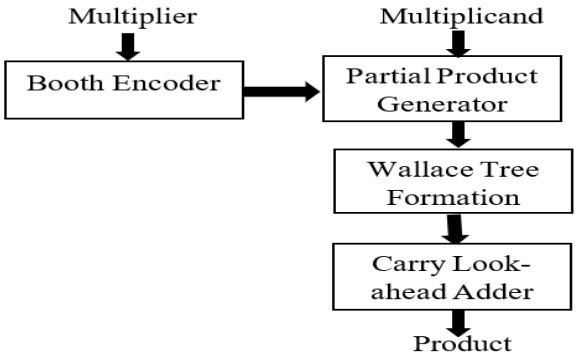


Figure.1. Block diagram of Wallace multiplier

Initially at 2014, an unsigned 32-bit multiplier was proposed using Radix-4 Booth encoder, a changed carry look ahead adder and a Wallace tree adder. It is verified on DE2-115 and then blend to ASIC execution, where as the result consist an area of 58.28mm^2 with 4.13ns total delay. They can be used in application involving DSP core [1]. Further implementing those multipliers for various sizes are synthesized using Synopsys Design Complier in 90nm process technology. Comparing Radix-4 Booth Wallace multiplier with Wallace multiplier has up to 17% less delay and 70% less power consumption [2]. However, Counter based Wallace multiplier is up to 22% quicker than the traditional Wallace multiplier [3]. A novel transistorized 8x8 multiplier outmoded displayed for rapid execution, which make use of 4:2 and 5:2 compressors which are designed with XOR XNOR and full adders of high speed and low power and multiplexer where

simulations are performed by Xilinx 10.1 ISE for minimum delay and PDP (Power delay product) [4]. In order to attain less area, low power and high speed Dadda multiplier using 6:3 counter is designed. The Dadda multiplier which is alike to Wallace multiplier, is moderately faster (for all operand sizes) and requires fewer gates [5]. A two fold counter considering a novel symmetric section aggregate and convey computation outlook has high speed than other higher request counter outlines while reduce force utilization [6]. In the year 2019, low power optimization binary multipliers using fast binary counters, power and area are reduced by 12% and 8% respectively and also this work is carried out using 90nm technology in cadence Innovus environment [7]. Greater speed with reduced latency and power consumption of binary counter is achieved as there is no absolute OR structures and multiplexers on reproving path. Applications such as image processing and real time signal are used as they have a mean computational error of just 1% and are energy efficient [8]. Using 6:3 and 7:3 counters, high speed with reduced latency is achieved in novel symmetric bit stacking approach and MUX based full adder (MFA) approach [9,14]. MFA based 7:3 counter results in low delay, achieving higher speed as compared to symmetric stacking 7:3 counter [10]. A 6:3 and 7:3 counter implemented with an approximate computing technique achieves higher speed reducing power consumption [11]. Reversible Peris logic gates are implemented in the reduced complexity Wallace multipliers to suppress the delay, area and power dissipation. This method has a depletion of power consumption by 89%, the area by 4.29% and propagation delay by 91.67% than the existing lower complexity Wallace multipliers [13].

In this paper we designed 16 bit symmetric stacking counter based Wallace tree multiplier using 6:3 and 7:3 stacking counter, which produces superior area, power and less delay contrast to that of Conventional counter based Wallace tree multiplier.

This paper is organized in the following sections:

- II Objectives and Flowchart
- III Methodology
- IV Conclusion

II. OBJECTIVES AND FLOWCHART

- To optimize the number of partial product summation.
- To increase computational speed of the multiplier.
- To provide physically compact size (lesser area).
- To achieve low power consumption unit.

The Flowchart for the Proposed model is given in the figure.2.

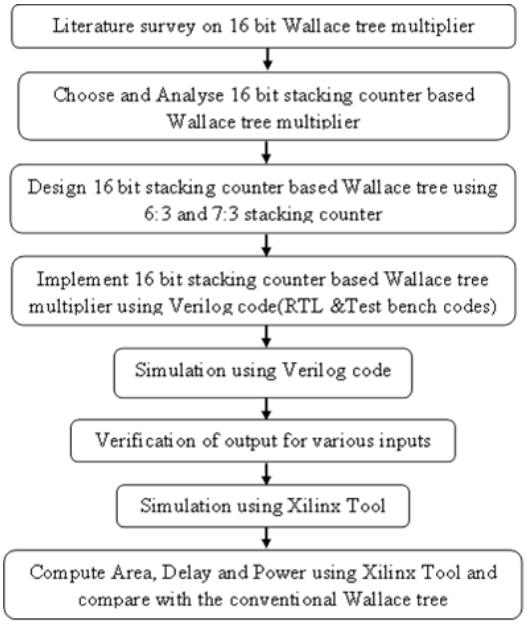


Figure.2. Flowchart of proposed model

III. METHODOLOGY

A. CONVENTIONAL COUNTERS

Counting operation is carried out by associating group of flipflops in cascade, termed as Counters. Generally, in order to attain excessive efficiency in partial product summation, the bits present in column will be counted and the bits with various mass should be generated.

By utilizing Half Adders(HA) and Full Adders(FA), Conventional counters (4:3, 5:3, 6:3 and 7:3) are built. Acceptance of "n" bits with equal weights which counts the number of "1" bits also brings about 3-bits of increasing weights from counters.

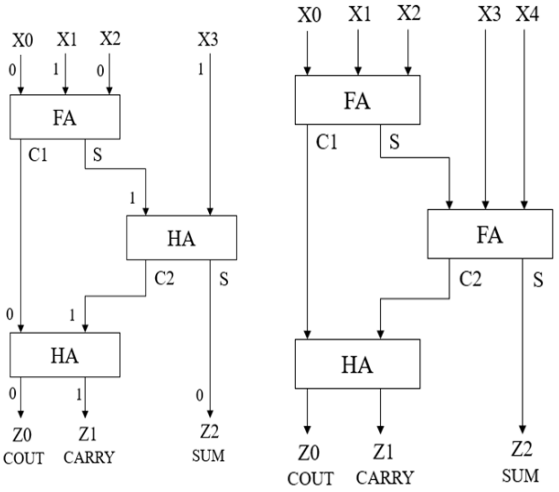


Figure.3. Block diagram of 4:3 and 5:3 conventional counter

Figure.3. shows that 4:3 and 5:3 Conventional counters are built consisting of HA & FA. In 4:3 counter, X0, X1, X2 and X3 are the 4 inputs contemplated which gives rise to 3 output bits Z0(COUT), Z1(CARRY) and Z2(SUM) utilizing 1 FA with 2 HA.
In case of 5:3 conventional counter X0, X1, X2, X3 and X4 are 5 input bits reduced into Z0, Z1 and Z2 output bits utilizing two FA and single HA.

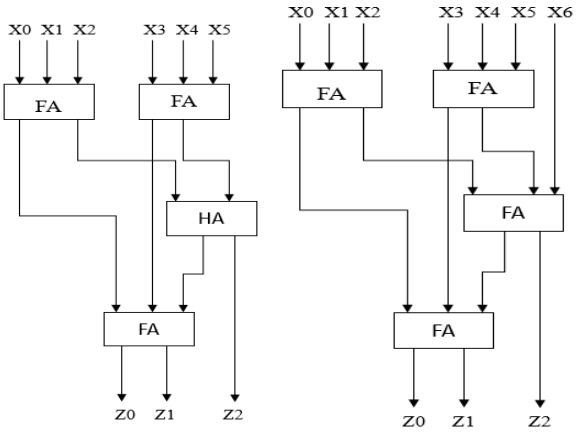


Figure.4. Block diagram of 6:3 and 7:3 conventional counters

Also by utilizing Half and Full adders 6:3 and 7:3 Conventional counters are intended as shown in the Figure.4. This 6:3 counter uses X0 through X5 as 6 input bits and creates Z0, Z1 and Z2 as 3 output bits naming COUT, CARRY, SUM utilizing 3 FA and 1 HA.
Likewise 7:3 counter consists of X0 through X6 as 7 input bits and creates Z0, Z1 and Z2 output bits utilizing 4 Full adders.
There is appearance of more delay in the circuit as there are 7 XOR gates in 6:3 counter and 8 XOR gates in 7:3 counter, which marks as the disadvantage of utilizing
conventional counter. Delay is caused in these counters due to existing chains of XOR gates on the critical path.
Henceforth Symmetric bit stacking circuits are designed for 6:3 and 7:3 counters.

B. COUNTER BASED SYMMETRIC STACKING

Symmetric stacking technique is based on fast binary counters, it is generally formed by first stacking of all the input bits thus all the "1" bits are combined together.
The stacking-based counters are speedy when compared to conventional counter design and utilizes low power.

[1] THREE BIT STACKING CIRCUIT

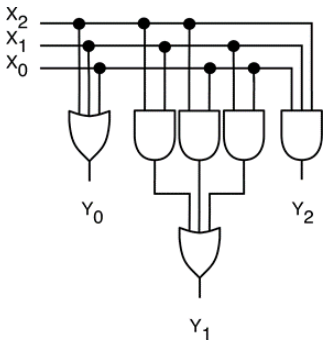


Figure.5. 3-bit stacker circuit

Designing of 3-bit stacking circuit is done by giving three inputs and three outputs X0, X1, X2 and Y0, Y1, Y2 respectively, thus the number of "1" bit in the outputs is same as the number of "1" bit in the inputs, but the "1" bits are grouped together to the left and then followed by "0" bits.
The outputs are given by

$Y0 = X0 + X1 + X2$
$Y1 = X0X1 + X0X2 + X1X2$
$Y2 = X0\ X1\ X2$

[2] MERGING STACKS

There are six inputs X0 through X5. 6-bits are divided into two groups of 3-bit stacker circuit as shown in Figure.6. The outputs of the first 3-bits are is H0, H1, H2 and other 3-bits is I0, I1, I2. First stacker output is reversed. For proper formation, the train of "1" bits shown in the Figure.6 starts from leftmost bit. The corresponding output of the vectors are formed to get a proper formation of 6-bit stacker circuit. The vectors formed are given by

$J0 = H2 + I0$
$J1 = H1 + I1$
$J2 = H0 + I2$

Similarly, other three "k" vectors are formed by

$K0 = H2\ I0$
$K1 = H1\ I1$
$K2 = H0\ I2$

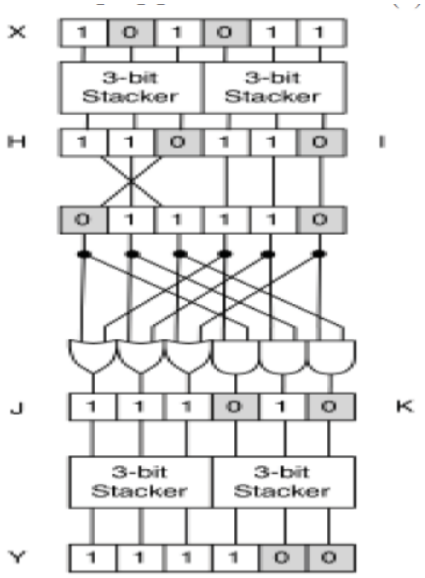


Figure.6. Merging stacks for 6-bit stacking

[3] DESIGN OF 6:3 STACKING COUNTER

A 6:3 stacking counters are formed by using the 3-bit stacking counter. Then it is converted to a binary number. The number of "1" in the input is given by the binary representation.

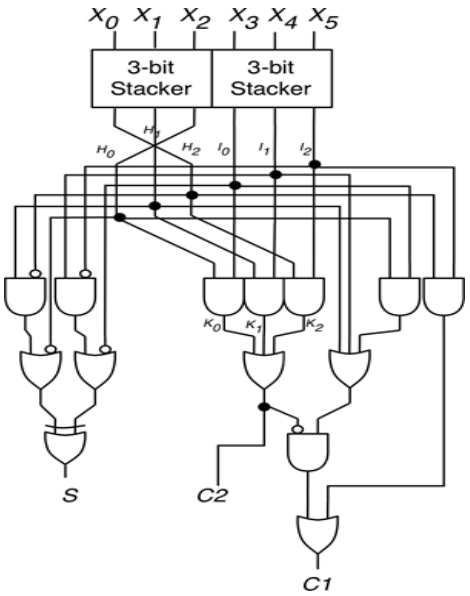


Figure.7. 6:3 Stacking Counter

The design of 6:3 stacking counter is obtained from boolean expression to find the sum, carry 1 and carry 2. It is designed by using two three-bit stacker circuits.

The Boolean expressions are given by

He = H0 + H1 H2

Ie = I0 + I1 I2

S = He * Ie

C1 = (H1 + I1 + H0 I0) (K0 + K1 + K2) + H2 I2

C2 = K0 + K1 + K2

[4] DESIGN OF 7:3 STACKING COUNTER

The symmetric stacking method used to create a 7:3 counter which provide a higher compression ratio as they are desirable.

