



Proceedings of

**NATIONAL CONFERENCE ON ADVANCES IN
ELECTRONICS, COMMUNICATION &
COMPUTING (NCAECC-2023)**

13th & 14th, May 2023

Organized By

**Dept. of Electronics & Communication Engineering,
Guru Nanak Dev Engineering College, Bidar,
Karnataka, India**



VISION AND MISSION OF THE INSTITUTE

VISION

To be a premier technological institution that fosters humanity, ethics and excellence in education and research towards inspiring and developing future torch bearers.

MISSION

M1: To impart quality educational experience and technical skills to students that enable them to become leaders in their chosen professions.

M2: To nurture scientific temperament and promote research and development activities.

M3: To inculcate students with an ethical and human value so as to have a big picture of societal development in their future career.

M4: To provide service to industries and communities through educational, technical, and professional activities.

VISION AND MISSION OF THE DEPARTMENT

VISION

To be a premier department known for quality education and research in the field of Electronics and Communication Engineering for the benefit of mankind.

MISSION

M1. To provide State-of-art education and skills in the field of Electronics and Communication Engineering.

M2. To promote research culture and life-long learning to meet the challenges of rapid technological change in their chosen professional field.

M3. To provide service to the society through engineering solution.

Program Educational Objectives (PEOs)

PEO1: Apply fundamentals and skills needed for a successful professional Electronics & Communication Engineer and to pursue higher studies.

PEO2: Adapt the latest technologies needed for addressing real-world problems.

PEO3: Embed self-learning abilities, humanitarian and ethical values for a successful professional career.



EDITORIAL

The developments in the field of Engineering and Technology have made enormous contributions to all walks of life. The world consists of a large number of natural and man-made systems which has paved the way for innovation and creativity. The field of electronics, Communication, and Computer science is not far behind in this race. The ever-increasing restrictions in power, space, Industrial Automation, and biomedical instrumentation are a cue to set up a new era in which communication tools, Control system algorithms, and Digital signal processing applications have to be embedded with VLSI techniques for attaining better results. These needs are the real inspirational force behind NCAECC-2023.

The department of E&CE, Guru Nanak Dev Engineering College, Bidar, Karnataka, India has organized the Two Day National Conference on Advances in Electronics, Communication & Computing (NCAECC-2023) on 13-14, May 2023. We received a total of 112 full-paper submissions from different countries. All papers were subjected to a rigorous review process. A total of 20 reviewers participated in the review and paper selection. After deliberation, 68 papers were selected based on the recommendations of the review committee.

Eminent scientists and professors have been invited to deliver plenary sessions at the conference, which will enlighten us with their enormous acquaintance in the field during various sessions of the conference. The invited speakers will bring to light cutting-edge technologies in various areas so that the participants may benefit from this technical gorge.

We are happy to place on record the cooperation, support and guidance received from all quarters. We would like to thank all the reviewers, authors, session chairs, and participants for their active participation in moulding this conference into a rich technical forum.

Editors

Dr. Kishan Singh

Dr. Veerendra Dakulagi





MESSAGE FROM PATRON

Dear Esteemed Participants,

It is my pleasure to extend a warm welcome to all of you attending the National Conference on Advances in Electronics, Communication and Computing (NCAECC-2023), being hosted by Guru Nanak Dev Engineering College (GNDEC), Bidar on 13-14, May 2023. This conference provides a platform for researchers, scholars, and experts in the field of electronics, communication and computing to share their knowledge, expertise, and insights, and engage in stimulating discussions on the latest trends, challenges, and opportunities in the field. As the President of GNDEC, Bidar, I am delighted to be a part of this esteemed conference and to have the opportunity to showcase our institution's academic excellence and research prowess. Our college has always been at the forefront of innovation and has consistently produced outstanding research that has contributed significantly to the field of electronics, communication and computing.

The theme of this conference is highly relevant in today's world, where technology is advancing at an unprecedented pace, and there is a growing need for cutting-edge research that can address the challenges of this fast-changing landscape. The research papers, presentations, and discussions at this conference will provide valuable insights into the latest advancements in the field and help shape the direction of future research.

I am confident that the proceedings of this conference will have a high impact on the field of electronics, communication and computing.

I encourage all the participants to take advantage of the opportunities provided by this conference to network, collaborate and learn from each other. Your contributions to this conference will be invaluable and will help make this event a grand success.

In conclusion, I wish you all a fruitful and enjoyable conference experience, and I look forward to the outcomes of this conference and its proceedings with a high impact on the field of electronics, communication and computing.

Best regards,

Dr. Sardar Balbir Singh

President, Shri Nanak Jhira Saheb Foundation, Bidar.





MESSAGE FROM PATRON

Dear Esteemed Participants,

It gives me immense pleasure to welcome all of you to the National Conference on Advances in Electronics, Communication and Computing (NCAECC-2023), being hosted by Guru Nanak Dev Engineering College (GNDEC), Bidar on 13-14, May 2023. The conference aims to bring together experts, researchers, scholars, and practitioners in the field of electronics, communication and computing to exchange their knowledge, share their experiences and showcase their latest research findings.

The conference has attracted participation from all over the country, and the quality of research papers and technical sessions is sure to be of a very high standard. This is a testament to the growing interest in the field of electronics, communication and computing, and the importance of conferences like NCAECC-2023 in promoting new ideas, identifying emerging trends, and exploring new avenues for future research.

As the Vice Chairperson of GNDEC, Bidar, I am proud to be associated with this conference and to have the opportunity to host such an esteemed event. Our institution has a strong reputation for academic excellence, and our faculty members and students have consistently made significant contributions to the field of electronics, communication and computing.

The theme of this conference is particularly relevant in today's world, where technological advancements have transformed every aspect of our lives. The papers and presentations at this conference will showcase the latest research in the field, and provide valuable insights into the challenges and opportunities that lie ahead. The networking opportunities provided by this conference will allow participants to connect with their peers and build new collaborations that will further advance the field.

I am confident that the proceedings of this conference will have a high impact on the field of electronics, communication and computing. The knowledge and insights shared during the technical sessions, and the discussions that will follow, will help shape the future of this dynamic and rapidly evolving field. The research presented at this conference will contribute to the development of new technologies, tools, and frameworks that will drive innovation and create new opportunities for growth and development.

I wish you all a productive and enjoyable conference experience and look forward to your contributions to the success of NCAECC-2023. I am confident that the knowledge and insights gained from this conference will have a positive impact on the field, and contribute to the advancement of the field of electronics, communication and computing.

Best regards,

Dr. Reshma Kaur

Vice-chairperson, Guru Nanak Group of Institutes, Bidar.

NCAECC-2023





MESSAGE FROM THE KEYNOTE SPEAKER

Dear Esteemed Participants,

I am delighted to be a keynote speaker at the National Conference on Advances in Electronics, Communication and Computing (NCAECC-2023), organized by Guru Nanak Dev Engineering College (GNDEC), Bidar.

As a scientist at UR Rao Satellite Centre, ISRO Bangalore, India, I have spent several years researching and developing cutting-edge technologies in the field of electronics, communication, and computing. I am excited to share my knowledge and insights with fellow researchers, academicians, and professionals at this conference.

The conference theme, "Advances in Electronics, Communication, and Computing," is highly relevant in today's rapidly evolving technological landscape. I believe that this conference provides an excellent platform for researchers to showcase their research outcomes and to discuss the latest trends, innovations, and challenges in the field.

I am confident that the conference proceedings will have a high impact on the field of electronics, communication, and computing. The research presented during the conference will shed new light on the latest developments and advancements in the field, and it will open new avenues for research, innovation, and development.

I look forward to meeting and interacting with all of you during the conference. I hope that my presentation will provide valuable insights and stimulate meaningful discussions among the participants. I would like to take this opportunity to thank the organizers for giving me the opportunity to speak at this conference. I also extend my gratitude to all the participants for their contributions to making this conference a grand success.

I wish all the participants a successful and productive conference.

Best regards,

Dr. Chandrakanta Kumar

Senior Scientist, UR Rao Satellite Centre, ISRO Bangalore, India





MESSAGE FROM THE PRINCIPAL

Dear Participants,

On behalf of Guru Nanak Dev Engineering College (GNDEC), Bidar, it is my pleasure to welcome you all to the National Conference on Advances in Electronics, Communication and Computing (NCAECC-2023). The conference is scheduled for 13-14, May 2023 and will be held at our esteemed institution. This conference is an excellent opportunity for researchers, scholars, and experts in the field of electronics, communication, and computing to come together and discuss the latest advancements in the field. It is an excellent platform to share ideas, showcase research, and learn from experts in the field.

At GNDEC, Bidar, we are committed to providing our students with the best academic and research facilities. Our institution has always been at the forefront of technology and innovation, and we are proud to host this prestigious conference. Our aim is to encourage and promote research in the field of electronics, communication, and computing, and we believe that this conference will contribute significantly to achieving this goal.

The proceedings of this conference are expected to have a high impact on the field of electronics, communication, and computing. The research presented here will contribute to the development of new technologies and tools that will transform our lives. It will also help create new opportunities for growth and development and lead to new breakthroughs that will benefit society as a whole.

I encourage all the participants to take advantage of this opportunity to network, collaborate, and learn from each other. Your contributions to this conference are essential, and I am confident that your research and presentations will be of great value to the field. I would like to extend my best wishes to all the participants for a successful and productive conference. I am confident that the outcomes of this conference and its proceedings will have a significant impact on the field of electronics, communication, and computing.

Best regards,

Dr. Dhananjay M

Chief Organizing Secretary, NCAECC-2023

Principal, GNDEC, Bidar.





MESSAGE FROM ORGANIZING SECRETARY & THE HOD (E&CE)

Dear Esteemed Participants,

It gives me immense pleasure to welcome you all to the National Conference on Advances in Electronics, Communication and Computing (NCAECC-2023) hosted by the Department of Electronics and Communication Engineering at Guru Nanak Dev Engineering College (GNDEC), Bidar.

As the Head of the Department, I am delighted to be a part of this event and to have the opportunity to interact with distinguished researchers, academics, and professionals in the field of electronics, communication, and computing. The conference provides a unique platform for researchers, scholars, and experts to come together, exchange ideas, and discuss the latest trends, innovations, and challenges in the field. It is a great opportunity for us to learn from each other, collaborate, and work towards creating a better future through technological advancements.

The proceedings of this conference are expected to have a high impact on the field of electronics, communication, and computing. The research presented during the conference will provide valuable insights into the latest developments and advancements in the field. It will also lead to the development of new technologies, tools, and methods that will transform our lives.

I encourage all the participants to take full advantage of this platform and make the most of this opportunity to present their research, network with their peers, and learn from experts in the field.

I wish all the participants a productive and fruitful conference, and I am confident that the proceedings of this conference will have a significant impact on the field of electronics, communication, and computing.

Best regards,

Dr. Kishan Singh

Organizing Secretary, NCAECC-2023 &

HOD & Professor, E&CE Dept., GNDECB





MESSAGE FROM THE CHIEF COORDINATOR

Dear Esteemed Participants,

It gives me immense pleasure to welcome you all to the National Conference on Advances in Electronics, Communication and Computing (NCAECC-2023), organized by Guru Nanak Dev Engineering College (GNDEC), Bidar.

As the Chief Coordinator of this conference, I am thrilled to be a part of this event, which provides a unique platform for researchers, academicians, and professionals to come together and discuss the latest trends, innovations, and challenges in the field of electronics, communication, and computing. The conference theme, "Advances in Electronics, Communication, and Computing," is highly relevant in today's rapidly evolving technological landscape. With new advancements and innovations emerging every day, it is crucial for researchers to stay updated and informed about the latest developments in the field. This conference provides a perfect opportunity for experts to share their knowledge, experiences, and research outcomes with each other.

I am confident that the conference proceedings will have a high impact on the field of electronics, communication, and computing. The research presented during the conference will shed new light on the latest developments and advancements in the field, and it will open new avenues for research, innovation, and development.

I would like to take this opportunity to express my sincere gratitude to the organizers, sponsors, keynote speakers, and all the participants for their contributions to making this conference a grand success. I am grateful for your support and encouragement, and I believe that your participation will play a significant role in making this conference a memorable and impactful event.

Finally, I wish all the participants a fruitful and enriching experience at the NCAECC-2023 conference. I hope that you will take this opportunity to interact with fellow researchers, network with experts in the field, and share your knowledge and experiences with others.

Best Regards,

Dr. Veerendra Dakulagi

Chief Coordinator, NCAECC-2023 &

Professor, E&CE Dept., GNDEC Bidar.



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VLSI Design of a Multiplexer

Kim Ho Yeap¹, Veerendra Dakulagi², Zi Xin Oh³, Nuraidayani Effendy⁴, Nursaida Mohamad Zaber⁵, and Yu Jen Lee⁶

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³*Universiti Tunku Abdul Rahman, Faculty of Information and Communication Technology, Kampar, Perak, Malaysia*

Abstract - Multiplexer is one of the most essential components used to build Configurable Logic Blocks (CLBs) in Field Programmable Logic Arrays (FPGAs). In this paper, we present the design and analysis of an 8-to-1 multiplexer using 0.12 deep submicron CMOS technology. The 8-to-1 multiplexer is built by interconnecting two 4-to-1 multiplexers with one 2-to-1 multiplexer. In order to allow the output to give a full voltage swing from 0 V to V_{DD} , both 4-to-1 multiplexers and 2-to-1 multiplexer are constructed using CMOS transmission gates. The transistor level and layout simulations have been successfully validated. In comparison to the static combinational CMOS logic design, this method can certainly reduce the number of transistors implemented in the design, optimizing the design of multiplexers in the die.

Index Terms - Configurable Logic Blocks, Field Programmable Logic Arrays, CMOS, Transmission Gates.

I. INTRODUCTION

Ever since the advent of VLSI technology [1 – 5], Application Specific Integrated Circuit (ASIC) devices have been made possible with the aid of Electronic Design Automation (EDA) tools. An ASIC is a chip designed to perform a specific function in a particular application. In order to optimize the cost and time to market, special architectures have been developed for ASIC designs. Among these architectures, Field Programmable Gate Arrays (FPGAs) are presently the most popular architecture used in the Integrated Circuit (IC) industries. An FPGA consists of arrays of Configurable Logic Blocks (CLBs) which can be programmed to implement any logic functions of its inputs [1]. Hence, the FPGA can easily be configured by simply downloading configuration bits that program functions into the CLBs and properly interconnecting the arrays of CLBs.

Multiplexer based logic has been extensively used to build CLBs [2]. A register which stores the output of a

desired logic function is typically connected to the input of the multiplexer. Selection switches in the multiplexer determine which appropriate input signal from the register is to be sent to the output pin of the multiplexer [1, 2].

In this paper, we present the design and analysis of an 8-to-1 multiplexer commonly used in CLBs, using Microwind EDA tools. In order to allow full signal swing from 0 V to V_{DD} , we have implemented CMOS transmission gate configuration to construct the multiplexer. Here, the feature length (2λ) of both PMOS and NMOS is 0.12 μm .

II. DESIGN

A 2-to-1 multiplexer is the fundamental building block for multiplexers with more than one selection switch and more than two input signals [1, 2]. Figs. 1 and 2 show the transistor level schematics of a 2-to-1 multiplexer and a 4-to-1 multiplexer respectively. As can be clearly seen, the 4-to-1 multiplexer is but merely the combination of three 2-to-1 multiplexers.

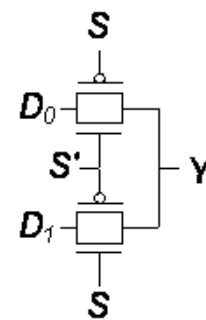


Fig. 1 A 2-to-1 multiplexer.

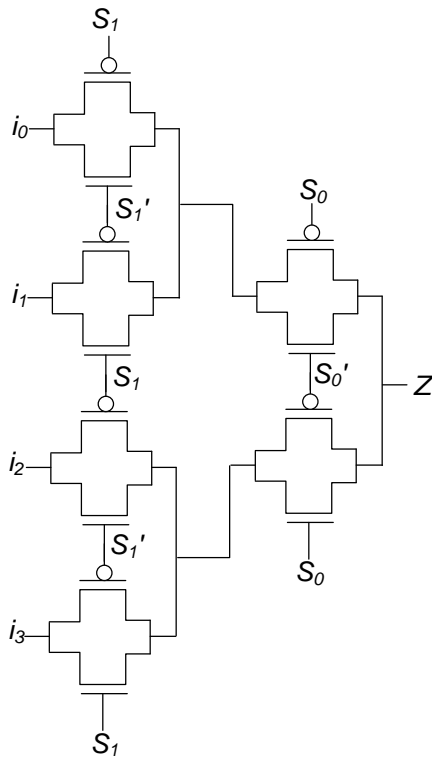


Fig. 2 A 4-to-1 multiplexer.

As illustrated in [1] and [2], two 4-to-1 multiplexers have been interconnected with a 2-to-1 multiplexer, for the case of an 8-to-1 multiplexer. As graphically depicted in Fig. 3, a total of seven 2-to-1 multiplexers have been used in the design.

In order to illustrate the operational concept of the 8-to-1 multiplexer with ease, we have divided and labeled each 2-to-1 multiplexer as circuits 1 to 7, as shown in Fig. 3. The selection switch s_1 in circuit 1 determines either the multiplexers in circuit 2 or circuit 3 is to be activated. When a logic 1 (i.e. V_{DD}) is being supplied to s_1 , circuit 3 will be activated; and vice versa, if a logic 0 is being supplied, circuit 2 will be activated instead. Subsequently, the selection switch s_2 of the multiplexer in circuit 2 is then used to control the activation of either circuit 4 or 5 in a similar manner. Likewise, the selection switch s_2 of the multiplexer in circuit 3 is used to determine either circuit 6 or 7 is to be activated. Table I depicts a summary of the output signal in correspond to different combination of selection switches.

III. RESULTS AND DISCUSSION

As soon as the transistor level schematic has been validated, the layout of the 8-to-1 multiplexer is then generated using Microwind EDA tools, as shown in Fig. 4. In order to verify the design, clock pulses with different frequency rates have been inserted to the inputs i_1 to i_8 , as well as, selection switches s_1 to s_3 . Figs. 5 to 7 illustrate the timing diagrams of the input (i.e. i_1 to i_8 and s_1 to s_3) and output (i.e. $pmos_6_out1$) signals. As can be observed from Fig. 5, at time range 82 to 83 ns, 86 to 87 ns, 90 to 91 ns, and 94 to 95 ns, the output pin $pmos_6_out1$ displays a logic 1 signal. At these time range, the selection switches $s_1s_2s_3 = 100$. Based on Table I, the multiplexer allows the input signal i_5 to be transmitted to the output. Comparison between the signals in both i_5 and $pmos_6_out1$ shows that they agree very well (i.e. both are displaying a high signal in the diagram). At time range, 89 to 90 ns, 91 to 92 ns, 93 to 94 ns, and 95 to 96 ns, the selection switches $s_1s_2s_3 = 110$. From Table I, it can be clearly seen that the output signal should correspond to that supplied by input i_7 . Clearly, both i_7 and $pmos_6_out1$ tally very well, i.e. both displaying high signals in the timing diagram as well. Similarly, by performing close analysis on Figs. 6 and 7, it could be observed that when the selection switches $s_1s_2s_3 = 010$ and 001 , respectively, the output signals agree very well with those shown in i_3 and i_1 as well. The results correspond with the desired outcomes summarized in Table I, verifying the validity of the design. In comparison to the static combinational CMOS logic method [3], it is worthwhile noting that designing multiplexers using this method reduces the number of transistors implemented in the design significantly. This will certainly optimize the number of transistors in the die, allowing more functionality to be incorporated into the die.

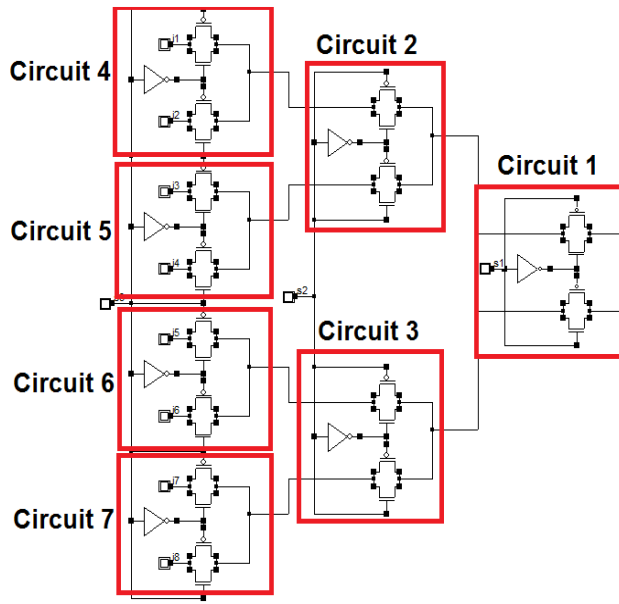


Fig. 3 An 8-to-1 multiplexer.

TABLE I

TRUTH TABLE OF AN 8-TO-1 MULTIPLEXER

| $S_1S_2S_3$ | Output |
|-------------|--------|
| 000 | i_1 |
| 001 | i_2 |
| 010 | i_3 |
| 011 | i_4 |
| 100 | i_5 |
| 101 | i_6 |
| 110 | i_7 |
| 111 | i_8 |

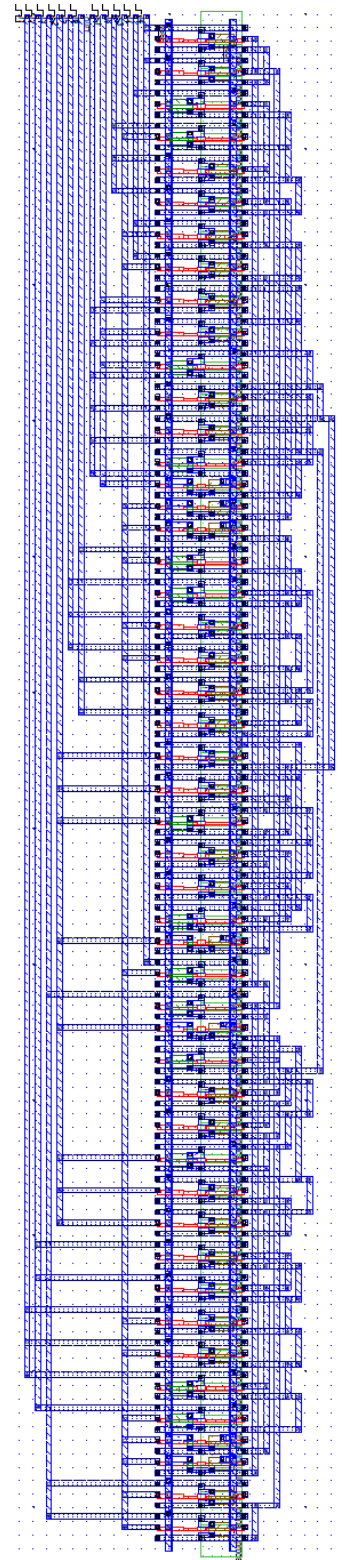


Fig. 4 Layout of an 8-to-1 multiplexer.

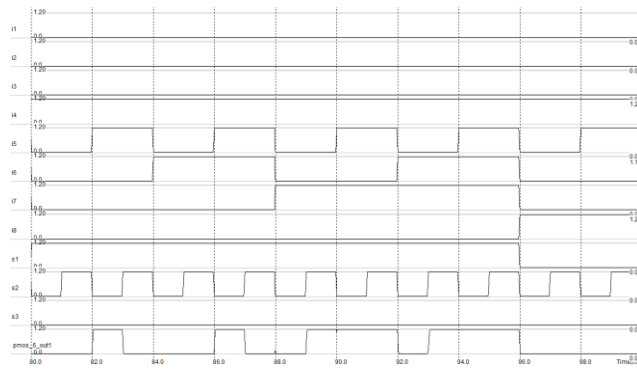


Fig. 5 Timing diagram of an 8-to-1 multiplexer from 80 ns to 100 ns.

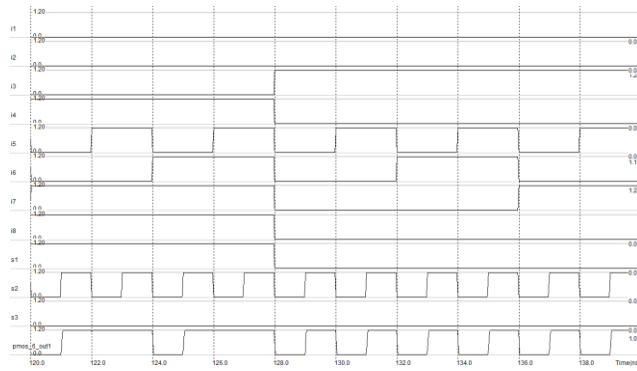


Fig. 6 Timing diagram of an 8-to-1 multiplexer from 120 ns to 140 ns.

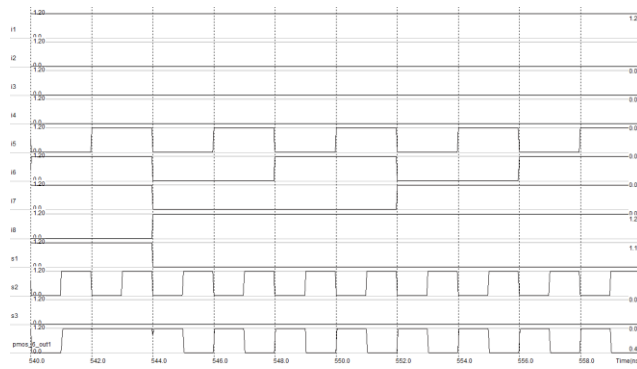


Fig. 7 Timing diagram of an 8-to-1 multiplexer from 540 ns to 560 ns.

IV. SUMMARY

The design and analysis of an 8-to-1 multiplexer has been performed based on the 0.12 μm CMOS transmission gate configuration. Simulations on the transistor-level schematic and layout of the multiplexer have been successfully validated.

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Classification of Emotional States using KNN and Decision Trees on EEG Brainwave Data

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Abstract - This study aims to explore the use of KNN and Decision Tree algorithms for predicting emotional states based on EEG brainwave data collected from two individuals using a Muse EEG headband. The data consists of three emotional states (positive, neutral, negative) and six minutes of resting neutral data. Statistical extraction of the alpha, beta, theta, delta and gamma brainwaves was performed to generate a dataset of 2548 features, which was then reduced to a subset of 63 features using feature selection techniques such as OneR, Bayes Network, Information Gain, and Symmetrical Uncertainty. The performance of KNN and Decision Tree algorithms was evaluated using accuracy, precision, recall, and F1-score metrics. The results showed that both algorithms performed well in predicting emotional states, with Decision Tree outperforming KNN in terms of accuracy and F1-score. The findings suggest that EEG brainwave data can be effectively used to predict emotional states using machine learning algorithms, and that Decision Tree is a promising technique for this purpose.

Index Terms - EEG brainwave data, emotional classification, ensemble classifiers, KNN, decision tree

I. INTRODUCTION

Emotions play a critical role in our daily lives and have a significant impact on decision-making, behavior, and social interactions. The ability to accurately predict emotions from physiological signals, such as electroencephalography (EEG) data, can have numerous practical applications, including mental health diagnosis and treatment, human-computer interaction, and affective computing. In recent years, machine learning algorithms have been increasingly employed to predict emotions from EEG data due to their high accuracy and efficiency.

In [1] Masruroh et. al used the Adaptive Multilayer Generalized Learning Vector Quantization (AMGLVQ) algorithm to classify emotions based on valence, low and high. The study found that AMGLVQ performed better than Random Forest (RF) and Support Vector Machine (SVM) in classifying emotions in imbalanced data conditions. The DEAP dataset is a database for emotion analysis using physiological and audiovisual signals. Rahman et. Al reviewed recent studies in [2] that have used EEG signals to identify interconnections between emotion and brain activity for the assessment of cognitive functions and state of clinical subjects in e-

health care delivery and the development of human-machine interfaces. The article discusses the theoretical conceptualization of basic emotions and the techniques used for feature extraction, selection, and classification. The outcomes of recent studies are compared, and future directions and main challenges for researchers developing EEG-based emotion analysis methods are discussed. Zhuang et. al presents a novel method for emotion recognition based on empirical mode decomposition (EMD) of EEG signals [3]. The extracted features include multidimensional information of Intrinsic Mode Functions (IMFs), the first difference of time series, the first difference of phase, and the normalized energy. The study shows that the high-frequency component IMF1 has a significant effect on different emotional states detection. The informative electrodes based on EMD strategy are also analyzed. The proposed method's classification accuracy is compared with several classical techniques, and experiment results on DEAP datasets demonstrate that the method can improve emotion recognition performance. A multistep hybrid approach for automatic feature selection of EEG signals to enhance EEG-based emotion recognition is proposed by Wosiak and Dura in [4]. The said approach incorporates the Reversed Correlation Algorithm to select automated frequency band-electrode combinations, resulting in a reduction of sensors to only three channels. The method was evaluated on the DEAP dataset, and the obtained results showed higher classification accuracy compared to other studies. The proposed method is considered a universal EEG signal classification technique and belongs to unsupervised method. The study performed by Zhu et. al in [5] focuses on improving the accuracy of speech emotion recognition for Chinese speech, which is challenging due to the complexity of the language. The paper explores five types of features extracted from a speech sample and compares statistical features with deep features extracted by a Deep Belief Network (DBN). The paper proposes a novel classification method that combines DBN and SVM and uses a conjugate gradient method to speed up the training process. Gender-dependent experiments are conducted using an emotional speech database created by the Chinese Academy of Sciences.

The results show that DBN features can reflect emotion status better than artificial features, and the new classification approach achieves an accuracy of 95.8%, which is higher than using either DBN or SVM separately. The study [6] proposes an automated model for identifying emotions based on EEG signals using empirical mode decomposition/intrinsic mode functions (EMD/IMF) and variational mode decomposition (VMD) for signal processing purposes, and entropy and Higuchi's fractal dimension (HFD) for feature extraction. Four classification methods - naive Bayes, k-nearest neighbor (k-NN), convolutional neural network (CNN), and decision tree (DT) - were used to classify emotional states. The model proposed by Rania Alhalaseh and Suzan Alasasfeh achieved a 95.20% accuracy using the CNN-based method on the DEAP database. The study highlights the importance of efficient algorithms for feature extraction, feature selection, and classification in emotion recognition systems using brain signals. Al-Nafjan et. Al focused on using Deep Neural Networks (DNN) for EEG-based emotion recognition, which is important for developing Brain-Computer Interface (BCI) systems [7]. The study uses power spectral density (PSD) and frontal asymmetry features to identify human emotions in EEG signals from the DEAP dataset. The proposed approach is compared to other state-of-the-art emotion detection systems on the same dataset. The results show that using DNNs greatly benefits EEG-based emotion recognition, particularly when a large amount of training data is available.

Mi Li et. Al investigated the effect of different frequency bands and number of EEG channels on emotion recognition accuracy in [8]. The DEAP dataset was used to classify emotional states based on valence and arousal dimensions using different combinations of EEG channels. The EEG signals were divided into four frequency bands using discrete wavelet transform, and features such as entropy and energy were calculated for classification using K-nearest neighbor Classifier. Results show that as the number of EEG channels increases, the classification accuracy of emotional states also increases. Additionally, the classification accuracy of the gamma frequency band is greater than that of the beta, alpha, and theta frequency bands. This study provides useful information for improving EEG-based emotion recognition systems. Septiana Pane et. Al presented a rule-based classifier and decision tree algorithm to construct EEG-based emotion classification models for happy, sad, angry, and relaxed emotions [9]. The EEG signal is separated into gamma, beta, alpha, and theta bands using a band pass IIR filter with Chebyshev type II window. Time and frequency domain

features extraction methods are used to extract relevant features within the EEG signals related to emotional states. The proposed method is evaluated using a real EEG dataset from the DEAP database. The rule-based classification model outperformed the decision tree algorithm in terms of emotion classification accuracy, and the features extracted from beta and gamma bands of EEG signals yielded promising results. The rules classifier model generated 10 rules of emotion classification, and the validation of the rules achieved an average accuracy of 81.64% for the relaxed emotion class.

In this study, we explore the use of k-nearest neighbor (KNN) and decision tree algorithms for predicting emotions from EEG data collected using a Muse EEG headband. The dataset consists of EEG recordings from two individuals (1 male, 1 female) in three emotional states - positive, neutral, and negative, as well as a six-minute resting neutral state. The dataset was preprocessed using a statistical extraction strategy, resulting in a subset of 63 features selected through information gain-based feature selection. We then trained and tested KNN and decision tree algorithms on this preprocessed dataset to predict emotions.

The results of our experiments show that both KNN and decision tree algorithms are effective in predicting emotions from EEG data, achieving an overall accuracy of 94% and 96%, respectively. These results demonstrate the potential of machine learning algorithms in predicting emotions from EEG data and provide a foundation for future studies investigating more advanced algorithms and feature selection techniques to improve the accuracy of emotion prediction.

II. METHODOLOGY

A. Dataset Description

The dataset [10] consists of EEG brainwave data collected from two individuals using a Muse EEG headband with four electrode placements (TP9, AF7, AF8, TP10) and includes three emotional states (positive, neutral, negative) and six minutes of resting neutral data. Fig. 1 shows the distribution of emotions' labels in the dataset.

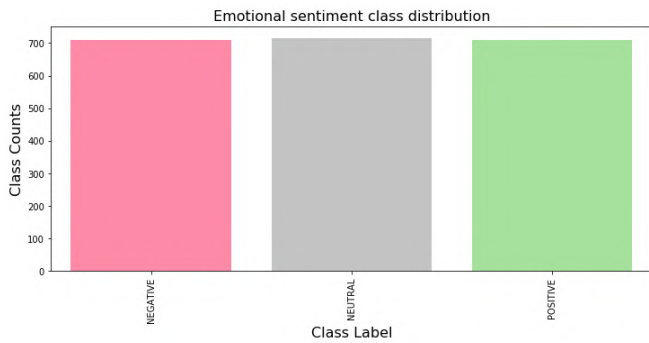


Fig. 1: Emotions distribution in dataset

B. Feature Extraction

The features extracted from the brainwave data include fast Fourier transform, covariance matrix, mean, max, correlation, logm, and eigen. The stimuli used to evoke the emotional states are film clips with an obvious valence, and each emotional state was recorded for one minute per session. Statistical extraction of alpha, beta, theta, delta and gamma brainwaves was performed to generate a large dataset of 2548 features, which was then reduced to a subset of 63 features using feature selection techniques.

C. Machine Learning Models

KNN (k-Nearest Neighbors) is a non-parametric algorithm that classifies data based on the majority class of its k nearest neighbors in a feature space. In this study, KNN was used to classify EEG data into three emotional states (positive, neutral, negative) based on their proximity to other data points. Specifically, the algorithm was trained on a labeled dataset of EEG features extracted from the Muse EEG headband, and the optimal value of k was selected using cross-validation techniques. The KNN algorithm was then used to predict the emotional state of new, unlabeled EEG data based on its similarity to the labeled dataset.

On the other hand, Decision Tree is a classification algorithm that uses a tree-like model of decisions and their possible consequences. In this study, Decision Tree was used to classify EEG data into the three emotional states based on a set of decision rules derived from the features of the EEG data. The algorithm was trained on a labeled dataset of EEG features, and the decision rules were learned by recursively partitioning the feature space into smaller regions based on their class labels. The resulting tree model was then used to predict the emotional state of new, unlabeled EEG data based on its feature values and the learned decision rules.

D. Performance Metrics

We used following metrics in this study; F1-score, RMSE, precision, recall, and accuracy. F1-score is a metric that balances the trade-off between precision and

recall, and it is often used to evaluate the performance of machine learning algorithms when dealing with imbalanced datasets. RMSE is used to evaluate the performance of regression algorithms that predict continuous values, such as the intensity of an emotion. Precision is used to evaluate the accuracy of the algorithm when predicting a specific emotion, while recall is used to evaluate the sensitivity of the algorithm to detect a specific emotion. Accuracy is used to evaluate the overall performance of the algorithm in predicting the emotional state of a person, but it may not be reliable when the dataset is imbalanced.

These performance metrics provide a quantitative measure of the performance of machine learning algorithms in EEG emotions classification, and they help in comparing different algorithms.

III. RESULTS

In this study, we explored the use of KNN and Decision Tree algorithms for predicting emotional states based on EEG brainwave data collected from two individuals using a Muse EEG headband. The data consisted of three emotional states (positive, neutral, negative) and six minutes of resting neutral data. Statistical extraction of the alpha, beta, theta, delta, and gamma brainwaves was performed to generate a dataset of 2548 features, which was then reduced to a subset of 63 features using feature selection techniques such as OneR, Bayes Network, Information Gain, and Symmetrical Uncertainty. The performance of KNN and Decision Tree algorithms was evaluated using various performance metrics such as accuracy, precision, recall, F1-score, and RMSE. In this section, we present the results obtained from the experiments conducted above. In fig. 2 it can be observed that both KNN and Decision Tree algorithms performed well in predicting emotional states using EEG brainwave data. The confusion matrix for KNN showed that out of the 225 test samples, 212 positive emotions and 177 negative emotions were correctly classified, resulting in an accuracy of 94.06%. For the Decision Tree algorithm, the confusion matrix showed that out of the 225 test samples, 207 positive emotions, 213 neutral emotions, and 197 negative emotions were correctly classified, resulting in an accuracy of 96.41%.