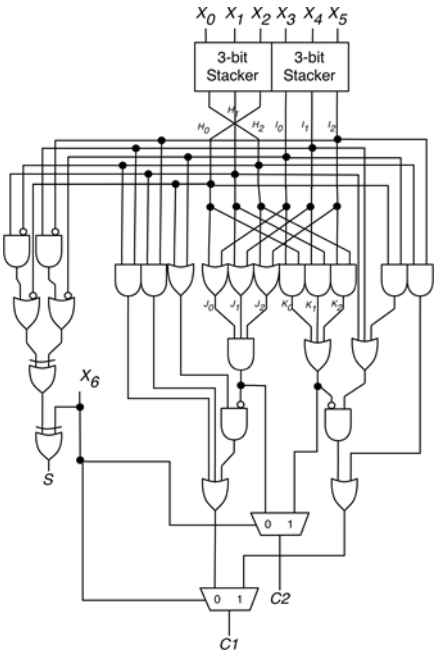


Figure.8. 7:3 Stacking Counter

Designing of 7:3 counter has outputs for C1 and C2 assuming both X6 as 0 & 1. Sum is obtained by adding one XOR gate. When X6 = 1,

C1 = (H0+ I0) J0J1^{1}J2 + H2 I1 + H1 I2

C2 = J0 J1 J2.

When X6 = 0,

C1 = (H1 + I1 + H0 I0) (K0 + K1^{1} + K2) + H2 I2

C2 = K0 + K1 + K2.

IV. CONCLUSION

The 6:3 and 7:3 stacking counters are replicated and the Stacking counters provides better power, delay and area as contrast to Conventional counter based Wallace tree multiplier.

On comparing, Conventional counter based Wallace tree multiplier is much faster and is also energy efficient than that of the Stacking counter based 16 bit Wallace tree multiplier.

ISBN: 979-85-27243-61-1

REFERENCES

[1] J.Selvakumar, S.Siddharth "Implementation of Power Optimized Binary M ultiplier Based on Fast Binary Counters Using Symmetric Stacking", International Journal of Engineering and Advanced Technology(IJEAT), Volume-8 Issue-5,June 2019.

[2] Mrs. Soundari.D.V, Mrs. N. Nanthini, Ms.Vidhya.B, Mrs.Priyadharsini.K "Implementation of Dadda Multiplier Using Counters", International Journal of Pure and Applied Mathematics,nVolume 119, March 2018

[3] Anish Fathima.B, Mahaboob, "Design and Analysis of a Low Power Binary Counter-based Approximate Multiplier Architecture", International Journal of Innovative Technology and Exploring Engineering(IJITEE) volume-8 Issue-9, July 2019.

[4] K.V.Jyothi, G.P.S.Prashanti, "Design and Implementation of High speed counters using MUX based Full Adder(MFA)", IOSR Journal of Electronics and Communication Engineering(IOSR-JECE) Volume 14,Issue 4,Jun-Aug 2019.

[5] Sheba K Sam, Mercy Mathew "Wallace Tree Multiplier Using MFA Counters", International Research Journal of Engineering Researchand Technology (IRJET) Volume 6 Issue2, Feb 2019.

[6] R.Raj, M.Navaneetha Velammal, "Design and Implementation of Low Power Wallace Tree Multiplier", IRE Journals Volume2,Issue 11, May 2019.

[7] Shahzad Asif, Yinan Kong, "Design of an Algorithmic Wallace Multiplier using High Speed Counters", December 2015.

[8] M.Navin Kumar, A.S.Devika, K.Hari Krishnan,S.Jane Selcia, "Symmetric Stacking Binary Counter", International Journal of Communication and Computer Technology, Volume 7,Issue 1, June 2019.

[9] Xuan-Vy Luu, Trong-Hoang, and Trong-Tu Bui, "A High Speed Unsigned 32-bit Multiplier Based on Booth encoder and Wallace Tree Modifications", IEEE, January 2017.

[10] Shahzad Asif, Yinan Kong, "Performance Analysis of Wallace and Radix-4 Booth Wallace Multipliers", IEEE, April 2016.

[11] Duraipandi Ajitha, Dr.J.Mangaiyarkarasi, "Symmetric Stacking Counter Based Testing", International Journal of Advances in Computer and Electronics Engineering, Volume 3,Issue 6, June 2018.

[12] S.Suguna, R.Kiruthika, "Low Latency and Power Efficient Aproximate Multipliers uding Compressors", ", International Research Journal of Engineering Researchand Technology (IRJET) Volume 8, Issue 4, Apirl 2019.

[13] K.Hari Kishore,K.Akhil,G.Viswanath,N.Pavan Kumar, "Design and Implementation of 8x8 Multiplier using 4-2 Compressor and 5-2 Compressor, International Journal of Reconfigurable and Embedded system(IJRES) Volume 5, November 2016.

[14] Sureshbabu J, "A Reduced Complexity Wallace Multiplier using a Noval Power Efficient Reversible Peres Logic Gate Adders", International Journal of Engineering Research and Technology(IJERT).

SMART NOTICE BOARD FOR COLLEGES USING STM32 MICROCONTROLLER

DILIP V[1], CHANDAN H C[2], HAFEEZUR RAHAMAN[3], SACHIN G D [4],
H C SATEESH KUMAR[5]
Department of Electronics and Communication Engineering, Sapthagiri College of engineering
Bangalore-560057, India.

viratkholidilip@gmail.com [2]chandanprince66@gmail.com [3]hafeez0331998@gmail.com
[4]sachngd206@gmail.com [5]hodece@sapthagiri.edu.in

Abstract: The paper will explain embedded systems and wireless networks. Wireless communication has announced its arrival on big stage and the world is going mobile. The remote control of appliances is possible through embedded systems. The use of embedded system in communication has given rise to many interesting applications that ensures comfort and safety to human life. Looking into current trend of information transfer in the campus, it is seen that important information takes time to be displayed on the notice boards. This latency is not expected in most of the cases and must be avoided. Automated lighting controls enable recall and selection of requirements with the press of a button, instantly customizing the lighting to accommodate different preferences and different uses of the space. Automated lighting, fan and projector control—programmable on-off control—can lead to low power consumption in home, classrooms etc.… with declining costs and complexity, these systems are no longer exclusively the province of power saving units.

Keywords: ***Led Display, Wi-Fi Module, STM32***

I. INTRODUCTION

In educational institutions, the organization use circulars and notice boards for conveying information to the students. This methodology takes additional time for updating also many students may not be aware of the information displayed on notice boards due to non-eye-catching notices. The Digital Notice board is one of the ways of displaying notices in which the notices are display on an LED Display Screen. These notices are changed dynamically. We have to only type the notices and send that notice for displaying on display screen. The Display screen and the System are connected with the help of the different mechanisms. We want to control everything and without moving an inch. This remote control of appliances is possible through Embedded Systems. The use of "Embedded System in Communication" has given rise to many interesting applications that ensures comfort and safety to human life. Here we are two parts on the one hand sender part and on the other hand there is receiving part. This LCD screen will be used to display the messages /advertisements by Smart phone.

In India cities are becoming smart and display boards and LEDs are placed at every square for advertisement and many other purposes. But still these technologies are not adapted in many institutions in majority of cities which need the wireless electronic boards the most. Sending the messages with a wireless electronic display board to the people and students which is synchronized using modern technologies will help passing the message without any delay with more reliability rather than traditional way of pasting message on the old notice board. Also, important notices will be displayed and will catch a glimpse on time. This many-to-one network of information transmission has become quite popular and many a business has entered into this model with mixed results. However, as of this writing, most businesses that revolve around the WI-FI system have been targeted to consumers. This paper aims to propose industrial applications that will utilize the distinct advantages of the WI-FI. This system over other possible technologies in the industrial process.

II. LITERATURE SURVEY

Previously lot of researches have done in the area of Smart Notice Board. They all follow various technologies for Manually controlled Notice Board. They have lot of drawbacks, to overcome these different methods have been used in this paper.

[1] In this paper a demo model of 'IOT based smart notice board' designed and developed. Digital notice Board that displays message sent from the user through mobile phone (SMS) and to design a simple, user friendly system, which can receive and display message/information in a particular manner with respect to date and time which will help the user to easily keep the track of notice board every day and each time he uses the system. System consists of two sections called as sender and receiver. Sender is responsible for sending valuable information through the GSM protocol. This system requires transformer, which consists of two winding's primary and secondary is used for converting the 220V to 24V ac because this system is directly connected to power supply. And it consists a led matrix of 8*8 resolution as shown in Fig [1].

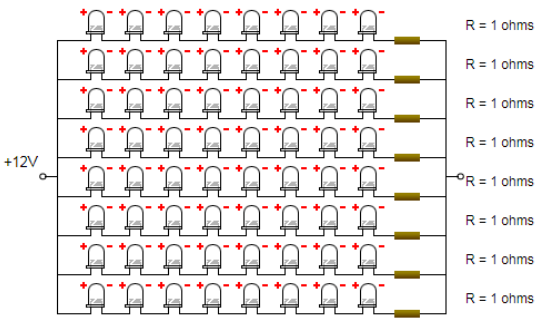


Fig. 1 Block diagram of LED

This system can be implemented for commercial purpose as well as for individual use. Generally, it can be used in classrooms, schools, seminar halls to updates. The main disadvantages of the system are totally dependent on sim card service provider to perform the transmission and reception, so any problem with service provider will affect the system.

[2] In this paper, a Smart Notice Board is projected. GSM MODEM SIM 300A: Designed for global market, SIM300 is a Tri-GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800MHz and PCS1900 MHz SIM300 provides GPR multi-slot class 10 capabilities and support the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. SIM300provide RF antenna interface. The SIM300 is integrated with the TCP/IP protocol

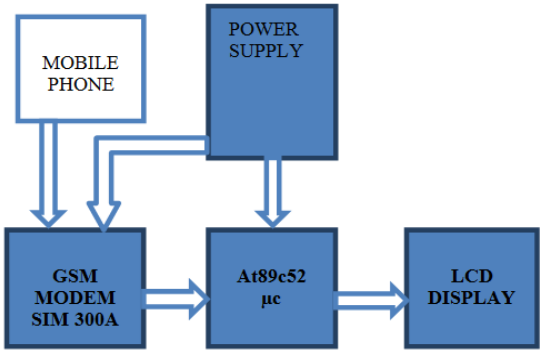


Fig. 2 Block Diagram of GSM Notice Board System.

The AT89C52 is a low-power, high-performance CMOS 8-bitmicro computer with 8Kbytes of Flash and the Programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is the industry-standard 80C51 and 80C52 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a, conventional non-volatile memory programmer. Transmitting section consists of just mobile which has inbuilt GSM modem for wireless data transfer through GSM. Receiving section consists of GSM modem and microcontroller which fetches the message and helps in displaying on LCD.

[3] In this paper, a prototype of a navigation system that helps to move display without touch by input of hand. This system designed has been focused on usability of the touch less notice board solution and also on its suitability for deployment in several public areas. Information is to provide that enables a user to make a display with appropriate manner on which route to follow in hand movement. It uses micro-navigation system. In order to deal with these issues, the solutions are using the interaction among several components as a platform to capture, process the user, to provide environment information, to generate and deliver navigation messages to users while they are moving in an indoor area. The system's main components are as follows: IR sensor, microcontroller, bilateral switch, and optical encoder that delivers the navigation display information to the user through touch less input such as hand movement. When the users

request to check information on the display, they move the hand as they required. It activates the IR sensor which is placed on digital display. The software application instantly tries to determine the user's position and the presence of hand in the surrounding display. The user's position and movement are detected by the sensor.

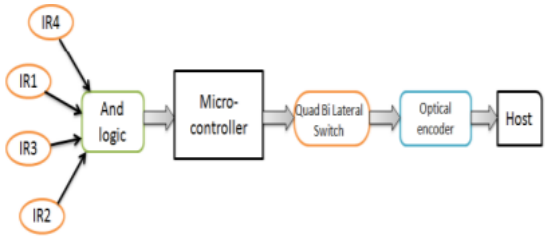


Fig. 3 Proposed Block Diagram

[4] In this paper, module user is going to add the notices. For adding notices, only the authenticate user will add the notices. For adding notices user must be login into the system. Before login user should have to register. While adding notice User has to enter the notice, its title and also priority. Priority is mainly use to send notices for display. If the priority is important, then that notice is immediately displayed on the notice board. User also have to set date and time for particular notice. Digital notice board is system user has to login first. If the user is valid then software shows the page in which user can add the notices. Notice can be a text, audio, video. While inserting the notices user has to set priority of the notice as well as the duration for which notice will be display on to the notice board. For the purpose of scheduling, we are going to use FIFO and Priority Scheduling algorithm. As per the scheduling the notices are displayed on the board. Raspberry pie Model B is using for connecting the software system and the LCD Board. Following is the flowchart which shows the flow of working of system. Update Notice In this module user will update the notices. Updating of notice will be performing on the basis of search by title and date. Delete Notice In this module user will delete notice. Notices will get deleted on the basis of search by title and date. ¬ Send Notice will be performed using raspberry pie on the basis of date and time.

[5] The project proposes a GSM Modem can Raspberry pie is mainly use for the sending notice to display on the notice board also scheduling accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232 applications. The project is a remote notice board with a GSM modem at the receiver's end. So, if the user wants to display any message, he can send the information by SMS and thus update the LCD display accordingly.

III. OBJECTIVES

1. To Send a data from the TCP/UDP to Wi-fi ESP8266 module.
2. To send a data from Wi-fi ESP8266 to STM32.
3. To display data in NOTICE BOARD from STM32.
4. Students can ask a question to the notice board.

IV. BLOCK DIAGRAM

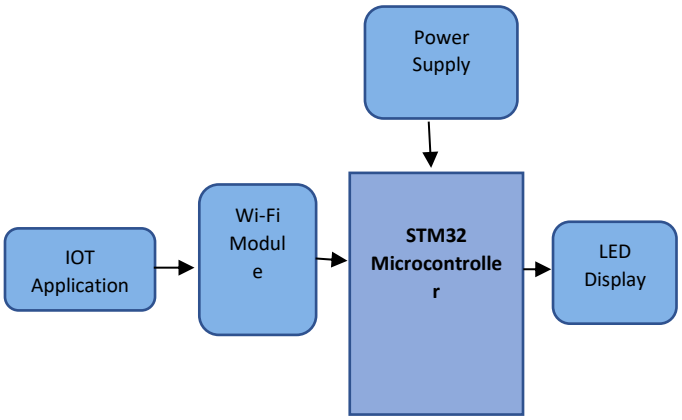


Fig. 4 Block diagram of the proposed system

V. METHODOLOGY

The working principle of the figure 4, we are using android app (TCP/UDP) for displaying the characters. To communicate with web page, we need to start a server with ESP8266 module. The information which has to display on the notice board is given through the app (TCP/UDP). The data which is send from the app is sent to the wi-fi. ESP8266 uses serial Tx\Rx to send and receive Ethernet buffers and similarly using serial command to query and change configuration of the Wi-Fi module. By using embedded C to build serial protocol that communicates data from ESP8266 to STM32.TX/RX of ESP8266 to RX/TX of STM32 has to connected to transfer data. The data which is send from the app is received by the wi-fi module. The STM32 will receive the data from the Wi-fi Module. So that data which will be sent in that unique format will be displayed and the rest of the thing other than unique format will not be displayed. The communication between the students and the Notice Board is controlled by only 2 Microcontroller pins (RXD/TXD).

VI. CONCLUSION

The SMART NOTICE BOARD gives least working time, it reduces the cost, decreased energy consumption. Notice board is used in digital field which uses modern technologies and efficient way to reduce the efforts of humans and provide maximum output. Now a days lot of human efforts and paper are wasted for sticking notices on notice board at school, colleges, industries. Command is received by the TCP\UDP and does the message will be displayed on notice board.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bengaluru for the facilities provided and their support. Also, we would like to thank the Head of department Electronics and Communication Engineering and faculties for their encouragement and support.

REFERENCES

[1] Gaurav Bhardwaj. Gunjan Sahu, Rajan Kumar Mishra. " IOT based Smart Notice Board " International Journal of Engineering Research & Technology (IJERT) Vol. 9 Issue 06, June-2020.

[2] Bhumi Merai, Rohit Jain, Ruby Mishra " Smart Notice Board ", International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 4, April 2015

[3] Y. P. Sushir, J. N. Borole, Prof. K. P. Rane " Wireless Direction Sensor for Digital Notice Board " International Journal of Computer Science and Applications. Vol. 8, No.2, Apr-June 2015

[4] Modi Tejal Prakash, Kureshi Noshin Ayaz, Ostwal Pratiksha Sumtilal, " Digital Notice Board ", International Journal of Engineering Development and Research. Volume 5, Issue 2, 2017

[5] Foram Kamdar, Anubbhav Malhotra and Pritish Mahadik. "Display Message on Notice Board using GSM ", journal of electronics and electromagnetic technology, Volume 3, Issue 7 (2013)

NOVEL METHOD OF FAST CHARGING OF ELECTRIC VEHICLES USING VIEENA RECTIFIER

LOKESH S*[1], HARISH S[2], BHRUNGESH M R[3], VIJAY KUMAR KULKARNI[4]

Department of Electronics and communication Engineering, Sapthagiri College of engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]lokesh04899@gmail.com
[2]hg912526@gmail.com
[3]bhrungesh9108@gmail.com
[4]vjykulkarni58@gmail.com

ABSTRACT:

A single-phase single-switch bridgeless power factor corrector (PFC) boost Vienna rectifier as battery charger. The presented topology generates 3-level voltage waveform at the input which eliminates harmonic contents significantly while using small filters. The reduced number of parts used in this topology makes to develop this PFC rectifier as a compact battery charger. Modelling of the single-phase Vienna rectifier is performed and a cascaded PI controller is designed to regulate the DC bus voltage at 400V to charge batteries as well as drawing low harmonic grid current and ensuring unity power factor operation of the converter. A flyback DC-DC converter is utilized for battery charging. The charging of lithium-ion battery is executed by constant current- constant voltage (CC-CV) charge PI control process. The proposed charging technique is applicable in energy storage applications toward the sustainable electric vehicle development. The proposed system is simulated in MATLAB/Simulink software.

Keyword: power factor corrector, Vienna rectifier , flyback.

I.INDRODUCTION

Electric Vehicles are manufactured and developed by many companies and researchers all around the world to reduce fossil fuel consumption and decrease environment pollutions effectively. Different types of converters are used in EVs including AC-DC, DC-DC and DC-AC categories. One of the main parts of each EV is the battery that provides energy for whole system. EV batteries should be charged up to a certain level to have enough energy for the car user during any travel. Various battery chargers have been introduced for EVs aiming at fast or slow charging dependent on the power rating and place of charge. For instance, three-phase high power rectifiers can charge the EV battery in less than 30minutes but they cannot be onboard. On the other hand, L1chargers can be placed in the car due to smaller size and lower power ratings, however the charging time is couple of hours which is useful at nights or parking times. EV battery charger can be a simple diode bridge rectifier with PFC circuit however due to increasingly development of power semiconductors, bridgeless topologies as active PFC rectifiers are usually proposed by researchers. Those active boost rectifiers generate a DC voltage at the output higher than the input AC peak voltage to ensure unity power factor operation of the converter by synchronized voltage and current waveforms at the AC side. Different rectifier topologies shave been reported in the literature that uses numerous active switches and passive components with single or multiple outputs as two-level or multilevel converter. Moreover, different controllers have been adopted on such rectifiers to have a good performance in different harsh conditions such

as no-load or AC source fluctuation. As an interesting topology with least switch counts, Vienna rectifier has been invented as a three-phase boost rectifier featuring high efficiency and low voltage stress on components. In continue single-phase structure based on Vienna rectifier configuration has been reported but the main issue was using two loads with middle point connected to the DC capacitors neutral point that makes is im practical .Moreover, hysteresis switching technique has been used to generate switching pulses which has its own disadvantages such as variable switching frequency. On the other hand, the derived model has some major mistakes that could not describe the dynamic behaviour correctly.

II. LITERATURE SURVEY

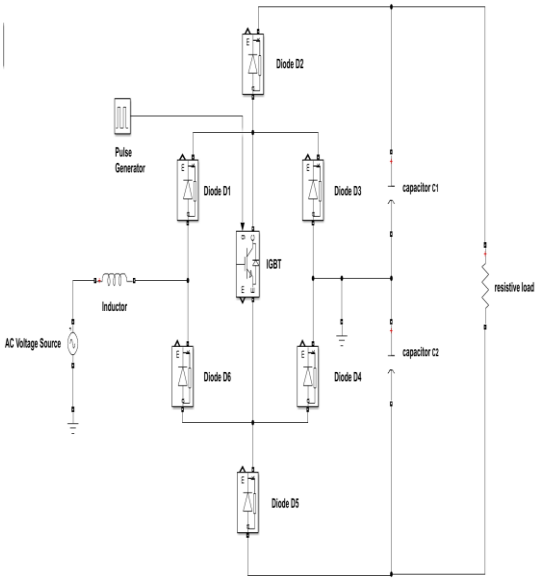
1. J. Metri, C. T. Saadeh, and H. Kanaan, proposed Design, control and simulation of a fuel-cell-fed power conversion system for electric vehicles,". Power conversion systems are a critical component in applications such as electric vehicles, oil & gas, solar/wind energy harvesting systems and active distribution networks. This project introduces the student to contemporary topics in the fields of electronic power conversion system design and control. Unique power converter architectures and controls will be utilized to meet specialized application requirements. The student will be exposed to the simulation, design, prototyping and testing of a representative power conversion system.
2. B. Singh, B. N. Singh, A. Chandra, K. Al-Haddad, A. Pandey, and D. P. Kothari, proposed"A review of three-phase improved power quality AC-DC converters,".Three-phase AC-DC converters have been developed to a matured level with improved power quality in terms of power-factor correction, reduced total harmonic distortion at input AC mains, and regulated DC output in buck, boost, buck-boost, multilevel, and multipulse modes with unidirectional and bidirectional power flow. This paper presents an exhaustive review of three-phase improved power quality AC-DC converters (IPQCs) configurations, control strategies, selection of components, comparative factors, recent trends, their suitability, and selection for specific applications. It is aimed at presenting a state of the art on the IPQC technology to researchers, designers, and application engineers dealing with three-phase AC-DC converters. A classified list of around 450 research articles on IPQCs is also appended for a quick reference
3. F. Sebaaly, H. Vahedi, H. Kanaan, N. Moubayed, and K. AlHaddad, proposed"Sliding-mode current control design for a gridconnected three-level NPC inverter,".Three-level neutral point clamped (NPC) inverter topologies are becoming more and more the interest of studies, especially in grid connected systems, due to their advantages compared to other multilevel inverters. Synchronization with an AC source remains a challenge ring current injection to the grid. In order to enhance the performance and the immunity of such grid connected inverters, a sliding mode current controller based on Gao's reaching law has been designed in this paper, and then applied to a three-wire three-level NPC inverter to have a unity power factor system. A PI regulator has been also employed to deal with the split DC-capacitors voltage unbalance problem. Robustness towards external disturbances was verified through simulations using MATLAB.
4. M. M. Hoque, M.A. Hannan and A. Mohamed, proposed“Voltage Equalization Control Algorithm for Monitoring and Balancing of Series Connected Lithium-Ion Battery,”.Battery powered electric vehicle technologies are advancing in the present world for minimizing the global warming effects. The electric vehicle concept comes as alternate to internal combustion engine vehicles that uses electric energy from electric energy storage systems of high-energy capacity and long-life cycle. Lithium-ion (Li-Ion) batteries are utilized as energy storage in most of the electric vehicles as its high energy density, long life cycle etc. However, Li-Ion battery needs the maintenance for safety

operation and long lasting. As protection, series connected battery cells monitoring and equalizing are mandatory. The individual cell monitoring and active balancing techniques are highly efficient as battery management system (BMS). In this paper, an equalization technique is proposed that exposes the individual cell monitoring and fast balancing of cell voltages. The balancing circuit with this equalization technique is modeled in MATLAB/Simulink and the balancing outputs are produced with series connected 8 Li-Ion battery cells.