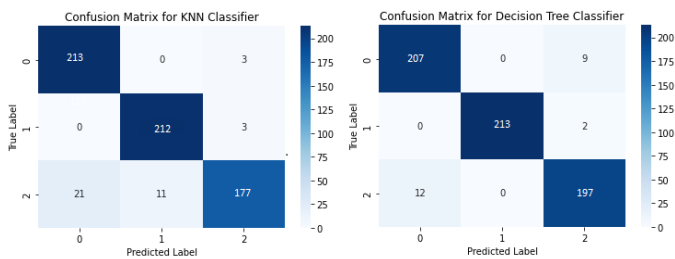


Figure 2: Left shows confusion matrix of KNN classifier, right shows confusion matrix for Decision Trees classifier.

The F1-score, which is a metric that balances the trade-off between precision and recall, was found to be 0.94, indicating that the KNN algorithm performed well in predicting all three emotional states. Fig. 3 shows that the F1-score was found to be 0.96, indicating that the Decision Tree algorithm outperformed KNN in predicting emotional states based on EEG brainwave data. The precision metric for both KNN and Decision Tree was found to be high, indicating that the algorithms were able to accurately predict the specific emotional state for a given EEG signal. The recall metric was also found to be high, indicating that the algorithms were sensitive to detect the specific emotional state. RMSE was not used in this study as the emotions were classified as categorical variables and not regression.

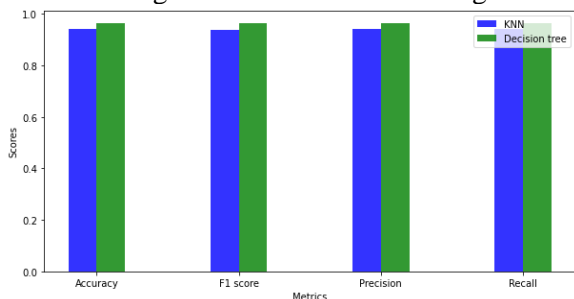


Figure 3 Accuracy, f1_score, precision and recall of KNN and decision tree classification.

IV. CONCLUSION

In summary, the study examined the use of KNN and Decision Tree algorithms for predicting emotional states based on EEG brainwave data. The results indicated that both algorithms were successful in predicting emotional states with high accuracy, but Decision Tree algorithm outperformed KNN algorithm in terms of accuracy and F1-score metrics. The study demonstrated the potential of using EEG brainwave data and machine learning algorithms for predicting emotional states, which has important implications for various fields such as healthcare, psychology, and neuroscience. It is noteworthy that the accuracy achieved by KNN was 94%, while Decision Tree achieved an accuracy of 96%. Overall, these findings suggest that machine learning algorithms can be effective tools for

predicting emotional states from EEG brainwave data, and further research can be conducted to investigate their potential applications in real-world settings.

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A Study on Cloud Computing in Health Care

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Abstract – Cloud computing is a technology that has revolutionized the way healthcare organizations manage their data and applications. By leveraging the power of the cloud, healthcare providers can store, process, and access large amounts of data and applications from anywhere in the world. This has led to significant improvements in healthcare delivery, including better patient outcomes, improved collaboration among healthcare professionals, and reduced costs. In this abstract, we explore the benefits of cloud computing in healthcare, including improved scalability, flexibility, and security. We also discuss some of the challenges and potential solutions associated with implementing cloud computing in healthcare, such as data privacy

Index Terms - Cloud computing, healthcare, electronic records, HIPAA, Mobile health

I. INTRODUCTION

Cloud Clinic Healthcare is a modern healthcare service provider that utilizes advanced technology to offer convenient and efficient healthcare services to patients [1,2]. The company operates through an online platform that connects patients with healthcare professionals, allowing them to receive medical advice diagnoses, prescriptions, and other healthcare services from the comfort of their [3]. The platform is designed to offer a seamless experience for patients, with features such as online booking, video consultations, secure messaging, and digital prescriptions. Patients can access healthcare services anytime and from anywhere, making it easier to manage their health and Cloud Clinic Healthcare's team of healthcare professionals includes doctors, nurses, pharmacists, and other specialists who are trained to provide high-quality healthcare service [4]. The company is committed to delivering personalized care that is tailored to the unique needs of each patient Overall, Cloud Clinic Healthcare is dedicated to making

healthcare accessible and convenient for everyone, using technology to improve the quality of care and enhance patient outcomes.

II. HEALTHCARE CLOUD ARCHITECTURE

A. Cloud Computing

Cloud computing is a technology that allows users to access and use computing resources such as servers, storage, databases, and software applications over the internet. Rather than storing and accessing data and applications locally on personal computers or servers, cloud computing enables users to access these resources from remote servers hosted in data centers shown as Fig. 1. Cloud computing offers several benefits, including cost-effectiveness, scalability, and flexibility computing, users can easily scale up or down their computing resources based on changing needs, pay only for the resources they use, and access their data and applications from anywhere with an internet connection. Cloud computing has revolutionized the way Healthcare cloud computing is the application of cloud computing technology in the healthcare industry It involves the use of cloud computing to store [1,2], manage, and access healthcare data applications, and services Organizations and individuals consume and manage computing resources, making it a key driver of digital Healthcare cloud computing is the application of cloud computing technology in the healthcare industry. It involves the use of computing to store, manage, and access healthcare data, applications, and services Healthcare cloud computing can be used for various purposes, including medical research, telemedicine, electronic health records (EHRs), medical image processing, and healthcare.

Community clouds: They have common infrastructure that serves a particular community and is used by numerous different organizations.

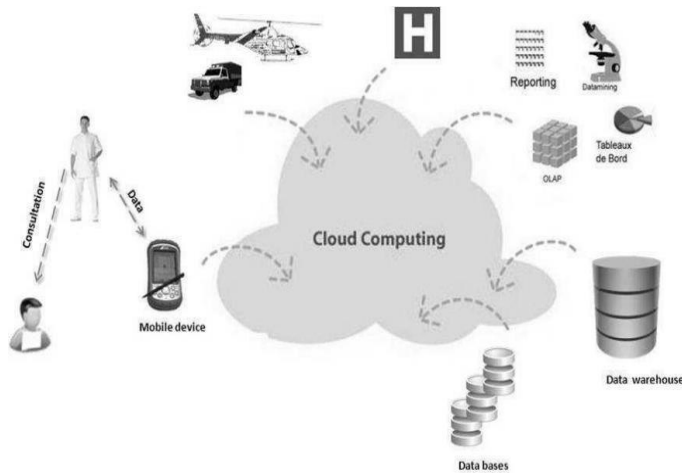


Figure 1. Shows the architecture of cloud computing

3. Healthcare Cloud Computing

Healthcare cloud computing offers several benefits, including cost savings, scalability, security, and accessibility. It enables healthcare organization to store and process large amounts of data in a cost-effective and secure manner, access medical applications services from anywhere, and providing secure and compliant storage and processing of healthcare data. Overall, healthcare cloud computing is an important technology that is transforming [3].

Cloud computing providers also help healthcare organizations to comply with regulatory requirements such as HIPAA providing secure and compliant storage and processing of healthcare data. Overall, healthcare cloud computing is technology that is transforming the healthcare.

Industry by improving Overall, we conclude that cloud computing has the potential to revolutionize.

The healthcare industry and improve the quality of care for patients. We also discuss some of the challenges and potential solutions associated with implementing cloud computing in healthcare enhance patient services, operational facilities, information sharing easily, and cost reduction [4].

Therefore, it can be demonstrated that using cloud technologies in healthcare is beneficial for people all over the world.

4. Requirements Under HIPAA

HIPAA (Health Insurance Portability Accountability Act) is a US federal law that sets standards for the privacy, security, and confidentiality of (PHI). Under HIPAA, healthcare organizations and their business associates that handle PHI must comply with certain requirements to protect the privacy and security of this sensitive information. Some of the key requirements under HIPAA Privacy Rule: The HIPAA Privacy Rule establishes standards for the use and disclosure of PHI. Covered entities must implement policies procedures to protect the privacy of PHI, obtain patient consent for certain uses and disclosures.

PHI provide patients with access to their PHI for Security Rule: The HIPAA Security Rule sets standards for the security of electronic PHI the safekeeping and discreet treatment of protected health information. (E PHI). Covered entities must implement administrative physical and technical safeguards to protect EPHI, including access controls, encryption, and backup) Breach Notification Rule: The HIPAA Breach Notification Rule requires covered entities to with access to the proper patient records would need to use electronic medical/health records (also known as EHRs or EMRs) or risk penalties. Notify affected individuals, the Department of Health and Human Services, and in some cases the media, in the event of a breach of unsecured care information on electronic billing and other procedures.

5. EMRs and EHRs

EMRs (Electronic Medical Records) and EHRs (Electronic Health Records) are digital versions of patient medical records that are used by accessible healthcare providers to store, manage, and access patient health information. While the terms EMR and EHR are often used interchangeably, there are some differences between EMRs are electronic versions of the paper-based medical records that have been used healthcare providers for many years. EMRs typically contain patient health information such as medical history, diagnoses, medications.

Test results, and they are used by healthcare providers within a single healthcare organization or EHRs, on the other hand, are more comprehensive digital records that contain a patient's health information from healthcare

providers and organizations [5,6]. EHRs are designed to be interoperable, meaning that they can be accessed and shared by healthcare providers across different healthcare organizations. EHRs typically include information from EMRs, as well as additional data such as HIPAA. The EMR/HER adaptation ratio varies according to year is given as follows Fig. 2.

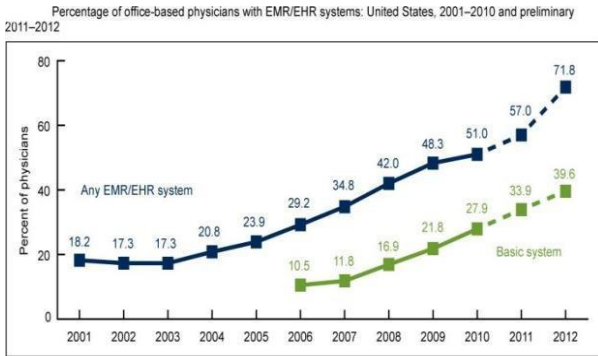


Figure 2. Shows EMR adaptation year wise

6. Healthcare Benefits of Cloud Computing

There are several healthcare benefits of cloud-based electronic health records (EHRs) and electronic medical records (EMRs) is as follows.

- I) **Accessibility:** Cloud-based EHRs and EMRs can be accessed from anywhere with an internet connection, making it easier for providers to access patient health information from multiple locations and devices patients’ superior medical treatment. Thus, the information about a that they can be accessed and shared by authorized healthcare providers across different healthcare organizations and settings.
- II) **Scalability:** Cloud-based EHRs and EMRs can be scaled up or down based on the needs of the healthcare Cost savings: Cloud-based EHRs and EMRs can help healthcare organizations to save money on IT infrastructure, hardware, and software, as well as maintenance and upgrades. This can be particularly beneficial for smaller healthcare organizations with limited Security: Cloud-based EHRs and EMRs can provide robust security features, including encryption, backups, and access controls, to protect patient health information from unauthorized access and breaches.

This makes it easier for healthcare providers to manage growing patient populations and changing healthcare need Cost savings: Cloud-based EHRs and EMRs can

help healthcare organizations to save money on IT infrastructure, hardware, and software, as well as maintenance and upgrades This can be particularly beneficial for smaller.

- III) **Security:** Cloud-based EHRs and EMRs can provide robust security features, encryption, backups, and access controls, to protect patient health information from unauthorized access and overall, cloud-based EHRs and EMRs offer several healthcare benefits that can help to improve patient care, enhance coordination, and reduce healthcare costs. However, healthcare organizations must also ensure that they comply with regulatory requirements, such as HIPAA, to protect the privacy and security of patient health [6,7].

7. Concerns About Healthcare Cloud Computing

While healthcare cloud computing offers many benefits, there are also some concerns that healthcare organizations may have. Some of the common concerns about healthcare cloud computing include.

- a) **Security and privacy:** Healthcare organizations are responsible for protecting patient health information and ensuring compliance with regulations such as HIPAA. There are concerns about the security and privacy of patient health information in the cloud, as well as the potential for unauthorized access or data Reliability and availability: Healthcare organizations rely on cloud computing services to be always available and reliable. There are concerns about downtime, system outages, and other issues that could impact the availability of critical patient health Integration and interoperability: Healthcare organizations use a variety of different systems and applications to manage patient health information.
- b) **Data ownership and control:** Healthcare organizations must ensure that they maintain ownership and control of patient health information, even when it is stored in the cloud. There are concerns about vendor lock-in and the ability to access and transfer data between different cloud-based costs: While cloud computing can help healthcare organizations to save money on IT infrastructure and maintenance costs, there are also concerns about the long-term costs of using cloud-based services, including licensing fees, data storage costs, and other Overall, healthcare organizations must carefully evaluate the risks and benefits of cloud

computing and ensure that they appropriate measures in place to address any concerns or issues that may arise. This may include developing robust security and privacy policies, selecting reliable cloud service providers, and ensuring that they have appropriate backup and disaster recovery plans in place.

c) *Data ownership and control:* Healthcare organizations must ensure that they maintain ownership and control of patient health information, even when it is stored in the cloud. There are concerns about vendor lock-in and the ability to access and transfer data between different cloud-based services. The Overall, cloud-based EHRs and EMRs offer several healthcare benefits that can help to improve patient care, enhance care coordination, and reduce healthcare costs. However, healthcare organizations must also ensure that they comply with regulatory requirements. Security: Cloud-based EHRs and EMRs can provide robust security features, including encryption, backups, and access controls, to protect patient health information from unauthorized access and breaches.

d) Overall, healthcare organizations must carefully evaluate the risks and benefits of cloud computing and ensure that they have appropriate measures in place to address any concerns or issues that may arise. This may include developing robust security and privacy policies, selecting reliable cloud service providers, and ensuring that they have appropriate backup and disaster recovery plans in place. Scalability: Cloud-based EHRs and EMRs can be scaled up or down based on the needs of the healthcare organization. This makes it easier for healthcare providers to manage growing patient populations and changing healthcare need [7-11].

That they can be accessed and shared by authorized healthcare providers across different healthcare organizations and settings. This helps to improve care coordination and patient outcomes the year wise growth in EHR data is shown in Fig. 3.

8. Portable Health

Portable health, also known as m Health, is a growing trend in healthcare that involves the use of mobile devices and wireless technology to provide healthcare services and information. Cloud computing can play a significant role in enabling portable health by providing a secure and reliable platform for storing and accessing

patient health information. Some of the benefits of portable health enabled by cloud computing: Access to real-time patient health information: Cloud computing can provide healthcare providers with instant access to patient health. This can help to improve the quality of care and patient outcomes, especially in emergency situations.

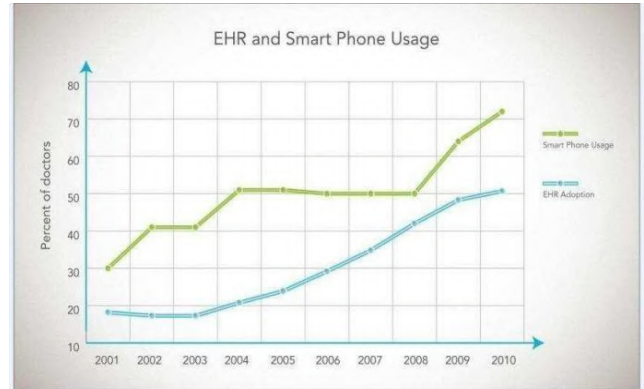


Figure 3. Shows EHR Plot graph

Remote monitoring and management: Cloud-based systems can enable healthcare providers to remotely monitor and manage patient health conditions, allowing for more proactive and preventative care. Patient engagement and education: Portable health enabled by cloud computing can help to engage patients in their own care and provide them with information and resources to help them make informed decisions about their health. Collaboration and care coordination: Cloud-based systems can enable healthcare providers to collaborate and share patient health information across different settings and organizations, improving care coordination and patient outcomes [12].

Cost savings: Portable health enabled by cloud computing can help to reduce healthcare costs by improving care coordination, reducing hospital readmissions, and increasing patient engagement and self-management.

9. Traveling Health

Traveling health, also known as travel medicine, is a field of medicine that focuses on the prevention and management of health problems that occur during travel. Cloud computing can play a role in supporting traveling health by providing a secure and reliable platform for storing and accessing patient health information. Some of the benefits of cloud computing in traveling health

include. Access to medical records: Cloud based systems can provide healthcare providers with access to patient medical records, including vaccination records, medical history, medication lists, regardless of where the patient is located [13,14]. This can help to ensure that patients receive appropriate medical care and treatment during their Real-time health monitoring: Cloud-based systems can enable healthcare providers to remotely monitor and track patient health conditions during travel, allowing for more proactive and preventative Telemedicine: Cloud-based systems can enable healthcare providers to deliver medical services to patients during travel through telemedicine technologies, such as video conferencing and remote Collaboration and care coordination: Cloud-based systems can enable healthcare providers to collaborate and share patient health information with other providers, improving care coordination and patient outcomes.

III. CONCLUSION

In conclusion, healthcare cloud computing has enormous potential to improve the quality of healthcare delivery services and the integration of health systems remotely located. Healthcare cloud security is a major concern due to the possibility of third-party access to clinical information shared and stored in the internet.

Acknowledgment

The Author would like to thank the department of Electronics and Communication Engineering, Meerut Institute of Engineering and Technology, Dr. Ratneshwar Kumar Ratnesh (Supervisor) and Dr. Mrityunjay Kumar Singh as Supporting & formulation of research work, Mr. Puneet Agarwal (Vice-chairman), Prof. Arun Parvete (Director) and Prof Bhawana Mallik (Dean) for providing useful infrastructure and support to carried out various experiment related to this paper.

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IOT Based Coal Mine Safety Monitoring and Alerting System

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Abstract-Safety must come first in all sectors of business. The safety and security of everyone is extremely important to the mining industry. The mining sector follows a few straightforward procedures to avoid accidents of all kinds. Nonetheless, accidents in underground mines are caused by a variety of factors, including methane gas escapes, high water levels, and temperature spikes. Here, we provide workplace safety. A worker can press the panic button to alert security when they are in danger. To improve safety in underground mines, a reliable communication system must be established between workers there and the fixed ground mining system. The communication network must never, under any circumstances, go down. This study suggests a low-cost ZigBee-based wireless mine supervision system with AI for early warning.

IndexTerms: Cloud Server, Safety system, Sensors, Blynk IOT.

I. INTRODUCTION

A mine is the riskiest place to work in the world because explosions there routinely result in thousands of fatalities. At the mines, there are a lot of coal mine accidents that happen, and the miners are risking their lives by working there. Nevertheless, fatal accidents do occur periodically in coal mines, making coal an unreliable energy source that cannot be widely substituted by people. The majority of the time, these mishaps are the direct result of antiquated equipment and wiring devices, which put coal mine excavators in great danger by leading to improper handling and the release of toxic gases. As a result, we developed the system to safeguard coal mines. Coal is the most valuable resource on the earth. These petroleum products are made from resources found on Earth and are utilised for power production and other things. Because coal is a finite resource that cannot be continuously supplied by humans, it is dreadful that occasionally miners perish in

the coal mines. The lives of the miners are at danger because of the frequent coalmine accidents that take place there. Most of these mishaps result in fatalities as a direct result of outmoded gear and electrical systems.

II. LITERATURE REVIEW

The design proposed by Kumar et al [1] is based on MSP430, A variety of factors, including temperature Many variables, including temperature, humidity, gas, and smoke, are tracked in coal mines. The climate of the nation is managed by the motor, which is positioned in the centre together with a Zigbee transmitter.

In a system created by Lihui et al [2], sensor nodes measure the temperature, humidity, and methane values of the coal mine. An ARM controller then collects the data and processes it. Zigbee is used for communication. To preserve the workers' safety, an SMS is delivered if any estimate rises.

A device based on an ARM controller and various sensors, including a temperature sensor, a humidity sensor, and a gasoline sensor, was defined by Ashish et al. in [3]. Inside the mine, an IR sensor is placed to monitor the circumstances.

Wakode et al. proposed a method that is mostly used to monitor the concentration of harmful gases in coal mines.[4]. The alerts that the devices provide for safety will enhance the mine miners' chances of survival. An alarm switch for usage in an emergency is present on both the transceiver and receiver sides.

Aarti et al. [5] created a system that measures temperature, humidity, and methane levels in coal mines. All of the numbers are relayed to the ARM9 processor,

which updates the webpage with the most recent readings via a Wi-Fi module.

Dheerajetal[6] suggested a framework where the values of all monitored parameters are recorded, visualised, and configurable through smartphone in the cloud in order to maintain the safety of coal mine workers.

A coal mine safety monitoring framework reliant on Zigbee and GPRS remote transmission was proposed by Dong et al. [7]. With theof genuine accidents and ongoing treatment, ultimately increasing the security of coal mining.

A coal mine safety monitoring system was created by Madhu et al[9] by using a temperature, humidity, and carbon dioxide level checker. If any uncertain condition occur then message is sent with the help of GSM to the forest and fire departments.

III. PROMBLEM STATEMENT

The data need to be downloaded manually from the datalogger using a wirelesscommunication to the industrial portable computer in the underground. Analysis of downloaded data are carried out offline after elapsed of certain time. Data analysis hardly become useful in quick decision making process in mines.

IV. METHODOLOGY

A. Block Diagram

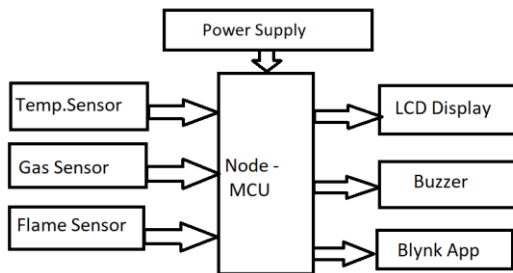
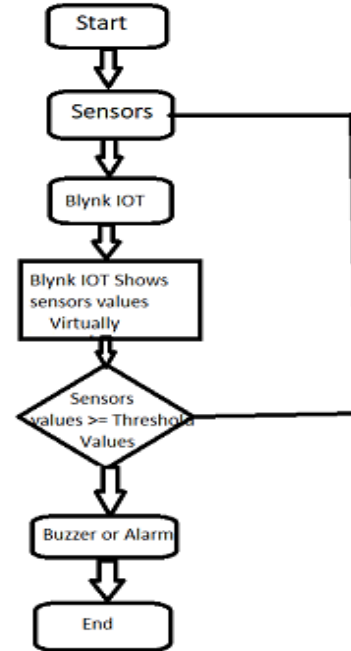


Fig. 1 System Block Diagram.

B. Flowchart

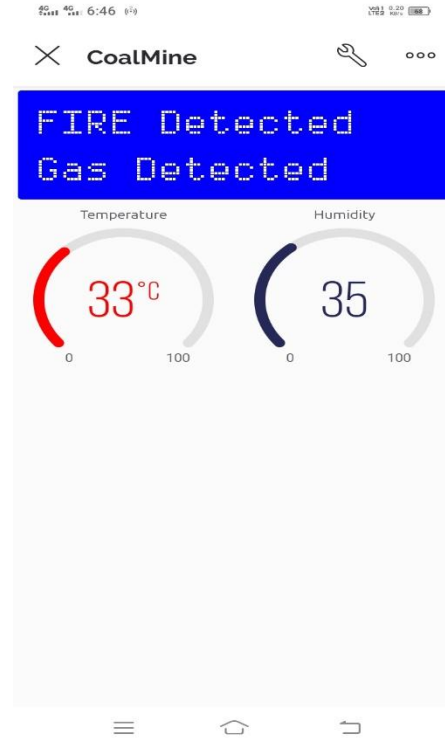


C. WORKING PRINCIPLE

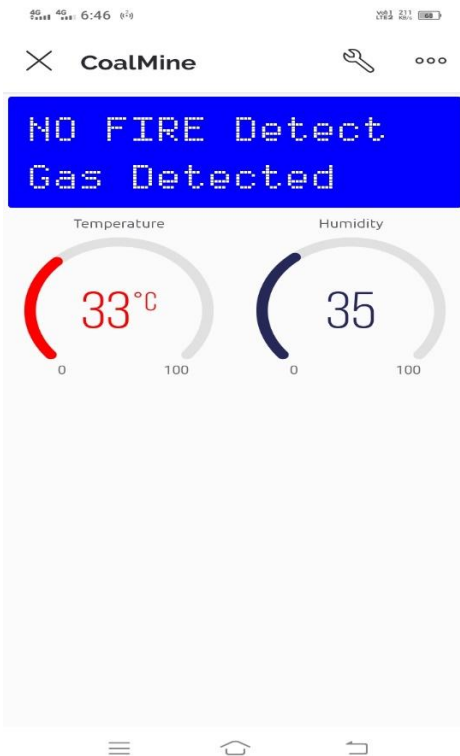
The "IoT Based Coal Mine Safety Monitoring And Alerting System" system as a whole is made up of many sensor Modules.

- 1) A temperature sensor that provides an analogue temperature reading.
- 2) A humidity sensor that provides a moisture value is a digital humidity sensor.
- 3)Flame Sensor: An electronic circuit can be used to construct this sensor/detector, which uses an electromagnetic radiation receiver.
- 4) Smoke Sensor - A smoke detector is a gadget that detects smoke, usually as a sign of a fire.
- 5)A buzzer,also referred to as a beeper,ia an auditorysignaling device that uses. •The entire system is controlled by the NODE MCU Controller. • All of these sensor readings were uploaded to Blynk IoT, an open source cloud platform. We can view the values in that cloud as plots, which are continuously updated values. • If the scenario exceeds the predetermined values, we can foresee it using that cloud API.

The temperature/humidity sensor, fire sensor, buzzer, LCD display, and gas sensor modules are fixed elements of the coal mine safety systems. The Node MCU incorporates all of the sensors. Initially, we must register for a Blynk IoT account. We primarily use monitoring and controlling systems in this system to keep track of all the data coming from various sensors. In the coal mine environment, a gas sensor detects gas; if the level of gas exceeds the typical threshold, the buzzer activates to warn the minestaff. Continuous uploads of these sensor readings are made to the cloud (Blynk IoT) for analysis and later use. Inside the coalmine, the temperature and humidity levels are also measured. Fire alert signals are quickly provided to the appropriate people if any fire mishaps take place. Blynk IoT has completed the control of the system. By combining the widgets we control with buzzer, we can construct widgets in the Blynk IoT. The sensor's value is shown on an LCD screen.



IV. RESULT



V. SCOPE OF PROJECT

If any uncertain condition occur then message is sent with the help of GSM to the forest and fire departments. Coal mine security framework is actualized utilizing Gas sensor. With the developing developments future work of this experimentation may incorporate, greater improvement of the framework by utilizing other progressed sensors for checking the underground. Dangers. Likewise, every one of the underground tasks can be completed from the beginning. New creating correspondence advancements can be utilized for fast information move in mix with keen sensors for detecting the mine conditions. Additionally, more IOT empowered frameworks can be created for further developed uses.

VI.CONCLUSION

To boost worker safety and keep them out of harm's way, a coal mine safety system is being deployed employing fire, gas, and DHT11 sensors. Blynk IOT is being used for this system's ongoing monitoring of the coal mine and worker alerting.

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Water Quality Analysis and Smart Water Meter using IoT

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Abstract- Now a days water is polluted by factories west chemical. The polluted water can cause various diseases to humans and animals, which in turn affects the life cycle of the ecosystem. To make pure water and the water quality should real time smart solution If water pollution is detected in an early stage, suitable measures can be taken and critical situations can be avoided. water quality meter management system need data regarding water storage present in tank for monitoring of water pollution are getting more and more significant these days with innovation in sensors, communication, and Internet of Things (IoT) technology.. Supply of water to the particular area water tank according to water tank it well be informing to the costumer about water level water meter which monitor water uses The paper proposes a cost effective and efficient IoT based smart water quality monitoring system which monitors the quality parameters uninterruptedly. The developed model is tested with three water samples and the parameters are transmitted to the cloud server for further action PH sensor ,turbidity sensor, float sensor , buzzer, water flow sensor are used in this project using checking for water quality and how much use water in daily life. Float sensor are used to the water tank are full filed to a buzzer is ON condition.

IndexTerms: IoT, water flow meter, pH Sensor, Turbidity, float sensor, water quality.

I. INTRODUCTION

The various cities and town, the supply of water has been a major problem as the demand of the water depends on various consumption factor and water distributors have to maintain the water supply in real-time to fill the gap between demand and supply. But, the challenge is to calculate the consumption trend. not wasting water and detecting the overconsumption of water have been practiced a lot to reduce the water consumption around the cities. Fortunately, smart water have been providing the perfect solution for water distributor and consumers to meet the volatile demand for water. Many companies have been coming up with advanced solution using Smart water meter to track water usage of individual house to avoid wastage.

II. LITERATURE REVIEW

A monitoring system that includes a variety of sensors to measure various quality characteristics, such as turbidity, pH value, water level in the tank, wetness of the surrounding environment, and water temperature was proposed by Pasika and Gandla [1].The sensors are connected to the Microcontroller Unit (MCU), which does additional processing, using the Personal Computer (PC). Mukta et al. developed an IoT-based Smart Water Quality Monitoring (SWQM) system. [2] to continuously measure the quality of water based on four different water quality parameters: pH, temperature, turbidity, and electric conductivity. In order to feel the quality metrics, four separate sensors are connected to an Arduino Uno. A desktop application built on the.NET framework receives the data gathered from all four sensors, and the extracted data are compared to the standard values. The created SWQM model will effectively assess the water quality characteristics using a rapid forest binary classifier to determine if the water sample being tested is potable or not based on the sensor data that has been gathered.

A approach for creating a Smart Water Quality Monitoring (SWQM) system with changeable sensor interface device using an IoT environment was put forth by Konde and Deosarkar [3]. The proposed model made use of sensors, an FPGA board, and a Zigbee-based wireless communication module. Real-time consideration was given to six different water quality metrics, including turbidity, pH, humidity, water level, water temperature, and carbon dioxide (CO₂) on the water's surface.

A solar-powered water quality monitoring system using

a wireless sensor network was proposed by Amruta and Satish [4]. The fundamental part of wireless sensor network (WSN) technology used to monitor water quality and powered by solar or photovoltaic panels is the underwater wireless sensor network (UWSN). An extraordinary system design that consists of a base station and distributed sensor nodes is proposed for monitoring water quality in real-time over multiple places. The Zigbee WSN technology is used to connect every node and base station.

A system for river water quality monitoring was put up by Unnikrishna Menon et al. [5] It enables continuous and remote monitoring of water quality indicators. The main factor influencing the water quality in this system is the pH of the water, which is continuously monitored by a wireless sensor node. The processor module, signal conditioning module, power module, and wireless communication module make up the majority of the sensor node design. The base station receives the sensed data from the pH sensor via a wireless communication module, namely a Zigbee module, following the required signal processing and signal conditioning procedures

By using remote sensing and IoT technology, Prasad et al. [6] created a way for a smart water quality monitoring system in Fiji. Potential Hydrogen (pH) and Oxidation and Reduction Potential (ORP) are the quality measures used to evaluate water. An early warning system for water pollution will be designed with an entirely implemented system using numerous monitoring stations with effective implementation of this monitoring approach.

III. PROMBLEM STATEMENT

The data need to be downloaded manually from In many countries, water conservation is becoming increasingly necessary as countries face a widening gap between ever-decreasing water availability due to climate change and the increasing need for population growth. Water efficiency means using less water and finding an alternative to traditional water meters to measure water quantity and quality. Water utilities create daily demand profiles and peak factors to build the infrastructure of the water supply network. The role of smart metering is increasingly being recognized by water utilities in demand management. Customer service, work optimization and operational efficiency.

IV. METHODOLOGY

A. Block Diagram

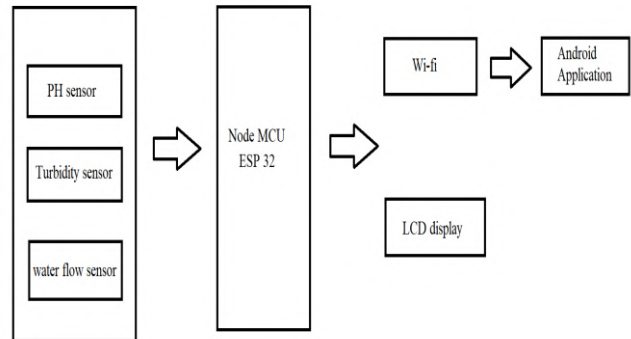
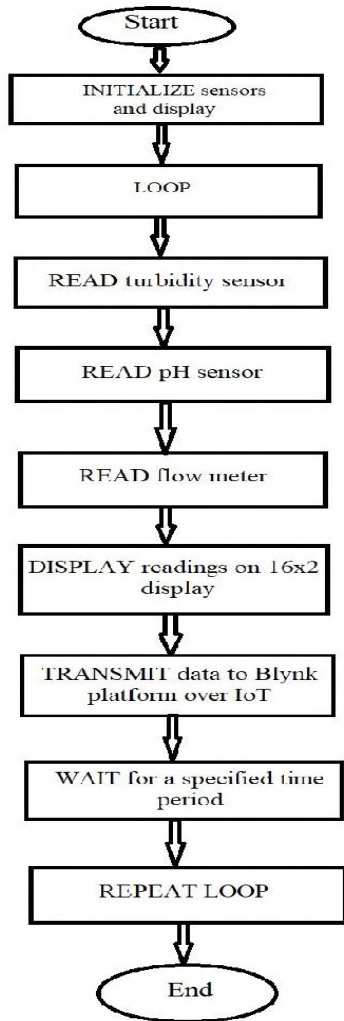
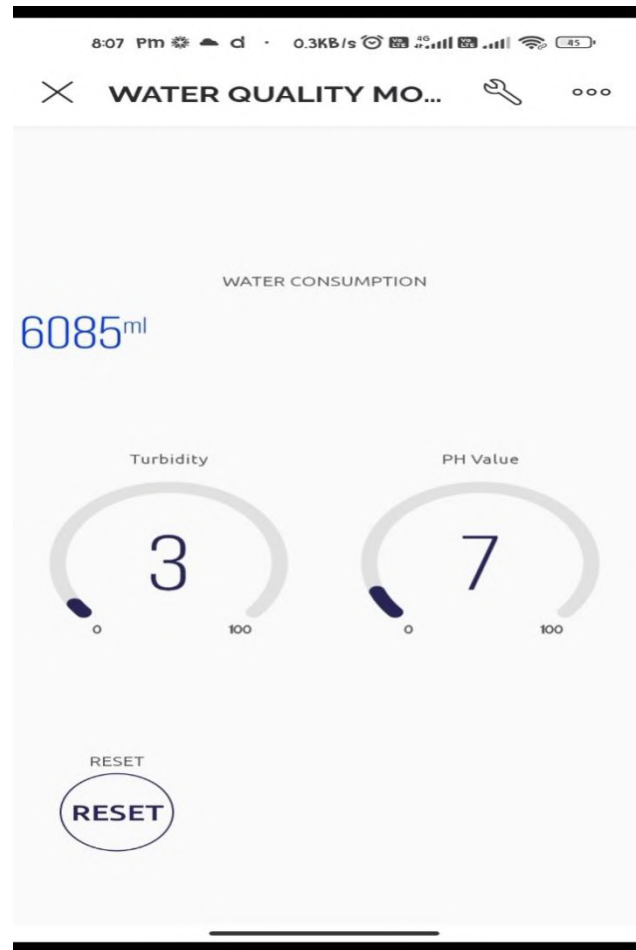


Fig. 1 System Block Diagram.