III.OBJECTIVES

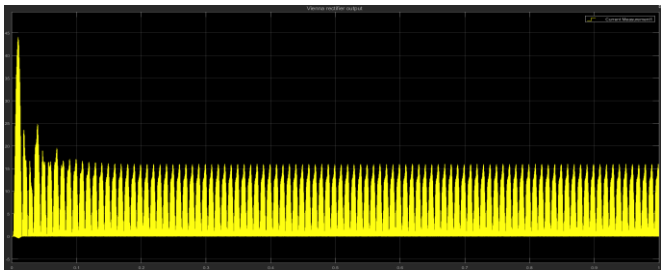
1. To convert AC input source to DC output

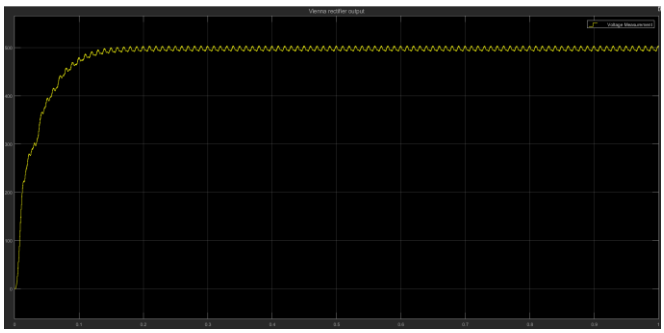
METHODOLOGY



- Vienna rectifier is used as a ac-dc converter and also Vienna rectifier is invented in 1993 by Johann W. Kolar
- Vienna rectifier is a unidirectional three-phase ,three-switch ,three-level Pulse Width Modulation and also with an intregrated boost converter.
- It consists of six diodes and one active switch as shown in the figure 1
- The main issue with this converter is the high voltage ripple at DC output.
- It produces low current harmonics frequency.

OBTAINED RESULTS





CURRENT INPUT :80A(P-P)

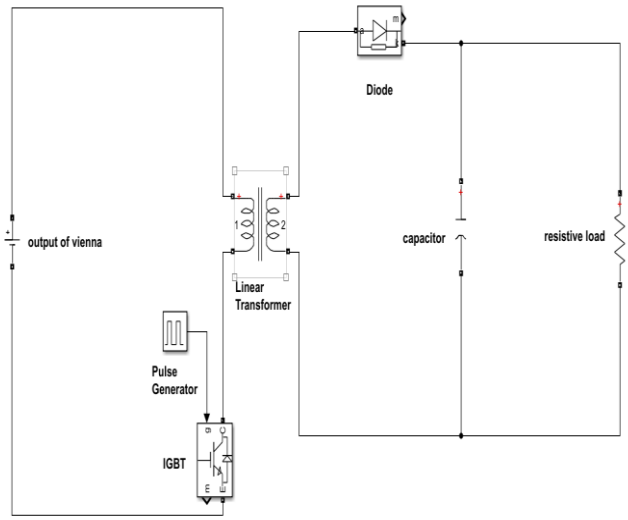
CURRENT OUTPUT:20A

INPUT VOLTAGE :250V

OUTPUT VOLTAGE:550V

2.To convert rippling DC to DC.

METHODOLOGY

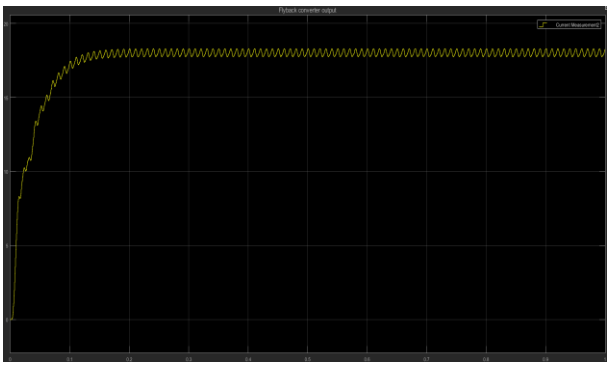


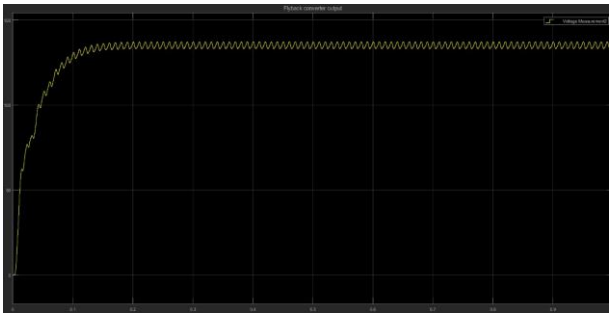
- Fly back converter is used as rippling DC –DC converter.
- Fly back converter works using single active switch ,which decreases the cost.
- The flyback converter is a buck-boost converter with the inductor split to form a transformer, so that the voltage ratios are multiplied with an additional advantage of isolation.
- A single converter can be used as AC-DC converter for battery charging and DC-AC conversion while battery discharging only when the inverter circuit is placed in secondary part of the flyback converter.
- The Flyback converter reduces the circuit building complexity and cost.

WORKING :

- The switch plays an important role on how flyback converter works.
- When the switch is ON, the current will flow through the primary winding of the transformer ,this will charge the primary winding and store energy.
- During this time, the secondary winding has no current flow as the diode is reverse bias.
- The load demand at this time is supplied by the output capacitance (C out).
- When the switch is turned off, the primary winding will resist to sudden change in current and reverses the polarity of the winding. This will result to the forward bias of the output diode.
- The stored energy in the primary will be transferred to the secondary and to the load via the diode. During this time, the output capacitor will replenish its charge.

OBTAINED RESULTS





CURRENT INPUT :20A
CURRENT OUTPUT:15A
VOLTAGE INPUT :550V
VOLTAGE OUTPUT:120V

IV CONCLUSION

In this paper,a single phase single switch PFC boost Vienna rectifier has been implemented for EV charges.It has been derived from three-phase Vienna rectifier that has advantage such as low voltage stress on each switch and high efficiency.flyback converter is used to convert rippling DC to DC .Flyback converter isolates output of the charger from input as a result it can be used as a ON-BOARD charger.

ISBN: 979-85-27243-61-1

V.REFERENCE

[1] S. Williamson, A. Rathore, and F. Musavi, "Industrial

Electronics for Electric Transportation: Current State-of-the-

Art and Future Challenges," IEEE Trans. Ind. Electron., vol.

62, pp. 3021-3032, 2015.

[2] H. Abu-Rub, M. Malinowski, and K. Al-Haddad, Power

electronics for renewable energy systems, transportation and

industrial applications: John Wiley & Sons, 2014.

[3] M. Yilmaz and P. T. Krein, "Review of battery charger

topologies, charging power levels, and infrastructure for plugin

electric and hybrid vehicles," IEEE Trans. Power

Electron., vol. 28, pp. 2151-2169, 2013.

[4] J. Metri, C. T. Saadeh, and H. Kanaan, "Design, control and

simulation of a fuel-cell-fed power conversion system for

electric vehicles," in Renewable Energies for Developing

Countries (REDEC), 2014 International Conference on,

2014, pp. 199-204.

[5] B. Singh, B. N. Singh, A. Chandra, K. Al-Haddad, A. Pandey,

and D. P. Kothari, "A review of single-phase improved power

quality AC-DC converters," IEEE Trans. Ind. Electron., vol.

50, pp. 962-981, 2003.

[6] B. Singh, B. N. Singh, A. Chandra, K. Al-Haddad, A. Pandey,

and D. P. Kothari, "A review of three-phase improved power

quality AC-DC converters," IEEE Trans. Ind. Electron., vol.

51, pp. 641-660, 2004.

[7] F. Sebaaly, H. Y. Kanaan, and N. Moubayed, "Three-level

neutral-point-clamped inverters in transformerless PV

systems—State of the art," in IEEE Mediterranean

Electrotechnical Conference (MELECON), 2014, pp. 1-7.

[8] F. Sebaaly, H. Vahedi, H. Kanaan, N. Moubayed, and K. Al-

Haddad, "Sliding-mode current control design for a gridconnected

three-level NPC inverter," in Renewable Energies

for Developing Countries (REDEC), 2014 International

Conference on, 2014, pp. 217-222.

[9] H. Y. Kanaan, K. Al-Haddad, and M. Fadel, "Modeling and

control of a two-switch asymmetrical half-bridge Boost

Power Factor Corrector for single-phase rectifiers," in

Industrial Electronics (ISIE), 2013 IEEE International

Symposium on, 2013,

International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values engineering: Principles and Practices"
(ICGCP-2021)

DESIGN OF LOW NOISE CMOS DIFFERENTIAL AMPLIFIER USING 90NM TECHNOLOGY

J R Girish, Nandini S, Janaki S, Eisha Sharma and Hemanth M R
Assistant professor, Dept of ECE, Sapthagiri College of Engineering
jrgirish.03@gmail.com
B.E Student, Dept of ECE, Sapthagiri College of engineering
nandinis2018@gmail.com
B.E Student, Dept of ECE, Sapthagiri College of engineering
janaki14299@gmail.com
B.E Student, Dept of ECE, Sapthagiri College of engineering
divyasharma40131024@gmail.com
B.E Student, Dept of ECE, Sapthagiri College of engineering
hemanthmr1999@gmail.com

ABSTRACT

This article presents the Low Noise CMOS Differential Amplifier design using 90nm technology. The analog circuit design includes favourable sets of restraints at the same time determining the effective design parameters value which inturn develops the performance of a circuit. The circuit with noise presence can affect its working by not providing exact information at the receiver end, therefore proper analysis is needed in achieving a sophisticated or well-functioning circuit. This Low Noise CMOS Differential Amplifier is used because of its properties like low noise figure, high gain and good reverse isolation as well as good stability. This paper presents a design of low noise CMOS differential amplifier with suitable compensatory circuit, along with this MOS transistor length and width is designed, by considering numerous specifications which is necessary for the circuit design. The design of LNA is simulated using Cadence virtuoso tool in 180nm technology and the results are shown by using Spectre simulator. The pre-simulation and post-simulation waveforms are obtained for Transient Analysis, AC Analysis and DC Analysis.

Keywords: **Low Noise Differential Amplifier, Noise Figure, Cadence, virtuoso, Spectre, Gain.**

I. INTRODUCTION:

The differential amplifier is one of the most effectively and efficiently used circuit in analog and mixed signal circuits. A Low Noise Differential Amplifier is the fundamental element in the Communication system as well as in Data Conversions circuits in terms of design, cost using 90nm Technology. Our project includes different techniques to explore the applications and implement of a low noise amplifier. The multiple properties like high gain, low noise, good matching of input and output and limitless stability are essentially important and that does not depend on each other's favour. Our project mainly focused to suppress the noise [1].

In a developed CMOS technique the demanding part of design and advancement of the LNA are circuit linearity, decreasing supply voltage, low noise figure and high gain. The simple way to design a Low Noise Amplifier with cascode-stage is to amplify weak and noisy signals. The cascode is a two stage amplifier that consists of a common-source stage feeding into a common gate stage. It is used to improve the performance of an analog circuit. [7].

Differential amplifier circuit receives only two input signals and amplifies the difference between those two input signals. The circuit mainly consists of NMOS and PMOS transistors where NMOS is used to form differential pair and PMOS is used as a current mirror active load (Compensatory circuit). Application are it amplifies a very low power signal without much reducing its signal to noise ratio and it also improves frequency responses and also helps to increase CMRR which further helps to avoid unwanted signal [3].

II. LITERATURE REVIEW:

As mentioned in the Literature Survey Paper [1], has proposed a paper which explains the designing of LNA for front end frequency of radio. The design aims for low noise factor and high gain, which is performed in 90NM technology. The result is being simulated by using Spectre RF simulator. For targeted design of low noise amplifier they have used, three stages which are

International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values engineering: Principles and Practices"
(ICGCP-2021)

Input and output matching set-up and core amplifier. Input matching necessities are completed using inductor at gate of MOSFET. The designed Low noise amplifier gives a reliable voltage gain of about 28dB, good reverse isolation of -70dB, maintains a good stability and noise figure of 0.7dB.

As mentioned in the Literature Survey Paper [3], has proposed a paper that involves the designing of LNA with compensatory circuit using automated design methodology for minimum circuit area. The paper uses HPSO nature inspired heuristic optimization algorithm that gives acceptable approximate solution within the time. They have used Matlab and Cadence tool where both are connected together to bring about the design using 90micrometer technology. The proposed design has better efficiency and took less time as compared to other HPSO based design method.

As mentioned in the Literature Survey Paper [5], has proposed a paper that deals with the designing of an amplifier array with neural recording which has ultra-power and low noise which is best suited for large scale integration. The design consists of supply sensitive single ended first stage and differential second stage. The design takes up 2.85 microampere per channel from 1v supply. The proposed design is accomplished using 90nm CMOS technology. The design has low input noise of 3.04microvolts.

As mentioned in the Literature Survey Paper [7], presents a paper that analyses low noise amplifier with 45NM technology that focuses on less power consumption and high gain. The design consists of common gate amplifier in the input stage, common drain amplifier at the output stage and an active inductor. It uses 12 transistors for reducing parasitic effect and reduced power consumption, the output gain is of 13.63dB and bandwidth of 10.71 KHz.