B. Flowchart

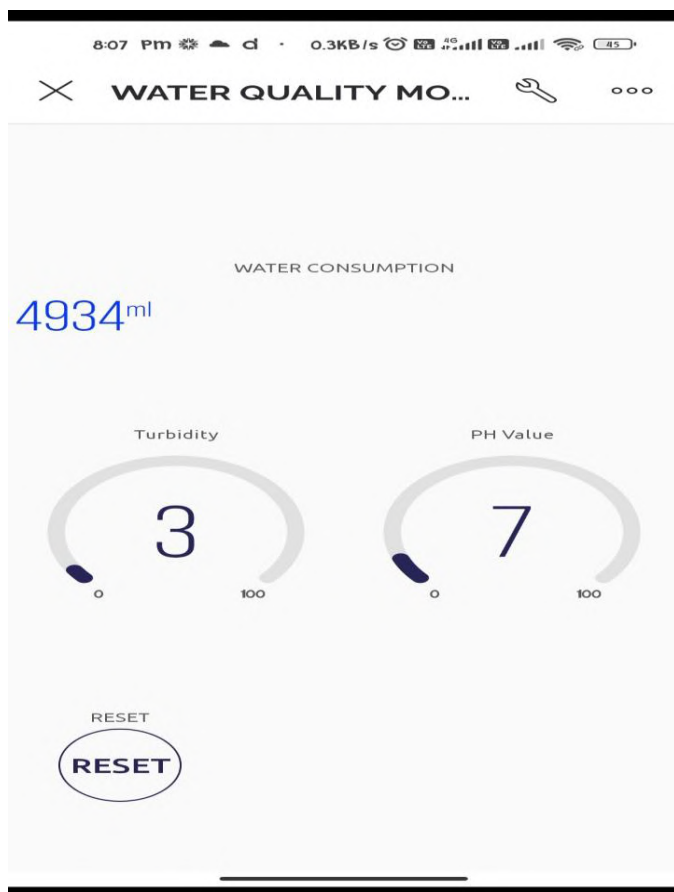


IV. RESULT



C. WORKING PRINCIPLE

Water flow meter, PH sensor, Turbidity sensor, Float sensor and buzzer are used in this project . Ph sensor are used to calculating the Ph value of water are able to drink or not. Turbidity sensor are used to water how much dirty and calculating the water of turbidity . float sensor are used to tank are full for 100% float sensor are upward direction and buzzer is ON . water flow meter are used in how much water are flow in pipe throw the tank. The Node MCU ESP32 are low cost and they are usefully for advance version of Arduino uno. All sensor are connected in ESP32. Blynk IoT has completed the control of the system. By combining the widgets we control with buzzer, we can construct widgets in the Blynk IoT. The sensor's value is shown on an LCD screen



V.SCOPE OF PROJECT

As the Internet of Things expands daily and incorporates new technology, new difficulties appear. individuals have been inspired to employ smart technologies as a result of the IoT, which has encouraged individuals to connect to devices via the internet and the proliferation of IoT devices. The distribution system's water quality is a significant aspect that has an impact on public health, and the smart water 5 system offers a user-friendly interface for checking the water quality in homes and, if necessary, taking corrective action. Managing the cost, energy, and efficiency needed for the water distribution system is one of the major difficulties in the development of smart water systems. Another difficulty in the smart water system is choosing the parameters for the quantity, quality, and topology of the water. Therefore, investigation into these issues is necessary.

VI. CONCLUSION

Water quality monitoring has become necessary work in environmental protection. Automating monitoring and telemetry is a trend for improving the ability of water quality monitoring system. With the help of sensors, we can check the water quality by use of Wi-Fi module.

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Sign Language Recognition Using Machine Learning

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Abstract - The project aims at construction a machine intelligence model that will be able to categorize the differing hand gestures second hand for nonverbal communication in sign language. In this place consumer independent model, categorization motor learning algorithms are prepared utilizing a set of image dossier and experiment is approved on a completely various set. For the image dataset, wisdom figures are used, that present better results, owing to the discounted pre-refine time. Miscellaneous machine intelligence algorithms are applied on the datasets, containing Convolutional Interconnected system (CNN).

Keywords: Visual studio, machine intelligence, sign language, CNN invention.

I. INTRODUCTION

Communication links nation by allowing bureaucracy to transport ideas for each other, to express their central impressions, and to exchange ideas, either verbally or non-orally. However, unwilling society incapable of corresponding orally. As such, the launching of nonverbal communication was designed to assist with reduced hearing societies to express their impressions to others. However, nonverbal communication is completely various from human language: it has its own syntax and allure own way of expression. Sign prose is a dialect that means by including the flow of fingers, hands. Therefore, it may be very questioning for society to gain and practice nonverbal communication. With specific methods, many sign acknowledgment orders have happened projected that capture hand gestures and before resolve and determine the recognized sign accent harvest, by document.

II. LITERATURE REVIEW

Sign language acknowledgment is a hard question if we consider all the likely associations of gestures that order concerning this kind needs to understand and change. That being pronounced, seemingly the best habit

to resolve this question is to separate it into plainer questions, and bureaucracy presented present would solution to individual of bureaucracy. Sign Language Recognition is progress for serving unwilling-mute public and has been examined for many ages. "Sign language Recognition Using Machine Learning". The documents scrutinized are in this manner:

The following are the documents subpoenaed in the literature review:

[1] The unwilling things have a ideas question handling additional folk. It is hard for a forementioned individuals to express what they be going to suggest because nonverbal communication is mind-boggling by all. This paper search out expands a Data Acquisition and Control (DAC) system that changes the nonverbal communication into passage that maybe express by one. This plan is named Sign Language Translator and Gesture Recognition. Sign language acknowledgment is a hard question if we consider all the likely associations of gestures that order concerning this kind needs to understand and change. That being pronounced, seemingly the best habit to resolve this question is to separate it into plainer questions, and bureaucracy presented present would pertain a attainable solution to individual of bureaucracy.

[2] Sign Language is used for one unwilling and silent society expected capable to correspond accompanying others, but ultimate usually met question present is that all about grant permission not be able to learn nonverbal communication. The main reason behind this arrangement searches out bridge the ideas breach middle from two points the communities, then, demonstrate the interplay betwixt the dazed society to ideas with possible choice.

[3] The nonverbal communication deliberates as the main terminology for unwilling and unintelligent community. So, interpreter is needed when a usual body wants to talk accompanying a unwilling or unintelligent

body. In this paper, we present a foundation for making Bangla Sign Language (BSL) using Support Vector Machine. The Bangla help sign alphabets for two together vowels and sound unit of speech have happened used to train and test the acknowledgment method.

[4] Hand shape acknowledgment for sign language utilizing problem . A method for help indication acknowledgment of Argentinian nonverbal communication (LSA) is projected. This paper offers two main offerings: first, the invention of a table of hand shapes for the Argentinian Sign Language (LSA). Secondly, a technique for concept , title origin and after handshape categorization utilizing a directed adaptation of self-system arising maps that is to say named.

[5] Automatic Indian Sign Language Recognition for Continuous Video Sequence .The projected method amounts to of four bigger modules: Data Acquisition, Preprocessing, Feature Extraction and Classification. Preprocessing stage includes Skin Filtering and histogram equal later that Eigenvector located Feature Extraction and Eigen advantage burden Euclidean distance located Classification Technique was used. 24 various alphabets were thought-out in this place paper place 96% acknowledgment.

[6] Here, we suggest a order for help segmentation that helps to build a better view located nonverbal communication acknowledgment structure. The projected plan is established color space, alone Gaussian model, and Bayes rule. It detects domain of argue for complex qualification and non-uniform light. Hand expression countenance are elicited by radial distance and Fourier revamp.

[7] A novel approach for seeing differing alphabets of Indian Sign Language is projected place unending program sequences of the signs have existed considered. The projected plan constitutes of three stages: Preprocessing stage, Feature Extraction and Classification. Preprocessing stage contains skin refining, graph with bars for values corresponding.

[8] A phoneme-based sign language recognition system using skin color Segmentation” ; style is a language that, a suggestion of correction acoustically transmitted sound patterns, uses visibly sent sign patterns

III. PROBLEM STATEMENT

Communication is main for every human. However, community who have a trial restriction and/or a speech restriction need a various way to correspond apart from vocal ideas. They apply sign language to ideas accompanying each other. However, Sign Language demands a lot of preparation expected understood and gain and not all may appreciate what the nonverbal communication gestures mean. Learning sign language is further opportunity consuming as skilled are no active, portable form for seeing sign language.

IV. METHODOLOGY

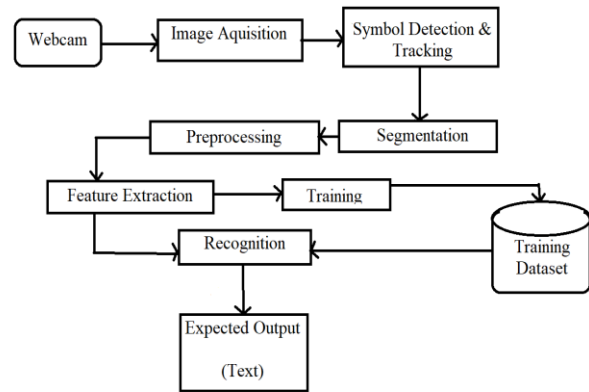


Fig. 1 System Block Diagram.

V. WORKING STEPS

A. CNN

We make use of Convolutional Neural Network (CNN) for training and to classify the images. We can recognize Sign alphabets with high accuracy. Finally, we will obtain the classification accuracy score of the CNN model in this task.

B. Data Collection

This dataset contains 27455 training images and 7172 test images all with a shape of 28 x 28 pixels. These images belong to the 25 classes of English alphabet starting from A to Y (No class labels for Z because of gesture motions). we will preprocess out datasets to make them available for the training. Some important libraries will be uploaded to read the dataset, preprocessing and visualization as keras, tensor board, pandas, NumPy, random, matplotlib.

C. Preprocessing

After successful Validation, we will visualize the training performance of the CNN model. Here, we can conclude that the Convolutional Neural Network

has given an outstanding performance in the classification of sign language symbol images.

D. Training

Now to train the model, we will split our data set into training and test sets. After successful training, we will visualize the training performance of the CNN model.

Now on the created data set we train a CNN. First, we load the data using Image Data Generator of keras through which we can use the flow _from _directory function to load the train and test set data, and each of the names of the number folders will be the class names for the images loaded.

E. Prediction

In GUI, the frame which will take the inputs of different hand gestures or symbols which we are showing in frame and that image is compared with the dataset & processes that image and by trained model, prediction is done.

“Prediction” refers to the output of an algorithm after it has been trained on a historical dataset and applied to new data when forecasting the likelihood of a *particular outcome*.

F. Final Result

After the prediction of almost all the images, we can conclude that the Convolutional Neural Network has given an outstanding performance in the classification of sign language symbol images, & output is displayed.

VI. FLOW CHART

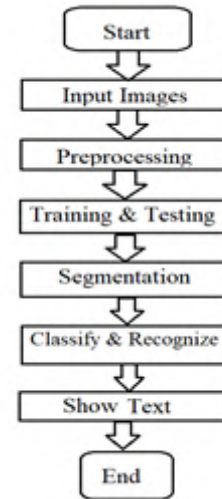


Fig. 2 Flow chart for Sign Language.

VII. RESULT

The basic document file detached into two groups, individual secondhand for preparation and added for experiment. The preparation set exists of 70% of the aggregate data and surplus 30% are secondhand as experiment. We too act experiments on unchanging (30% or 70%) dataset that is preparation in addition to experiment for KNN classifier. The results on these experiments have a 100% veracity rate. This method, if the consumer the one is presumed to use this project has earlier provided to our dataset former, the system will guarantee 100% acknowledgment rate.

VIII. EXPECTED OUTCOME

In this work, we have decamped through mechanical sign language acknowledgment plan in certain-time, utilizing various forms. Although our proposed work anticipated to acknowledged the sign language and convert it into the ABCs, there’s still plenty opportunity for possible future work. In this work, we have through an mechanical nonverbal communication recognition scheme in certain-period, using various finishes. Sign language acknowledgment system is a strong finish to form an expert knowledge, edge discover and the blend of inaccurate news from various beginnings. The intend

of loop interconnected system search out get the appropriate categorization

IX. CONCLUSION

Sign language acknowledgment is a hard question if we consider all the likely associations of gestures that order concerning this kind needs to understand and change. That being pronounced, seemingly the best habit to resolve this question is to separate it into plainer questions, and bureaucracy presented present would pertain a attainable solution to individual of bureaucracy.

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Detection and Classification of Brain Tumor Using MRI

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Abstract - Analysing the preferential localization of particular genes within cell nuclei is a cutting-edge technique being used to diagnose brain cancers. Since they can significantly improve objectivity and repeatability, computer-aided techniques have garnered a lot of attention in recent studies. Computer-assisted methods that examine cell or nucleus identification and segmentation play a significant role in characterising the molecular morphological information. Thresholding is a method that is widely used in segmentation. In this paper, we provide the Lloyd's clustering method for segmenting brain tumour nuclei and cells on various types of microscopy images. The developed strategy is simple, and the suggested method leverages these algorithms to segment and detect nucleated cells, distinguishing it from previous strategies.

Index Term:- Magnetic resonance imaging, segmentation, Lloyds clustering, discrete wavelet transform (DWT), probabilistic neural network (PNN), and radial basis function network (RBFN) are all used to analyse brain tumours.

I. INTRODUCTION

The tumor is an abnormal growth of cancer cells in any part of the body. Tumors are of different types and have different characteristics and different treatments. The brain tumors are mainly classified into two categories primary brain tumors and secondary brain tumors. The Primary tumors are classified into Benign and Malignant tumor. The emerging new imaging modalities, such as X- ray, Ultrasonography, Computed Tomography (CT), and Magnetic Resonance Imaging (MRI), show the detailed and complete aspects of brain tumors. Once a brain tumor is clinically suspected, radiologic evaluation is required to determine the location, the level of the tumor, and its relationship to the surrounding structures. The MRI scan is more comfortable because it doesn't involve radiation. An MRI scanner creates images of the body by using strong magnets to polarise and excite hydrogen nuclei (single proton) in human tissue. To

choose between various forms of therapy like surgery, radiation, and chemotherapy, this knowledge is crucial and extremely vital.

An MRI or CT scan can show the brain's structural makeup at the preprocessing step. For the entire process of detecting brain tumours, the MRI scanned image is taken. When it comes to diagnosis, an MRI scan is more pleasant than a CT scan. The human body is not being impacted. since there is no radiation involved. A low contrast image is an MR image. Doctors have a difficult time making diagnoses with these low contrast photos. By utilising the potent image processing technique known as mathematical morphology, the contrast of MR brain images can be enhanced.

The objectivity and reproducibility of image analysis with the use of computers can be greatly enhanced. Due to nucleus blockage or contact, form variation, intra-nucleolus homogeneity, background clutter, and weak contrast, it is difficult to distinguish nuclei from each other as well as the backdrop. Many cutting-edge techniques for medical picture segmentation have been used up to this point in order to address these problems. The segmentation of brain tumours has been accomplished using a variety of methods and methods. Some use clustering phenomena, some processes, and some are based on the cellular automata technique. The depth and extension region of the detected area are divided into groups using Lloyd's clustering. When working with human lives, it's crucial to acquire high accuracy results for the automatic classification and detection of tumours in various medical images. Compared to other neural networks, the probabilistic neural network is a faster and more accurate classifier, making it a viable tool for classifying tumours.

To increase the accuracy of tumour detection, the MR images used as input for the procedure are pre-processed. The suggested method employs discrete wavelet transform for hybrid feature extraction, probabilistic neural network for tumour classification, and Lloyd's clustering for tumour segmentation. Pre-processing, segmentation, feature extraction, and classification are the four primary divisions of the system.

II. LITERATURE REVIEW

MRI image analysis and brain tumour extraction from MRI images are difficult issues in medical image processing. By utilising a variety of methodologies and unique hybrid approaches, researchers have made contributions to the segmentation and analysis of brain tumours. To identify tumours from various brain MR images, these techniques primarily use segmentation, feature extraction, and classification stages. We have put forth a straightforward technique to segment and detect brain tumours using PNN and Lloyd's clustering from various brain MR images after examining a number of relevant literatures. The study of threshold-based, edge-based, region-based, and clustering-based segmentation approaches for the identification and segmentation of brain tumours from MRI images was done by Harsimranjot Kaur et al. in their article "Studied Techniques for Brain Tumour Segmentation of MRI Images" [1].

Aside from Xing Fuyong, [2] In An Automatic Learning-Based Framework for Robust Nucleus Segmentation, a framework for trustworthy and automatic nucleus segmentation with shape preservation was put forth. A probability map is first generated from a nucleus image using a deep convolution neural network (CNN) model, and forms are then initialised on that probability map via iterative region merging. One of the recommended framework's main benefits is its adaptability to different staining histopathology images. after a clustering technique, morphological filtering. CC Benson and others [5] Two straightforward algorithms that are simple to implement were proposed in Morphology Based Enhancement and Skull Stripping of MRI Brain Images for enhancing MR brain images and skull stripping based on mathematical morphology. The

input image is a low contrast image during the contrast enhancement technique. High generated output is shown in MR images of the brain. image with contrast.

N. P. Natarajan et al. [6] The study "Tumour Detection Using Threshold Operation in MRI Brain Images" advocated the use of morphological processing and threshold operation to identify brain tumours. The structuring components of the image can be changed by the morphological operators depending on their intended purpose. In order to identify the brain tumour from the MRI brain images, some operators, including open, spur, dilate, and close, have been effective.

P.Kishore Kumar and colleagues [7] Effective Segmentation of Image Using Lloyd's Clustering and Otsu Thresholding suggested two techniques for segmenting grey scale images. Even in the presence of background noise, the Otsu technique can recognise the target region. Results from Lloyd's approach are excellent. In difficult situations, this technique can deliver greater results.

J. Selvakumar and others [8] The purpose of the proposed K-means algorithm is to separate the tumour from the brain cells. Brain Tumour Segmentation and Its Area Calculation in Brain MR Images Using K-Mean Clustering and Fuzzy C-Mean Algorithm. Before the K-means method, the brain MR image's noise was eliminated. The k-means algorithm is used to extract the tumour from the MRI image using the noise-free picture as an input.

M.V SubbaRao and colleagues [9] Using a probabilistic neural network and tumour detection, Mri can classify brain images. PNN was proposed to use the clustering technique to detect the tumour and classify the stage of pictures of brain tumours. Two steps of decision-making were carried out: feature extraction with GLCM and classification with Probabilistic Neural Network (PNN). By Shreepad S. Sawant and others [10] a description of the probabilistic neural network Basic PNN classifiers have been proposed and used for image classification. PNN is superior to other kinds of neural network classifiers in terms of advantages. It has categorization accuracy that is adequate. The speed of

operation is equivalent to the MLP after excluding extraneous neurons. PNN classifiers are more accurate than other varieties of Neural Network classifiers.

III. OBJECTIVE

In order to analyse and prepare MR images for improved segmentation.

using Lloyd's clustering to examine and divide nuclei. to research and put into practise a straightforward method for brain tumour identification.

For the categorization of brain tumours, research and implementation of a probabilistic neural network with a radial basis function classifier is needed.

IV. PROBLEM STATEMENT

Different automated processing techniques have been developed for segmenting nuclei for the examination of spatiotemporal dynamics. For segmenting images with dense nuclei, these techniques frequently involve a lot of steps. Therefore, it is helpful to assess the capacity of straightforward techniques to segment images with varying degrees of crowded nuclei.

The suggested system's general process is completely described by the system architecture depicted in figure 1. The procedure includes steps including preprocessing the input MR image, followed by segmentation, feature extraction, and classification using a probabilistic neural network.

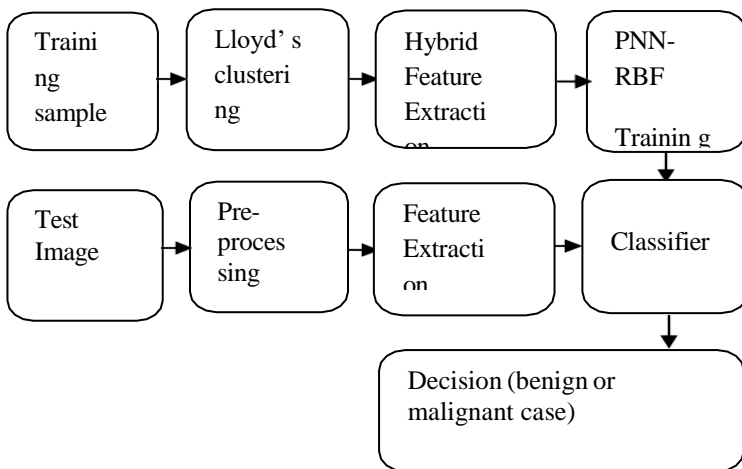


Figure 1: system block diagram

SEGMENTATION

In comparison to other clustering approaches, the k-means clustering offers high computing efficiency and minimal memory consumption. Data complexity is reduced through K-means grouping. The nearest centroid can be used to partition inputs by repeatedly determining the centroid for each set in the partition using the K-mean method. A centroid model is the Lloyd's algorithm (1957; published 1982). This algorithm locates equally spaced groupings of points in subsets of Euclidean spaces and divides these subsets into convex cells with a uniform shape and size. Voronoi diagrams are used by Lloyd's algorithm to re-partition the input rather than only identifying the centres closest to each of a finite set of points.

MATHEMATICAL EQUATION

The "normal" (i.e. straight-line) distance between any two places in Euclidean space is known as the Euclidean distance.

$dE = \sqrt{2 \sum_{i=1}^k (x_i - c)^2}$, Cluster Centre, x , the case being compared, i , the dimension of x (or c), and k , the total number of dimensions.

ALGORITHM IN SOFTWARE & FLOWCHART

A. ALGORITHM:

1. Enter k for the number of clusters.
2. Pick k cluster centres at random.
3. Determine each cluster's mean or centre.
4. Determine the separation between each pixel and the centre of each cluster.
5. Move to that cluster if the distance is close to the centre.
- If not, move on to the following cluster.
7. Update the center's estimate.
8. Continue till the centre doesn't budge.

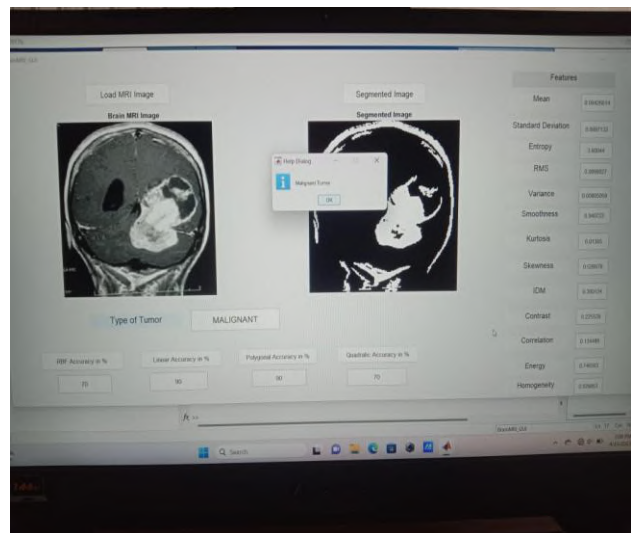
The image can be clustered by grouping pixels together based on some uniqueness. In order to use Lloyd's approach, we must first specify the k th cluster. Then, k cluster centres are randomly selected. Each pixel calculates the distance between the centres of each cluster. The distance can be a straightforward Euclidean function. We can compare every single pixel to every cluster centre using the distance formula. The pixel will relocate to the cluster with the smallest distance out of all of them. After that, centroids are recalculated. Once more, each pixel was compared to every centroid. Till the centre converges, the process is ongoing.

CLASSIFICATION:

Four layers make up the multilayered feed forward network that organises the classification process. For tumour classification, the suggested method combines a probabilistic neural network with RBFN.

V. RESULT

To find brain tumours, we have taken various microscope brain MR images. To decrease noise and get the precise structure of the brain MR image for subsequent processing of segmentation, the brain MR image first underwent multiple phases of pre-processing. The results of the pre-processing stage are displayed in table 2 below. To segment and extract the tumour from a brain MR image, the noise-free picture is provided as input to k-Mean clustering coupled with Lloyd's algorithm. Finally, a brain tumour is determined by classifying a segmented tumour image using a probabilistic neural network with radial basis function. The suggested method is simple & provides more accurate results.



VI. CONCLUSION

Brain tumour categorization has been done using a probabilistic neural network with radial basis function, and segmenting the nuclei in images of brain tumour tissue has been done using Lloyd's clustering. 95.4% accuracy was attained..

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Design of MIMO Antenna for 5G Application With Defected Ground

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Abstract - Modern medical systems are working by the concept of monitoring human health conditions by implanting certain devices into the body. These body devices have to be compact and small in size with good efficiencies. Driven by the concept of wireless communication, many projects have been started to combine antennas and medical devices in a way that the wearer does not notice the working of the systems. The antenna designed for these purposes are called Implantable Antennas and should be compact, flexible, lightweight and strong. Implantable medical devices (IMDs) are capable of communicating with an external monitoring device wirelessly. These IMDs have a huge recognition in the field of biomedicine for obtaining real time and stored data in biomedical field. This project presents an implantable antenna design for biomedical applications. The parameters such as SAR, frequency, bandwidth is compared and analyzed. The problem is identified causing changes to the results and in order to get better results a system is proposed. The parameters are modified to obtain a change in the design. Ansys High Frequency Structure Simulator (HFSS) is the software used for designing and simulating the proposed antenna. The human safety is taken as an important parameter. To preserve patient safety, Implantable devices must be biocompatible.

Keywords: HFSS software,UWB,5G MIMO antenna

I. INTRODUCTION

A Multiple-Input-Multiple-Output (MIMO) Microstrip Patch Antenna 2 ports has been Input-designed and implemented. The proposed antenna consists of two ports and a two Array of Microstrip Patch Antenna ground plane extruded on the substrate. The antenna is fabricated on an inexpensive FR4 a dielectric constant of $\epsilon_r = 4.4$. MIMO system characteristic evaluation of a four port MIMO antenna operating at 5 GHz is performed. a new MIMO patch antenna is proposed, the proposed antenna consist of patch with certain dimensions in the top layer of FR-4 dielectric substrate, and ground plane in the bottom of it, this antenna is feeding by microstrip feed line

with 50- ohm characteristic impedance. A MIMO antenna operates at 5 GHz has been proposed in this project. This first chapter discusses the background of the project providing the project overview, problem statement, objective, scope of the study and the methodology taken to achieve the objectives. Over the years, wireless

system have increased rapidly. Antenna is the most important part of wireless communication system for transmitting and receiving information in the form of Electromagnetic EM Waves. Advancements in communication technology have led to increased usage of wireless devices. Moreover there is always an increase in demand for miniaturization, higher data rate as well as operating speed of these wireless device.

II. LITERATURE REVIEW

The intense research is going on in UWB antenna design since it is widely acceptable in various applications. The various design is introduced with modifications in recent Microstrip Antenna Structures with modifications like different shapes, use of neutralized structure, defected ground structures. Some of the papers related to UWB antenna design is discussed in this section.

[1] **Ajay Kumar Dwivedi, Anand Sharma, Akhilesh Kumar Pandey, Vivek Singh:** The presented 2-port MIMO antenna has two T shaped radiating elements placed in front of each other and energized by the 50 Ω SMA connectors. Rectangular ring shape ground plane and T shaped radiators are designed on the top side of the FR-4 substrate having attributes ($\epsilon_r = 4.4$, $\tan\delta = 0.019$, and thickness of 0.8 mm). Modeling, simulation, and optimization of the proposed antenna are carried out by

Ansys HFSS 18 electromagnetic solver. In order to achieve the proposed design firstly, we take a simple rectangular patch antenna with a grounded substrate represented as antenna 1. In the second step, the ground plane of rectangular shape has converted into a rectangular ring and shifted on the top side of the substrate where the patch antenna is already printed, which originates antenna 2. Parametric variation is executed on the width of the patch in antenna 2 to enhance the bandwidth and for the attainment of circular polarization. This parametric variation

changes the width of the antenna from 10 to 2 mm results in antenna Proposed antenna 4 is obtained from antenna 3 by incorporating a rectangular slot of 3 mm on the rectangular ring shape ground plane in the appropriate position. Based on minimum return loss, maximum IBW, and maximum 3-dB ARBW findings the antenna 4 is considered as an optimum antenna for MIMO design.

[2] **M. Paranthaman, S.Palanivel Rajan:** This rectangular antenna is made of FR4 substrate with a relative permittivity of 4.4 and thickness of 1.6mm. The radiator is made of copper. The use of FR4 is because of the good strength to weight ratios and very negligible water absorption. This is also very biocompatible and goes hand in hand with our application requirements. The main reason of going for FR4 is that it has no radiation. The design of this rectangular antenna comprises of various rectangles of various dimensions. The outer rectangle measures 900mm² (30*30) in area. The inner rectangles are of dimensions 94.09mm² (9.7*9.7). Here the excitation is done through the port which is a lumped port. Antenna design requirements: This antenna does not operate in free space but operate in the human body. In order to do so, there are certain requirements which are patient safety, good communication, biocompatibility, low power consumption and long life. Patient safety: The ISM band frequency that is recommended for patient safety is 2.4 to 2.5GHz and MICS recommends 401 to 406MHz. SAR values should be considered. Communication: The implantable antenna that fit inside the body is the transmitting antenna and the off-body devices are the receiving end.

[3] **Derin Arda Şahin, Adnan Kaya:** In this article a dual-band microstrip antenna resonating at 2.4 GHz and

5 GHz frequencies is designed for use in Wi-Fi applications. The overall dimensions of the antenna are 29 x 26 x 1.6 mm³. For the antenna to operate at two different frequencies, the antenna is printed on the substrate of FR4 with two C-shaped strips and a microstrip feed line on the front side. L-shaped slot in ground plane. While the bandwidth of antenna at 2.45 GHz resonance frequency is 140 MHz (2.38-2.52 GHz), the bandwidth obtained at 5 GHz resonance frequency is 552 MHz (4.78-5.34 GHz).

[4] **Ankit kumar Patel, Akhilesh Kumar Pandey, Shekhar Yadav, Komal Jaiswal, Rajeev Singh:** This paper presents a compact multiband micro strip patch antenna with defected ground structure (DGS). The patch and ground are made on top and back side of the FR-4 substrate. The designed antenna has multiple resonating bands because of a loaded slot on ground plane. Designed antenna operates in the frequency bands of 16.9–21.1 GHz, 23.4–25.1 GHz and 28.65–37.56 GHz with centre frequencies of 20, 24, and 32 GHz respectively. The fractional bandwidth of designed antenna is 21%, 7%, and 27.8% at centre frequencies orderly. These resonating bands are applicable in surface movement radars (SARs) and satellite communications. The group delay of the proposed antenna is in the range of -0.5 n-sec to 0.5 n-sec for all bands. It is shown that the designed antenna has appropriate gain and good radiation efficiency over operating bands. The frequency ratio of antenna for proposed dimension is above 1.2 and VSWR is below 2 for all bands. Keywords: DGS, multiband antenna, SAR antenna, HFSS.

III. PROBLEM STATEMENT

In order to Increase the capacity of a wireless communication channel a single antenna element is not enough, this issue could be solve using MIMO.

By having multiple antennas in a closely packed system, the problem of mutual coupling is a very challenging issue.

In order to improve the mutual coupling, normally the antenna elements are spaced farther apart to reduce their effect on each other. However, this results in increasing

the size of the structure.

Designing a MIMO antenna for point-to-point communication, which requires antenna with high gain, precise directivity and high efficiency, is also challenging work.

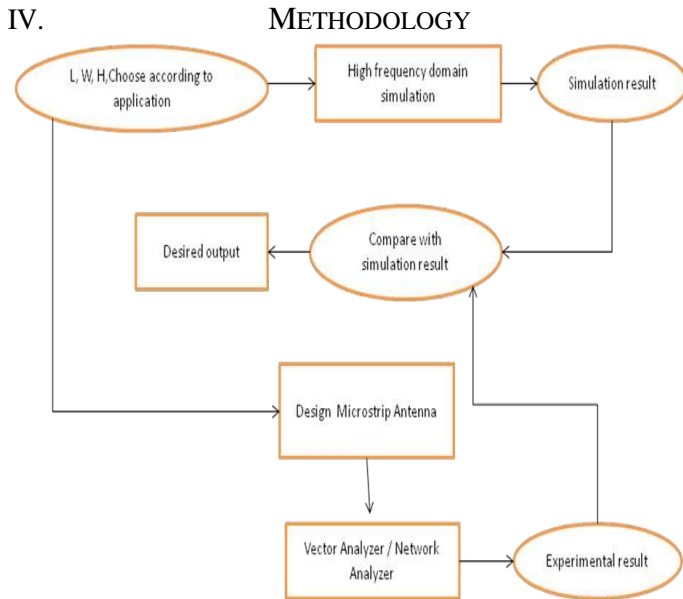


Fig1 Block diagram

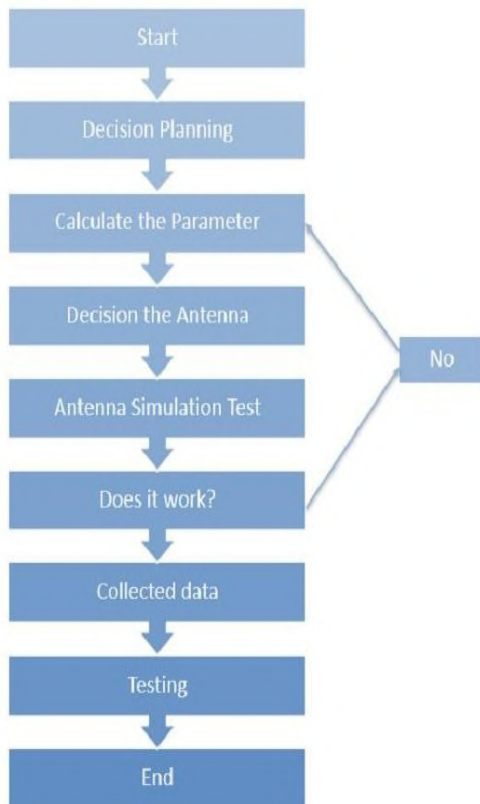


Fig2. Flow Chart

V. Figures and Tables

Fig3.Front View Of Antenna

| parameter | Length(L) | Width(W) | Height(H) |
|-----------------|-----------|----------|-----------|
| Patch | 2mm | 17mm | - |
| Ground 1 | 30mm | 4mm | - |
| Ground 2 | 30mm | -4mm | |
| Defected Ground | -2mm | -29mm | |
| Substrate | 30mm | 37mm | -1.6 |

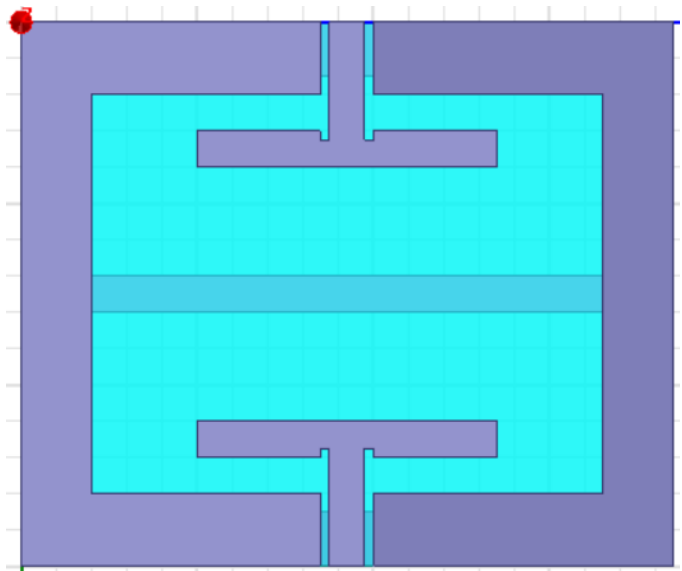
Table Antenna Parameter Value

VI. Abbreviations

MIMO Multiple Input Multiple Output

UWB Ultra-Wideband

HFSS High Frequency Structure Simulator



VII. CONCLUSION

The MIMO antenna is designed using HFSS. The result shows that it has minimum return loss in the frequency range of 5 GHz. Multiple-input multiple-output, or MIMO, is radio communications technology or RF technology that is being mentioned and used in many new technologies these days. Wi-Fi, LTE (3G long term evolution) and many other radio, wireless and RF technologies are using the new MIMO wireless technology to provide increased link capacity and spectral efficiency combined with improved link reliability using what were previously seen as interference paths.

| Operating Frequency (GHZ) | Return Loss (DB) |
|---------------------------|------------------|
| 4.98 | -17.02 |
| 8.87 | -16.23 |
| 14.02 | -15.48 |
| 4.68 | -10.06 |
| 5.42 | -10.01 |
| 8.76 | -10.19 |
| 9.00 | -9.96 |
| 13.53 | -10.17 |
| 14.68 | -9.92 |

Table2 Return loss for various operating frequencies

VIII. RESULT

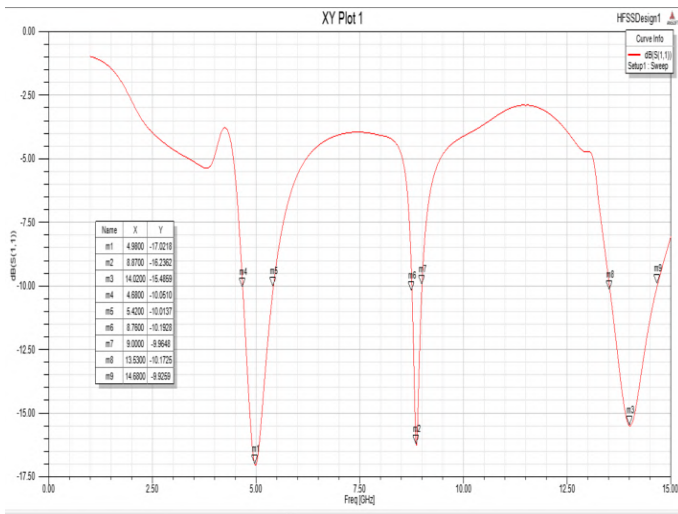


Fig4 Return loss of proposed antenna

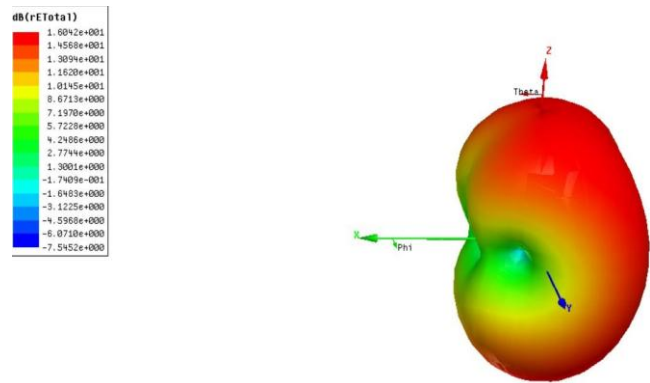


Fig5 Total Electric Field

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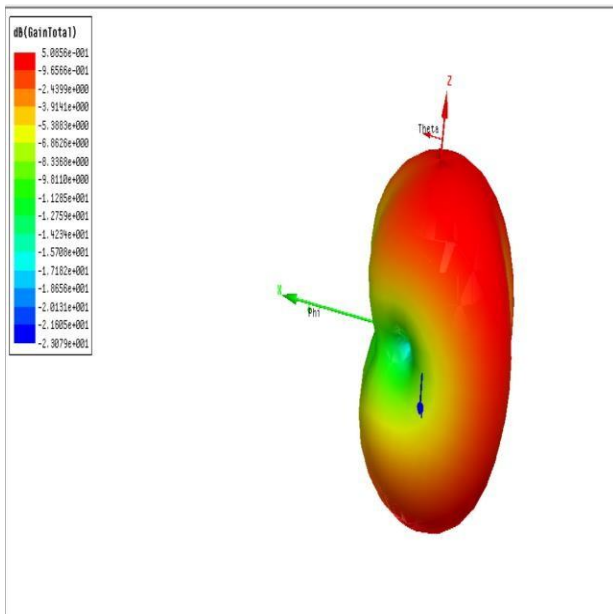


Fig6 Total Gain in dB

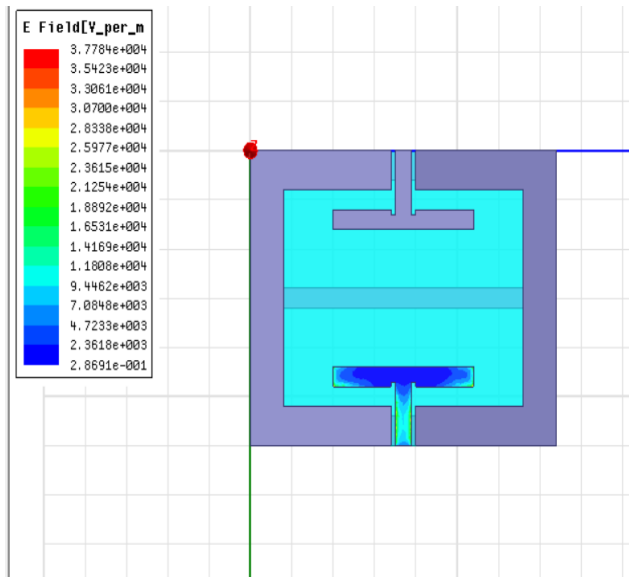


Fig7 Magnitude of e field on patch

IoT based Weather Monitoring System

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Abstract - The technology suggested in this research is a cutting-edge method for tracking local meteorological conditions and making the data available anywhere in the world. Internet of Things (IoT), a cutting-edge and effective method for tying everything in the world of things together in a network, is the technology that underpins this. With the use of sensors, the system keeps tabs on environmental factors including temperature, humidity, pressure, soil moisture, and rain. It uploads the information to the cloud and plots the sensor data as percentages. Anywhere in the world can access the updated data from the established system over the internet.

Index Terms: IoT (Internet of Things), Node MCU, Smart environments, Temperature and Humidity sensor, Wi-fi

I. INTRODUCTION

A college campus or any other particular facility is just one site where people would wish to be aware of the most recent weather conditions. Given how swiftly the globe is changing, weather stations should be present. In this post, we provide a weather monitoring technique that is very beneficial everywhere. This weather monitoring system is IOT-based. It features sensors for the surroundings that may be used to collect data wherever it is. To do this, we combined the Node MCU with numerous environmental sensors, such as the BMP180, DHT11, soil moisture sensor, and rain sensor. These sensors continuously sense the weather and report it to the internet web server using a Wi-Fi connection. The weather parameters are uploaded to the cloud.

II. LITERATURE REVIEW

[1] "Weather Monitoring System using Internet of Things." By R. Kavin; K. Lakshmi; S.Sheeba Rani; K. Rameshkumar

IoT is the technology used for monitoring, collecting, controlling, and connecting the system to worldwide, which is the more effective and cutting-edge solution for accessing the information in the world. The system proposed for monitoring weather conditions in a specific

place like temperature, humidity, and CO Level using sensors, sensors detect changes in environment and send it to the users for making statistical analysis.

[2] "Multimodal GAN for Energy Efficiency and Cloud Classification in Internet of Things".By Shuang Liu; Mei Li.

A major challenge for the Internet of Things (IoT) is the efficient processing of massive amounts of multimodal sensor data. For IoT applications that include weather and climate monitoring, accurate cloud classification is essential. In this paper, we present a unique multimodal generative adversarial network (Multimodal GAN) to enhance the IoT's cloud classification accuracy as well as energy efficiency. The feature representations obtained from the classification model capture the essential details of the original multimodal cloud data, making them suitable for IoT storage and transmission. The multimodal dataset is used to validate the proposed method's efficacy in energy efficiency and cloud classification.

[3]"Remote Access Weather Monitoring System Based on Soft Real-Time System (SRTS)" By Megatar Wahyu Ningrum Handani; Giva Andriana Mutiara; Devie Ryana Suchendra.

This study creates a mobile application that can deliver real-time weather data for a specific region. Despite considerable study being done, the program is still unable to accurately and instantly deliver straight meteorological information from the desired location. DHT11 sensors, rain sensors, LDR sensors, BMP 280 sensors, and IP cameras were used in the system's design. Soft Real-Time System (SRTS) is the real-time idea that is utilized. According to the testing procedure carried out at various periods, we have temperature variation of 220 °C - 380 °C, humidity 10%-70% RH is

produced, and the system's response time is in the range of 151 ms - 157 ms. This information was then compared to information from several weather forecasting applications in various mediums. Sending and storing data

[4]“IoT Based Weather Monitoring System for Smart Cities: A Comprehensive Review” By Samridhhi Banara; Teena Singh; Anamika Chauhan.

The Internet of Things (IoT) is a new paradigm that seeks to integrate all intelligent physical objects so that they will always provide intelligent and cognitive solutions to people. In the current era of research and technology, the IoT has played a significant role in the development of applications in various fields such as health, education, smart cities, homes, agriculture, and so on.

[5]“Internet of Things (IoT) enabled water monitoring system” By Thinagar Perumal; Md Nasir Sulaiman; C. Y. Leong.

Everyday living always requires access to water. Due to the current state of the ecosystem, water management and conservation are essential for human survival. Using Internet of Things (IoT) technology, there has recently been a great need for consumer-based humanitarian projects that might be quickly produced. In this study, we suggest a real-time water level monitoring system built on the Internet of Things. Our prototype is based on the notion that, especially in disaster-prone locations, water levels can be a crucial factor in determining when and where there will be floods. When a desired parameter is detected by a water level sensor, a real-time signal is sent to a social network like Twitter if the water level meets the desired value.

III. PROBLEM STATEMENT

The earlier Monitoring System described in literature has drawbacks. In this situation, it is crucial to develop an effective and low-pass weather monitoring system that can measure variables like temperature, air pressure, humidity, wind speed, and wind direction.

IV. METHODOLOGY

This project will measure the parameters of humidity, temperature, soil moisture, rainfall, and pressure and show the results on the Blynk application, making it an Internet of Things (IoT) based weather monitoring system that enables weather conditions to be checked online from any location.

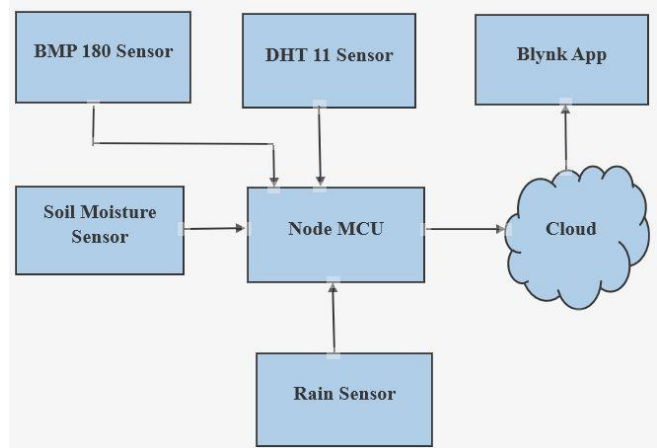


Fig.1. Block Diagram

A. Working:

The components of this ecosystem are the ESP8266 module, the DHT11 sensor, the BMP180 sensor, the rain sensor, and the soil moisture sensor as shown in figure 1.

The Node MCU board serves as the project's brain, and all of the sensors have both digital and analogue outputs for collecting data on the local surroundings and weather. The 2.4GHz Wi-Fi spectrum is utilized by a generic Node MCU to connect the cloud and sensors to the internet.

A calibrated digital output is produced by the DHT11 sensor, which detects the temperature and humidity. With great reliability and long-term stability, DHT11 provides us with extremely precise humidity and temperature readings. Any microcontroller, including Arduino, Raspberry Pi, Node MCU, etc., may readily communicate with this sensor. Instantaneously, it measures temperature and humidity.

Pressure Sensor BMP180. It has an I2C interface and measures barometric pressure. This sensor

records the surrounding air's absolute pressure. The weather affects the absolute pressure levels. It relies on how you analyze the information and how you can quickly keep track of weather changes.

One of the switching devices is a rain sensor. This is employed to measure rainfall. It functions like a switch, and its operating premise is that if it rains, the switch is generally closed, and when it doesn't, the switch is normally open. The amount of water in the soil is measured using a soil moisture sensor.

The data from these sensors will be collected and sent to the cloud by Node MCU. The output will then be shown in the cloud using the Blynk App.

B. Flowchart

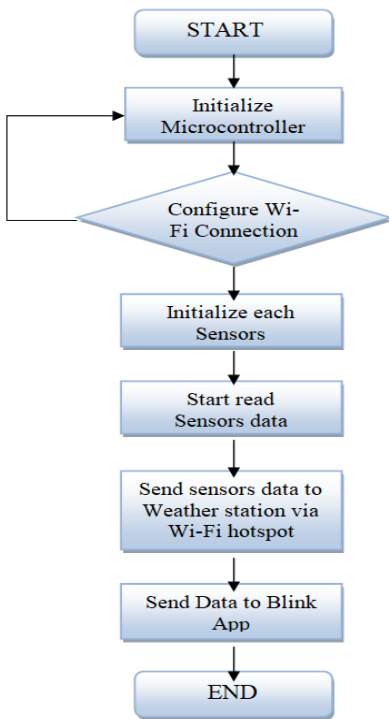


Fig.2 Block Diagram

V.RESULT

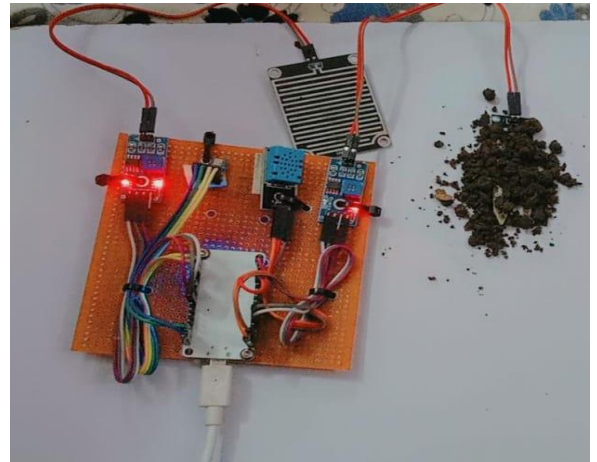


Fig.3 Setup of Proposed System

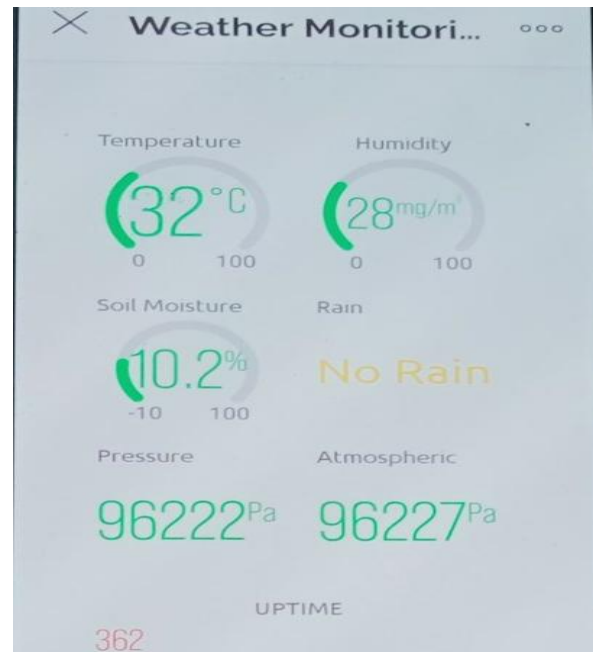


Fig.4 Result on Blynk App

CONCLUSION

The environment may be monitored using this equipment, which also allows for self-defense. The environment must have sensor devices deployed for data collection and processing in order to implement this. We can make the environment more interactive by placing sensor devices there, allowing it to communicate with other items across a network and become more real-world. In this research, many embedded system models are provided together with an intelligent method of environment monitoring. Functions of several modules were described in the suggested architecture.

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Alcohol Detection and Automatic Engine Speed Control For drunken Driver

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Abstract—In this project, the Arduino UNO is used to create and implement an alcohol detection system with engine locking for automobiles. The device will continuously check the alcohol detection sensor's level of concentration and, if it rises above a certain level, will shut off the vehicle's engine. The method that enables an Arduino board with an alcohol sensor immediately locks the vehicle's motor. The technology then enables entering the user's numbers into the program first. And by applying the necessary voltage, the input triggers were perceived by the driver, who was intoxicated by alcohol levels over the legal limit. The concept offers a practical way to reduce accidents caused by intoxicated driving.

I. Introduction

When you open the newspaper, reading about a car accident is not unusual.

According to a 2010 WHO analysis, India actually sets the global record for the number of annual traffic accidents. India experiences approximately 1,34,000 fatal traffic accidents each year. The most alarming statistic is that alcohol intake accounts for 70% of these, according to a 2011 study. In this project, we'll cover how to use an Arduino to create an alcohol sensor. The MQ-3 sensor will be the alcohol sensor we employ. Not only is this sensor sensitive to alcohol, especially ethanol, which is the form of alcohol found.

II. Literature Review

The papers surveyed for literature are as follows:

[1] An productive resolution is provided to evolve the brainly system for car that will monitor miscellaneous parameters of overcome by alcoholic liquor constant level and will please this overcome by alcoholic liquor to the base unit has made clear in this paper, by utilizing hardware principle who's core is Arduino, alcohol sensor mq3 the whole control method has the advantage of breadth of view and extreme

reliability future outlook concerning this system search out control the accident and providing beneficial analyses about the accidental car, through reducing the accidents happen on account of drunk driving. This arrangement influences innovation to the existent science in the car and also upgrades the security lineaments, hence trying expected an effective incident in the car manufacturing.

[2] All types of vehicles need to establish an ignition interlock device or breath alcohol ignition interlock device installed in order to prevent drunk drivers. It is a form of breath analyzer that can determine how much alcohol a driver has consumed, but because it is a prototype module, a basic alcohol detector is employed in this project work, and the findings are determined to be satisfactory. Currently, it is useful for our traffic police employ breath analyzers that often need the motorist to blow into a mouthpiece in order to detect intoxicated drivers.

[3] In this paper an active resolution to resolve the issue like drunk and drive demands a direct bright whole for car that monitors the alcohol consumption for drunken driver. Here the information is alcohol sensor and if the driver is drunk intoxicating the engine will be secured certainly by turned off the engine and an warming idea is presented on the LCD display and having level of alcohol to the webpage by utilizing ESP8266 Wi-Fi module on NodeMCU board.

[4] A persuasive answer is provided to cultivate the inventive system for automobiles that will monitor miscellaneous parameters of car in constant and will this overcome by alcoholic liquor to the base unit has made clear in this place paper, by utilizing

hardware whose core is Arduino alcohol sensor mq3. the whole control order has the advantage of limited book extremere reliability. Future purview concerning this system search out control the accidents and providing beneficial analyses about the accidental car, with reducing the rate of accidents happen on account of drunk driving this scheme leads innovation to the existent electronics in the car and also helps the security face, hence trying expected an effective happening in the car manufacturing.

[5] Many procedures and methods are employed to prevent accidents brought on by drivers who have consumed too much alcohol. There are typically several various approaches, some of which include locking the steering, using an ignition interlock, using a vehicle interlock system, and many others. The technique involves a number of factors, some of which include cost, look, application of the approach, and many others. In this paper study, we have made every effort to identify the ideal threshold at which we can impose restrictions on the driver in the event that excessive alcohol consumption has him unconscious. On a daily basis, traffic accidents can be avoided in this way. Utilizing such a method, the rate of traffic accidents can reduce.

III. Problem Statement

Accidents caused by intoxicated driving are a significant contributor to fatalities on Indian roadways. This occurs as a result of inebriated drivers being able to seize control of a car. In our proposal, we propose to address this issue by developing a system that shuts off the car's engine automatically whenever a certain amount of alcohol is found in the driver's breath. The microcontroller immediately stops the vehicle's engine when alcohol is found, and a siren is blown to notify people in the area that something is wrong with the vehicle.

Block Diagram

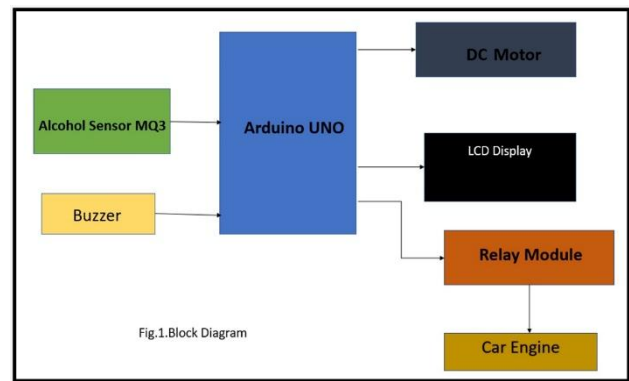


Fig.1 Block Diagram

Working

This project makes use of a small Arduino Uno board, and it develops microcontroller programmers. Because it focuses on preventing drunk driving, it also includes a DC motor, an Arduino board, an LCD display, a relay module, a buzzer, and a resistor. The LCD display is used to show the amount of alcohol present in the driver's breath while the MQ3 sensor is used to detect alcohol. Arduino is used for programming and interface purposes. When a driver tries to operate the vehicle while overly intoxicated, this sensor is mounted on the fitted in car steering. sensor senses the presence of alcohol and when the percentage level is above the stated value a signal will be send to Arduino. Of that signal the engine working will stop. in this project we have set the percentage level of alcohol is 35% or a 40%.

Components

1 Arduino-

Arduino is a original floor(open-beginning) based on an smooth-to-use fittings and operating system. It resides of a motherboard which is compute (refer to as a microcontroller) and a more prepared spreadsheet called Arduino /IDE (integrated Development Environment), that is used to compose and transfer the calculating rule to the physical board.



LCD display used to display the message. driver is drunken or not and he drunk then how many percent drunk the drink and display the percentage of LCD display.



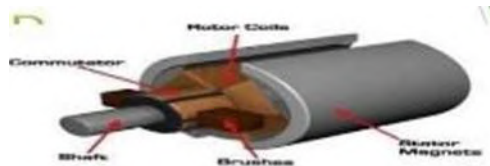
2 Alcohol MQ3 Sensor-

Alcohol MQ 3 sensor is sensing the when a drunk person breathes near the alcohol sensor it detects the ethanol in his breathe and provides an output based on alcohol concentration



DC motor-

gear motor is used with 12 volt, 100rpm and weight 125gms



Buzzer-

Buzzer is a output audio signal



3 Relay-

A transmit is an electromagnetic switch that is to say used to excite and disgust a circuit by a reduced capacity signal, or place various circuits must be conditional individual signal. We know that most of the extreme end modern request schemes have relays for their productive active.



Expected Outcome

The goal of the research is to create a system that can detect the presence of alcohol in the driver's exhaled air and shut off the vehicle. The microcontroller receives information about alcohol from the alcohol sensor, warns users of the condition it has detected using a buzzer, and

4 LCD Display-

switches off the vehicle's motor automatically using a relay

IV. Conclusion

We have provided an extraordinarily capable method of dealing with the issue and have developed a smart system for cars to reduce the amount of accidents Sbrought on by drunk driving. People are beginning to realize how important car security is on a daily basis. The structure's ultimate goal is to reduce the negative effects of alcohol consumption. By enhancing personal safety, this technology contributes to the automotive industry's convincing advancement in the reduction of accidents related to driving.

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- ALCOHOL SENSING AND AUTOMATIC ENGINE LOCKING SYSTEM”

Digital Stethoscope for Teaching and Telemedicine

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Abstract— This article explores the development of a digital stethoscope that amplifies and filters heart and lung sounds captured from the skin's surface to produce signals above the audible threshold. The amplified signals are then processed and played through a speaker for clear listening. Additionally, the signals are sampled, digitized, and analyzed through the Fourier Transform to obtain time and frequency characteristics, and the heart rate is calculated. One of the most notable features of this digital stethoscope is its real-time display of Phonocardiogram (PCG) waveforms on a monitor. This allows healthcare professionals to visually analyze the time and frequency characteristics of heart and lung sounds, aiding in the diagnosis of various cardiac and respiratory conditions. The PCG waveforms are obtained through Fourier Transform analysis of the digitized signals, providing valuable diagnostic information that can assist in the accurate treatment and management of patients. This digital stethoscope is designed with user-friendliness in mind, ensuring that healthcare professionals can easily and effectively use the device during auscultation. This results in a more pleasant and rewarding experience for both healthcare professionals and patients, while also improving the accuracy of diagnoses and treatment outcomes.

Index Terms— Digital Stethoscope, PCG, Stethoscope, Medical Technology, Diagnosis.

I. INTRODUCTION

The heart is one of the most vital organs in the human body, responsible for pumping blood to all the other organs and tissues. Any damage or disease to the heart can lead to severe health consequences, including death. Therefore, it is crucial to take care of the heart and diagnose any issues promptly. This article aims to explore the importance of the heart, heart diseases, the use of stethoscopes, and how PCG helps in heart diagnosis. The heart is a muscular organ that pumps blood throughout the body. It is responsible for supplying oxygen

and nutrients to the body's tissues and organs, ensuring that they function correctly. A healthy heart is essential for overall health and well-being. Heart diseases refer to a range of conditions that affect the heart's function. These conditions can range from minor issues to severe, life-threatening diseases. Common heart diseases include coronary artery disease, heart failure, arrhythmia, and heart valve disease. A stethoscope is a medical device that doctors and other healthcare professionals use to listen to the sounds produced by the heart and lungs. Stethoscopes help healthcare professionals identify any abnormalities in the heart's rhythm, rate, and sound, indicating potential health problems. They are crucial diagnostic tools that can help healthcare professionals diagnose heart diseases early, enabling timely treatment and management. Stethoscopes work by amplifying and transmitting the sounds produced by the heart and lungs. They consist of a chest piece, which is placed on the patient's chest, and a set of earpieces, which the healthcare professional uses to listen to the sounds. When the chest piece is placed on the patient's chest, it picks up the sounds produced by the heart and lungs and amplifies them. The amplified sounds are then transmitted through the tubing to the earpieces, where the healthcare professional can listen to them. Phonocardiography (PCG) is a diagnostic tool that uses a digital stethoscope to record and analyze the sounds produced by the heart. PCG is useful in diagnosing heart diseases because it can detect abnormalities in the heart's sound and rhythm that may not be apparent through other diagnostic tools. PCG waveforms provide valuable information about the time and frequency characteristics of heart sounds, which can aid healthcare professionals in diagnosing various cardiac conditions. Traditional stethoscopes are the most common type of stethoscope used by healthcare professionals. They consist of a chest piece, a set of tubing, and a set of earpieces. Traditional stethoscopes work by amplifying and transmitting the sounds produced by the heart and lungs. They are simple to use, inexpensive, and reliable, making them a popular choice for healthcare professionals. digital stethoscopes also have a user-friendly design that makes the auscultation

experience more pleasant for both healthcare professionals and patients. The earpieces are often made from soft materials that provide a comfortable fit, and the chest piece is designed to reduce ambient noise and prevent discomfort for the patient. Digital stethoscopes are particularly useful for diagnosing heart conditions, as they can detect subtle changes in heart sounds that traditional stethoscopes may miss. The PCG waveform display is an essential feature that allows healthcare professionals to diagnose and monitor conditions such as heart murmurs, valve abnormalities, and arrhythmias. Additionally, digital stethoscopes can help to distinguish between normal and abnormal heart sounds, making it easier for healthcare professionals to make accurate diagnoses. Despite their many advantages, digital stethoscopes are not yet widely used in all healthcare settings. Traditional stethoscopes are still the primary diagnostic tool in many healthcare facilities due to their lower cost and widespread availability. However, as the technology continues to advance, and the benefits of digital stethoscopes become more widely recognized, it is likely that they will become more commonly used in healthcare settings. Digital stethoscopes are a valuable diagnostic tool that offer several advantages over traditional stethoscopes. They provide accurate, real-time PCG waveform displays, record and playback features, telemedicine integration, and a user-friendly design. Healthcare professionals can use digital stethoscopes to diagnose and monitor a range of heart conditions more accurately, leading to improved patient outcomes. As technology continues to advance, digital stethoscopes are likely to become more commonly used in healthcare settings, improving the accuracy and efficiency of heart disease diagnosis and treatment.

II. LITERATURE REVIEW

Digital stethoscopes have been rapidly gaining popularity among healthcare professionals due to their numerous advantages over traditional stethoscopes. One of the main advantages of digital stethoscopes is their ability to amplify and filter heart and lung sounds, making it easier to detect subtle abnormalities that may not be audible with a traditional stethoscope. This can be especially helpful in noisy environments or for healthcare professionals with hearing difficulties. Another advantage of digital stethoscopes is their ability to record and store heart and lung sounds, allowing for later analysis and sharing with other healthcare professionals for consultation. This feature has led to the development of telemedicine applications, where healthcare professionals can remotely monitor patients and diagnose conditions without the need for physical visits. This is particularly useful in rural or remote areas where access to healthcare is limited. Digital stethoscopes have also been shown to be effective in paediatric care, where traditional stethoscopes may not be appropriate due to the small size of the patient. The ability to amplify and filter heart and lung sounds can make it easier to diagnose conditions in children, and the ability to record and share sounds can facilitate consultation with paediatric specialists. The use of digital stethoscopes has also been

explored in the field of sports medicine, where they can be used to monitor the cardiovascular and respiratory health of athletes. This can help detect early signs of overtraining or fatigue, and can be useful in preventing injuries and improving performance. Digital stethoscopes have revolutionized the way healthcare professionals diagnose and monitor heart and lung conditions. Their ability to amplify, filter, record, and share heart and lung sounds has opened up new possibilities for remote patient monitoring, pediatric care, sports medicine, and other fields. As technology continues to advance, it is likely that the potential applications of digital stethoscopes will continue to expand.

Furthermore, the use of digital stethoscopes in combination with artificial intelligence (AI) and machine learning algorithms has also been explored in recent research. By analysing large amounts of heart and lung sounds, these algorithms can identify patterns and markers that indicate certain conditions or diseases, such as heart murmurs or lung disorders. This has the potential to significantly improve the accuracy and efficiency of diagnosis, as well as enable early detection of diseases that may otherwise go undiagnosed until later stages. Digital stethoscopes also have the potential to improve patient outcomes by enabling remote monitoring of chronic conditions such as heart failure, chronic obstructive pulmonary disease (COPD), and asthma. By monitoring patients' heart and lung sounds remotely, healthcare professionals can detect early signs of exacerbations or complications and intervene promptly, potentially preventing hospitalizations and improving outcomes. The integration of digital stethoscopes with electronic health records (EHRs) also offers numerous benefits, including improved accuracy and efficiency of documentation and easier tracking of patient progress over time. This can help healthcare professionals make more informed decisions about patient care and enable better communication among healthcare teams. However, despite the numerous advantages of digital stethoscopes, there are also some limitations to their use. One potential limitation is the cost, as digital stethoscopes are generally more expensive than traditional stethoscopes. Additionally, some healthcare professionals may prefer the tactile feedback and familiarity of traditional stethoscopes. It is also important to ensure that digital stethoscopes are properly calibrated and maintained to ensure accurate and reliable results. The potential applications of digital stethoscopes are vast and have the potential to transform the way healthcare professionals diagnose and monitor heart and lung conditions. With ongoing research and development, digital stethoscopes are likely to continue to evolve and improve, further expanding their potential applications and benefits for patient care. Moreover, pediatric care presents a unique challenge due to the differences in anatomy and physiology compared to adults. The paper discussing the design and development of a digital stethoscope for pediatric patients emphasized the device's child-friendly design and advanced signal processing algorithms that allow for accurate heart and lung sound analysis. This design innovation holds immense potential for

improving the accuracy of heart disease diagnosis in pediatric patients, making it an essential tool for pediatricians. Finally, the review of signal processing techniques used in digital stethoscopes highlighted the significance of this area in digital stethoscope design. Signal processing techniques such as filtering, amplification, and noise reduction play a crucial role in the accuracy and efficiency of heart sound analysis. Moreover, the incorporation of machine learning techniques such as backpropagation neural networks in digital stethoscope design has proven to be a promising approach for detecting the presence of abnormal heart sounds. The potential applications of digital stethoscopes are vast, and the reviewed papers suggest that these devices have the potential to revolutionize the diagnosis and monitoring of heart and lung conditions. Digital stethoscopes have advanced signal processing algorithms and high-quality microphones that improve heart and lung sound analysis accuracy. They have numerous applications in healthcare, from remote patient monitoring to paediatric care.

III. METHODOLOGY

Heart disease is one of the leading causes of death worldwide. Therefore, it is essential to diagnose heart diseases at an early stage to prevent them from becoming fatal. One of the commonly used methods for diagnosing heart diseases is auscultation. Auscultation involves listening to the sounds produced by the heart using a stethoscope. However, traditional stethoscopes may not be sensitive enough to detect all heart sounds. This is where digital stethoscopes can prove to be beneficial. The digital stethoscope used in this project comprises an acoustic sensor, an Arduino board, and a computer with MATLAB software installed. The acoustic sensor used is a sensitive microphone that can capture even the slightest heart sounds. The sensor is placed on the chest, near the heart, and records the sounds produced by the heart. The recorded sound is then transferred to an Arduino board for processing. The Arduino board is a microcontroller that can perform various tasks, including digital signal processing. In this project, the Arduino board is used to remove noise from the recorded sound and amplify the signal. This ensures that only the relevant heart sounds are analyzed and that the signal is strong enough for further processing. The processed sound is then played back through a speaker, allowing the user to hear the sound of their heart. This can be useful for detecting any abnormalities in the sound of the heart. However, the real power of the digital stethoscope lies in the analysis of the sound signal using digital processing. The signal is converted into a form that can be analyzed using digital processing. This involves using techniques such as Fourier transforms to convert the sound signal into a series of frequency components. The frequency components can then be analyzed to identify any abnormalities in the heart sounds. This analysis is done using phonocardiography (PCG) techniques. PCG involves analyzing the sound produced by the heart and using it to diagnose various heart conditions. The PCG signal is used to display the waveform of the heart sound on a monitor. This

allows the user to visualize the heart sound and identify any abnormalities that may not be easily audible. Finally, MATLAB is used to process and analyze the PCG signal. MATLAB is a programming language that is commonly used for data analysis and visualization. It is used in this project to analyze the PCG signal and display the waveform on a monitor. MATLAB provides powerful tools for data analysis and can be used to identify specific patterns in the heart sound that may be indicative of various heart conditions.

In conclusion, the digital stethoscope is a powerful tool for diagnosing heart diseases. It allows for more accurate detection of heart sounds and provides a visual representation of the heart sound waveform. The use of digital processing and PCG techniques can help identify abnormalities in the heart sound that may not be easily audible. This can aid in the early diagnosis and prevention of heart diseases, ultimately saving lives.

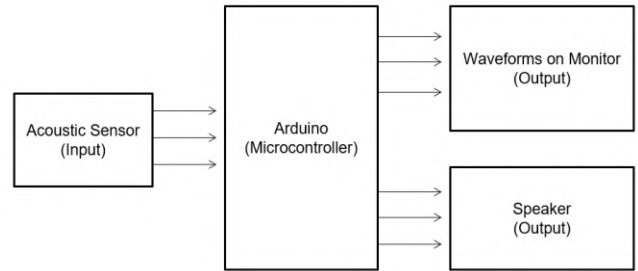


Fig. 1: Block Diagram

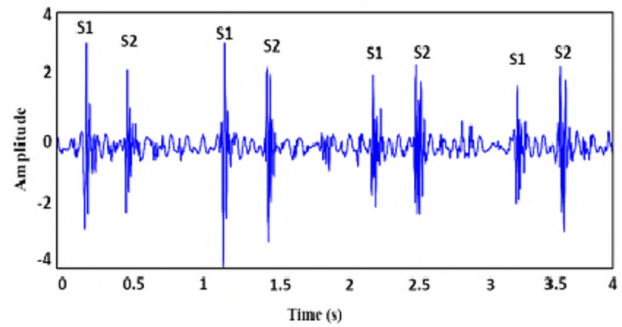


Fig. 2: PCG Signal



Fig. 3: Existing Digital Stethoscope

IV. RESULT

The results of this research project demonstrate the effectiveness of using a digital stethoscope for diagnosing heart diseases. The acoustic sensor used in the digital stethoscope was found to be highly sensitive and capable of capturing even the slightest heart sounds. This makes it a powerful tool for detecting heart abnormalities that may be missed using traditional stethoscopes. The use of digital signal processing techniques on the recorded sound signal was found to be effective in removing noise and amplifying the relevant heart sounds. The processed sound was played back through a speaker, allowing the user to hear the sound of their heart and identify any abnormalities. The real power of the digital stethoscope lies in the analysis of the sound signal using digital processing. The signal was converted into a form that could be analyzed using PCG techniques. The PCG signal was used to display the waveform of the heart sound on a monitor. The visualization of the heart sound waveform allowed the user to identify any abnormalities that may not be easily audible. This makes the digital stethoscope an effective tool for early diagnosis and prevention of heart diseases. The use of MATLAB for processing and analyzing the PCG signal was found to be effective. MATLAB provided powerful tools for data analysis and visualization, allowing for the identification of specific patterns in the heart sound waveform that may be indicative of various heart conditions.

Overall, the use of a digital stethoscope with digital processing and PCG techniques can aid in the early diagnosis and prevention of heart diseases, ultimately saving lives. Further research can be done to explore the potential of digital stethoscopes in detecting specific heart conditions and developing algorithms for automated diagnosis.

V. ADVANTAGES AND DISADVANTAGES

Digital stethoscopes have become increasingly popular in recent years due to their potential advantages over traditional acoustic stethoscopes. However, they also have some limitations and drawbacks. Let's take a closer look at the advantages and disadvantages of digital stethoscopes. Digital stethoscopes offer numerous advantages over traditional stethoscopes. Firstly, they have advanced sound sensors and signal processing technologies that significantly improve sound quality. Digital stethoscopes can detect and amplify even the faintest sounds, making it easier for medical professionals to diagnose heart and lung problems. In addition, the ability to filter sound signals enhances sound clarity, allowing for easier distinction between different sounds produced by the body. This feature is especially useful for diagnosing respiratory conditions, where different sounds may indicate different types of respiratory diseases. Secondly, digital stethoscopes can record and store sound signals for future reference and analysis. This is beneficial for doctors who need to review patient information or for training purposes. The recorded sound signals can be analysed later, allowing for a more comprehensive diagnosis of the patient's condition. Digital stethoscopes can also help in monitoring a patient's progress over time by comparing the recorded sound signals from different time periods. Thirdly, some digital stethoscopes come with Bluetooth or Wi-Fi connectivity, enabling real-time monitoring and analysis of sound signals on a computer or mobile device. This is especially useful in emergency situations, where medical professionals need to make quick decisions and require real-time monitoring of sound signals.

Digital stethoscopes offer many advantages over traditional stethoscopes, but they also have some limitations. One significant disadvantage is their higher cost, which may limit their use, particularly in low-resource settings. Additionally, digital stethoscopes rely on batteries for operation, and their battery life may be limited, which can be problematic in situations where charging facilities are limited. Furthermore, digital stethoscopes are more fragile than traditional stethoscopes, which makes them more susceptible to damage if mishandled. Finally, medical professionals who are accustomed to traditional stethoscopes may require additional training to effectively use digital stethoscopes, which may slow down adoption and use.