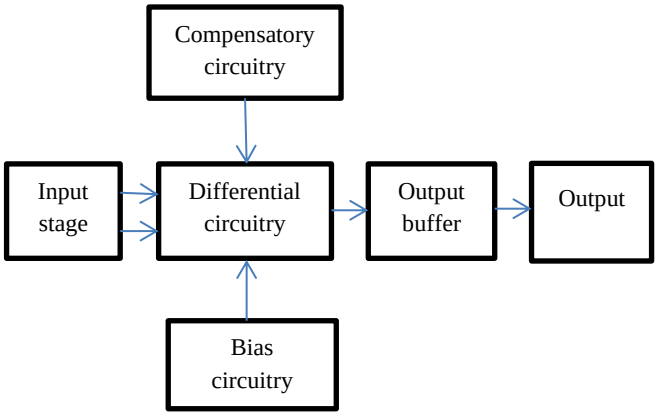
As mentioned in the Literature Survey Paper [10], proposed a paper that focuses on balanced differential amplifier which is Complementary metal oxide semiconductor based with MOS loads. In the paper they have used active loads with are diode connected and current source for balanced differential amplifier. The proposed paper uses 0.25micrometer CMOS technology. The CMRR for differential amplifier with the diode connected load is found to be 40.56dB, with current source load it is found to be 34.87dB and with the combination of both it is found to be 51.67dB.

III. WORKING:

A Low Noise Differential Amplifier (LNA) is one of the most used part in designing of receiver and it plays a vital role in millimetre wave application such as Remote Sensing, Radio Astronomy, trans-receivers and also in satellite communication.

A LNA provides trade-off between gain and noise figure. A good signal to noise ratio (low noise figure) and high gain is the main requirement for the better working of LNA. The efficiency determination of LAN is necessary to analyse parameter such as linearity, high gain, noise figure and stability and matching of input and output in the circuit.

IV. BLOCK DIAGRAM:



A Differential Low Noise Amplifier amplifies the difference between the two inputs, it provides common-mode rejection as it eliminates noise which is common to both of the input signals.

Designing of an analog circuit involves selection of enhanced dimension of transistor which gives an outcome of good performance in desired circuit specifications. To obtain the improved working of a circuit, the parameters used in the design are calculated under different set of conditions. In this project, we are going to design a Low Noise CMOS Differential Amplifier with current-mirror load acts as

International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values engineering: Principles and Practices"
(ICGCP-2021)

Compensatory circuit. Current mirrors are current source that uses the principle that if the gate-source potentials of two uniform CMOS transistors are equal, then the currents in the channel should be equal.
The Differential Low Noise Amplifier has a pair of MOSFET which forms differential circuitry which receives two signals as input and amplifies the difference of the signal by gain Av. Another pair of MOSFET is used to form current mirror active load and a single MOSFET is used for biasing.

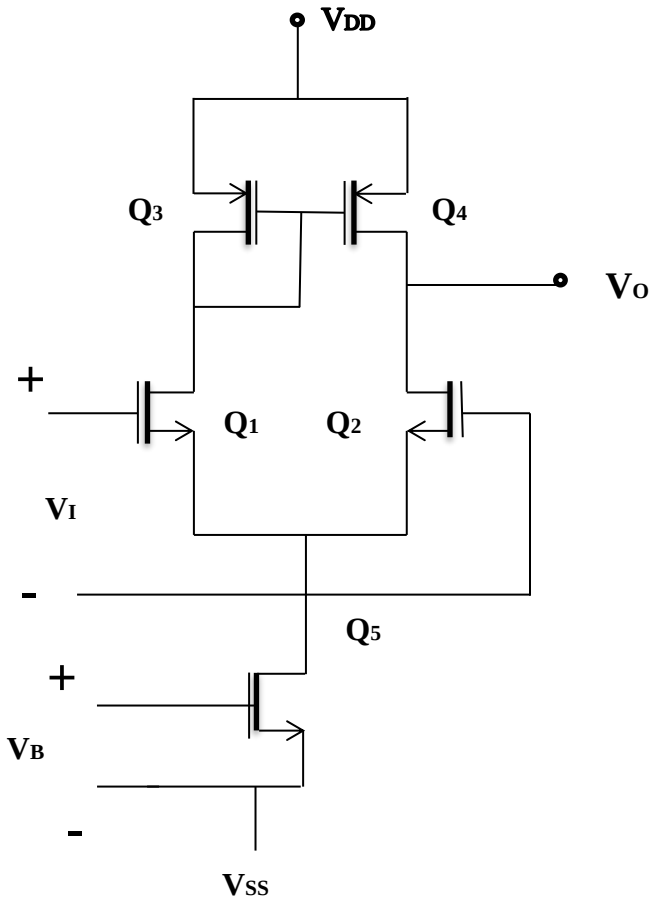


Fig1. Differential Amplifier with current mirror load

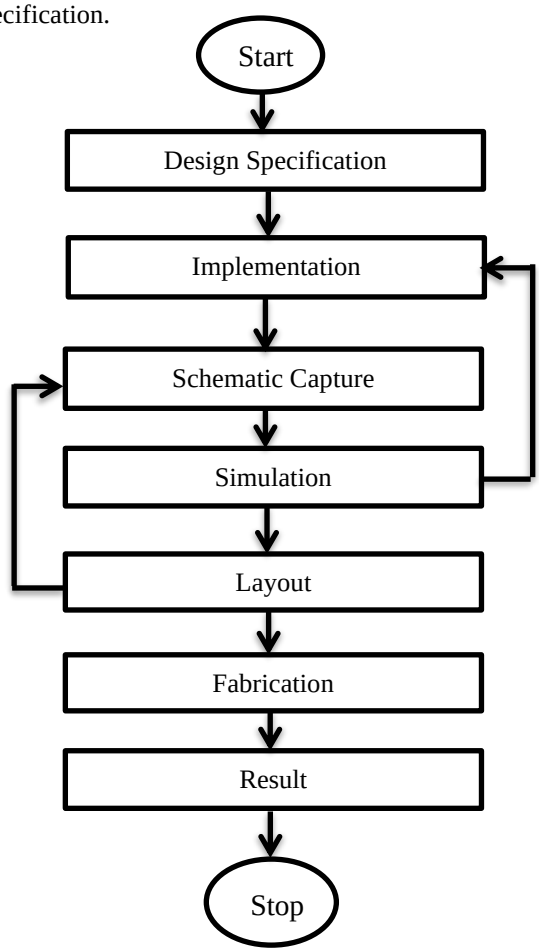
V. FLOW CHART

The flow chart shows sequence of steps in which our project is going to be executed.

We will initiate the project by collecting the specification data required for the design of LNA such as small signal gain, ICMR, Slew rate and so on.

Then we start making a schematic of LNA, which is in our project is a current mirror load LNA then we start determining the (W/L) ratio of CMOS transistors to achieve the given set of constraints, hence optimizing the length and width of MOS transistors.

Then the schematic capture with optimized length and width is simulated using cadence tool using 180nm technology. If simulation yields expected results we move on to next step that is layout formation of LNA, else we iterate again from implementation step until we get expected result. If anything goes wrong in layout we iterate the steps from schematic capture, else the layout given for fabrication to get LNA of desired specification.



International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values engineering: Principles and Practices"
(ICGCP-2021)

VI. DESIGNING PROCEDURE

In the design of CMOS circuit, it is significant to identify the suitable relation that connects the design specification to its parameters. The design includes two types of details. The first type is designing of different parameters namely power supply, technology and the temperature. The other type of information is specifications.

The design specifications for the differential amplifier consists of small-signal gain (Av), frequency response of load capacitance (w-3db), input common-mode range (ICMR) or maximum input common-mode voltage [V_{IC}(max)], minimum input common-mode voltage [V_{IC}(min)], slew rate (SR) and power dissipation (P_{diss}).

- Small signal voltage gain

$$A_V = g_m . R_{out} \quad (1)$$

Where g_m can be calculated by,

$$g_m = \sqrt{2\mu n Cox \left(\frac{W}{L}\right) Ibias} \quad (2)$$

$$C_{ox} = \frac{\epsilon ox}{tox} \quad (3)$$

- Slew rate (SR), Calculation of I_5

$$SR = I_5/C_L \quad (4)$$

- Frequency response (ω_{-3dB}), Calculation of R_{out}

$$\omega_{-3dB} = 1/R_{out}.C_L \quad (5)$$

- Upper ICMR (V_{IC}(max), Calculation of $(W/L)_3$

$$V_{IC}(max) = V_{DD} - V_{SG3} + V_{TN1} \quad (6)$$

$$(W/L)_3 = 2I_5/K'_P (V_{SG3} + V_{TP}) \quad (7)$$

- Lower ICMR (V_{IC}(min), Calculation of $(W/L)_5$

$$V_{IC}(min) = V_{SS} - V_{DS5}(sat) + V_{GS1} \quad (8)$$

$$(W/L)_5 = 2I_5/K'_N V^2_{DS5}(sat) \quad (9)$$

- Power dissipation (P_{diss})
- $P_{diss} = (V_{DD} + |V_{SS}|). (I_5)$ (10)

- The design procedure involves the assumption of small signal voltage gain Av, the -3dB frequency (ω-3dB), lower common mode voltage [V_{IC}(min)], upper common mode voltage [V_{IC}(max)], Slew Rate (SR), power dissipation (P_{diss}) are given.
- Select I_5 that satisfy the slew rate with the known values of C_L or P_{diss}.
- Frequency response can be calculated using R_{out}, if it is not satisfied then check for I_5 or modify the topology.
- Select $(W/L)_3$ and $(W/L)_4$ ratio which satisfies upper ICMR.
- Select $(W/L)_1$ and $(W/L)_2$ ratito which satisfies small signal voltage gain Av.
- Select $(W/L)_5$ ratio to satisfy lower ICMR.
- Repeat the step anywhere that is essential to meet requirement.

Silicon CMOS Technology has become the dominant fabrication process for relatively high performance and cost effective VLSI circuits. While compared to other technologies like ECL, TTL, GaAs, nMOS and BiCMOS, there are several advantages for CMOS technology as follows:

- Low static power consumption
- High input impedance
- High noise margin
- Scalable threshold voltage

Design Specifications:

Threshold of MOSFET is given by $V_{th} = \emptyset_{ms} + 2\emptyset_f + \frac{Q_{dep}}{C_{ox}}$

$\emptyset_{ms}$ = difference between work function of polysilicon gate and silicon substrate.

$$\emptyset_f = \left(\frac{kT}{q}\right) \ln\left(\frac{N_{sub}}{n_i}\right)$$

k = Boltzmann's constant
q = Electron charge
N_{sub} = doping density of substrate
n_i =Density of electron in undoped silicon
Q_{dep} = charge in depletion region
C_{ox} = gate oxide capacitance per unit area

Relationship between drain current of MOSFET and its terminal voltages:

Consider a semi-conductor bar carrying a current I with charge density Q_d and velocity v

$$I = Q_d\, v$$

International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values engineering: Principles and Practices"
(ICGCP-2021)

$$Q_d = WC_{ox}(V_{gs} - V_{th})$$
$$Q_d(x) = WC_{ox}(V_{gs} - V(x) - V_{th})$$

Drain current of MOSFET is given by

$$I_d = -WC_{ox}(V_{gs} - V(x) - V_{th})v$$
$$I_d = WC_{ox}(V_{gs} - V(x) - V_{th})\mu_n \frac{dV(x)}{dx}$$
$$\int_{x=0}^{L} I_d dx = \int_{V=0}^{V_{ds}} WC_{ox}\mu_n(V_{gs} - V(x) - V_{th})dV$$

Drain current is given by

$$I_d = \mu_n \frac{W}{L} C_{ox}[(V_{gs} - V_{th})V_{ds} - \frac{1}{2} {V_{ds}}^2]$$

Peak current is given by

$$I_{d,max} = \frac{1}{2}\mu_n C_{ox} \frac{W}{L} (V_{gs} - V_{th})^2$$

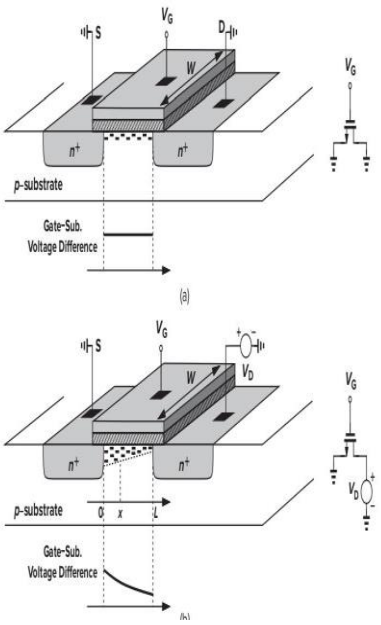
If $V_{ds} << 2(V_{gs} - V_{th})$

$$I_d \approx \mu_n C_{ox} \frac{W}{L}(V_{gs} - V_{th})V_{ds}$$

The Linear relationship implies that the path from the source to the drain can be represented by a linear resistor is given by

$$R_{on} = \frac{1}{\mu_n C_{ox} \frac{W}{L}(V_{gs} - V_{th})}$$

Channel change with equal source and drain voltages and unequal source and drain voltages:



The design procedure involves the assumption of small signal voltage gain Av, the -3dB frequency (ω_{3dB}), lower common mode voltage [$V_{ic}min$], upper common mode voltage [$V_{ic}max$], Slew Rate (SR), power dissipation (P_{diss}) are given.