VI. CONCLUSION

The conclusion of the project highlights the significance of digital stethoscopes in diagnosing heart diseases, which is crucial in preventing fatal outcomes. The project utilized a digital stethoscope comprising an acoustic sensor, an Arduino board, and MATLAB software for signal processing and analysis. By using digital processing and phonocardiography (PCG) techniques, the project was able to identify heart abnormalities that may not be easily audible. The visualization of the heart sound waveform proved to be a powerful tool for data analysis and helped in identifying specific patterns in the heart sound that may be indicative of various heart conditions. Digital stethoscopes have the potential to revolutionize the way doctors diagnose heart diseases. They offer several

benefits over traditional stethoscopes, including the ability to amplify sounds and filter out background noise, record and store sounds for later analysis, and visualize the sound waveform. Furthermore, digital stethoscopes can be integrated with telemedicine systems, allowing doctors to remotely monitor patients' heart sounds, especially those in remote or underserved areas. However, the accuracy and effectiveness of digital stethoscopes in diagnosing heart diseases in clinical settings need to be validated through further research. While digital stethoscopes have shown promising results in detecting heart abnormalities in laboratory settings, their effectiveness in real-world scenarios is yet to be determined. The reliability and consistency of digital stethoscopes' performance should also be evaluated to ensure their accuracy and effectiveness in clinical practice. In conclusion, the potential of digital stethoscopes in improving the accuracy of heart disease diagnosis is significant, and they have the potential to save many lives by facilitating early detection and treatment. However, further research is necessary to validate their accuracy and effectiveness in diagnosing heart diseases in clinical settings. The project presented here provides a basis for future research to explore the use of digital stethoscopes in diagnosing heart diseases and improving patient outcomes.

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An Experimental Studies on Non-Isolated Boost Converter with Series Voltage Multiplier Cells for Green Energy Sources

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Abstract - The classical non isolated boost converters exhibit high voltage and high current stresses for green energy sources. Basically, the output of the green energy sources like photovoltaic cells output and the stored energy voltage levels of the battery is low, so in order to increase voltage we use a boost converter but the boost converter step up ratio as go on increases the voltage and current stresses are increased and this will lead to reduced system efficiency. In order to solve the issue with the conventional non-isolated boost converter, a series voltage multiplier cell technique is effectively implemented in this work. The outcomes of the simulation of several series cells as well as the hardware findings are presented in this paper.

Index Terms - DC-DC converter, Boost converter, Voltage multiplier cells, Efficiency etc.

I. INTRODUCTION

The demand for effective step-up DC-DC converters is rising due to the recent expansion in the utilization of renewable energy sources, battery-powered applications and low voltage storage elements. Embedded systems, sources of green energy, fuel cells, mobility applications and uninterruptible power supplies are examples of typical uses. Large step-up static gain, high efficiency and decreased weight, volume and cost are required for these applications. Due to the operation with high input current and high output voltage, the step-up stage is typically the crucial point for the design of high efficiency converters therefore, a careful study must be done in order to determine the topology for a high step-up application.

High step-up voltage gain can be easily attained by several classical converters that use magnetic coupling as the flyback or a current-fed push-pull converter. Yet, the size of the power transformer is a challenge for the creation of a small converter. The

converter efficiency can be decreased by the energy of the transformer leakage inductance, which can also cause high voltage stress, increased switching losses and electromagnetic interference (EMI) issues. Switching losses and EMI production can be decreased using active clamping soft-commutation techniques. Although the cost and circuit complexity are higher, the voltage stress is higher than in hard-switching structures. Thus, the isolated DC-DC converters used in embedded applications are constrained by the weight, volume and power transformer losses [10].

Non-isolated DC-DC converters, the traditional boost, can give significant step-up voltage gain at the expense of significant voltage and current stress, extreme duty operation and restricted dynamic response. While running at high current and voltage levels, the diode's reverse recovery current can lower efficiency. There are several non-isolated DC-DC converters operating with high static gain, as the quadratic boost converter, however additional inductors and filter capacitors must be utilized and the switch voltage is high. However, recently new non-isolated DC-DC converter topologies were suggested [4] – [10], indicating that it is possible to get high static gain, low voltage stress and low losses, enhancing the performance with relation the classical topologies. The usage of voltage multiplier cells combined with traditional non-isolated DC-DC converters is presented in this paper as a unique method for the development of high step-up structures. The voltage multiplier's applications in traditional dc-dc converters add additional operational properties, creating a structure that is well suited for the implementation of high-static gain step-up converters.

The power converters are modelled with LT Spice XVII software to validate the findings of the simulations and experimental measurements. The comprehensive experimental results and their analysis are covered in this paper.

II. STEP UP CONVERTER

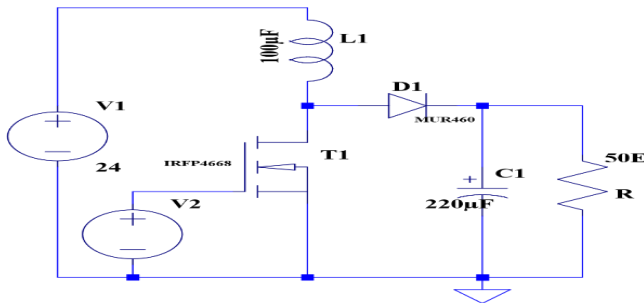


Fig. 1 Classical boost converter circuit diagram (CBC).

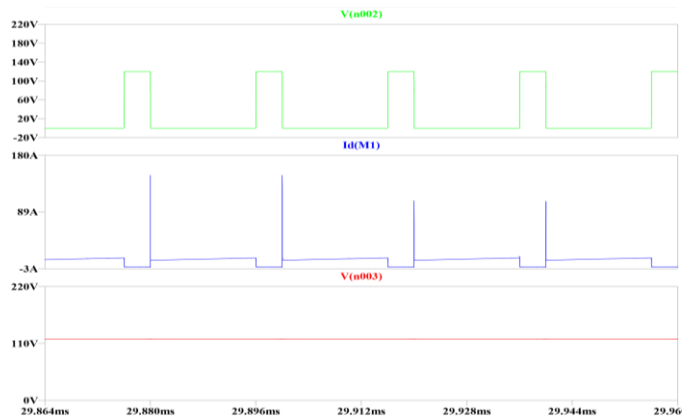
Fig. 2 Classical boost converter simulated waveforms (CBC).

A non-isolated classical boost converter's circuit diagram is shown in Fig. 1. The converter is operated at a duty ratio of 0.8 and a switching frequency of 50 KHz. For a 20Ω resistive load with a 12V input voltage, the converter gives output of 58.04V and for 24V input voltage it gives of output 117.08V. The obtained static gain of this converter is 4.8 and its conversion efficiency is 95.4%. The output voltages produced by the 12V and 24V input voltages converter for a 50Ω resistive load are

58.03V and 118.22V respectively. The obtained static gains for these converters are 4.8 and 4.79 respectively. The obtained conversion efficiency for this converter is around 95.3% and the simulated waveforms are shown in Fig. 2.

III. STEP UP CONVERTER WITH VOLTAGE MULTIPLIER CELLS

A non-isolated single switch boost converter with one voltage multiplier cell circuit diagram is shown in Fig. 3. The converter is operated at a duty ratio of 0.8 and a switching frequency of 50 KHz. For a 20Ω resistive load with a 12V input voltage, the converter



outputs 89.31V and for 24V input voltage it outputs 180.75V. The obtained static gain of this converter is 7.4 to 7.5 and its conversion efficiency is 93.23% to 94.56%. The output voltages produced by the 12V and 24V input voltages converter for a 50Ω resistive load are 100.96V and 204.25V respectively. The obtained static gains for these converters are 8.4 and 8.5 respectively. The obtained conversion efficiency for this converter is around 94.46% and the simulated waveforms are shown in Fig. 4.

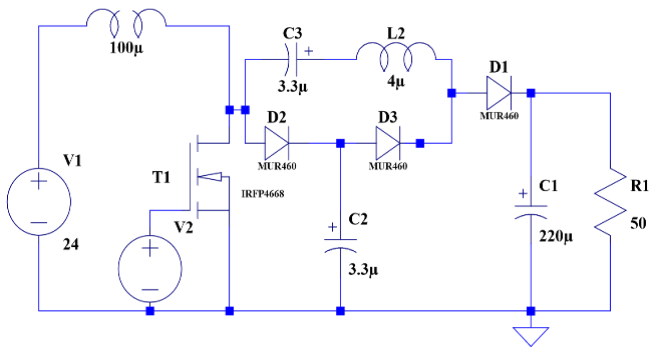
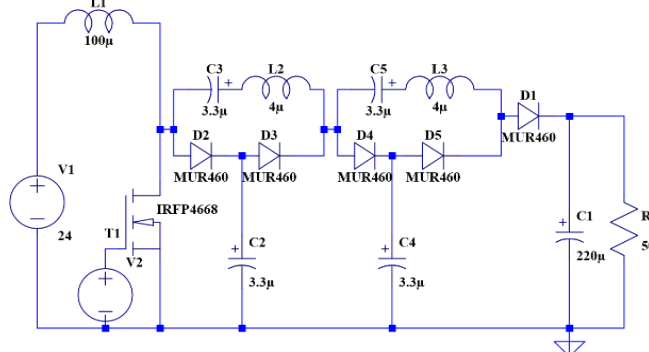
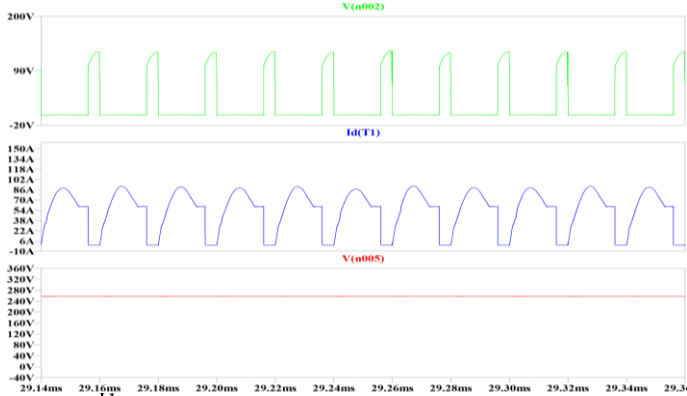


Fig. 3 Boost converter circuit diagram with single voltage multiplier cell (BCM₁).

Fig. 4 Boost converter with single voltage multiplier cell (BCM₁) simulation results.

A non-isolated boost converter with two voltage multiplier cell circuit diagram is shown in Fig. 5. The converter is operated at a duty ratio of 0.8 and a switching frequency of 50 KHz. For a 20Ω resistive load with a 12V input voltage, the converter outputs 108.35V and for 24V input voltage it outputs 220.41V. The



obtained static gain of this converter is 9.0 to 9.18 and its conversion efficiency is 89.23% to 91.35% respectively. The output voltages produced by the 12V and 24V input voltages converter for a 50Ω resistive load are 127.01V and 256.97V respectively. The

obtained static gains for these converters are 10.3 and 10.37 respectively. The obtained conversion efficiency for this converter is around 95.17%. The simulated waveforms are shown in Fig. 6.

Fig. 5 Boost converter with two voltage multiplier cells circuit diagram (BCM₂).

Fig. 6 Boost converter with two voltage multiplier cell (BCM₂) simulation results.

A non-isolated boost converter with three voltage multiplier cells circuit diagram is shown in Fig. 7. The converter is operated at a duty ratio of 0.8 and a switching frequency of 50 KHz. For a 20Ω resistive load with a 12V input voltage, the converter outputs 117.84V and for 24V input voltage it outputs 239.52V. The obtained static gain of this converter is 9.8 to 9.9 and its conversion efficiency is 85.43% to 88.19% respectively. The output voltages produced by the 12V and 24V input voltages converter for a 50Ω resistive load are 148.10V and 301.547V respectively. The obtained static gains for these converters are 12.3 and 12.5 respectively. The obtained conversion efficiency for this converter is around 92.8% and the simulated waveforms are shown in Fig. 8.

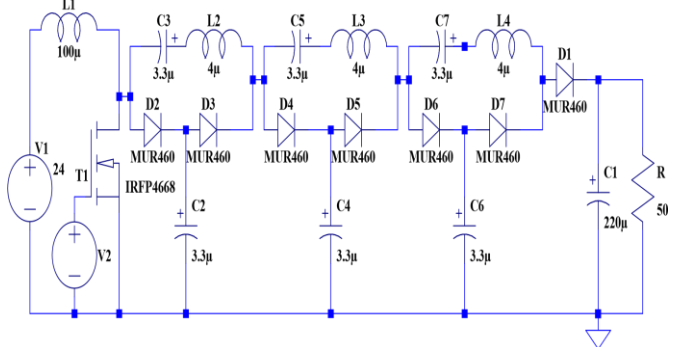
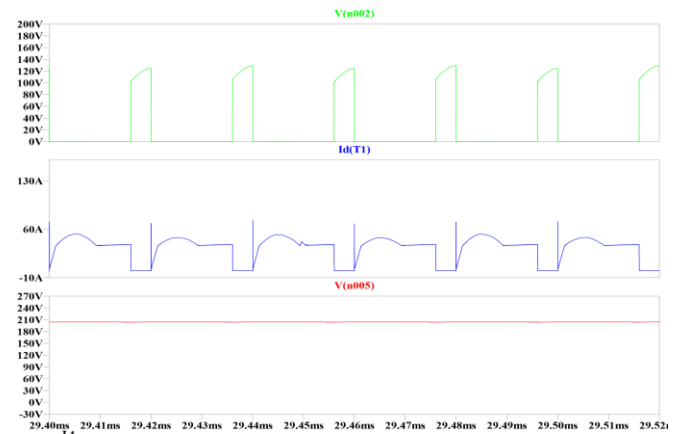


Fig. 7 Boost converter with three voltage multiplier cells circuit diagram (BCM₃).

Fig. 8 Boost converter with three voltage multiplier cell (BCM₃) simulation results.

IV. RESULTS AND DISCUSSIONS

TABLE I

| Input voltage | CBC Output voltage | CBC Static gain | BCM ₁ Output voltage | BCM ₁ Static gain | BCM ₂ Output | BCM ₂ Static gain |
|---------------|--------------------|-----------------|---------------------------------|------------------------------|-------------------------|------------------------------|
| 9V | 43V | 4.77 | 71V | 7.88 | 92V | 10.22 |
| 12V | 58V | 4.83 | 103V | 8.58 | 123V | 10.25 |
| 14V | 68V | 4.85 | 117V | 8.35 | 145V | 10.35 |
| 18V | 85V | 4.72 | 151V | 8.38 | 189V | 10.5 |
| 24V | 115V | 4.79 | 200V | 8.33 | 249V | 10.37 |
| 26V | 125V | 4.80 | 218V | 8.38 | 270V | 10.38 |
| Mean gain | | 4.79 | | 8.31 | | 10.34 |

Simulation results for a 50Ω resistive load using a single-phase DC–DC power converter with and without voltage multiplier cells operated at 50 KHz switching frequency with a 0.8 duty ratio and a fixed 12V input voltage are tabulated in Table II.

TABLE II

| | V _{in} | I _L | V _o | I _o | I _{in} | P _{in} | P _o | η % |
|------------------|-----------------|----------------|----------------|----------------|-----------------|-----------------|----------------|------|
| CBC | 12 | 14.66A | 58.034V | 5.716A | 14.667A | 176.01W | 168.4W | 95.6 |
| BCM ₁ | 12 | 17.84A | 100.96V | 2.018A | 17.841A | 213.91W | 203.9W | 95.2 |
| BCM ₂ | 12 | 28.41A | 127.01V | 2.540A | 28.413A | 340.96W | 322.6W | 94.6 |
| BCM ₃ | 12 | 40.75A | 148.10V | 2.962A | 40.754A | 489.05W | 438.7W | 89.7 |

Simulation results for a 50Ω resistive load using a single switch DC–DC power converter with and without voltage multiplier cells operated at 50 KHz switching frequency with a 0.8 duty ratio and a fixed 24V input voltage are tabulated in Table III.

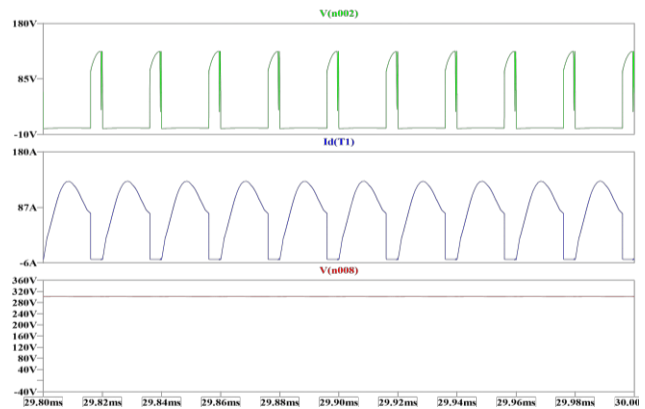
TABLE III

TABLE IV

| | V _{in} | Peak switch voltage | Peak switch current | V _o | I _o |
|------------------|-----------------|---------------------|---------------------|----------------|----------------|
| CBC | 24 | 119.67V | 14.23A | 118.22V | 2.3645A |
| BCM ₁ | 24 | 127V | 50A | 204.25V | 4.0851A |
| BCM ₂ | 24 | 256.97V | 91.5A | 256.97V | 5.1394A |
| BCM ₃ | 24 | 301.54V | 130.6A | 301.54V | 6.0309A |

| | V _{in} | I _L | V _o | I _o | I _{in} | P _{in} | P _o | η % |
|------------------|-----------------|----------------|----------------|----------------|-----------------|-----------------|----------------|------|
| CBC | 24 | 12.6A | 118.22V | 2.3645A | 12.684A | 303.91W | 279.5W | 92.1 |
| BCM ₁ | 24 | 36.0A | 204.25V | 4.0851A | 36.014A | 880.89W | 834.1W | 94.5 |
| BCM ₂ | 24 | 57.8A | 256.97V | 5.1394A | 57.825A | 1.38KW | 1.32KW | 95.2 |
| BCM ₃ | 24 | 82.3A | 301.54V | 6.0309A | 82.122A | 1.97KW | 1.82KW | 92.8 |

The experimental results of non-isolated single switch boost converter with and without multiplier cells as given in Table I. It is clear that, for a 24V input voltage single switch boost converter without multiplier cell produces an output voltage of 115V with its static gain about 4.79. Further, after adding a single voltage multiplier to the boost converter it gives 200V as its output with a static gain of 8.31 and for two voltage multiplier cells converter output is 249V with 10.37 as its static gain. Thus, from the experimental findings it clears that the step-up ratio is increased from 4.79 to 8.31 and 10.34 respectively for single and two voltage multiplier cells. By go on adding the multiplier cells to



the single switch boost converter it significantly gives higher step-up ratio, but also increases peak switch voltages and currents, this will lead to increased voltage and current stresses in the chopper switch of the boost converter and as seen from Table IV. The results show that adding more than two voltage multiplier cells to the converter increases switch voltage and current stresses, lowering system efficiency.

V. CONCLUSION

From experimental findings, it can be seen that, how the static gain of the DC-DC boost converter may be raised with the aid of voltage multiplier cells. However, this voltage multiplier cell also increases switching current and voltage stresses, which again restricts the application to low power only. The overall system efficiency decreases when the number of voltage multiplier cells is gradually increased. As a result, one or two multiplier stages will produce good results, whereas

three or more will result in a decrease in system efficiency.

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Investigation on Ring Coupled Rectangular Microstrip Antenna for Wireless Applications

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Abstract:- Microstrip antenna plays an important role in wireless communication system; size of an antenna reduces as frequency increases. Because of its low profile and better radiation characteristics, there is a lot of scope for compact ring coupled rectangular microstrip antennas for hand held devices. Ring coupled rectangular microstrip antenna with slots on centre patch is designed by embedding slots of E shape. In this paper ring coupled rectangular microstrip antenna is designed with horizontal and vertical slots parallel to the non-radiating edge for 3GHz frequency using FR4 substrate with dimensions 23.43x30.42x1.6mm³ having loss tangent 0.02, dielectric constant 4.4. Studied following parameters i.e. return loss, VSWR, gain, directivity, Bandwidth and size reduction. Then we studied for size reduction. The antenna simulation carried out using HFSS tool.

Key words: Microstrip antenna, stacked ring, VSWR, Return loss, bandwidth, slots, size reduction.

1. Introduction

Antennas having long history plays an important role in communication system. In this advanced wireless communication system it is a challenging task to design antenna for our growing requirements. Many researchers working in this area to meet growing requirements.

There is a huge demand for microstrip antennas in wireless communication system, because of its ease of fabrication [1-8]. Microstrip antenna have useful properties such as low profile, lightweight. We can print antennas directly on printed boards. In personal communication systems large bandwidth and multi frequency, operation antennas much needed. Slot loaded antenna can produce dual frequency. Stacked ring coupled antenna provides large bandwidth, compactness and dual frequency operation. [11-16]

Fig (2) shows microstrip antenna that consists of conducting patch with ground plane. There is a dielectric medium in between called substrate, which is having particular dielectric constant. Size of antenna depends upon resonating frequency and dielectric constant. There are various shape patch antennas ie rectangular, circular, and triangular patches are commonly used.[9,10] Feeding technique is also important in antenna for efficient transmission of signals from source to patch, i.e. for impedance matching. There are two types (1) contact feeding

technique and (2) Non-contact feeding technique in this work I used quarter wave transformer feed, under contact feed technique.[12,13] In this conducting strip in contact with edge of microstrip patch. Conducting strip is smaller than the microstrip patch. Fig (1) shows quarter wave transformer-fed rectangular microstrip antenna it consists of microstrip patch of width W and length L in the form of rectangular. Theoretical calculations and analysis of microstrip antenna for different frequencies by using following formulae.

Present paper deals with ring coupled rectangular microstrip antenna with slots at centre patch is designed by embedding slots of E- shape slot were inserted on centre patch and studied for size reduction. The dimensions of antenna are given in table a.

The size reduction can be calculated by

Fundamental resonating frequency of conventional antenna minus Fundamental resonant frequency of proposed antenna/Resonating frequency of conventional antenna.

1.1 Width of patch

Width of patch can be calculated by equation (1)

$$W = \frac{c}{2f} \sqrt{\frac{2}{\epsilon_{r+1}}} \text{ ---- (1)}$$

C=Speed of light (3x10¹¹mm)

f_r=Resonating frequency

1.2 Ground plane calculations:

The ground plane is greater than patch, which can be calculated by using equations 1a & 1b.

Can be calculated by

$$L_g = 2 * L \text{ ---- (1a)}$$

$$W_g = 2 * W \text{ ---- (1b)}$$

Here L is length and W is Width of the patch.

1.3 Effective relative permittivity

The effective relative permittivity or is calculated by equation (2)

$$\text{For } \frac{W}{h} > 1$$

$$\epsilon_{r_{eff}} = \frac{\epsilon_{r+1} + \epsilon_{r-1}}{2} + \frac{\epsilon_{r-1} - \epsilon_{r+1}}{2} \left(1 + 12 \frac{h}{W}\right)^{-1/2} \text{ ---- (2)}$$

Where ϵ_r = relative permittivity. 'h' is height in mm.

1.4 Extension length (ΔL)

Extension length ΔL is given by equation (3)

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{reff} + 0.3) \left(\frac{W}{h} + 0.264\right)}{(\epsilon_{reff} - 0.258) \left(\frac{W}{h} + 0.8\right)} \dots \dots (3)$$

1.5 Elemental length

Elemental length of patch can be calculated by equation (4)

$$L = \frac{C}{2f\sqrt{\epsilon_{reff}}} - 2\Delta L \dots \dots (4)$$

1.6 Feed line calculations

The feed line of characteristics impedance $Z_0=50\Omega$ is calculated by equation (5)

$$\frac{w}{d} = \frac{8e^A}{e^{2A} - 2} \text{ for } \frac{w}{d} < 2 \dots \dots (5)$$

$$\frac{2}{\pi} \left\{ B - 1 - \ln(2B - 1) + \frac{\epsilon_r - 1}{2\epsilon_r} \left[\ln(B - 1) + 0.39 - \frac{0.61}{\epsilon_r} \right] \right\} \frac{W_0}{h} \geq 2$$

Where

$$A = \frac{Z_0}{60} \sqrt{\frac{\epsilon_r + 1}{2}} + \frac{\epsilon_r + 1}{\epsilon_r - 1} \left(0.23 + \frac{0.11}{\epsilon_r} \right)$$

$$B = \frac{377\pi}{2Z_0\sqrt{\epsilon_r}}$$

To calculate length of feed line is given by equation (6)

$$\lambda_g = \lambda_0 / \sqrt{\epsilon_{reff}} \dots \dots (6)$$

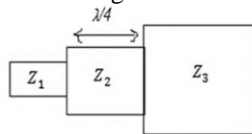
$$\epsilon_{reff} = \epsilon_r \left\{ (\epsilon_r - \epsilon_e) / [1 + G(f_r/f_p)^2] \right\} \text{ and}$$

$$G = [(Z_0 - 50) /$$

2. QUARTER WAVE TRANSFORMER

Impedance matching is necessary requirement to ensure the efficient transmission of energy transmission via the feed network. For this purpose, transmission lines are put in to service in order to accomplish this goal. Impedance matching can be accomplished in an effective manner by making use of a quarter wave transformer.

By the impedance matching circuit, the reflection coefficient between two impedances i.e. Z_1 & Z_3 is minimized. Quarter wave transformer between two impedances as shone in fig 1 and 2.



fig(1)

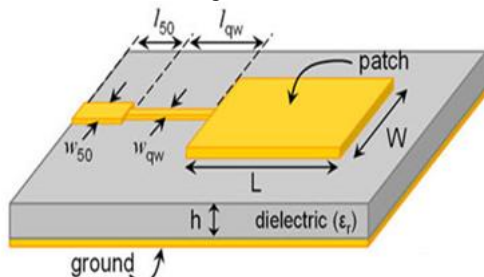


Fig 2

2.1 Quarter wave transformer calculations

The impedance offered by the radiating element at its centre point along its width can be evaluated as follows.

$$W_c = \frac{W}{2} \text{ cm} = \frac{2\pi}{\sqrt{\epsilon_r} / \lambda_0}$$

$$R_{in} = [(120 \lambda_0)^2 + (377h) / \sqrt{\epsilon_r} L^2 \tan^2 \beta l] / 240 L \lambda_0 (1 + \tan^2 \beta l)$$

$$R_{in} = Z_{in}$$

Impedance of the transformer

$$Z_t = \sqrt{Z_{in} \times Z_o}$$

1.Length of quarter wave transformer taking $Z_o=Z_t$

Length of quarter wave transformer is $\lambda_g/4$

2. Width of quarter wave transformer- W_t

Same formula used by taking $Z_o=Z_t$

3. ANTENNA GEOMETRY:

The proposed antenna designed on FR4 substrate having thickness of 1.6mm, with dielectric constant $\epsilon_r = 4.4$. loss tangent $\tan \delta = 0.02$, having dimensions $23.43(L) \times 30.42(W) \text{ mm}^2$ for 3GHz frequency.

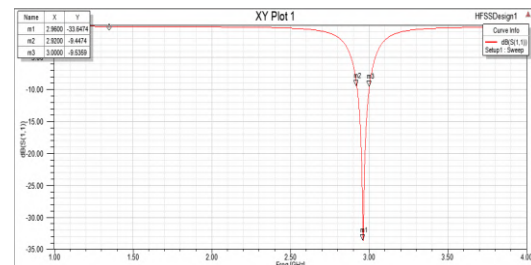
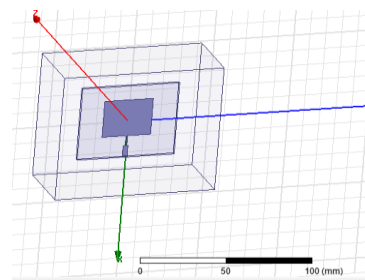
Ring coupled rectangular microstrip antenna is designed by etching ring slot of dimension $L_1 \times W_1$ and $L_2 \times W_2$ in side rectangular patch. Slots of different length are loaded on centrepatch. E Shaped -slots are embedded on antenna shown in fig 1(a),1(b)

Dimensions of ring slots are $W_s = 0.5 \text{ mm}$

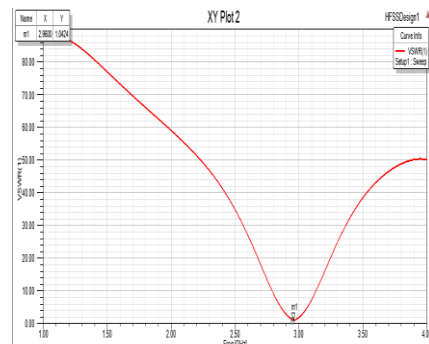
Length of ring slot $= L_1 = L/3$

Width of slots $W_s = W/3$

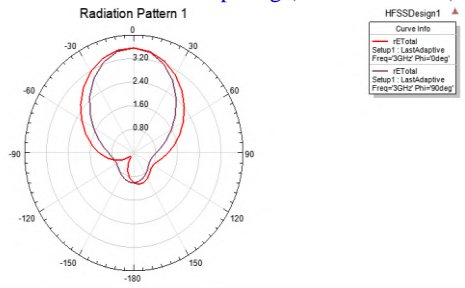
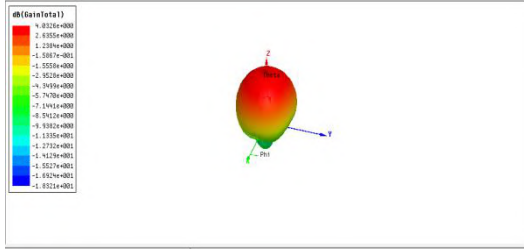
Conventional antenna



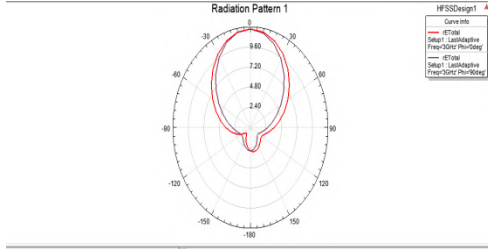
S11 plot, Return loss- 35.91, 800MHz BW



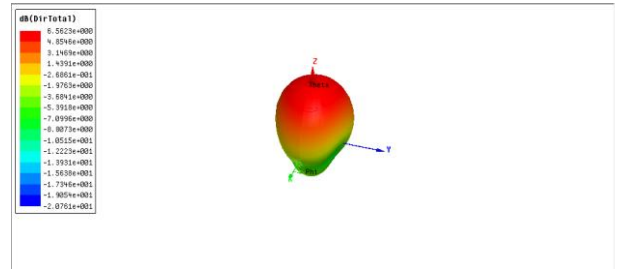
VSWR-1.042



Gain total -4.03db

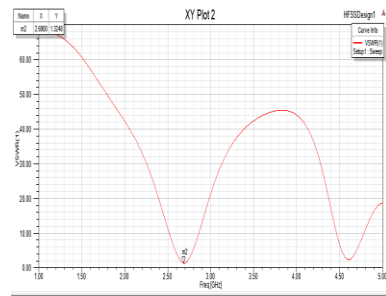
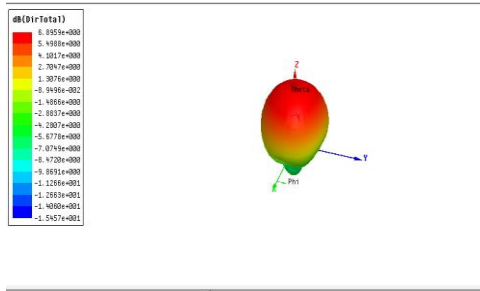


Radiation pattern



Radiation pattern

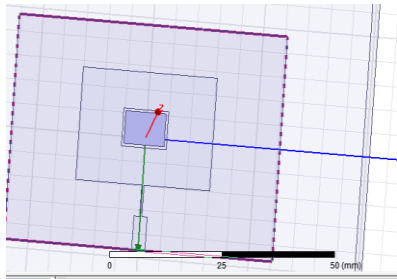
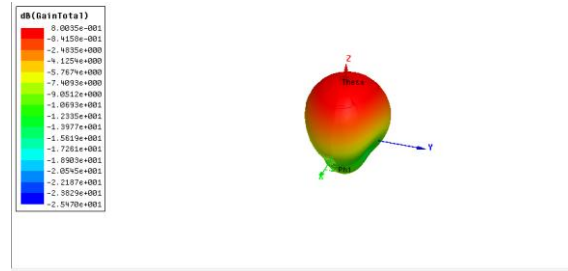
Directivity-6.52



Directivity-6.89

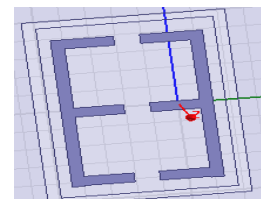
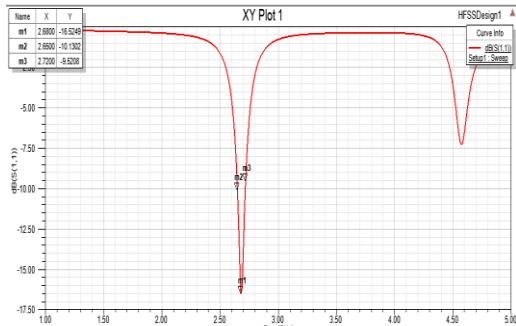
VSWR 1.37

RCRMA

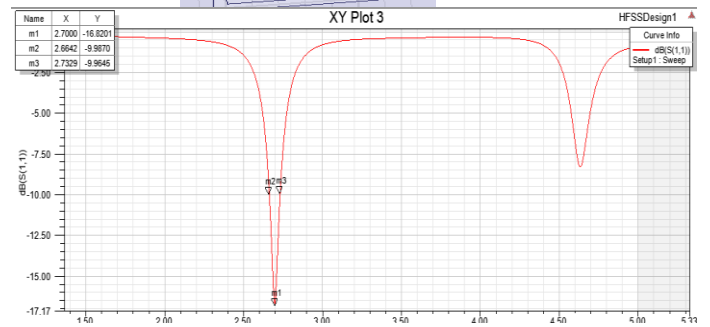


Gain total- 8.00db

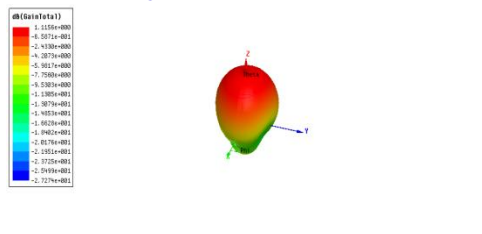
RCRMA with E slots (1)



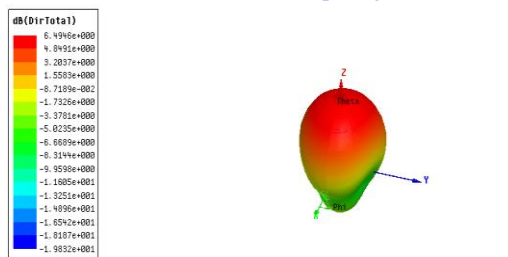
S11 plot -16.52 Return loss



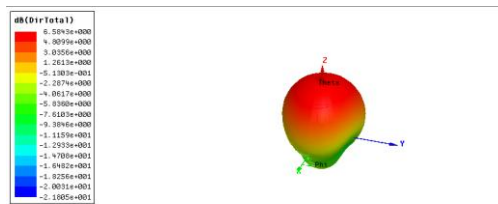
S11 plot -16.82, BW 687



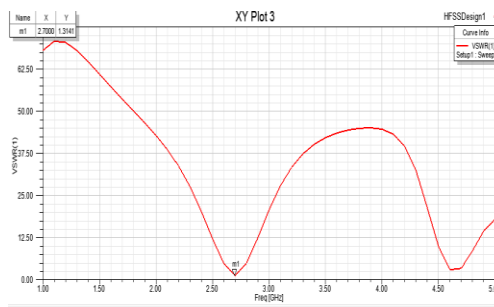
Gain total:1.115



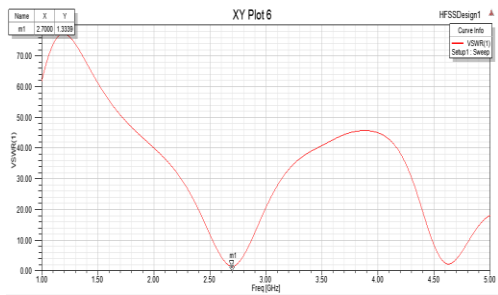
Directivity:6.49



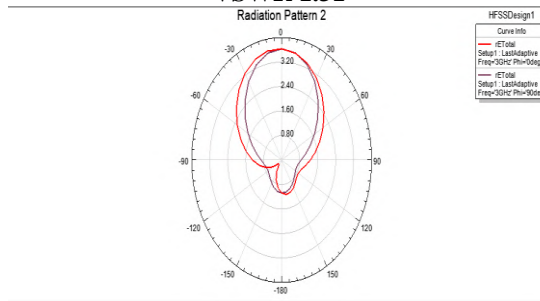
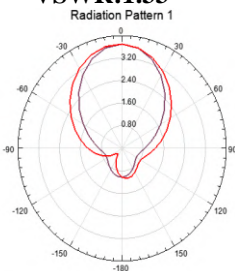
Directivity:6.58



VSWR 1.31



VSWR:1.33



Radiation pattern

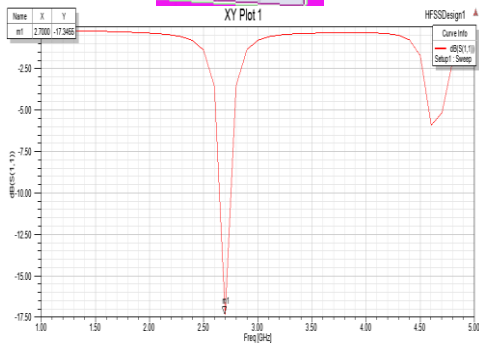
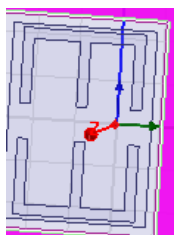
SIMULATION RESULTS

| Configuration | Res Freq in GHz | VS WR | Ret loss | Size reduction | Total gain | B W In MHz | Directivity |
|---------------|-----------------|-------|----------|----------------|------------|------------|-------------|
| RMA | 2.96 | 1.04 | 3.64 | - | 4.03 | 800 | 6.89 |
| RCRMA | 2.69 | 1.32 | 16.52 | 10.47% | 8.00 | 700 | 6.56 |
| E-slot(1) | 2.70 | 1.33 | 16.82 | 10.13% | 1.11 | 687 | 6.58 |
| E-Slot(2) | 2.70 | 1.31 | 17.34 | 10.13% | 9.71 | 105 | 6.49 |

Table a

Radiation pattern

RCRMA E-Slots(2)



S11 plot, Ret loss-17.34,BW.1052

4. CONCLUSION

Ring coupled slotted rectangular microstrip antenna designed for 3 GHz frequency, are simulated. Simulation results are investigated that ring coupled rectangular microstrip antenna obtained by embedding ring slot at centre patch with E slots, produces size reduction around 10% in all cases. Which can be improved by adding some more slots. All the radiation patters are directional in nature. Directivity almost remains constant around six in all cases. Total gain of an antenna varies, in RCRMA it is 4.03db,RCRMA E-slot(1) produces 1.11db, we get good gain in RCRMA

E slots(2) by 9.71. We get good bandwidth 800MHz in RCRMA. This type of antenna finds applications in weather radar, surface ship radar, and sometimes in communication satellites.