Select I_5 that satisfy the slew rate with the known values of C_l or P_{diss}.

Frequency response can be calculated using Rout, if it is not satisfied then check for I_5 or modify the topology.

Select $\left(\frac{W}{L}\right)_3$ and $\left(\frac{W}{L}\right)_4$ ratio which satisfies upper ICMR.

Select $\left(\frac{W}{L}\right)_1$ and $\left(\frac{W}{L}\right)_2$ ratio which satisfies small signal voltage gain A_v.

Select $\left(\frac{W}{L}\right)_5$ ratio to satisfy lower ICMR.

Repeat the step anywhere that is essential to meet requirement.

The small signal voltage gain:
$\left(\frac{W}{L}\right)_1$ and $\left(\frac{W}{L}\right)_2$ ratio of differential pair transistor is designed to satisfies small signal voltage gain A_v.

$$A_v = g_m R_{out}$$

Where g_m can be calculated by,

$$g_m = \sqrt{2\mu n C_{ox}\left(\frac{W}{L}\right) I_{bias}}$$

$$C_{ox} = \frac{\epsilon_{ox}}{t_{ox}}$$

VII. PERFORMANCE PARAMETERS

1. Gain:

- The open-loop gain is defined as the ratio of change in output voltage to the change in voltage across the input terminals.
- The open-loop gain of a differential amplifier determines the precision of the feedback system employing the differential amplifier.

The primary requirement of a differential amplifier is to have an open-loop gain that is

International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values engineering: Principles and Practices"
(ICGCP-2021)

sufficiently large to implement the negative feedback concept.

- A high open-loop gain may also be necessary to suppress nonlinearity.
- The input voltages are represented by V_{i1} and V_{i2}. The source resistance Ri1 and Ri2 are negligibly small in comparison with the very high input resistance offered by the op-amp, and thus the voltage drop across these source resistances is assumed to be zero. The output voltage V_0 is given by
  $V_0 = A (V_{i1} – V_{i2})$
- 'A' is the large signal voltage gain in an inverting amplifier; the input signal is amplified by the open-loop gain A and in phase shifted by 180^0.
- In Non-inverting the input signal is amplified by the open – loop gain and the output is in-phase with input signal.

2. Slew Rate (SR) :

- Slew rate, SR, is the rate of change in the output voltage caused by a step input.
- Its units are V/us or V/ms .
- The primary factor controlling slew rate is an internal compensation capacitorC_c, which is added to make the differential amplifier unity gain stable.
- Voltage change in the second stage is limited by the charging and discharging of the compensation capacitor C_c or load capacitor,C_l. The maximum rate of change is when either side of the differential pair is conductingI_{ss}.

$$SR = \frac{I_{ss}}{C_l}$$

- Not all have compensation capacitors. Without internal compensation capacitors, the slew rate is determined by internal parasitic capacitances and load capacitances.
- Non-compensated have greater bandwidth and slew rate, but the stability of the circuit should be maintained. Power consumption is traded for noise and speed. In order to increase slew rate, the bias currents are increased.

3. Common Mode Rejection Ratio (CMRR):

- The goal of differential amplifier is often to amplify the difference signal and reject the
- common mode signal. A figure of merit that describes the quality of the differential amplifier is the ratio of differential mode gain to common mode gain, which is called Common Mode Rejection Ratio.
- To reduce Common mode gain and improve CMRR, the bias current source must have a large internal resistance.
- Ideally, CMRR is infinite. A typical value for CMRR would be 100 db.
- For an ideal differential port, the common-mode gain is zero and the CMRR infinite

$$CMRR = \frac{V_{cm}}{V_{diff}}$$

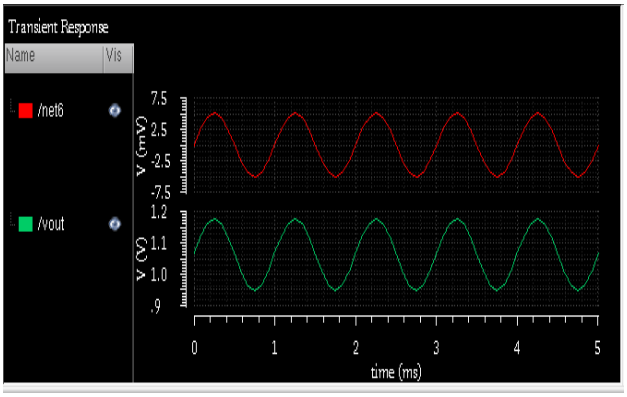
Where,

V_{diff} : Differential input voltage,
V_{cm} : Common-mode input voltage

VIII. SIMULATION AND ANALYSIS:

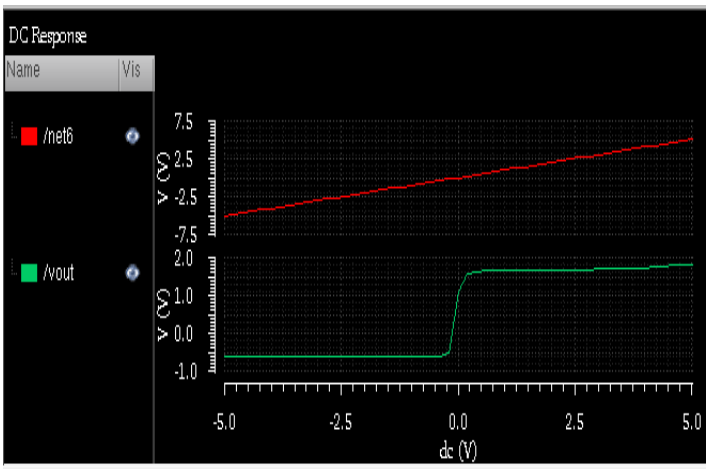
There are three types of analysis done basically to know the performance of the circuit. They are:

- Transient Analysis

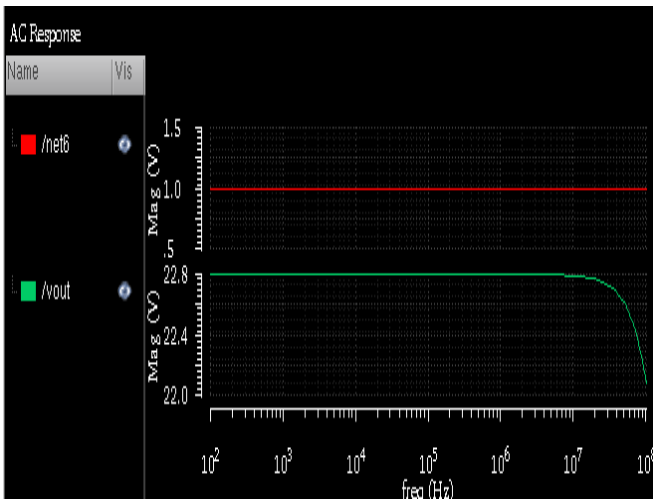


International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values engineering: Principles and Practices"
(ICGCP-2021)

- DC Analysis



- AC Analysis



This analysis are the most basic fundamentals of device and circuit analysis. While designing of an analog circuit, checking bias condition that is DC analysis is important. This tells what would happen when circuit is turned on and no signal is applied to it. AC analysis is done basically to figure out the circuit frequency response. It helps to analyse the circuit when AC signal is applied to its input. Then transient analysis is used to identify the circuit behaviour under non well-behaved signals.

XI. ADVANTAGES:

- Improves frequency responses.
- It amplifies a very low power signal without much reducing its SNR.
- Helps to increase CMRR which further helps to avoid unwanted signal.

X. APPLICATIONS:

- Used in RF Receiver.
- Wireless Communication System.
- Biomedical Applications.
- Uses in automatic gain controlled circuit

XI. CONCLUSION

Low Noise Differential Amplifier has been developed for the required Signal to Noise ratio with desired Noise Figure, and high Gain with a low power consumption of about 1.8-2.8V is applied. The design of LNA is analysed and simulated using Cadence 90nm CMOS Technology successfully with the desired specifications. It can be used for different applications to obtain low noise at their output. The constraints for differential amplifier are identified. The width to length ratio of different transistors are designed to meet constraints. The Low Noise Differential amplifier is simulated using cadence virtuoso tool. AC, DC and Transient analysis are carried for differential amplifier circuit. Low Noise is achieved in Differential Amplifier.

REFERENCES:

1. Mahesh, Hari Kishore, Srinivas Bhukya, Babu Gundlapally and Prashanth Chittireddy, "Differential CMOS Low Noise Amplifier Design for Wireless Receivers", IJRTE, November 2019.
2. I.M. Filanovsky, J.K. Järvenhaara, and N.T. Tchamov, "On Design of Low-Voltage CMOS Current Amplifiers", IEEE, 2014.
3. Chabungbam Lison Singh, Ashim Jyoti Gogoi, Chabungbam Anandini and K. L. Baishnab, "Low-Noise CMOS Differential-amplifier design using Automated-design methodology", Devices for Integrated Circuit (DevIC), 23-24 March, 2017, Kalyani, India.
4. M. I. Idris, n. Yusop, S. A. M. Chachuli, M.M. Ismail, Faiz Arith and N. Shafie, "Design and analysis of Low Noise Amplifier using Cadence", Journal of Theoretical and Applied Information Technology (JTAIT), Malaysia, 10th November, 2014.
5. Tan Yang and Jeremy Holleman, "An Ultralow-Power Low-Noise CMOS Biopotential Amplifier for Neural Recording", IEEE Transactions on Circuits and Systems—II: Express Briefs, Vol. 62, No. 10, October 2015.
6. Neha Rani and Suraj Sharma, "Design of CMOS LNA for Radio Receiver using the Cadence Simulation Tool", MIT
7. International Journal of Electronics and Communication Engineering, Vol. 3, No. 2, August 2013.
8. Ashwitha A, Kudva N and Praveen Kumar Konda, "Analysis of Low Noise Amplifier using 45nm CMOS Technology", International Research Journal of Engineering and Technology (IRJET), Volume: 06 Issue: 07, July 2019.
9. Rakshitha M, Rakshitha Urs S and Shreyas R, "Two Stage CMOS Operational Amplifier Using Cadence 180nm Technology", IJIRSET, January 2020.
10. Soumen Pal, Pinkey Ghosh and Pranab Hazra, "Design of Switched Capacitor Amplifier for sampled output using 180nm CMOS Technology", IJETAE, January 2016.
11. Jayanti Kumawat and Poonam Pathak, "A CMOS Based Balanced Differential Amplifier with MOS Loads", IJR, November 2016.
12. Anuj Singh Yadav and D.K.Mishra, "A High CMRR-CMOS Instrumentation Amplifier Intended for Bioimpedance Imaging", IJIRSET, July 2016.
13. Snehal Bharadi and K.U.Aade, "A Review on Low Noise Amplifier IJIRSET, July 2015.
14. K.Sakthidasan and Purushothaman, "Adaptive Enhancement of Low Noise Amplifier Using Cadence Virtuoso Tool", IEEE, 2017.
15. Douglas Pucknell and Kamran Eshraghian, "Basic VLSI Design", the University of Michigan, Prentice hall, 1994 (Digitized 11 Dec 2007).
16. B. Razavi, "Design of Analog CMOS Integrated Circuits" McGraw Hill Education (India) Private Limited, 2013.
17. Philip E. Allen, Douglas R. Holberg, "CMOS ANALOG CIRCUIT DESIGN", Oxford University Press, 2014.