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Dual Axis Solar Tracker with Weather Sensors

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ABSTRACT- The purpose of this project is to design and construct a solar tracker system that follows the sun direction for producing maximum out for solar powered applications. The system also displays the voltage measured onto the LCD display module. This system also has DHT11 and Rain sensor to depict the weather parametric values. Achieving balance between power consumption and power production is a bigger challenge today. The best way to solve this imbalanced equation is to use solar energy as efficiently as possible. The problem in the usage of solar energy is with solar cell panel should be exposed maximum to the sun light. If the solar panel is fixed in a particular direction then the sun light intensity varies from morning to evening. Moving the solar cell panel in the direction of sun can increase the solar energy generated from the solar cell.

This project consists of few sun light sensors and a motorized mechanism for rotating the panel in the direction of sun. Microcontroller based control system takes care of sensing sunlight and controlling the motorized mechanism. DHT11 and Rain sensors are also interfaced to arduino. This system works continuously without any interruption. The microcontroller also takes the responsibility for displaying the measured voltage from solar panel and also the sensors values onto the LCD.

I. INTRODUCTION

Solar power is the fastest growing means of renewable energy. The project is designed and implemented using simple dual axis solar tracker system. In order to maximize energy generation from sun, it is necessary to introduce solar tracking systems into solar power systems. A dual-axis tracker can increase energy by tracking sun rays from switching solar panel in various directions. This solar panel can rotate in all directions. This dual axis solar tracker project can also be used to sense weather, and it will be displayed on LCD. This system is powered by Arduino, consists of servo motor, stepper motor, rain drop sensor, temperature and humidity sensor and LCD.

II. LITERATURE SURVEY

1. Asmarashid Ponniran, Ammar Hashim, Ariffuddin Joret. "A Design of Low Power Single Axis Solar Tracking System Regardless of Motor Speed". Internal Journal Of Intergrated Engineering, Vol.3 No.2(2011) p 5-9

Solar power generation had been used as a renewable energy since years ago. Residential that uses solar power as their alternative power supply will bring benefits to them. The main objective of this paper is to present development

of an automatic solar tracking system whereby the system will caused solar panels will keep aligned with the Sunlight in order to maximize in harvesting solar power. The system focuses on the controller design whereby it will caused the system is able to tracks the maximum intensity of Sunlight is hit. When the intensity of Sunlight is decreasing, this system automatically changes its direction to get maximum intensity of Sunlight. LDR light detector acts as a sensor is used to trace the coordinate of the Sunlight by detecting brightness level of Sunlight. While to rotate the appropriate position of the panel, a DC-g geared motor is used. The system is controlled by two relays as a DC-g geared motor driver and a microcontroller as a main processor. This project is covered for a single axis and is designed for low power and residential usage applications. From the hardware testing, the system is able to track and follow the Sunlight intensity in order to get maximum solar power at the output regardless motor speed.

2.V. A.K. Saxena & V. Dutta, "A versatile microprocessor- based controller for solar tracking", IEEE Proc., 1990, pp. 1105 – 1109.

A microprocessor-based solar tracking controller was designed and fabricated. In addition to tracking, the controller is capable of acquiring photovoltaic and meteorological data from a photovoltaic system and controlling battery/load. These features are extremely useful in autonomous PV power systems installed in remote areas for system control and monitoring. Solar tracking can be achieved in closed-loop and open-loop modes, and the controller can provide either six PWM (pulse-width-modulated) signals for a three-phase, 50 Hz AC motor or four step signals for a stepper motor. The controller has been laboratory tested.

The Sun's Position. (2013, March 28). In Photovoltaic Education Network, from <http://pveducation.org/pvcdrom/properties-ofsunlight/sun-position>.

A course consisting of 4 hours of theoretical teaching a week and 4 hours of practical laboratory work every two weeks was established at COPPE/UFRJ in Rio de Janeiro, Brazil, to initiate education on solar electric systems (also photovoltaic (PV) systems). The course is presented during a quarter. Further details are also accessible by the Internet.

3. A. Yazidi, F. Betin, G. Notton & G. A. Capolino, July 2006, "Low cost two-axis solar tracker with high precision positioning", Proceedings of 6.00p.m. As for the static panel, the highest and the lowest output power produced were 0.94W and 0.06W respectively.

In this paper, the design of a low cost two-axis solar tracker is introduced. The aim is to obtain a high precision positioning of the cell. The control-board is able to support different control strategy such as classical techniques as PID algorithm or more advanced strategy such as fuzzy logic control (FLC). Using the error signal, the tracking capacities of the proposed approaches can be tested experimentally on the experimental prototype built in our laboratory.

4.J.Beltran A.,J.L Gonzalez Rubio S.yC.D.Garcia-Beltran“Design,Manufacturing and Performance Test of a Solar Tracker Made By a Embedded Control.Fourth Congress of Electronic,Robotic and Automotive Mechanics

Energy crisis is one in every of the major problems in world developing countries like Republic of India. There\'s a huge gap between generation and demand of current. Nearly half of the population of the country cannot get the power supply. Renewable energy is one of the answers to solve this issue. Solar power is one in every of the foremost effective resources of the renewable energy that might play a big role to resolve this drawback. This analysis presents a performance analysis of the dual axis solar tracking system using Arduino and led & servo motors. The most objective of this research is whether the solar tracker is better than a solar panel. This work is split into 2 light dependent resistors (LDR) is employed to observe the almost source of illumination from the sun. Two servo motors put together accustomed move the electrical device to most source of illumination location perceived by the LDRs. In the other half, the software part is written by using C programming language which head towards to the Arduino UNO controller. The result of the solar tracking system has analyzed and compared with the mounted or static solar panel found higher performance in terms of current, power and voltage. Therefore, the solar tracking system is evidenced additional sensible for capturing the most daylight provide for star gathering applications. The result showed dual axis solar tracking system made further 10.53-watt power compared with mounted (fixed) and single axis solar tracking system. Components hardware and computer code.

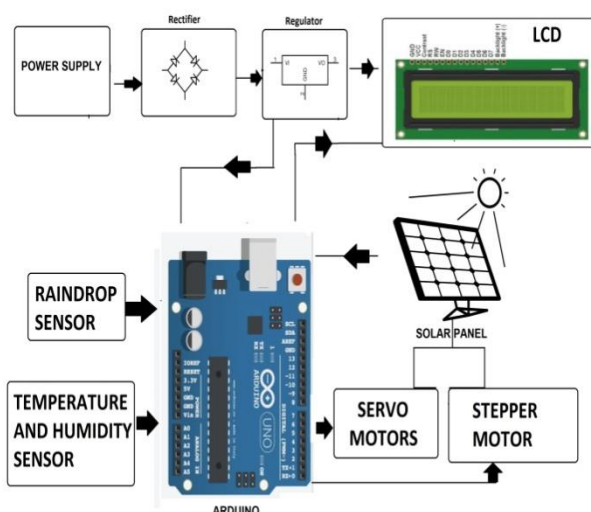
5.Bosetti,Valentina,et al. "The future prospect of PV and CSP solar technologies: An expert elicitation survey." *Energy Policy* 49 (2012): 308-317

In this paper we present and discuss the results of an expert elicitation survey on solar technologies. Sixteen leading European experts from the academic world, the private sector and international institutions took part in this expert elicitation survey on Photovoltaic (PV) and Concentrated Solar Power (CSP) technologies. The survey collected probabilistic information on how Research, Development and Demonstration (RD&D) investments will impact the future costs of solar technologies and the potential for solar technology deployment both in OECD and non-OECD countries. Understanding the technological progress and the potential of solar PV and CPS technologies is crucial to draft appropriate energy policies. The results presented in this paper are thus relevant for the policy making process and can be used as better input data in integrated assessment and energy models..

6.Solar Tracking System: More Efficient Use of Solar Panels , January 2008 Authors: Jamal Rizk ,Western Sydney University , Yelena Chaiko Riga Technical University

This paper shows the potential system benefits of simple tracking solar system using a stepper motor and light sensor. This method is increasing power collection efficiency by developing a device that tracks the sun to keep the panel at a right angle to its rays. A solar tracking system is designed, implemented and experimentally tested. The design details and the experimental results are shown. XTRACTING useable electricity from the sun was made possible by the discovery of the photoelectric mechanism and subsequent development of the solar cell - a semi-conductive material that converts visible light into a direct current. By using solar arrays, a series of solar cells electrically connected, a DC voltage is generated which can be physically used on a load. Solar arrays or panels are being used increasingly as efficiencies reach higher levels, and are especially popular in remote areas where placement of electricity lines is not economically viable. This alternative power source is continuously achieving greater popularity especially since the realisation of fossil fuel's shortcomings. Renewable energy in the form of electricity has been in use to some degree as long as 75 or 100 years ago. Sources such as Solar, Wind, Hydro and Geo- thermal have all been utilised with varying levels of success. The most widely used are hydro and wind power, with solar power being moderately used worldwide. This can be attributed to the relatively high cost of solar cells and their low conversion efficiency. Solar power is being heavily researched, and solar energy costs have now reached within a few cents per kW/h of other forms of electricity generation, and will drop further with new technologies such as titanium- oxide cells. With a peak laboratory efficiency of 32% and average efficiency of 15-20% (1-4) , it is necessary to recover as much energy as possible from a solar power system. This includes reducing inverter losses, storage losses, and light gathering losses. Light gathering is dependent on the angle of incidence of the light source providing power (i.e. the sun) to the solar cell's surface, and the closer to perpendicular, the greater the power (1-7).

III. BLOCK DIAGRAM



Hardware Specifications

- Atmega Microcontroller
- Solar Panel
- Servo Motor
- DC Motor
- Rain Sensor
- Humidity Sensor
- Temperature Sensor
- Resistor
- Capacitors
- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- Push Buttons
- Switch
- IC
- IC Sockets

Software Specifications

1. Arduino Compiler
2. Programming Language: C

ADVANTAGES

- High degree of flexibility, efficient.
- High energy output on good weather.
- Energy cost reduction.
- Low maintenance cost.
- It will reduce the electricity bill.
- High degree of accuracy.

DISADVANTAGES

- Lower lifespan.
- Low reliable.
- More complex design and control mechanism than single-axis tracker.

- Not more efficient in cloudy and overcast weather conditions like wind, dust etc.
- More maintenance is required due to the presence of rotating components.

APPLICATION

- It can be used for large and medium scale power generations. It can also be used for power generation at remote places. It may be used as domestic backup power systems.
- It can be used for solar street lightning system. It may be used in water treatment technologies and solar heating.

IV. CONCLUSION

The aim of this project was to propose a dual-axis tracking system which can sense the incident solar light on the panel and move it in the direction of maximum solar light incident. Further the advantages and disadvantages were also studied. were the challenges that had to be overcome. From this study the main conclusions are:

1. Proposed system is low cost and compact as compared to the other tracking systems in use for same application.
2. It is very easy to program and modify because it is Arduino based and no external programmer is required.
3. The designed system is easy to use and provides better efficiency of the panel

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Low Power High Order Approximate Multiplier Using Approximate High Order Compressor

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Abstract - To reduce the power consumption, the design of approximate multiplier appears as a promising solution for many error-resilient applications. In this paper, we propose a low-power high-accuracy approximate 8 x 8 multiplier design. The proposed design has two main features. First, according to the significance, different weights utilize different compressors (in different levels of accuracy) to accumulate their product terms. As a result, the power consumption can be saved with a small error. Second, for the middle significance weights, we use high-order approximate compressors (e.g., 8:2 compressor) to reduce the logic of carry chains. To our knowledge, the proposed design is the first work that successfully uses highorder approximate compressors in the approximate multiplier design. Compared with an exact multiplier (Dadda tree multiplier), experimental results show that the proposed approximate multiplier can achieve both low power and high accuracy

Index Terms: Approximate Computing, logic design, Arithmetic circuits, low power design, partial product design

I. INTRODUCTION

Multiplication is a basic arithmetic operation that plays an important role in digital signal processing. To many error-tolerant applications, the design of an approximation multiplier seems like a viable approach for reducing the power consumption of an embedded system. Several ideas for power-efficient approximation multipliers (using approximate 4:2 compressors).

Contrarily, their NMED (normalized mean error distance) values are rather substantial. Constrained carry propagation to closest neighbors allows for rapid accumulation of partial products. In order to lessen energy use, partially perforated the product. The use of carry-maskable adders helped shorten the carry chain. These methods (3-5) use post-processing logic in order to minimize the error distance (i.e., error recovery). In this study, we suggest a design for a low-p

We contribute primarily by demonstrating that high-order approximation compressors (such an 8:2 compressor) may be included into the design of an approximate 8 x 8 multiplier to reduce power consumption without sacrificing accuracy. It's important to emphasize that the suggested architecture doesn't call for any post-processing logic beyond what's already there (i.e., error recovery).

The architecture of the proposed approximate 8 x 8 multiplier design has the following two main features.

(1) *Significance Driven Logic Compression*. According to the significance, different weights use different compressors (i.e., counters) to accumulate their product terms. The higher significance weights use accurate 4:2 compressors, the middle significance weights use nearaccurate

compressors, and the lower significance weights use inaccurate compressors. As a result, the power consumption can be reduced with a small error.

(2) *High Order Approximate Compression*. For the middle significance weights, we use high-order approximate compressors (e.g., 8:2 compressor) to reduce the logic of carry chains. As a result, both the delay and the power can be greatly saved. To the best of our knowledge, the proposed design is the first work that utilizes high-order approximate compressors in the approximate multiplier design. Note that this architecture allows the designers to configure the number of higher significance weights, the number of middle significance weights and the number of lower significance weights for the trade-off between the power dissipation and the computational accuracy. Compared with an exact multiplier (Dadda tree multiplier), experimental results show that the proposed approximate multiplier can achieve 14.62% ~ 25.92% reduction in power consumption with only 0.07% ~ 0.89% NMED. Therefore, the proposed approximate multiplier does achieve both low power and high accuracy.

ower, high-accuracy approximate 8 x 8 multiplier.

. II. PROPOSED HIGH ORDER COMPRESSORS

The critical path of a multiplier is often related to the maximum height of PPM (partial product matrix). Thus, there is a need to compress the PPM. A n:2 compressor is a slice of a multiplier that reduces n numbers (i.e., product terms) to two numbers when properly replicated. In slice *i* of the multiplier, the n:2 compressor receives n bits in position *I* and one or more carry bits from the lower positions (such as *i-1*), and produces two output bits in positions *i* and *i+1* and

one or more carry bits into the higher positions. Conventionally, 4:2 compressors are used in the

multiplier design [1,2]. Fig. gives the block diagram of an accurate (i.e., exact) 4:2 compressor. The four input bits are denoted as X0, X1, X2 and X3. The two output bits in

positions *i* and *i+1* are denoted to as *Sum* and *Carry* respectively. The carry bit from the lower position is denoted as *Cin* while the carry bit into the higher position is denoted as *Cout*.

Fig. 1 gives the block diagram of an approximate 4:2 compressor. To save the logic of carry chains, the carry bits *Cin* and *Cout* are omitted.

Moreover, in [1,2], to reduce the error rate, the logics of *Sum* and *Carry* are re-designed (i.e., different from the logics of *Sum* and *Carry* in an accurate 4:2 compressor). Previous works [1,2] did not consider high-order compression (i.e., did not consider $n \geq 5$). In fact, high-order compression can further reduce the delay and power. In this section, we introduce our high-order compressor design (i.e., $n \geq 5$). Section II-A presents the approximation of *Carry*. Section II-B presents the approximation of *Sum*. Section II-C presents the implementation results.

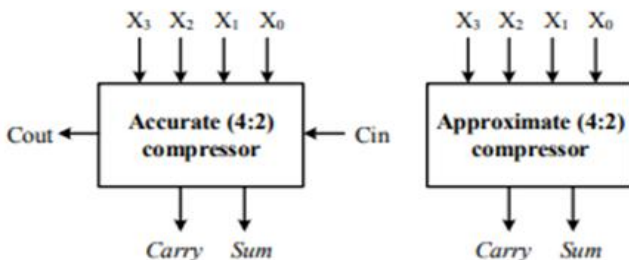


Fig 1. Accurate 4:2 Compressor, Approximate 4:2 Compressor

The Approximation of Carry

Here, we study the approximation of the logic of the *Carry* output. In a conventional half adder, the carry bit *C_h* is defined as below:

$$C_h(X_0, X_1) = X_0 \cdot X_1$$

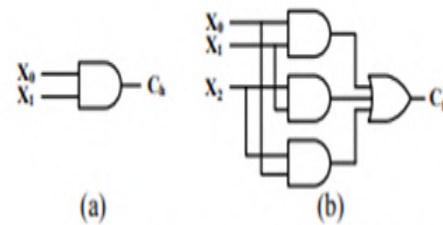
In a conventional full adder, the carry bit *C_f* is defined as below:

$$C_f(X_0, X_1, X_2) = X_0 \cdot X_1 + X_1 \cdot X_2 + X_0 \cdot X_2$$

The Approximation of Sum

Here, we study the approximation of the logic of *Sum* output. Conventionally, the tree of XOR gates are used to produce the output *Sum*. However, compared with other logic gates, XOR gate often has larger design overheads. We use the logic gates in SAED 32nm cell library as an example. Table I tabulates the comparisons among OR gate, NOR gate, XNOR gate, and XOR gate. From Table I, we find that XOR gate has the largest power, the largest area, and the largest

delay. Thus, if we can replace XOR gates with other logic gates, all the design overheads (including the power, the area, and the delay) can be reduced.



(a) Modified half adder (b) Modified full adder.

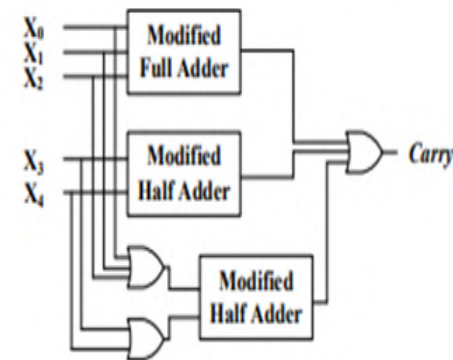


FIG.2 THE LOGIC OF CARRY OUTPUT OF OUR APPROXIMATE 5:2 COMPRESSOR.

III. PROPOSED APPROXIMATE MULTIPLIER DESIGN

Typically, a multiplier consists of three parts. In the first part, AND gates are utilized to generate partial products. In the second part, the maximum height of PPM (partial product matrix) is reduced by using a carry save adder tree. In the third part, a carry propagation adder is used to produce the final result. The design complexity of a multiplier is primarily related to the PPM reduction circuitry (i.e., the multiplier is primarily related to the PPM reduction circuitry (i.e., the second part). Thus, the study of multiplier design [1-6] focuses on the optimization of the PPM reduction circuitry.

In this section, we propose an approximate 8×8 multiplier design. Fig. 5 gives the overall structure of our PPM reduction circuitry. According to the significance, the weights are classified into three categories: the higher significance weights, the middle significance weights, and the lower significance weights. Note that the designers are allowed to configure the number of higher significance weights, the number of middle significance weights and the number of lower significance weights for the trade-off between the power consumption and the computational accuracy.

To reduce the power consumption with a small error, our PPM reduction circuitry applies the significance driven logic compression technique as below: the higher significance weights use accurate (i.e., exact) 4:2 compressors; the middle significance weights use our approximate high-order compressors (i.e., the approximate $n:2$ compressors proposed in Section II); the lower significance weights use inaccurate compressors (OR-tree based approximation).

Our PPM reduction circuitry has two stages. The first stage is for all the weights. The second stage is only for the higher significance weights.

After the second stage is completed, each weight has at most two product terms. Thus, a carry propagation adder can be used to produce the final result. In the following, we elaborate the details of these two stages.

A. THE FIRST STAGE

FOR EACH LOWER SIGNIFICANCE WEIGHT, WE USE A SIMPLE OR TREE BASED APPROXIMATION FOR POWER SAVING. SUPPOSE THAT THE NUMBER OF INPUTS IS N . IF $N \leq 2$, NO ACTION IS PERFORMED. ON THE OTHER HAND,

IF $N > 2$, WE USE AN OR TREE FOR $N-1$ INPUTS TO APPROXIMATE THE ACCUMULATION RESULT OF THESE $N-1$ INPUTS. THUS, AFTER THE FIRST STAGE IS DONE, EACH LOWER SIGNIFICANCE WEIGHT HAS AT MOST TWO PRODUCT TERMS. FOR EACH MIDDLE SIGNIFICANCE WEIGHT, WE USE OUR APPROXIMATE $N:2$ COMPRESSOR (AS DESCRIBED IN SECTION II) FOR POWER SAVING, WHERE N IS THE NUMBER OF PRODUCT TERMS IN THIS WEIGHT. AS DESCRIBED IN SECTION II, THE DESIGNERS CAN CHOOSE ONE OF THE FOLLOWING TWO IMPLEMENTATIONS: ONE IMPLEMENTATION IS WITH ACCURATE *SUM* AND APPROXIMATE *CARRY* AND THE OTHER IMPLEMENTATION IS WITH APPROXIMATE *SUM* AND APPROXIMATE *CARRY*. AFTER THE FIRST STAGE IS DONE, EACH MIDDLE SIGNIFICANCE WEIGHT HAS AT MOST TWO PRODUCT TERMS.

TO ACHIEVE HIGH ACCURACY, FOR EACH HIGHER SIGNIFICANCE WEIGHT, WE USE ACCURATE (I.E., EXACT) 4:2 COMPRESSORS. FOR EACH ACCURATE 4:2 COMPRESSOR, IF THE NUMBER OF PRODUCT TERMS IS LESS THAN 4, THE VALUES OF OTHER INPUTS TO THIS COMPRESSOR ARE SET TO BE 0. IN THE RIGHTMOST HIGHER SIGNIFICANCE WEIGHT, THE CARRY BIT C_{IN} OF ONE ACCURATE 4:2 COMPRESSOR IS FROM THE *CARRY* OUTPUT OF THE LEFTMOST MIDDLE SIGNIFICANCE WEIGHT, AND CARRY BIT C_{IN} OF OTHER ONE ACCURATE 4:2 COMPRESSOR IS SET TO 0.

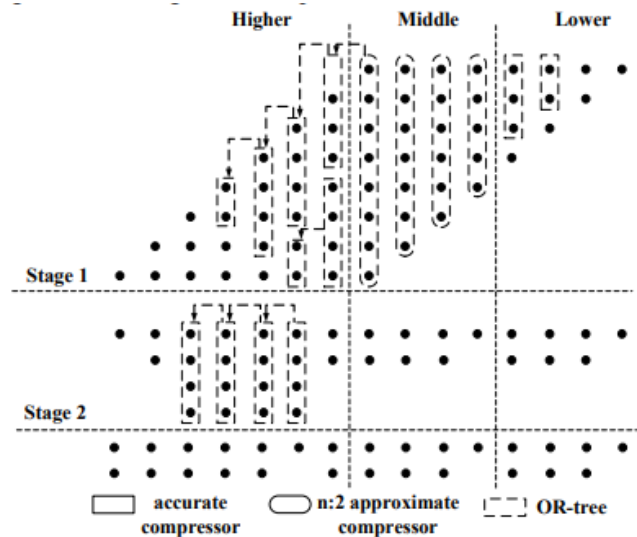


Fig.3 The PPM reduction in the proposed approximate multiplier.

B. The Second Stage

Note that the second stage is only for the higher significance weights. In order to achieve high accuracy, we use accurate (i.e., exact) 4:2 compressors to reduce the maximum height of the

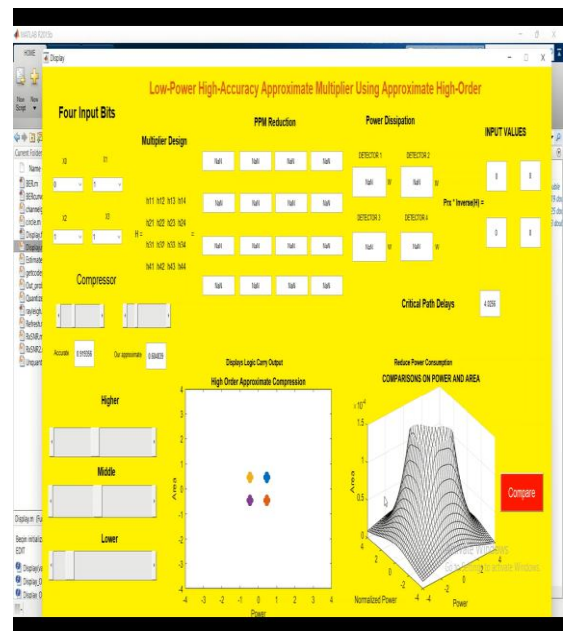
PPM. The carry bit C_{in} of the rightmost accurate 4:2 compressor is set to be 0. As shown in Fig. 5, after the second stage is completed, each higher significance weight has two product terms.

IV SIMULATION RESULTS

Note that the proposed approximate 8 x 8 multiplier allows the designers to configure the number of high-significance weights, the number of middle significance weights and the number of lower significance weights for the trade-off between the power consumption and the computational accuracy. Moreover, the proposed high-order compressor (used in the compression of middle significance weights) also has two possible implementations: one implementation is with accurate *Sum* and approximate *Carry* and the other implementation is with approximate *Sum* and approximate *Carry*.



Fig.2 Block Diagram



Using a carry save adder tree lowers the maximum height of a PPM partial product matrix. To get the final result, a carry propagation adder is used. The complexity of a multiplier's design is mostly due to the PPM reduction circuitry.

Our two-stage PPM reduction circuitry is quite effective.

All the weights go in in the first stage. Only the higher significance weights go to the second phase. After the second step is finished, there can be no more than two product words for each weight. A carry propagation adder may then be used to get the final tally.

The implementation using approximate Sum and approximate Carry offers the fewest design overheads in terms of power, area, and latency among the three solutions.

Graph displaying an approximation of a multiplier
Our PPM reduction circuitry pertains to the problem of lowering power consumption while maintaining a low level of inaccuracy.

Below is an explanation of the importance driven logic compression method: statistical methods to determine the greater importance Conjecture about, Keep displaying OR-tree values on a graph to save energy, where n is the number of product terms in this weight. to Section II, there are two possible implementations available to designers, one of which is correct.

Contraction along the route of least resistance

One method uses a delayed presentation of graph power and area Sum and approximate Carry, whereas the other uses approximate Sum and approximate Carry.

After the first phase is complete, there are a maximum of two product terms for each middle significant weight.

CONCLUSION

Herein is detailed the architecture of a low-power, high-accuracy approximate 8×8 multiplier. To ensure precision, we use precise 4:2 compressors in the more weighted areas of importance. In order to save energy, we employ high-order approximation compressors for the intermediate weights of importance.

The results of the experiments demonstrate that the suggested approximation multiplier design may reduce the power consumption by 15.6225.92% compared to the Dadda tree multiplier, while only incurring a noise mean error rate (NM-ED) of 0.0710.89%. This is the first known attempt to use high-order approximation compressors in an approximate multiplier design, with the goal of reducing power consumption without sacrificing accuracy.

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Towards An Automated Design Flow for Memristor

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Abstract - As today's CM-OS technology approaches its physical limitations, emergent technologies like as carbon nanotubes, magnetic tunnelling junctions, and Memristors are being investigated as potential replacements. Among them, Memristors are a good choice for future VLSI circuit implementation. It has excellent scalability, near-zero standby power usage, and so on. It is critical to construct an automated design cycle in order to create Memristor-based VLSI circuits and evaluate their possibilities. However, such a design flow is still lacking. Mo-sys is an automated design technique that uses current CM-OS VLSI circuit design tools. Mo-sys offers a circuit design cycle that starts with a Verilog programming interface and ends with performance prediction models. Furthermore, rather than exhaustive searching, it employs a probabilistic computation of power. It decreases execution time by up to 3001 times with minimal error in our trials (when compared to the current standard). Many integers arithmetic functional units (e.g., add, multiply) are devised and implemented in Verilog to test the whole Mo-sys flow. The EP-FL benchmark suite is also used to compare Mo-sys to the industry standard. Mosys, according to data, considerably improves the area and latency.

Index Terms: Memristor, VLSI circuits, Gates

I. INTRODUCTION

The physical device boundaries of today's CM-OS technology are rapidly approaching. As a result, substantial issues such as lowered reliability, saturation routine gain, increased leakage power expenditure, and so on have been accumulated. To solve such issues, new device technologies are being investigated as options for implementing future VLSI circuits. Memristor is a good choice among them [2-5], since huge Memristor devices may be readily constructed utilizing crossbar design, in which Memristors are positioned at the intersection of row and column nano-wires. Memristor crossbars may offer excellent scalability, increased integration density, and other benefits.

Memristor crossbar has showed considerable promise in a variety of applications, including neuromorphic systems, Non-volatile memories, computation-in-memory processors, and logic circuits. Memristor-based logic circuits may be broken down into three distinct types depending on the kind of logic gates they use: threshold/majority logic, material implication logic [21], and Boolean logic. The logic types that have been documented up to this point are limited to either elementary logic gates (like AND) or deliberately constructed logic circuits (e.g., 1-bit full adder). Therefore, there is a significant divide between the complexity of VLSI circuits and that of simple circuits created by hand. The development of an

automated design flow is an important step in closing this large chasm. Recent writings only cover a small subset of possible design strategies for threshold/majority logic, implication logic, and Boolean logic..

II. PROPOSED DIAGRAM

2. Memristor crossbar based Boolean logic

2.1 Electronic characteristics

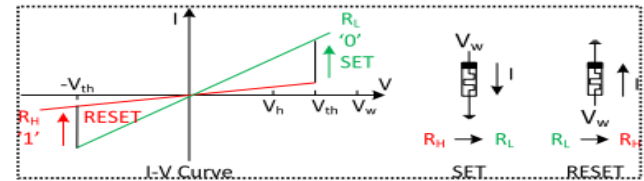


Fig 2.1: Electronic Characteristics

Fig.2.1 shows the electronic characteristic of a memristor device. A memristor has a high (RH) and low (RL) resistive state. In order to switch a memristor from one resistive state to another, a voltage should be applied across the device and its absolute value should be greater than a threshold voltage V_{th} . Otherwise, the memristor keeps its current resistive state. The process that a memristor switches from high to low resistive state is referred to as SET; while the opposite switching process is RESET. Note that the polarities of the applied voltage for SET and RESET are opposite (see the right part of Fig.2.1). The voltage V_w and V_h to control primitive logic gates as shown in the next fig.

2.2 Primitive logic gates

CBL employs four primitive logic gates to realize any Boolean functions [25]; they are copy, inverter (INV), NAND and AND as shown in Fig. 2. Copy is used to transfer data within/between the crossbar arrays while other logic gates are used to process data. A logic gate typically consists of one or multiple input memristors, as well as one or multiple output memristors (see Fig. 2(a)). In addition, a resistor (R_s) is required as a reference. CBL uses high (RH) and low (RL) resistive state to represent logic 1 and 0, respectively. A copy gate in Fig. 2(a) is given as an example to illustrate the working principle of primitive logic gates. The other logic gates in Fig. 2(b) can be understood similarly (details can be found in Ref. [25]). A copy gate consists of an input and output memristor. Besides, a resistor R_s ($R_L \ll R_s \ll R_H$) is attached to the column nanowire as a reference [25]. Before copying the logic state stored in the input memristor to the output one, the output memristor is initialized to RH (i.e., logic 1). This initialization step is not shown in Fig. 2(a) for

brevity. In order to perform a copy operation, a control voltage $V_w > V_{th}$ is applied to the input memristor while the output memristor is grounded; the column nanowire is left floating. In case the input is 1, the input memristor is in high resistive state (R_H). The output memristor is initialized to high resistive state. Hence, the voltage V_x of the floating column nanowire is around 0; the voltage V_{om} across the output memristor is around 0. As a result, the output memristor keeps in high resistive state. The input-0 case can be understood in a similar way. Note that the INV and NAND gate need another control voltage V_h except V_w ; its value typically satisfies the following relation with V_w and V_{th} : $V_h = V_w / 2 < V_{th}$ [25]. In addition, V_h is used to alleviate the impact of sneak path currents within the crossbar [25]

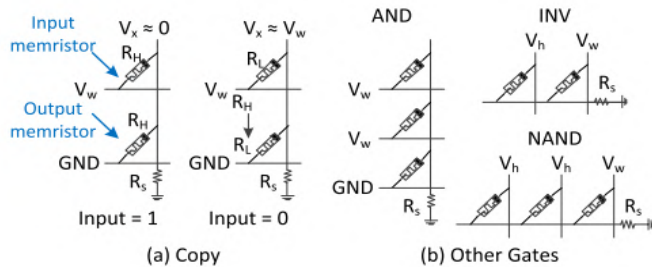


Fig 2.2: Primitive logic gates

2.3A Design Example:

Carry of a one-bit full adder CBL is able to implement any Boolean functions expressed in the format of sum-of-product (SoP) using one or multiple computing elements (CE). Next, we use the carry c of a one-bit full adder as an example to show this method. Carry c is expressed in Eq. (1). $c = xy + yci + cix = xy \cdot yci \cdot cix \{1\}$

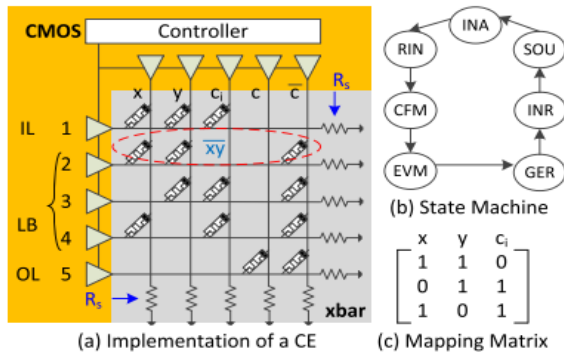


Fig 2.3: Design example: Carry of a one-bit full adder

Based on Eq. (1), three NAND gates are needed to implement xy , yci and $ci x$, respectively. Then an AND gate is needed to realize $xy \cdot yci \cdot ci x$ and an INV gate is needed to calculate the result of the carry c . These gates can be mapped onto a crossbar as shown in Fig. 3(a). Three NAND gates are mapped to row 2, 3 and 4, respectively. For instance, xy is mapped onto row 2. Two input memristors are located in the intersection of row 2 with column x and y . An output memristor is located in the intersection of row 2 and column c . The output memristors of the three NAND gates are then used as the input memristors of the followed AND gate. The output memristor of the AND gate is located in the intersection of

row 5 and column c . Finally, the INV gate uses the output memristor of the AND gate as its input. Its output memristor is placed in the intersection of row 5 and column c . Row 2, 3, and 4 together are referred to as logic body (LB). Row 1 is used to store the primary inputs of the entire circuit; it is referred to as an input latch (IL). Row 5 stores the circuit outputs; it is referred to as an output latch (OL). Resistors R_s that are required by primitive logic gates are attached to each row and column. The remaining junctions of the crossbar array are disabled without applying the forming process [6,25]; these disabled junctions are always in a very high resistance $R_D \gg R_H$ [6,25]. A CMOS circuit is utilized to control the crossbar [25]. It consists of a controller and voltage drivers (triangles in Fig. 3(a)). A voltage driver is attached to each row or column. It is used to apply control voltages to nanowires or leave them floating. The behavior of the controller is described by a finite state machine (FSM). Fig 2.3 shows such an FSM that consists of seven states.