International Conference
On
"Global Convergence in Technology, Entrepreneurship, Computing and values Engineering: Principles and Practices"
(ICGCP-2021)

Design of High Gain CMOS Operational Amplifier Using 90nm Technology for Biomedical Monitoring Application

J R Girish,Anusha SV,Ganavi D,Geetha M,Nethravathi KG
Assistance professor,Dept of ECE,Sapthagiri college of Engineering
jrgirish.03@gmail.com
B.E Student,Dept of ECE,Sapthagiri college of engineering
anusha.sv001@gmail.com
B.E Student ,Dept of ECE,Sapthagiri college of engineering
ganavid2017@gmail.com
B.E Student,Dept of ECE,Sapthagiri college of engineering
geethammbgh23@gmail.com
B.E Student,Dept of ECE,Sapthagiri college of engineering
nethranaik9980@gmail.com

ABSTRACT

Design of an analog circuit is a energizing task in the field of VLSI domain. The proposed word is mainly based on the design of the high gain operational amplifier. The high gain operational amplifier is widely used circuit in analog circuit design and these serves as the step to next higher level complexity in analog system. The high gain operational amplifier is mainly based on the concept of feedback circuit and it functions as high gain when connected in close loop configuration. Generally the op-amps with high gain are always stable as they never reduces its amplifying efficiency .The gain defines how greater magnitude. The design uses a compensation circuit. The technology toward employing the system with depressed supply voltage has created a energizing task. High gain, high phase margin and high input common mode range is achieved. Here we use a cascading of two or more stage as it can generate huge DC gain as it is serviceable for low voltage operations. This high gain operational amplifier is implemented using Cadence software for 90nm CMOS technique.

Keywords- High gain Operational amplifier; CMOS (Complementary metal oxide semiconductor); Bio medical; 90nm technology.

I. INTRODUCTION

The Operational Amplifier (Op-amp) is a very basic building block in Analogue Electronic Circuits. Operational amplifiers are linear devices that have all the properties required for nearly ideal DC amplification and are therefore used extensively in signal conditioning, filtering or to perform mathematical operations such as add, subtract, integration and differentiation .The big energizing task is to sketch a high gain operational amplifier which is stable with reducing voltage supply and length of the channel. Trade off among several parameters such as power dissipation, stability, speed, and gain has to face while designing Op-Amp [1]. With higher gain and speed the accuracy of the amplifier is flared up, but the stability in negative feedback is decreases. One of the distinctive execution reduces quickly for frequencies which is greater than 1 MHz, however the several models using different techniques are sketched specifically to control excess amount of frequencies. It always a big task to design a stable Op-amp with higher frequency. Hence aim is to build an Operational amplifier with a large gain and high unity gain bandwidth at a maximum phase margin and gain margin to ensure the stability. Various compensation

ISBN: 979-85-27243-61-1

techniques are adopted in this paper to achieve this. In this paper two stage CMOS Op-amp is designed with high gain and stability. The two stage operational amplifiers are used to produce very huge gain , when there is a need of very high gain because single stage operational amplifier cannot produce high gain[3].Modern high performance analog integrated circuits make use of fully differential signal paths. Op-amps having differential input as well as differential output are referred to as fully differential op-amp. Common Feedback circuit is added with fully differential op-amp to provide the common mode output voltage[7].Different techniques are used in this paper to increase the DC gain. Cascading of multiple stages and enhancing output impedance are two of the common methods used for increase the overall gain. Cascading two or more stages can produce high DC gain and also applicable for low-voltage applications. In this design the operational amplifier mainly uses two stages initial stage where the design consist of differential stage ,high gain stage, compensation stage and the biasing circuit. Using high output impedance biasing circuit and the compensation circuit structures can result in high gain [4]. The biasing circuit and the compensation circuit are used between two stages which sums the differential current of first stage and sends it to second stage where this design provides very high stability and high gain with low power consumption [2].

This design also very much suitable low supply voltage devices and also when supply voltage is decreases then power dissipation is decreases so amount of heat produced is less hence the chances of affecting organs of human body is less. Basically, bio-medical signals are very weak signals with less frequency which is less than 1 Hz. For recording and monitoring the biomedical signals the main requirements is low power and high gain(ECG, EEG..,) which is used for medical diagnosis. The usage of bio-medical equipment is become more and more because of rapid development in medical science field. The functions of biomedical equipment have become increasingly complex, along with the inbuilt electronic circuitry[10]. In this proposed work the design of a high-gain operational amplifier is achieved which is stable and used for bio-medical applications. Low power consumption, high-input common mode range (ICMR), high-gain, high stability and high-phase margin are obtained.

II. EXPLANATION

Biomedical signal aims to fetch the useful information from the biomedical signals ,but earlier these processing was carried out ,firstly by extracting the original biomedical signal then the original signal is processed to remove the unwanted noise and detecting these biomedical signal forms a challenging task as their amplitude is some mV and even it has low frequency signals. So these week frequency and amplitude biomedical signals has to be amplified suitably with some elimination of noise .The solution for these problems is done using a instrumentation amplifiers as they suppresses the unnecessary noise or the regular or the common signals that effect the original signal and also give a effective amplification to get the required signal .To suppresses all these problems an operational amplifier should be designed which meets all the specification and gives a better compensation strategy and design methodology[9].

Operational amplifiers are the integral part of many mixed signal and analog signal. When the operational amplifier is connected in negative feedback it produces a adequate high forward gain and when it is connected in the close loop configuration virtually the transfer function is individualistic of the gain produced by operational amplifier. The Operational Amplifier is one of the incomparable and adaptable and most salient block of analog design. Usually most CMOS operational amplifier uses two or more stages of gain. Operational amplifiers has diverse levels of convolution and these is used for realization functions which ranges from a DC bias generation to a huge speed amplification or filtering. These scheme of operational amplifier abide to challenging task, as the voltage supply and the lengths of the transistor channel which gradually decreasing in every generation CMOS technologies. CMOS operational amplifiers uses two or more stages of gain [6,4].

ISBN: 979-85-27243-61-1

Among different op-amps the most prevalent operational amplifier is two stage operational amplifier, there are two reasons for this, initially it is straight forward and yet thriving implementation of operational amplifier, secondly it can be used as initial point for evolving other type operational amplifier. This two stage operational amplifier gives us important theory of compensation. The duty of using compensation is to keep up the stability of operational amplifier in closed loop while the negative feedback is applied to an operational amplifier[4].

III. WORKING

It has two stages, as shown in the block diagram where stage 1 is the differential amplifier and common source amplifier becomes stage 2. The differential amplifier has two different voltage inputs vin+ and vin- which amplifies the differences between two input voltages. Since the gain obtained from the first stage is not sufficient, it uses common source amplifier at second stage. Thus, the output of this differential amplifier continues to enter the common source amplifier where further more gain is increased. In order to obtain low gain at high frequencies and maintain the device' stability, it includes compensation circuit whenever the device is in negative feedback condition.

The each block in basic Op-Amp shown in fig.1 is replaced with an actual circuit implemented in VLSI technology. All the stages like differential amplifier, second gain stage, bias circuit, output buffer stages are shown in the figure. To overcome the problems in the present CMOS realization of Op-Amp like low gain value and low phase margin we move to the new design methodology to have the high gain and slew rate.

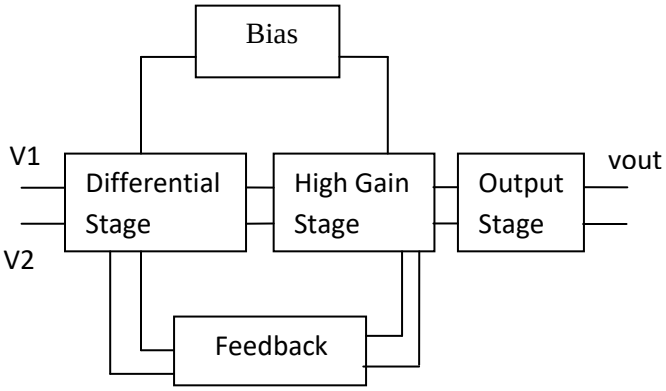


Fig: 1 Block diagram of Op-amp

IV. OPERATION OF CIRCUIT

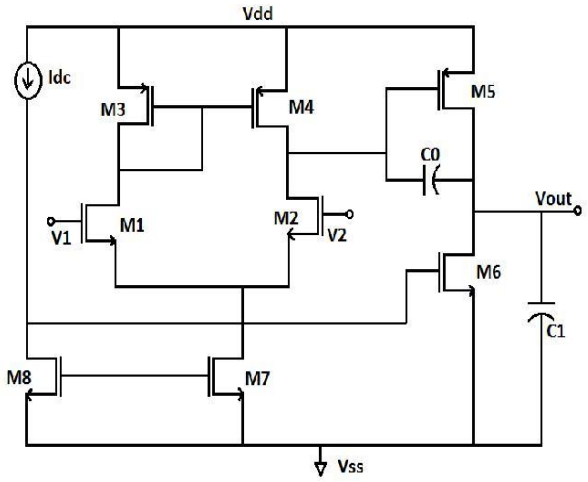


Fig: 2 Circuit Diagram of Op-amp

A. Design of Op-amp

The total gain of two stage CMOS Op-amp is defined by Av. The corresponding equation is given by the product of Av1 and Av2.

Where Av1 is called as differential amplifier gain and Av2 is called as common source amplifier gain.

ISBN: 979-85-27243-61-1

B. Design Equations

The equation is given by,
$Av = A_{v1} . A_{v2}$
Where, $A_{v1}=V_{01}/V_{in}$
However $V_{01} = V_{in2}$ for common source amplifier

Therefore $Av2= V_{0ut}/ V_{01}$
$gm1=\sqrt{(2\beta1 * Id_{s1})} = \sqrt{(2\beta2\ Id_{s2})} = g_{m2}$
$Ids1 = Id_{s2} = I_{ss}/2$
Then $gm1 = \sqrt{(\beta1 * I_{ss})}$

The current I_{ss} divides through the MOSFETS M1 and M3 and Id_{s2} passes through M2 and M4.
let assume M1 and M2 are identical
$=>g_{m1} = g_{m2}$

Let's start with stability criterion:

For stability requirement, it is observed that the phase margin should be greater than 45˚.
$g_{m6} /C_0 \geq 2.2 (g_{m1}/C_1)$
$C_0>(2.2* g_{m1}* C_1)/ g_{m6}$
$g_{m1}/ g_{m6} \leq 0.1$
$C_0 \geq 0.22.C_1$ (1)

The obtained relation of C_1 and C_0 as
$C_1 \geq 0.22C_0$
so,C_0=5pF (2)

From slew rate
$(dV0/dt) \geq 10v/\mu secs$

$=>C_0*(dV0/dt)=ID_{S7}$
$I_{DS1}= I_{DS2}=I_{SS}/2$
Neglecting λ from saturated transistor current,
$V_{gs}=V_t \sqrt{(2\ I_{ds}/\beta(W/L))}$ (3)

ICMR evaluation
$Vinmin=V_{ss} + V_{dsat7} + V_{gs1}$ (4)
$=Vss+V_{dsat7}+ V_{t1}+\sqrt{(2\ I_{ds1}/\beta(W/L)_1)}$

$Vinmax=V_{dd}-V_{t3} -\sqrt{(2\ I_{ds3}/\beta(W/L))_3}-V_{ds1}+V_{gs1}$ (5)
$=>V_{dd}-V_{tp3}-\sqrt{(2\ I_{ds3}/\beta(W/L)_3)}+V_{tn3}$

By using $V_{dsat}=Vgs-V_t$ relation,
$=>V_{dd}-V_{tp3}+V_{tn1}-\sqrt{(2\ I_{ds3}/\beta(W/L)_3)}$ (6)

By substituting for V_{dd}, V_{tp}, V_{tn} and I_{ds3}, $(W/L)_3$ is obtained.
Hence $(W/L)_3=(W/L)_4$ (7)
Evaluation of $(W/L)_1$ and $(W/L)_2$
Given,
$GBW= g_{m1}/C_1= g_{m2}/C_0$ (8)
$g_{m1}= g_{m2}=\sqrt{(2\ I_{ds1}.\beta(W/L)_1)}$
Therefore $(W/L)_1$ is obtained
Hence, $(W/L)_1=(W/L)_2$

Evaluation of $(W/L)_7$
As known from the equation,
$Vinmin=V_{dsat7}+V_{ss}+V_{t1}+\sqrt{(2\ I_{ds1}/\beta(W/L)_1)}$ $(W/L)_7$ is obtained.

Evaluation of $(W/L)_8$
$dI_{ds8}/dV_{gs8}= g_{m8}$ (9)
$=>\beta_{p8}.(V_{gs8}-V_{t8})$
$=>\beta_{p8}.V_{dsat8}$

Therefore, $(W/L)_8= g_{m8}/(\beta_{p8}* V_{dsat8})$
So, first evaluate Vdsat8
$V_{outmax}= V_{DD}- V_{dsat8}$ (10)
$V_{dsat8}= V_{DD}- V_{outmax}$
So, $(W/L)_8$ is obtained.
Similarly, $(W/L)_3= (W/L)_4$,
$(W/L)_7= (W/L)_8$

Using the above equations calculated (W/L) values for all MOSFETS are listed below.