1. INA: All the memristors are initialized to high resistive state R_H .
2. RIN: The IL in row 1 receives inputs from other CEs or is programmed by the controller.
3. CFM: The inputs stored in IL are copied to the input memristors of all three NAND gates located in row 2 to 4 at the same time.
4. EVM: The results of all three NAND gates are evaluated simultaneously.
5. GER: The results of the AND gate in column c is calculated.
6. INR: The result of the INV gate located in row 5 is evaluated and the final result carry c is achieved.
7. SOU: The outputs c and c are sent to other CEs

3. Mosys Design Flow

Mosys provides a circuit design flow from a Verilog programming interface to performance estimation models.

3.1. Design flow

Fig. 3.1 shows Mosys design flow for CBL. The white boxes are the reused components which are used in today's CMOS EDA flow; the gray boxes are new components added for CBL; the white boxes with red let are the new/modified parts for Mosys. Its inputs are Verilog source codes; its outputs include the SPICE netlists for the crossbar part as well as (synthesized) Verilog files of the CMOS controller. The entire flow consists of the following major steps. Verilog Parsing: The input of Mosys is a circuit description in Verilog. The Verilog code(s) is(are) translated into a netlist described in Berkely Logic Interchange Format (BLIF). This translation is processed by a Verilog front end. Currently, several open-source front ends are available such as ODIN II [37] and Yosys [38]. Yosys is integrated into Mosys design flow. Note that Mosys is a combination of 'Mosaic' and 'Yosys'. Logic Synthesis: The BLIF netlist is optimized and rewritten into a netlist consisting of look-up tables. This step is completed by the logic synthesis tool ABC [39]. Crossbar Mapping: Mosys first extracts the required information from the LUT netlist. Such information includes mapping matrix of each LUT and signal names at each stage. Subsequently, Mosys maps all

LUTs onto a crossbar array. The mapped crossbar array is described using a global mapping matrix. The detailed mapping scheme is referred to our preliminary work [32]. Simulation Files Generation: Mosys automatically generates simulation files used to verify the CBL circuits. They contain both the crossbar and CMOS part. Two Verilog-A files are generated; one is used to describe the CMOS controller; another describes a voltage driver and it is used a subcircuit. A SPICE netlist is generated to describe the crossbar part. It connects the crossbar and CMOS part together. In addition, the CMOS controller has another Verilog version as the input of Synopsys Design Compiler, which is used to estimate the performance. Performance Estimation: Mosys estimates the performance of the generated hybrid memristor/CMOS circuit in terms of area, delay, and power consumption. The detailed performance estimation model and visualization are referred to our preliminary work [32].

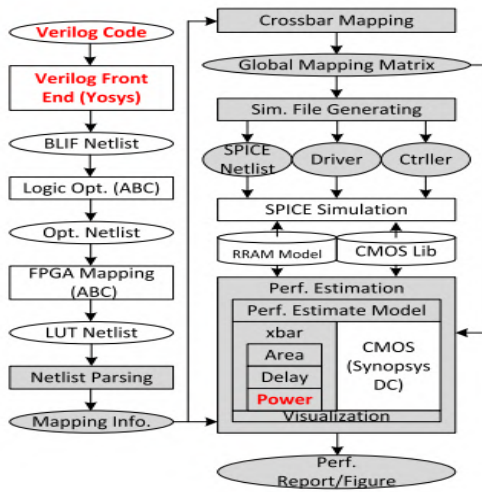


Fig 3.1 Design flow for Mosys

3.2. Extend mosys from mosaic

Mosys has extended our previous work Mosaic [32] in two aspects; see the white boxes with red letters in Fig.6.1. First, Mosys has added a Verilog front end using Yosys RTL framework [38]. As a result, Mosys significantly facilitates the VLSI circuit design and it can easily reuse existing soft IP cores that are developed for today’s VLSI circuits. Second, Mosys has improved the power estimation model. Mosaic uses a power model that needs to calculate the power consumption of all the possible input combinations and then average them as the metric of power consumption. As the input combinations grow exponentially with the number of input bits, it is extremely time-consuming and is infeasible to be applied for large circuits with many input bits. Mosys adopts a probabilistic method that has been applied in CMOS power estimation [34]. Such a probabilistic model saves the running time significantly with a marginal error.

4.Probabilistic power estimation model

This section presents a probabilistic method to estimate the power consumed by the crossbar part of CBL. It first presents the motivation. Next, it explains the basic idea of the probabilistic method. Note that the probabilistic method is

generic and therefore it can be applied in other types of memristor-based logic.

4.2. Basic idea

To show the basic idea of the probabilistic power model, a 2-input AND gate is used as an example. Fig. 6 shows such an example. The power consumed by an AND gate is the sum of power consumed by three memristors and a resistor R_s ; see Fig. 6(a). To apply the probabilistic model, the following four steps should be taken. All the parameters used in this example are summarized in Table 3. Step 1: Calculate the probabilities. The AND has two different cases depending on the resistance of input memristors. In the first case, all the inputs are in high resistance as shown in Fig. 6(b). Therefore, the output memristor does not switch. This is referred to as a non-switching probability, denoted by $p_{sw} = p_1 p_2$. In the second case, at least one of the inputs is in low resistance, the output memristor switches from R_H and R_L . This is referred to as a switching case, denoted by $p_{sw} = 1 - p_1 p_2$. Fig. 6 (c) and (d) show the two phases before and after the output memristor switches, respectively. Step 2: Calculate the voltage of the floating nanowire. To perform an AND gate, V_w is applied to the rows of input memristors while the row of the output memristor is grounded; the column is left floating (see Fig. 7.2 Therefore, the voltage across the three memristors and resistor R_s is determined by the voltage of the floating column

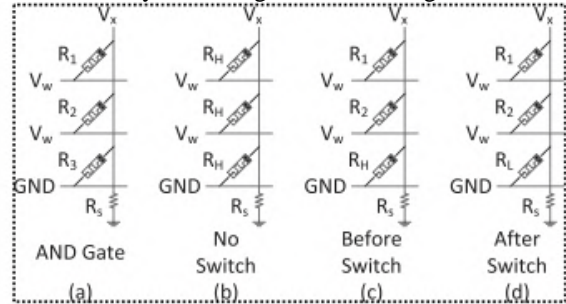


Fig.4.2 An example of the probabilistic power model: And gate

V_x . After applying Kirchhoff’s circuit law, V_x is calculated by Eq. (2).

$$V_x = \frac{1}{R_1 + \frac{1}{\frac{1}{R_2} + \frac{1}{R_3 + R_s}}} V_w \quad (2)$$

V_x varies with the value of R_1 , R_2 and R_3 . For instance, the probabilistic average value of V_x before and after the output memristor switches are expressed by Eq. (3) and 4, respectively. $V_{x, bsw} = (p_1 R_H + 1 - p_1 R_L) + (p_2 R_H + 1 - p_2 R_L) (p_1 R_H + 1 - p_1 R_L) + (p_2 R_H + 1 - p_2 R_L) + 1 R_H + 1 R_s V_w$ (3)

$$V_{x, asw} = (p_1 R_H + 1 - p_1 R_L) + (p_2 R_H + 1 - p_2 R_L) (p_1 R_H + 1 - p_1 R_L) + (p_2 R_H + 1 - p_2 R_L) + 1 R_L + 1 R_s V_w \quad (4)$$

where $V_{x, bsw}$ and $V_{x, asw}$ present the value of V_x before and after the output memristor switching; $R_i=1,2$ of Eq. (3) are replaced $1 R_i$ with $p_i \cdot 1 R_H + (1 - p_i) \cdot 1 R_L$; R_3 of Eq. (4) are substituted by R_H and R_L in the two phases before and after the output memristor switching, respectively. Step 3: Calculate the power consumption of each case. The power consumption of each case is the sum of the power consumed by all the memristors and resistor R_s at the case. As a

memristor can be regarded as a resistor, its power is estimated by Eq. (5) [40].

$$PR = V^2 R \quad (5)$$

Let us calculate the power consumption when the output memristor switches as an example. The power consumed by a memristor or resistor R_s is expressed in Eq. (5). For instance, the power consumed by the first input memristor R_1 and output memristor R_3 are estimated by Eqs. (6) and (7) [40].

$$P1, sw = 0.5 \cdot (P_{bsw} + P_{asw}) = 0.5 \cdot [(V_w - V_x, bsw)^2 p1 RH + 1 - p1 RL + (V_w - V_x, asw)^2 p1 RH + 1 - p1 RL] \quad (6)$$

$$P3, sw = 0.5 \cdot (P_{bsw} + P_{asw}) = 0.5 \cdot [(0 - V_x, bsw)^2 RH + (0 - V_x, asw)^2 RL] \quad (7)$$

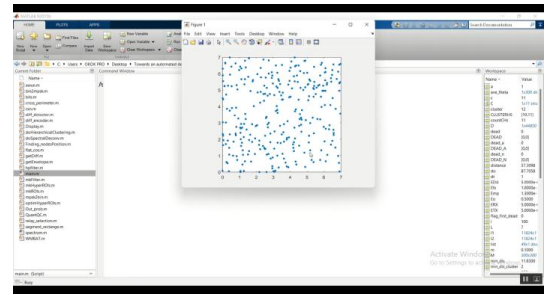
The power consumption P_{sw} of the switching case is the sum of power consumed by all the memristors and resistor R_s at the switching (sw) case. The power consumption P_{nsw} of the non-switching case is calculated in the same way. Step 4: Calculate the overall power consumption of a Gate. The overall power consumption P_{AND} of the AND gate is expressed by Eq. (8). $P_{AND} = p_{nsw} \cdot P_{nsw} + p_{sw} \cdot P_{sw}$ (8)

Power consumption of other primitive gates (i.e., NAND, INV, Copy) can be estimated using the above four-step procedure. As a crossbar array of CBL consists of many primitive logic gates, the power consumption of the entire crossbar is estimated by summing up the power consumed by each primitive gate at each execution step. The power consumption of all the execution steps are accumulated together as the performance metric of power consumption.

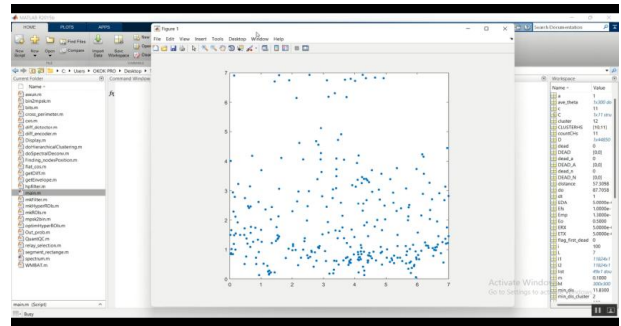
| Symbol | Definition |
|--------------------------|---|
| Probability | |
| P_i | The probability when an input memristor is the high resistance |
| P_{sw} | The probability when an output memristor is switching to low resistance |
| P_{nsw} | The probability when the memristor stays at high resistance |
| Resistance | |
| R_i | Resistance value of a memristor |
| R_s | Resistance value of a resistor |
| R_L | Low resistance of a memristor |
| R_H | High resistance of a memristor |
| Voltage | |
| $V_{x(asw, bsw)}$ | The voltage of the floating nanowire (before and after the output memristor switches) |
| V_w | A control voltage used to program memristor |
| Power consumption | |
| P_{low} | Power consumption of a memristor when it is switching |
| $P_{l,bsw/asw}$ | Power consumption of a memristor before or after it switches |
| P_{gate} | Power consumption of a primitive gate |

Table 4.2 Parameters used in power estimation

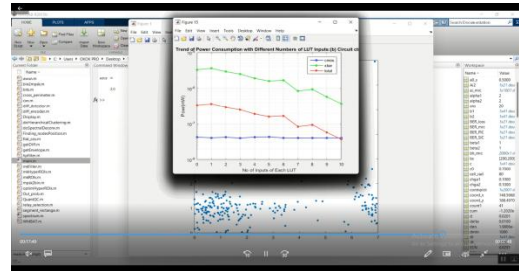
V.RESULT



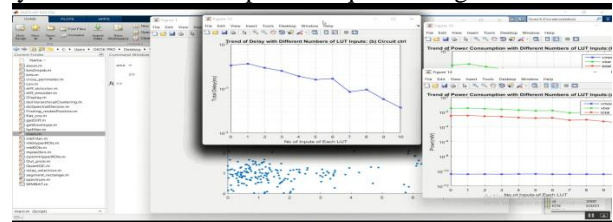
It is exceedingly time-consuming and impractical to use for large circuits with numerous input bits since the input combinations increase exponentially with the number of input bits. A probabilistic approach is used by Mosys and has been used for CMOS power estimate [34]. With a minor mistake, such a probabilistic model greatly reduces running time. These two expansion components will be thoroughly explained in the next two sections.



They include both the CMOS portion and the crossbar. One Verilog-A file is used to describe the CMOS controller, while the other one is used to define a voltage driver and a subcircuit. The crossbar component is described by a SPICE netlist.

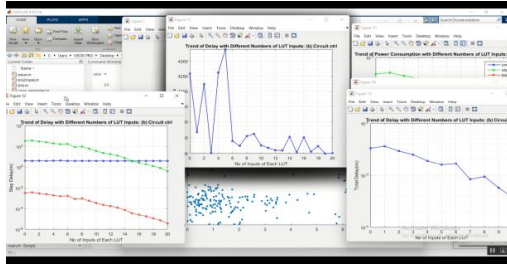


Mosys can only build combinational logic circuits at the moment, because a logic block's output from a current cycle cannot be used as an input for a subsequent cycle using the mapping mechanism used in Mosys. As a result, Mosys has not yet been able to incorporate sequential logic.

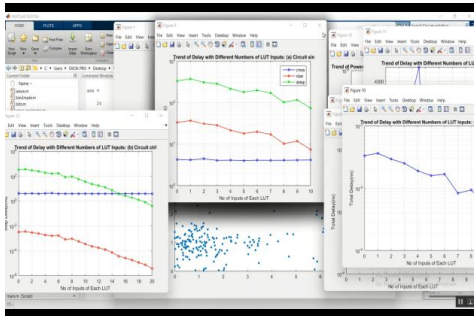


In the diagram, the black dots represent the memristor devices while the white areas represent the disabled connections.

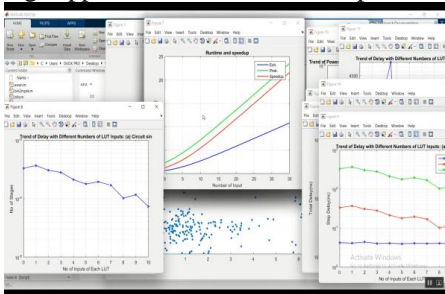
There are 10080 rows and 782 columns in the mapped crossbar



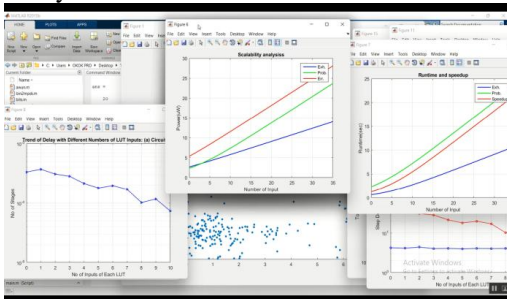
The AND logical operation may take one of two forms, determined upon the resistance of the input memristors. When we look at the first scenario, each of the inputs has a significant resistance.



Both the crossbar and the CMOS component contribute to the overall power consumption of a CBL system. Because the crossbar section is responsible for processing incoming data, the amount of power required is dependent on the format of the data being supplied. Mosaic, our earlier piece of art



Since Xbar-Gen does not already have a place-and-route system, the suggested scheme has been included into Xbar-Gen. In addition to this, the performance estimate model for the CMOS component is included, despite the fact that the original study did not include it.



The accuracy, scalability, and running time of the suggested probabilistic power model are all examined. The exhaustively

searching power model that was used in our earlier work is utilized as a baseline since it leverages the voltage information retrieved from the SPICE simulations. This allows the model to accurately represent the power consumption of the device.

CONCLUSION

In this work, Mosys, an automated method for designing Memri-stor-based VL-SI circuits, is proposed. Mo-sys offers a set of tools that includes the Verilog programming interface, circuit synthesis, crossbar mapping, the creation of simulation files, and the estimation of performance. Using a probabilistic method, it also speeds up the power estimation process by a lot. Mo-sys is trying to make the design of hybrid CM-OS-Memri-storVLS-I circuits as easy as possible.

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Low-Cost Ventilator

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Abstract - Respiratory failure complicates most critically ill patients with COVID-19 and is characterized by heterogeneous pulmonary parenchymal involvement, profound hypoxemia and pulmonary vascular injury. The high incidence of COVID-19 related respiratory failure has exposed critical shortages in the supply of mechanical ventilators, and providers with the necessary skills to treat. Traditional mass-produced ventilators rely on an internal compressor and mixer to moderate and control the gas mixture delivered to a patient. However, the current emergency has energized the pursuit of alternative designs, enabling greater flexibility in supply chain, manufacturing, storage, and maintenance considerations. To achieve this, we hypothesized that using the medical gasses and flow interruption strategy would allow for a high performance, low cost, functional ventilator. A low-cost ventilator designed and built-in accordance with the Emergency Use guidance from the US Food and Drug Administration (FDA) is presented wherein pressurized medical grade gases enter the ventilator and time limited flow interruption determines the ventilator rate and tidal volume. This simple strategy obviates the need for many components needed in traditional ventilators, thereby dramatically shortening the time from storage to clinical deployment, increasing reliability, while still providing life-saving ventilatory support. The overall design philosophy and its applicability in this new crisis is described, followed by both bench top and animal testing results used to confirm the precision, safety and reliability of this low cost and novel approach to mechanical ventilation. The ventilator meets and exceeds the critical requirements included in the FDA emergency use guidelines. The ventilator has received emergency use authorization from the FDA.

Index Terms: IoT (Internet of Things), Node MCU, Smart environments, Temperature and Humidity sensor, Wi-fi

I. INTRODUCTION

Respiratory disorders or lung diseases are conditions such as asthma, lung cancer, cystic fibrosis, pulmonary hypertension, tuberculosis (TB), emphysema, esothelioma to name a few. These are either inherited genetically or are caused by the long-term exposure to external irritants that damage the lungs and the airways. Respiratory diseases produce health complications and life-threatening conditions if they are left untreated. They make up to five out of the

thirty most common causes of death around the world: Chronic Obstructive Pulmonary Disease (COPD), lower respiratory tract infection, lung cancer, TB, and asthma are ranked third, fourth, sixth, twelfth, and twenty-eighth, respectively. More than one billion people around the world suffer from acute or chronic respiratory conditions. Respiratory disorders are the third leading cause of death in Canada and the United States both in adults and infants. In Canada, one in five people have a respiratory disorder. Over two million Canadians suffer from asthma, one of the leading causes of hospital admissions among children. In 2014, lung cancer caused more cancer deaths among Canadians than colorectal, breast and prostate cancer combined. The leading cause of hospitalization among adults is COPD, which also accounts for more than 10% of all disability-adjusted life-years (DALYs). DALYs is a metric that estimates the amount of active and productive life lost due to a condition. Respiratory diseases impose a significant burden on the Canadian economy, particularly COPD, asthma, and lung cancer. Respiratory disorders account for 6% of annual healthcare costs in Canada. In 2014, respiratory disorders were estimated to cost the Canadian economy over \$12 billion every year according to an analysis by the Conference Board of Canada. The internal organs that are most vulnerable to injury and infection from the external environment are the lungs. The constant exposure to chemicals, such as toxic smoke of biomass fuel, particles, inhaling polluted outdoor air, and infectious organisms in the air cause lung infection. The annual economic burden is also projected to be double by 2030. Innovative strategies, policies to further reduce and modify the risk factors and treatments must be developed in order to reduce the imminent burden of these conditions on the economy and the health care systems. A potential area of research is in the development of technologies to assist patients with respiratory disorders.

II. LITERATURE REVIEW

[1] Cost effective portable ventilator

Authors: Irfan Ali, Ahsan Ejaz; Prototyping of a Cost-Effective and Portable Ventilator Software || 2016.

This literature review provides a background into mechanical ventilation, and a discussion about key ventilator settings and waveforms for reading and analyzing output signals. A literature search was conducted using Google Scholar for literature published in the range from 2010 to 2021. The topics covered in this chapter include breathing anatomy in Section 2.2, under which mechanism of breathing, respiratory modes and factors that affect breathing are discussed. Mechanical ventilators, including types, working mechanisms, ventilator settings, uses, and risks are discussed in Section 2.3. Section 2.4 discusses the current COVID-19 situation and the need for emergency ventilators, and Section 2.5 briefly outlines the existing open-source ventilator designs.

[2] Breathing Anatomy

Authors: Dino Dominic Ligutan, Julius Palingcod, and Carl John Patrick Castillo || 2017.

Breathing is essential for survival. The human body can live without food for 3 weeks and water for 3 days, but only 3 minutes without air. Normal bodily functions cease to occur when brain is starved of oxygen. The act of breathing is called pulmonary ventilation and is described as the process of air flow into and out of the lungs from the atmosphere during inspiration (breathing in air) and expiration (breathing out air). The air movements inside the lungs are governed by the principles of the gas laws. Pulmonary ventilation is dependent on three types of pressure: atmospheric pressure (P_{atm}); intrapleural pressure (P_{ip}), the pressure within the pleural cavity; and intra-alveolar pressure (P_{aiv}), the pressure within the alveoli. The air flows into the lungs due to the difference in the pressure. The air flows down a pressure gradient from an area of higher pressure to an area of lower pressure. Atmospheric pressure is greater than intra-alveolar pressure and intra-alveolar pressure is greater than intrapleural pressure. The same principle applies during expiration, when air flows out of the lungs. During exhalation, pressure within lungs becomes greater than the atmospheric pressure.

[3] Mechanism of Breathing

Authors: Divas Karimanzira, Thomas Rauschenbach ||

2019.

The two major steps involved during respiration are inspiration and expiration. When air enters the lungs, the process is called inspiration, and when the air leaves the lungs, it is called expiration. One full sequence of expiration and inspiration is called a respiratory cycle. The two general muscle groups that are used during normal inspiration are the diaphragm and the external intercostal muscles. When a person takes bigger breath, additional muscles are required. The diaphragm moves towards the abdominal cavity when it contracts, this creates a larger thoracic cavity and hence there is more space for the lungs. The rib cage then expands and the volume of the thoracic cavity increases due to the contraction of the external intercostal muscles. Ribs move upward and outward due to the contraction of the external intercostal muscles. This increase in volume leads to a decrease in intra-alveolar pressure. Hence, a pressure lower than atmospheric pressure is created. This creates a pressure gradient that then drives air into the lungs. The expansion and contraction of the thoracic cavity causes inspiration and expiration respectively. The intra-alveolar (i.e., the pressure within the alveoli) and intrapleural pressures (i.e. the pressure within the pleural cavity) are dependent on certain physical features of the lung. However, the ability to breathe i.e., to have air enter and leave the lungs during inspiration and expiration, respectively, is dependent on the air pressure of the atmosphere and the air pressure within the lungs.

[4] Mechanical Ventilators

Authors: IEEE | Electrical and Computer Engineering Department, National Chiao Tung University, Taiwan (R.O.C.) || 2021.

A mechanical ventilator is a device that aids a patient to breathe when they are having difficulties; for example, if they are recovering from a surgery or serious sickness or have difficulty breathing on their own for any reason (e.g. a critical illness). When using a ventilator, a hollow tube or a mask is placed in the patient's mouth to connect them to the ventilator. Airflow is then pushed into patients' lungs via the mechanical ventilator to help them breathe. Patients remain on the ventilator until their condition is improved or until they can breathe on their own. The two types of mechanical ventilation include the following: Invasive ventilation: usually performed in the intensive care unit with a tube inserted into the patient's airway. Noninvasive ventilation: usually a

mask that goes around a person's mouth; it can be used at home by people that are facing respiratory difficulties.

[5] Pressure-Volume (PV) Relationship

Authors : Stiff D, Kumar A, Kisson N, et al.: Potential pediatric intensive care unit demand || 2020.

Compliance is equal to change in volume over the change in pressure ($C' = \Delta V / \Delta P$; C' =compliance, ΔV =change in volume, ΔP =change in pressure), which means that when a small change in pressure causes a large change in volume, it means that the lung is very compliant. In the case of a low compliant lung, it will take a lot of pressure to make a small amount of change in volume. If the compliance of the lung decreases, it results in higher pressure requirements, and vice versa. The waveform in Figure 2.6 explains this concept. In this example, the reading was taken where BPM is 18, V_t is 600 ml and PEEP is 5 cmH₂O. In this case since the patient is not taking a voluntary breath there is no negative pressure. The ventilator starts and volume goes up to a certain pre-set tidal volume. As the volume starts to go into the lungs the pressure will go up in the lung until it reaches maximum. The flow starts at that time and reaches a user defined preset. When the flow stops and comes out of the patient the pressure in the lung falls back down and volume will come out of the lung again and the cycle repeats.

[6] Obstructive and Restrictive Lung Disease

Authors: MacLaren G, Fisher D, Brodie D: Preparing for the Most Critically Ill Patients With COVID-19 || 2018.

Lung conditions have been classified as obstructive or restrictive lung diseases by doctors. The condition that makes it hard to exhale the air in the lungs is obstructive lung disease and the condition where people find it difficult to fully expand their lungs with air is restrictive lung disease. Both diseases share the same main symptom which is shortness of breath during exertion. People with restrictive lung diseases cannot fully fill their lungs with air hence their lungs are restricted from fully expanding. This disease results from the condition causing stiffness in the lungs, chest wall, weak muscles or damaged nerves that may cause restriction in lung expansion. People with obstructive lung diseases have shortness of breath caused due to difficulty exhaling all the air from the lungs. In this condition exhaled air comes out more slowly than

normal. The most common causes of obstructive lung diseases are COPD, asthma, cystic fibrosis to name a few.

[7] Low-Cost Open-source Ventilators

Authors Malatino EM: Strategic national stockpile: overview and ventilator assets. Respir Care || 2019.

An open-source ventilator is made by using freely-licensed design and is often thought to be used for disaster situations, the sources include the components that are freely available. Parts can be 3D-printed instead of purchasing to help keep the cost low. Documentation and testing of open source ventilators has been going on since the start of the COVID-19 pandemic. This discusses the different types of low-cost ventilator systems that can be used to treat COVID-19 patients.

III. PROBLEM STATEMENT

Human lungs use the reverse pressure generated by the contraction motion of the diaphragm to suck in air for breathing. A contradictory motion is used by a ventilator to inflate the lungs by pumping type motion.

A ventilator mechanism must be able to deliver in the range of 10 –30 breaths per minute, with the ability to adjust rising increments in sets of 2.

Along with this, the ventilator must have the ability to adjust the air volume pushed into the lungs with each breath. The last but not the least is the setting to adjust the time duration for inhalation to exhalation ratio.

Apart from this the ventilator must be able to monitor the patient's blood oxygen level and exhaled lung pressure to avoid over/under air pressure simultaneously.

IV. METHODOLOGY

This project will measure the parameters of humidity, temperature, soil moisture, rainfall, and pressure and show the results on the Blynk application, making it an Internet of Things (IoT) based weather monitoring system that enables weather conditions to be checked online from any location.

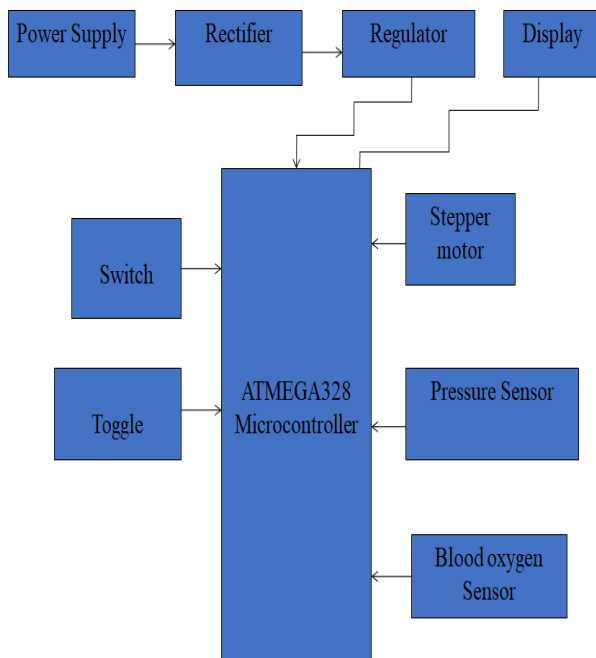


Fig.1. Block Diagram

Components Used

- Power Supply
- Rectifier
- Regulator
- Display
- ATMEGA328 Microcontroller
- Switch
- Toggle
- Stepper motor
- Pressure Sensor

V. ADVANTAGES

Pneumatic and electrical circuits used are simple, reliable and of low cost. Thus, DEVEN has advantage over other low- cost/portable ventilators. DEVEN employs a solenoid valve-based, micro-processor-controlled technology; hence, its design is different from most of the low-cost ventilators.

1. Various important parameters such as inspiration pressure and its status, tidal volume

FiO₂, breathe rate, inhaling– exhaling (I:E) ratio, PEEP (positive endexpiratory pressure), sigh inhalation, etc. can be controlled and adjusted manually as well as in automated mode. DEVEN can be operated in three modes, and each mode gets displayed on the LED screen

2. Control of various parameters: Ranges of certain parameters which can be controlled are as follows:
3. Respiration (breathe) rate: 8–30 BPM (breathes per minute). Inhaling–exhaling ratio (IER) (including inverse ratio ventilation): from 4:1 to 1:4 (4:1, 3:1, 2:1, 1:1, 1:2, 1:3, 1:4).
4. Tidal volume (VT): 50–500 ml (depending on pediatric or adult use). Inspiration pressure: 5–50 cmH₂O. Percentage of oxygen (FiO₂): 0–100% of oxygen
5. Safety features such as alarms, interlock for switching of and power backup give DEVEN an edge over other low-cost ventilators
6. Display of all the parameters on an LCD screen with inbuilt alarms.
7. The exhaled air can be contained in a line and can be vented safely for any chemical treatment if it is contagious. Feature of adjustable PEEP is provided
8. Low cost/economical: Rs. 50,000/– (for basic model in hospital use) when produced in numbers of 500 or more

VI. DIS ADVANTAGES

Ventilator complication : lung damage

Medical staff members carefully measure the amount, type, speed, and force of the air the ventilator pushes into and pulls out of your lungs. Too much oxygen in the mix for too long can be bad for your lungs. If the force or amount of air is too much, or if your lungs are too weak, it can damage your lung tissue. Your doctor might call this ventilator-associated lung injury (VALI)

Among the conditions VALI can lead to are:

- **Pneumothorax:** A hole or holes in your lungs that release air into the opening between your lungs and the wall of your chest. This can cause pain and loss of oxygen. It might also cause your lungs to collapse, which is an

emergency.

- **Pulmonary edema:** The buildup of liquid in your lungs. Your lungs may collect more liquid if you already have pneumonia.
- **Hypoxemia:** Too little oxygen in your blood. Damage to your lungs can cause this. Medical staff will notice it if your blood oxygen levels start to drop and you are short of breath

Ventilator complication : Other Disease

- **Delirium:** You're usually unconscious or heavily sedated when you're on a ventilator. Either way, you take strong medications. Sometimes, these drugs may take some time to wear off even after the tube is removed from your airway.
- **Immobility:** Because you're sedated, you don't move much when you're on a ventilator. That can lead to bedsores, which may turn into skin infections. You're more likely to get blood clots for the same reason. Your muscles, including those that normally help you breathe for yourself, may get weak. You might need rehab with a physical or respiratory therapist.
- **Vocal cord problems:** When your doctor removes the breathing tube to take you off the ventilator, it can damage your vocal cords. Expect some soreness and a raspy voice at first. But let your doctor know if it's hard to breathe or speak after the tube comes out.

V. APPLICATIONS:

- A ventilator is a machine that helps you breathe when you're sick, injured, or sedated for an operation. It pumps oxygen-rich air into your lungs.
- It also helps you breathe out carbon dioxide, a harmful waste gas your body needs to get rid of.
- A ventilator is a machine that helps a patient breathe (ventilate) when they are having surgery or cannot breathe on their own due to a critical illness. The patient is connected to the ventilator with a hollow tube (artificial airway) that goes in their mouth and down into their main airway or

trachea

CONCLUSION

The environment may be monitored using this equipment, which also allows for self-defense. The environment must have sensor devices deployed for data collection and processing in order to implement this. We can make the environment more interactive by placing sensor devices there, allowing it to communicate with other items across a network and become more real-world. In this research, many embedded system models are provided together with an intelligent method of environment monitoring. Functions of several modules were described in the suggested architecture.

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Circular Polarized Microstrip Patch Antenna Array for Wireless Communication Applications

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Abstract: This paper represents the novel feed circularly polarized 2x2 microstrip patch antenna array operating at 5.8 GHz for wireless communication applications. The designed shape is called as novel because antenna array which is designed fed through the element of antenna. The edge of each microstrip patch antenna is truncated in order to obtain circular polarization. FR4 epoxy material which has dielectric constant of 4.4 and dielectric height 1.6 mm was used as a substrate. The 2x2 rectangular patch antenna array design is fed by using microstrip line feeding technique, which can be used in applications where antenna size required to be small. The Various antenna parameters namely S11, VSWR, Impedance bandwidth, Axial ratio and Gain are calculated. The 3DEM of Mentorgraphics software is used for design and simulation purposes.

Keywords: *Microstrip antenna arrays, Novel fed, Circular polarization, FR-4 Substrate, microstrip line feed.*

I. INTRODUCTION

Now a days various communication systems such as radar systems, mobile systems, RFID, GPS, satellite communications use the applications of microstrip antenna arrays due to their lightweight, low cost, low profile, superior portability and easy for fabrication and integration with MMIC's [1]. Microstrip antennas have certain limitations such as narrow impedance bandwidth, relatively large size and low gain [2]. Planar antenna designs are used in most of the cases because of their applications in modern wireless mobile systems [3]. The various different frequencies are used for wireless communication [4-6]. The proposed work selects 5.8 GHz ISM band frequency for its operation.

Polarization is known to be the fundamental nature and characteristics of antenna. Linear, circular and elliptical are the three types of polarization in electromagnetics. Circular polarization main advantage is that it will usual go on change the direction of rotation of waves due to this it will prevent the addition or subtraction main signal and the reflected signal. By

circular polarization there will be less flutter and fading at end of link. The circular polarization waves will radiates energy in vertical and horizontal planes, as well as every plane in between.

The circular polarization approaches with two directions of propagations that are Left Hand Circular Polarization (LHCP) and Right Hand Circular Polarization (RHCP). The Left Hand Circular Polarization (LHCP) follows counterclockwise direction and Right Hand Circular Polarization (RHCP) follows clockwise direction. The many advantages make circular polarization to be used in various wireless communication applications. Figure 1 below shows the representation of circular polarization.

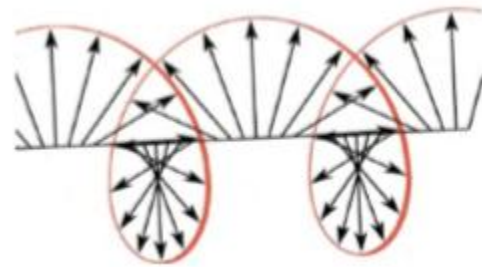


Figure 1. Circular Polarization

Some feeding techniques such as proximity-coupled microstrip feed, coaxial feed, microstrip line feed are developed for the design of microstrip antenna. The investigation is carried out to calculate gain and return loss at 5.8 GHz ISM band frequency. The feeding is done through an element of the array. The obtained result shows that feeding technique is novel and obtains the required results for 5.8 GHz applications.

M. T. Islam et al. designed a novel feeding strip using U-shaped feeding for 150 mm X 150 mm microstrip patch at frequency 2.45/5.8 GHz. They

obtained 31.9 dB return loss and 10.1 dBi gain for 5.8 GHz [7]. T. S. Ooi et al. designed 60 mm X 60 mm circularly polarized compact dual band patch antenna operating at 2.45/5.8 GHz ISM frequencies. They obtained 12.8 dB return loss and 7.34 dB gain [8]. Lin Peng et al. designed 64 mm X 62 mm M-shaped asymmetric patch antenna for 2.45/5.8 GHz ISM bands. They obtained 6.32 dB gain and -15 dB return loss for 5.77 GHz [9]. Pingan Liu et al. designed 23 mm X 36.5 mm compact circularly polarized tri-band printed antenna operating at 2.4/5.8 GHz ISM bands. They obtained 2.5 dB gain and 15 dB return loss for 5.8 GHz [10].