Table 1: Aspects ratio of our designed op-amp

MOSFETS	REGIONS	WIDTH(W)	LENGTH(L)
M1, M2 (nmos)	**Linear**	**30u**	**9u**
M3, M4 (pmos)	**Saturation**	**400n**	**890n**
M5 (pmos)	**Saturation**	**120n**	**1.05u**
M6 (nmos)	**Saturation**	**180n**	**955n**
M7, M8 (nmos)	**Linear**	**120n**	**100n**

ISBN: 979-85-27243-61-1

V. SIMULATION

The simulation tool for simulating the operational amplifier designs is advanced features such as cadence virtuoso schematic editor, which produces a huge speed with uncomplicated methods. Cadence virtuoso layout suite is used for faster up the physical layout of the design, and the cadence virtuoso visualization and examination for efficient analysis of the presentation of the design, the Cadence assura physical authentication is used to reduce overall verification time , the rapid and spontaneous debug potentiality is embedded in the virtuoso custom scheme, it can easily contrast ,restore, eliminate and distinguishes the error.

Designing of operational amplifier mainly involves two stages. First one is Design compensation and second is Design optimization. The architecture is designed in such a way that it meets all the design specifications in the design conception. These steps is firstly carried out by hand calculations which is significant and should be made for choice that are made, later the initial cut of the design is taken and authenticated with the specification and later design optimization takes place. This optimization includes different atmospheric instigate or the litigate variation further this is customarily carried out by the computer simulation.

Simulation Results

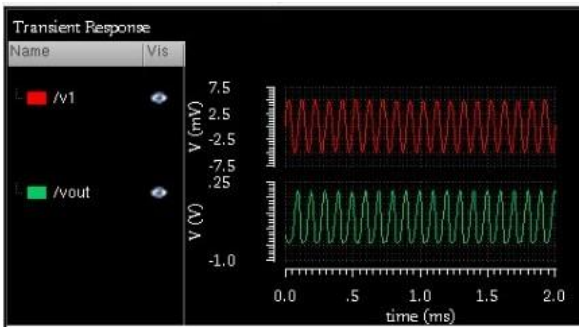


Fig.3 Transient analysis

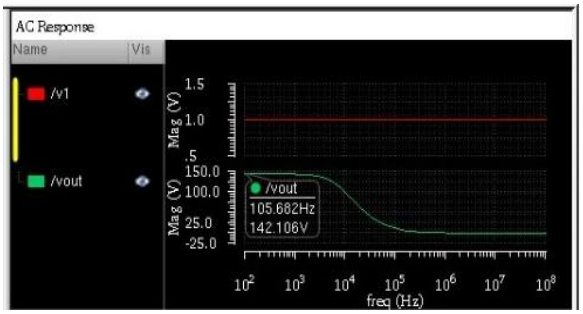


Fig.4 Ac analysis

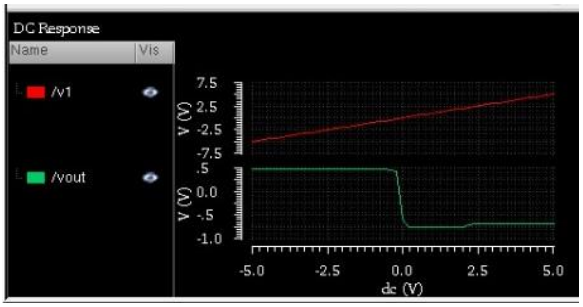


Fig.5 Dc analysis

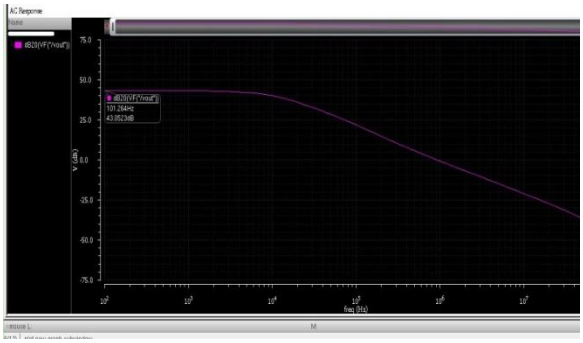


Fig.6 CMRR

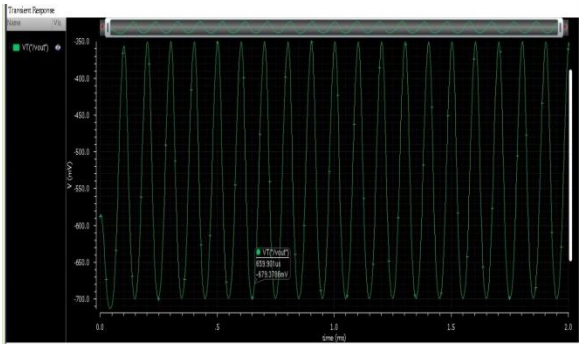


Fig.7 Slew Rate

ISBN: 979-85-27243-61-1

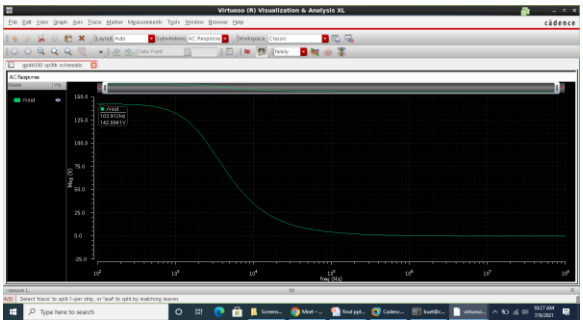


Fig.7 Gain of an Op-amp

Table.2 Design specification of two-stage CMOS op-amp

Specifications	Values
Technology	90nm
Transistors	8
Gain	142dB
Vdd	+0.75V
CMRR	43.05dB
Slew Rate	8V/µsec
Compensation Capacitor	20pf
Load Capacitor	40pf

VI. CONCLUSION

This work presents the full sketch and examination of a high gain CMOS Operational amplifier using 90nm technology for biomedical monitoring applications. Effective procedures are enforced to contribute a surpassing specification such as high gain, low supply voltage, stability. The Op-Amp has low power as well as low voltage. Cascading of multiple stages and enhancing output impedance , the compensation and biasing circuits are used to stabilize the operational amplifier .Operational amplifier with high gain are always stable as they never reduces the amplifying efficiency. As the biomedical signal has low frequency, the signal strength is week with low amplitude. In order to get the accurate result, an amplifier which has high gain and stability is needed. The portrayed operational amplifier has this potential. This can be applied in low drop out regulators where the main objective is to suppresses the power consumption. The operational amplifier designed has low power with high gain and high input common mode range.

REFERENCE

1. Shahid Khan "Design of high gain low voltage CMOS operational amplifier" IEEE 2016.
2. Sanjay Singh Rajput, Ashish Singh, Ashwani K. Chandel, Rajeevan Chandel "Design of low power high gain in op amp for biomedical applications" IEEE 2016.
3. Akhil Gupta,Shweta Singh" Design of two stage CMOS op-amp with high slew rate and high gain in 180n m" IEEE 2017.
4. P. E. Allen and D. R. Holberg, CMOS Analog Circuit Design, Book, Oxford University Press, 2002.
5. Tripti Kackar, Shruti Suman, P. K. Ghosh" Design of high gain low-power operational amplifier" IEEE 2016.
6. B. Razavi, "Design of Analog CMOS Integrated Circuits", New York: Mc-Graw-Hill, 2001.
7. Neha Arora, Shalu malik "High gain phase Margin CMOS operational amplifier design" IEEE 2013.
8. Atieh S Khansarizadeh, s Hassan Mirhosseini "Low voltage high gain CMOS operational amplifier for switched capacitor application in digital 90nm CMOS process" IEEE 2012.
9. Y. Chih-Jen, C. Wen-Yaw, and C. M. Chen, "Micro-power low-offset instrumentation amplifier IC design for biomedical system applications," IEEE Trans. Circuits and Systems I: Regular Papers, vol. 51, pp. 691-699, 2004.
10. K. A. Ng and P. K. Chan, "A CMOS analog front-end IC for portable EEG/ECG monitoring applications," IEEE Trans. on Circuits and Systems I: Regular Papers, vol. 52, pp. 2335-2347, 2005.

ISBN: 979-85-27243-61-1

Glimpses of ICGCP - 2021

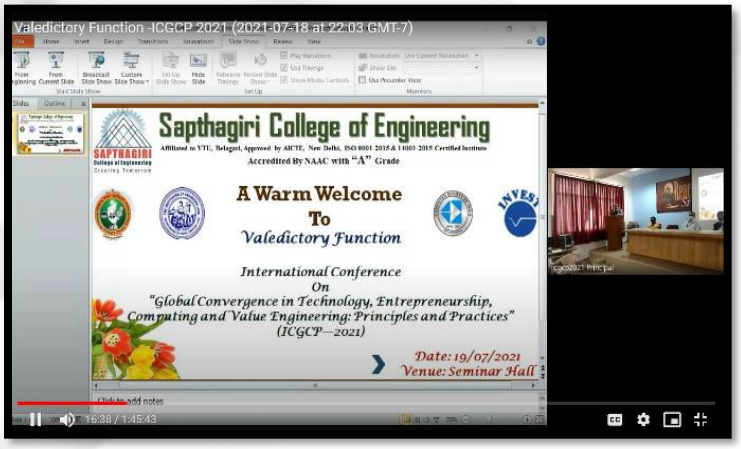


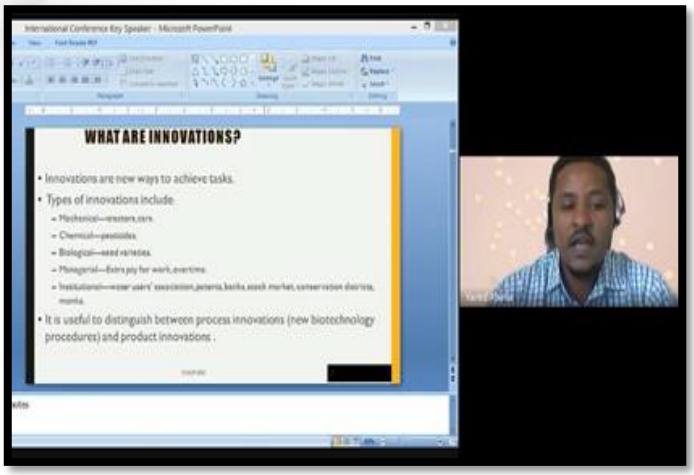


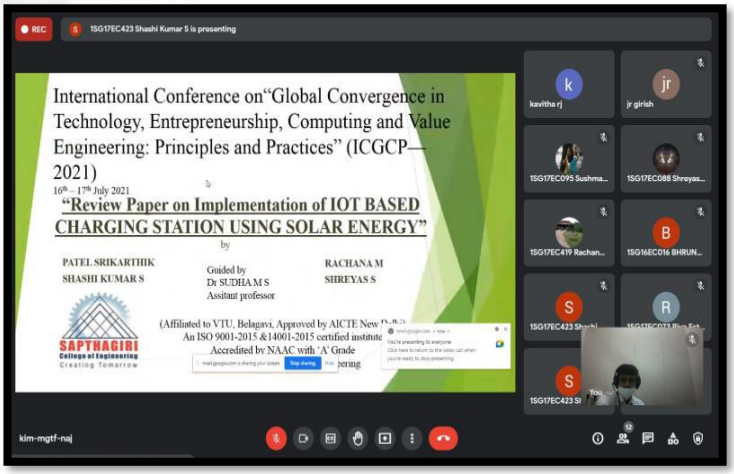


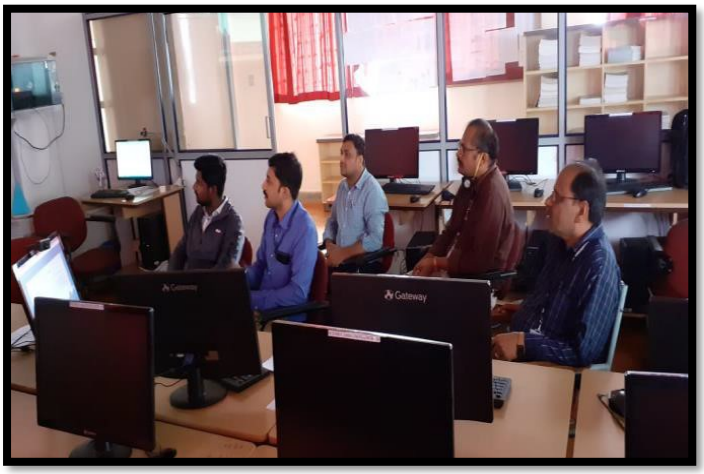


Glimpses of ICGCP - 2021











ICGCP-2021

SAPTHAGIRI
College of Engineering
Creating Tomorrow



Website: http://www.sapthagiri.edu.in

Google Map