First we selected the designed 2x2 novel feed circularly polarized antenna array because of its small dimensions, easy fabrication and low cost. The designed array exhibits planar movements. Primarily we measured dimensions of the single patch for array element. Afterwards we designed 2x2 novel feed circularly polarized antenna arrays according to our goals like 2 or 3 dB gain and less than 10 dB return loss using 3DEM of Mentorgraphics software. The feeding is novel and resulted in good reading, we came to conclusion that it can be used at 5.8 GHz ISM band applications.

II. DESIGN AND ANALYSIS

In the proposed work, we use the FR4 (flame retardant) dielectric material with dielectric Constant of 4.4 and the thickness of substrate to be 1.6 mm. The rectangular patch width and length is calculated using the formula

The designed patch Width is calculated using the equation

$$W = \frac{c}{2f_r} \sqrt{\frac{2}{\epsilon_r + 1}} \quad (1)$$

The designed patch Length is calculated using the equation

$$L_p = L_{re\text{ff}} - 2\Delta L \quad (2)$$

The Extension Length of the Patch is calculated as

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{re\text{ff}} + 0.3) \left(\frac{w}{h} + 0.264 \right)}{(\epsilon_{re\text{ff}} - 0.258) \left(\frac{w}{h} + 0.8 \right)} \quad (3)$$

The relation between actual length and effective length of designed patch is given by

$$L_{e\text{ff}} = L + 2\Delta L \quad (4)$$

The effective length of patch is given by

$$L_{e\text{ff}} = \frac{\lambda_g}{2} \quad (5)$$

Further, we also calculated the Return loss, Impedance Bandwidth, VSWR, Axial Ratio and Gain for 2x2 Antenna Array Design. We use 3DEM of Mentorgraphics software for simulation of the designed antenna array.

III. 2x2 ANTENNA ARRAY DESIGN

The proposed novel feed circularly polarized 2x2 microstrip antenna array operating at 5.8 GHz for wireless communication applications is shown in below Figure 2, and its fixed antenna dimensional parameters are given in Table 1. Polarization on a rectangular microstrip antenna can be obtained by truncating small portion of the patch as shown in Figure 2. The width and length of rectangular patch is 16.5 mm x 10.5 mm. We truncated the each rectangular patch at two opposite corners whose size is equal to $L/4=10.5/4=2.625$ mm in order to obtain the circular polarization in the proposed novel feed rectangular 2x2 microstrip patch antenna array. Port 1 is excited with wave source of magnitude 1 and phase 0 and Port 2 is excited with wave source of magnitude 1 and phase 90 in order to obtain circular polarization. From the simulated results it shows that axial ratio values are below the limit of 3dB. So we came to conclusion that the designed antenna array exhibits the property of circular polarization.

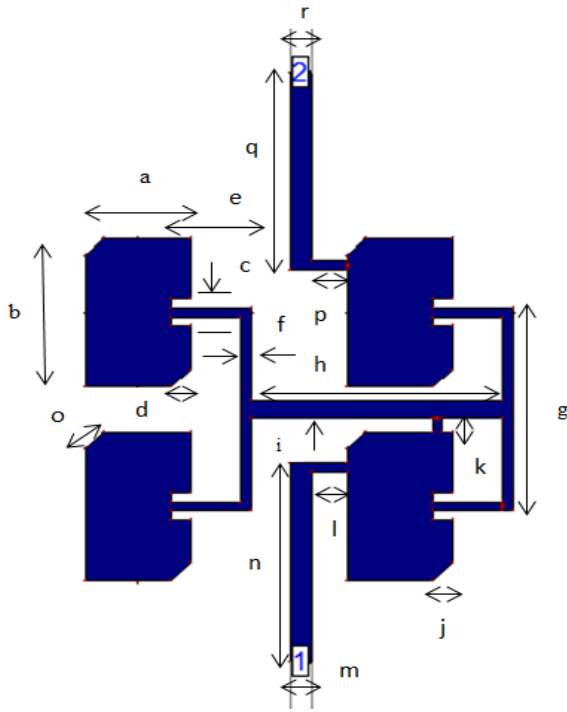


Figure 2. The dimensions of our novel fed antenna.

Table 1. Physical Parameters of Antenna

| | | | | | | | |
|-----------|-------|------|----|---|-----|----|------|
| Parameter | a | b | c | d | e | f | g |
| mm | 10.5 | 16.5 | 3 | 2 | 7 | 1 | 21.5 |
| Parameter | h | i | j | k | l | m | n |
| mm | 26 | 2 | 1 | 2 | 3.5 | 2 | 22 |
| Parameter | o | p | q | r | -- | -- | -- |
| mm | 2.625 | 3.5 | 22 | 2 | -- | -- | -- |

IV. SIMULATED RESULTS OF THE PROPOSED 2x2 MICROSTRIP PATCH ANTENNA ARRAY

Figure 3 shows the simulated return loss and bandwidth of the proposed 2x2 microstrip antenna array. The 10dB impedance bandwidth obtained is from range 5.73 GHz to 6.09 GHz is around 355 MHz.

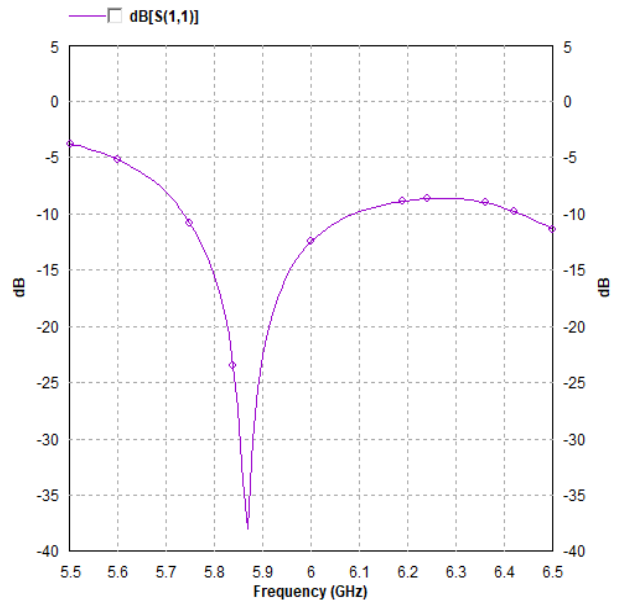


Figure 3. The simulated of return loss and bandwidth

The Figure 4 represents the simulated radiation pattern for proposed microstrip antenna in 3-D. The obtained maximum gain for the proposed design is 2.82 dBi.

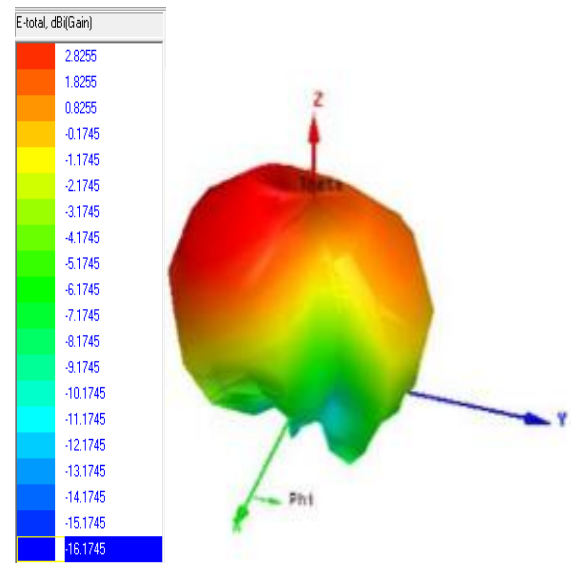


Figure 4. Simulated radiation pattern in 3-D

The simulation result of the proposed 2x2 microstrip patch antenna array has got return loss of value of -37dB at 5.8 GHz.

The Figure 5 demonstrates that for the circular polarization axial ratio value should be below the 3dB limit. We obtained Slight cross polarization level for (Theta=0, Phi=0) for front end of the antenna. The designed antenna on further optimizing we got required

axial ratio, broad impedance bandwidth and better radiation patterns.

V. CONCLUSION

The results show that the return loss value of the simulated antenna is within the designed 5.8 GHz ISM band frequency range. This proposed 2x2 antenna array can be easily designed and used in wireless communication applications such as fixed-satellite, radiolocation, mobile, Amateur & Amateur-satellite services. Also it can be integrated into devices because of its small dimensions. As it stated previously our designed antenna has enough values of return loss and gain at 5.8 GHz. To our understanding as it feeded through element of antenna it has a unique and novel feeding.

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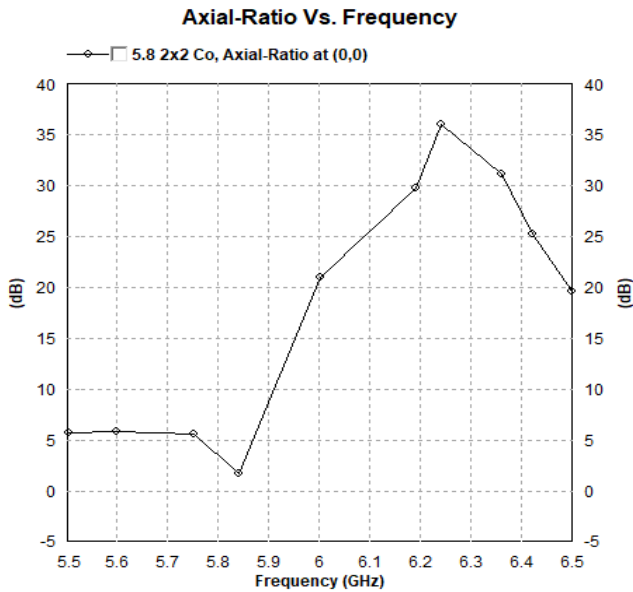


Figure 5. Axial Ratio (Phi = 0, Theta = 0)

The Figure 6 represents the simulated result of Voltage standing wave ratio (VSWR) of the proposed 2x2 microstrip patch antenna array. The achieved VSWR value for proposed antenna is 1.05.

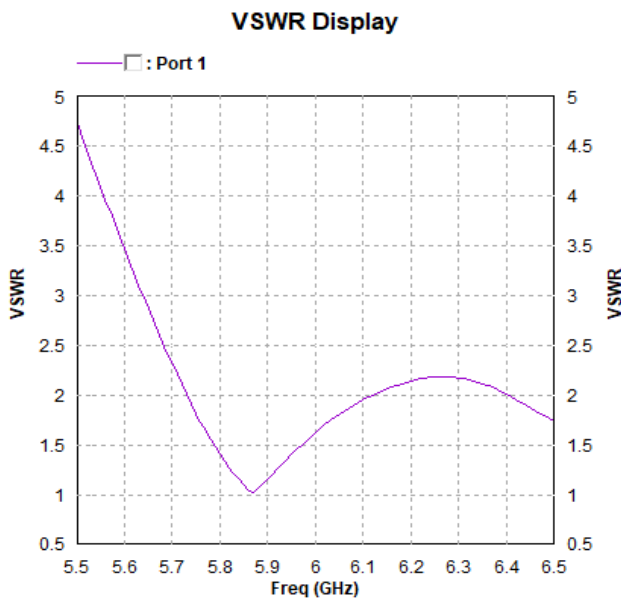


Figure 6. The Simulated result of VSWR

Advanced Defence System for Indian Army Base

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Abstract-In our paper we are going to build an Indian army base in which the controls of the attack or the control of the security will be done using the electronics components like in this project we are going to add on the Radar System in which we get to detect any of the object coming in our radar, Weather detection system is used to check weather there is a change in climatic conditions, defence must get to know the conditions there area so that will be helped to any kind of action towards attacking or defending, Automatic alarm system can easily detect and helps to know the entering of enemy in the surveillance area, which can be placed around the base, vehicle number plate detection helps us to avoid the enemy vehicles into the military base, Communication system helps to communicate between different bases which helps to gather the information and know the situation.

I. INTRODUCTION

Defence system plays an important role in building a better nation one of it's worst case is enemy attack. To overcome these kind of attack the defence system has took several steps to defend them. One of the major step goes with the radar system, gives all the information about the enemy objects that may be it's distance from the radar, the angle through which it is approaching towards It and it has a very little amount of latency that is ignored. Radar was developed secretly for military use by several countries in the period before and during world war 2. As there will be lot of change in climatic conditions, defence must get to know the conditions there area so that will be helped to any kind of action towards attacking or defending. For that purpose weather detection sensors will be used which helps to know the weather conditions around the base. Automatic alarm system can easily detect and helps to know the entering of enemy in the surveillance area, which can be placed around the base. Whenever the buzzer starts to wake the defence system will be present at the situation and will take action. There will different sensors used to detect the object or man or any kind of animal entering the base system. Enemy will take any step to enter the base like moving in by vehicles but vehicle number plate detection helps us to avoid the enemy vehicles into the military base. The defence will take a high measures to defend the entrance of the enemy into the base. Similarly

object detection will help to know carrying of the objects in and out of the base. If any kid of unwanted object will be carried in the area than object detection will sense and alert the system. Communication system helps to communicate between different bases which helps to gather the information and know the situation. Nowadays we can use edge devices and edge technology for the collection of data in the military domain and how we can use those collected data to make our defence system more secure and robust.

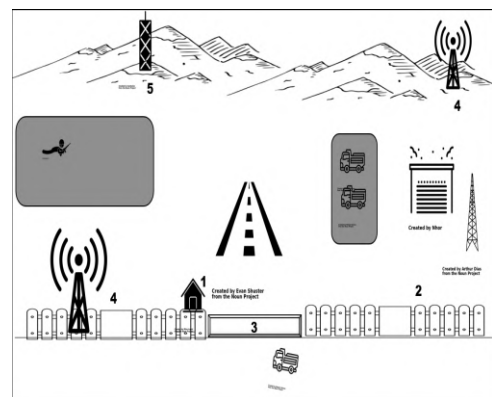
II. PROBLEM STATEMENT

. The increasing population in world concerns more about nation's security.

. So it becomes the priority to make the defence system of a nation more advanced with constant developments in it, with the situation of war going in west it's more important to be always ready with the latest defence system to tackle the enemy attack at any situations.

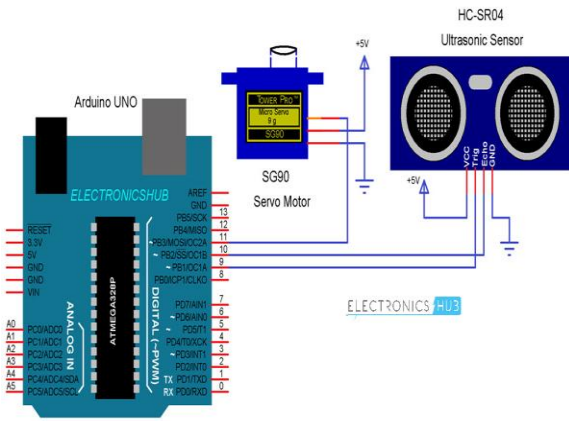
III. BLOCK DIAGRAM

SKETCH OF INDIAN ARMY BASE



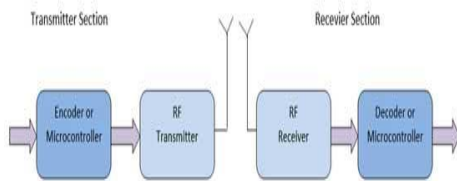
1. Automatic Number Plate Recognition System (ANPR)
2. Encrypted Communication System
3. Automatic Gate opening System
4. RADAR systems
5. Weather Detection System and Object movement detection

Radar System:



- Rain Sensor (1)
- LDR Sensor (5)
- LCD display with I2c module (4)
- DHT 11 Sensor (1)
- Servo Motor (2)
- Ultra Sonic Sensor (2)
- Node MCU (1)
- Gear Motors (4)
- Bread Board (4)
- Jumping Wire (3 set)

Encrypted Communication System :



ADVANTAGES AND DISADVANTAGES :

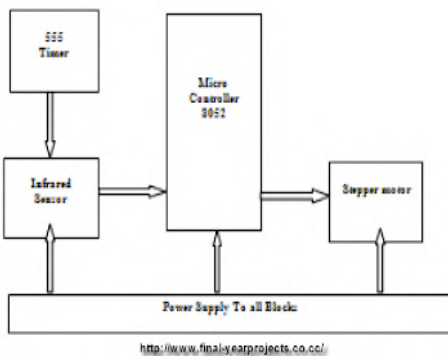
1. ANPR(Automatic Number plate Recognition)

Advantages

Real Time Monitoring & Surveillance Automatic number plate recognition does away with the painful and tedious process of manually recording the numbers. Very few people can spot the number plates and the exact registration numbers when a car speeds by. When there are multiple cars on the road, it is humanly impossible for anyone to record all the numbers. Automatic number plate recognition systems don't just record the numbers and have images but they also do so in real time.

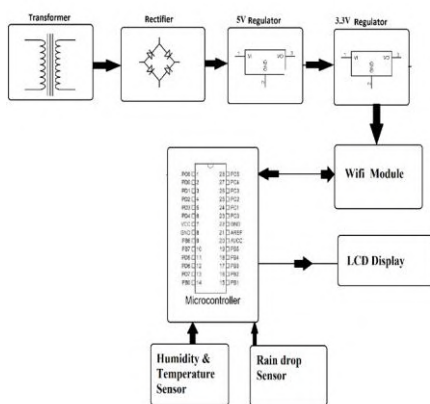
Still and Video Footage Not every automatic number plate recognition system has both still and video footage but many do. Some systems are specially designed to take snapshots when a vehicle speeds or jumps a red light, takes a wrong turn or just goes haywire on the road. The stills and video footage can help law enforcement agencies, traffic departments and can also assist legal counsels.

Automatic Gate Opening System:



Proactive and Reactive Security Automatic number plate recognition is a deterrent. Those who are serial traffic offenders would resist from breaking the law. The systems also help with reactive security, including inspections and forensics, investigations and legal proceedings. Whichever perspective you look at it from, automatic number plate recognition seems a necessity and a boon.

Weather Detection System :



Disadvantages

1. Lack of Manned Surveillance The availability of an automatic system has reduced the importance of manned surveillance. Not only is there less traffic personnel on the streets and major crossroads but those that are there don't bother to check number plates. This may lead to lapse in manned security.

2. Bad Weather or Hindrances Coupled with the lack of manned surveillance, bad weather or any kind of hindrances and obstructions can make

HARDWARE COMPONENTS :

- Arduino Uno (4)

automatic number plate recognition systems ineffective. In such cases, the security measures may go kaput.

3. Privacy Concerns

The fact that images and records are kept and stored for a long time raises privacy concerns. The records of a person’s whereabouts in all the footages can be misused. Stalkers, data thefts and people with various nefarious intentions can misuse all such data.

Applications

- It is used in Car Park management and access control
- It’s also used in Industrial estates
- It is used for Site entrances
- And used in Leisure, hotels and commercial

2. Radar system

Advantages

1. RADAR can penetrate mediums such as clouds, fogs, mist, and snow. The signals used by RADAR technology are not limited or hindered by snow, clouds, or fog. This means that even in the presence of these adverse conditions, data will still be collected.
2. RADAR signal can penetrate insulators. Materials that are considered insulators such as rubber and plastic do not hinder RADAR signals from collecting data. The signals will penetrate the materials and capture the necessary data required.
3. It can measure the distance of an object. RADAR systems work by measuring the exact distance of an object from the transmitter.
4. RADAR signals do not require a medium of transportation. RADAR employs the use of radio signals that can travel in air or space. They do not require any medium to be transported.
5. It is fast if the area is not too large. RADAR systems return data quite fast if the area under observation is not too wide.
6. Cheap and fast method of calculating base maps when no detailed survey is required. The systems can be used to figure out base maps, especially if the data being sorted is not complicated.

Disadvantages

RADAR takes more time to lock on an object. Since radio signals travel freely in air and space, it takes more time to get to the object and back.

Large objects that are close to the Transmitter can saturate the receiver. The radio signals work best when the object is further away from the receiver and not closer.

It cannot distinguish or resolve multiple targets. If there are several targets, the radio signals may not tell the objects apart.

It can be interrupted by other signals. Radio signals travel through air and space where it can be combined with other radio signals from other frequencies. If not properly directed, the signals can be interrupted by other signals and alter the information being transmitted.

It requires specialized training to analyze the data. The data captured by the RADAR system are usually stored in raw format. It requires specialized training to be able to analyze and interpret the data to make sense out of it.

Applications

- RADARs Used In Military
- RADARs Used For Remote Sensing of Environment
- RADARs Used In Aircraft Navigation
- RADARs Used In Navigating Ships
- RADARs Used In in Air Traffic Controller

3. Automatic gate opening system

Advantages

- It has Increased security.
- Less vulnerability in high wind loading situations.
- It is convenient.
- It’s more secure.
- It take up less space.

Disadvantages

First, your automatic security gate relies heavily on electrical power. This means that when you lose power, your gate also loses power. You are going to have to plan to have backup generator in case the electricity’s out.

The second disadvantage is the price. Automatic security gates come in different options, some come with a keypad that unlocks with a code, some come with an intercom system while some even come with a video camera. All of these options are great but this also means that all of these are more expensive compared to the usual and conventional type of gates.

The third disadvantage is that automatic security gates require a professional for installation and regular maintenance. However, many companies now offer more affordable options when it comes to automatic security gates.

Applications

It has various applications, some of them are Used in house, home and private properties

Used in highly secured areas like the premises of govt officers

Used in army, navy and airforce bases.

4. Encrypted communication

Disadvantages of end-to-end encryption

But end-to-end encryption isn't the perfect solution to every kind of communication need. If an app's communication is fully encrypted, that can prevent the app from offering additional features like contextual services based on the content of the message, or the ability to automatically generate calendar invites, message history, and other additional features. Simply put, the data is a black box to everyone except the sender and receiver, which might not always be desirable.

The security that end-to-end privacy offers might be limited if a third party gets physical access to the device at either end of the transmission — not only can they read existing messages, but also send new ones. That's why it's critical to use passwords, passcodes or biometrics to protect access to your device.

While end-to-end encryption can prevent anyone (including, in general, the government and law enforcement) from reading the content of your messages, it doesn't hide or encrypt the metadata. That means it's possible to determine who you sent messages to, and when, even if the content is encrypted.

Advantages

End-to-end encryption has some obvious advantages over "cleartext" (when messages or data are sent without any encryption at all) and encryption-in-transit. It's protected every step of the way, for one example.

When an app uses encryption-in-transit, that means the service you're using owns the key to encrypt and decrypt the message at the server. That provides a point of vulnerability and a vector for hackers or malicious actors to intercept your information before it travels to its destination.

Applications

Automobiles, including PEM fuel cells.

Aerospace.

Industrial control of machines and processes.

Biomedical uses, including robotic surgery and drug discovery and development.

Electronics and communication networks.

5. Automatic weather detection

Advantages

High quality of data:

One of the main advantages of weather radar is the fact that

the data collected by the radar is of high quality and can be used to determine various aspects of the weather reliably.

Reliable weather forecasts:

The forecasting of the weather is one of the most important uses of weather radar. Through radar technology, experts have been able to reliably predict the weather and sometimes even measure the exact amount of rainfall or precipitation.

Locate precipitation: Weather radar can also be used to locate precipitation in any given area of the earth. This information comes in handy when determining the exact amount of rainfall that is expected.

Hail detection:

We can also use weather radar to detect hailstorms that are expected within a particular locality. This information is important in determining the exact nature of the hailstorms and helps prevent their effects.

Flood forecasting: Weather radar can also be used for flood forecasting to predict the occurrence of floods.

Disadvantages

Cannot detect fog:

Weather radar has the limitation of not being able to detect fog. This creates a gap in weather forecasting where an area that is likely to receive fog is not properly profiled.

Cannot detect wind independently:

A weather radar is not known to detect wind independently unless with the use of additional remote sensing. This also creates a gap in weather forecasting.

Not entirely reliable:

Weather radar has a variety of limitations that makes it lack some of the most important forecasting principles. This means the radar is not entirely reliable in terms of weather forecasting.

Requires expertise to analyze: The usage of weather radar to forecast the weather is not an easy thing and requires some level of expertise to analyze the data that comes through it.

The estimates can be wrong: The estimates obtained from weather radar are not 100 percent accurate. This means that the data may be wrong in some cases and this may impact the final decision making.

The analysis is not instant: The weather analysis done through weather radar is not always instant and therefore the information is not real-time.

CONCLUSION

The Project review indicates that this project will help in advancing the defence system or getting the proper information without going out checking the things. We get all the information on our fingertips. It is used for easy observstion without putting anyone in risk.

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Automation in Polyhouse Using IOT

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ABSTRACT — The use of automation in Polyhouse farming has revolutionized the way plants are grown, making it easier for farmers to optimize crop yields while minimizing labor and resource costs. Automation systems allow for the control of temperature, humidity, sunlight exposure, and pesticide application within the Polyhouse, ensuring that plants receive the ideal growing conditions throughout their lifecycle. This abstract explores the benefits of automation in Polyhouse farming, including improved crop yields, reduced manual labor, and optimized resource utilization. It also discusses the different components of automation systems, such as microcontrollers, sensors, and IoT infrastructure, and their role in achieving optimal plant growth. Overall, automation in Polyhouse farming is a sustainable approach to agriculture that maximizes yield while minimizing resource use, making it a promising solution for future food production needs.

I. INTRODUCTION

Agriculture is a major source of livelihood for Indians, and the key to maximizing its growth lies in adopting automation. Greenhouses offer a solution to improve plant growth, and mechatronic devices can closely monitor plant growth. Automating the greenhouse environment using sensors, microcontrollers, and tuning is an easy way to improve plant growth. Manual observation of larger fields can be difficult and is dependent on natural weather conditions, leading to potential loss. Combining greenhouse technology with automation results in maximum production and positive outcomes. The monitoring of various plant growth factors, such as heat and radiation, is crucial for successful yield. The micro-controlled climate in the greenhouse structure is essential for achieving maximum plant yields. The Internet of Things (IoT) can connect physical devices, such as sensors and microprocessors, to the internet, using an IoT gateway. For instance, a home lighting system can use IoT to connect switches to a main controller linked to the internet.

The process of taking heat or radiation as an example depends on several factors, including environmental conditions, the crop being grown, and the variations in sensors or actuators used. Achieving maximum plant yields and better results can be accomplished by utilizing micro-controlled climates in greenhouse structures. The Internet of Things (IoT) refers to a network of physical devices, including microcontrollers, microprocessors, actuators, and sensors, which are interconnected and can communicate with each other over the internet through an IoT gateway. This entire infrastructure is commonly referred to as IoT infrastructure.

An example of this can be seen in a home lighting system, where all switches are connected to a main controller that is linked to the internet.

II. PROBLEM STATEMENT

At present, Polyhouse farming relies on manual control through the use of blowers and windows to regulate temperature. If the temperature exceeds the acceptable range, these mechanisms are manually operated to bring it back within range. To maintain optimal temperature and humidity levels inside the Polyhouse, a door opening and closing mechanism is critical. During the rainy season, the roof top mechanism is used to regulate the temperature inside the Polyhouse. However, there is currently no solution available for farming during this season. Pesticides are necessary for plant growth, but their use can harm humans. To minimize risks, spray mechanisms can be used to apply pesticides without requiring direct human contact with the plants.

III. BLOCK DIAGRAM

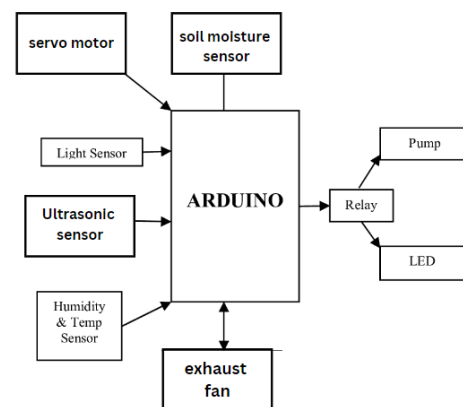
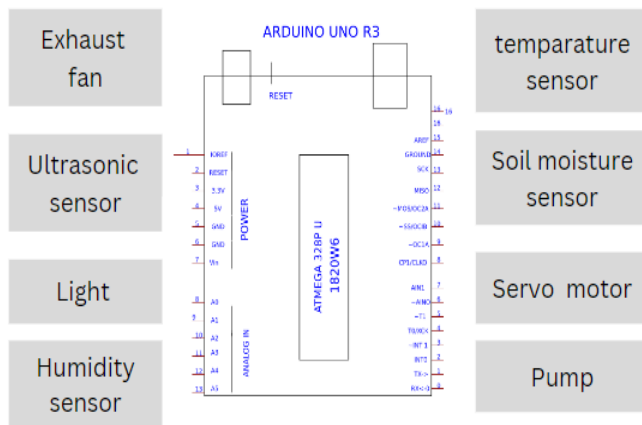


Fig.1.Circuit diagram



HARDWARE USED

- Arduino uno
- Ultrasonic Sensor
- Servo Motor
- Humidity Sensor
- Temperature Sensor
- Soil Moisture Sensor
- Polysheet
- Exhaust Fan
- Light

IV. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

Climate Control Systems :- These systems include sensors that modify various indoor conditions of the Polyhouse automatically to create the best conditions for the plant. The climatic aspects controlled by these systems include; Heat control systems to monitor and adjust the polyhouse temperatures to the required settings. The heat control will modify the in-house conditions based on the indoor climate.

Auto-pest Control Systems:- These systems are programmed to dispense pesticides in calculated amounts automatically.

Equipment Control Systems:- Commercial greenhouses require systems in place to handle the movement of polyhouse tables along specific polyhouse sections. The equipment control system also makes it possible to move and control installed lights, shade canopies, or harvesting and planting equipment.

Fertigation Manager:- Greenhouse fertigation management refers to using water infused with fertilizers. The pipes are laid in the soil and work in hand with the soil sensors. When the treated water level in the soil drops below the required amount, the fertigation manager automatically dispenses the water through the water systems. polyhouse fertigation management allows commercial polyhouses to focus on the quality of yields.

Increased Plant Yields:- Automation and smart optimization of the greenhouse provide the plant with every favorable condition as per requirements. polyhouse automation equipment make it possible to monitor the plants and adjust fertigation rates, lighting, water, temperature, and air to the optimum.

Remote Real-Time Monitoring:- Automating a commercial polyhouse will enable you to do remote monitoring through a standard Wi-Fi connection. Sensors detect any changes and send alerts to the computer control system and o your phone .

DISADVANTAGES

Area:- Greenhouse farming is more appropriate on a smaller surface. For this reason, it's limited to the production of vegetables, flowers, herbs, and small fruits, such as strawberries.

Pollination:- Another disadvantage of polyhouse farming is the lack of pollination due to the enclosed structure. In addition to the aforementioned disadvantages, polyhouse farming is often criticized for being an expensive farm practice.

Cost:- However, the costs of polyhouse construction and maintenance depend exclusively on the type of polyhouse structure and farm management technology being used.

Awareness:- There is lack of awareness among farmers which requires training. Return on Investment :- It is possible to get back the investment on greenhouse within a period of 3-5 years period. The success of polyhouse depends on the scale of the project

V. APPLICATIONS

To protect crops from external factors which can damage them substantially, they are grown in polyhouse.

Product is of High-Quality: The first thing a consumer look for in the food market is quality. If your product is of high quality, you never have to worry about the demand. Polyhouse is a protected structure and has equipment which continuously monitors the growth and development of the crop. The management of nutrient and water supply is precise in polyhouse farming. It helps in maintaining the industry level quality standards.

Crops can be grown vertically: Indeterminate tomatoes and cucumbers are the perfect examples of crops most commonly grown vertically inside a polyhouse. According to the data, tomato shares about 12% of the total vegetable production in India. Vertical crop production in a polyhouse allows the grower to utilize the space more efficiently, and it multiplies the yield three to four times. Effortless training and pruning of plant are other advantages of growing crop vertically in a polyhouse. Regular pruning increases the growth of the plant.

Controllable Climate: In states like Punjab, the ambient air temperature rises above 30 °C in March and the temperature inside the polyhouse increases due to it. With the controlled environment the growers can raise plants in regions which are un-favourable for crop production

VI. RESULT

The system uses sensors to monitor temperature, humidity, and soil moisture levels and automatically controls the ventilation system, irrigation system, and cooling system to maintain the ideal growing conditions for plants. The authors report that the proposed system significantly improves the crop yield and reduces the labor and energy costs associated with manual control. The results show that the system successfully maintains the desired environmental conditions inside the polyhouse and enhances the growth of crops, thereby increasing the overall yield.

VII. CONCLUSION

Automation in polyhouse is highly useful for farmers as they don't have to monitor the conditions inside the polyhouse physically and take the required steps. Polyhouse is a solution for lack of agricultural lands. We can get more crops from less space in Polyhouse farming. The system will monitor the conditions and take the respective steps required to maintain the threshold conditions inside the polyhouse. Rainwater Harvesting also ensures that rainwater is used for irrigation inside the polyhouse. The temperature, humidity, light intensity are measured and controlled. The lab View is used as the monitoring system for the controlling of the poly house.

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Obstacle Detection and Identification for Blind People

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Abstract —In order to help the visually challenged people, a study that helps those people to walk more confidently is proposed. The study hypothesizes smart walking gloves that alerts visually-impaired people over obstacles, pits thus this device could help them in walking with less accident. It outlines a better navigational tool for the visually impaired. It consists of a simple walking equipped with sensors to give information about the environment. GPS technology is integrated with microcontroller which will help their loved ones to keep eye on them. In this system ultrasonic sensor, GPS receiver, vibrator, PIC controller and battery are used. The overall aim of the device is to provide a convenient and safe method for the blind to overcome their difficulties in daily life.

I.INTRODUCTION

As per WHO or the World Health Organization, 39 million individuals are evaluated as blinds around the world. The target of this task The Third Eye for the Blind is to plan an item which is particularly helpful to those individuals who are outwardly debilitated and the individuals who frequently need to depend on others. Third eye or Blind task is a development which helps the outwardly debilitated individuals to move around and move between different places with speed and certainty by knowing the adjacent hindrances utilizing the assistance of the wearable band. Band which delivers the ultrasonic waves which inform them with buzz sound or vibrations. It permits the client the individuals who are outwardly impeded to walk unreservedly by distinguishing the snags. It permits the client the individuals who are outwardly impeded to walk unreservedly by distinguishing the snags. They just need to wear this gadget as a band or fabric on their body. The current frameworks advise the visually impaired the nearness of the protest at a particular separation in front of or near to him. These points of interest enables the client or the visually impaired individuals in distinguishing the snags and subsequently to change the way and walk appropriately.

They are enduring a great deal of hardship in their everyday life. The physically impaired ones have been utilizing the customary way that is the white cane for many years which although being effective, still has a lot of disadvantages and limitations. These gadgets work like the radar and the arrangement of the gadget utilizes the ultrasonic waves fascicle to distinguish the tallness, course and the speed of the

items. The separation between the individual and the

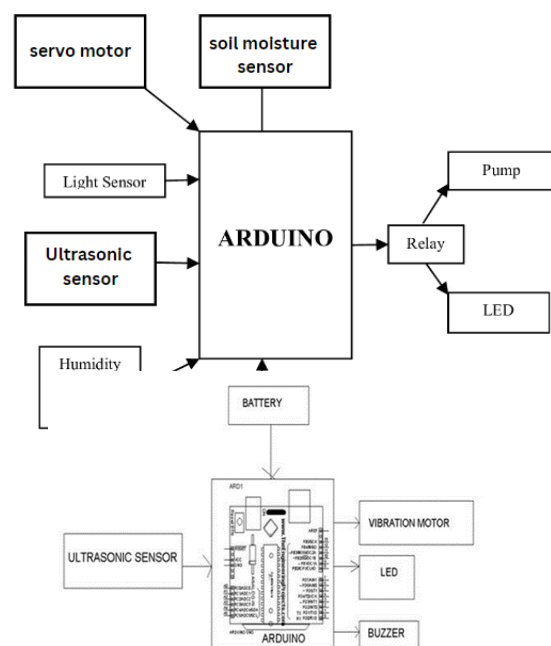


Fig.1. Circuit diagram

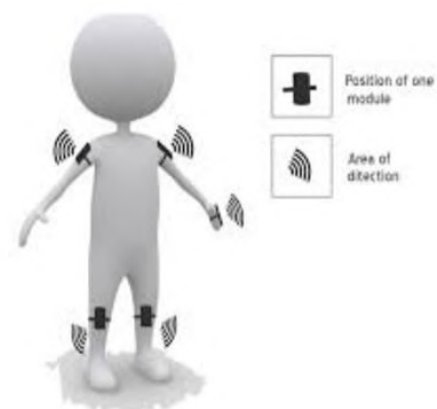


Fig.2. DEMO diagram

IV. HARDWARE USED

- Arduino uno
- Battery's
- Ultrasonic Sensor
- Vibration Motor
- LED
- Buzzer
- Switches
- PCB Board
- Jumper Wires

V. WORKING PRINCIPLE

This proposed system consists the equipment like Arduino UNO, ultrasonic sensor, bread board, buzzers for detecting the obstacles and letting the user know about the obstacle, Red LEDs, Switches, Jumper cable, power bank, Male and female header pins, some elastic and stickers to make the device wearable as a band for wearing for the users. The wiring of the device is done in a following manner. The Ground of LED, buzzer are connected to GND of the Arduino. The +ve of the LED and the middle leg of switch is connected to the Arduino pin 5. The +ve of the Buzzer is wired to the first leg of the switch. The Ultrasonic sensor is wired accordingly.

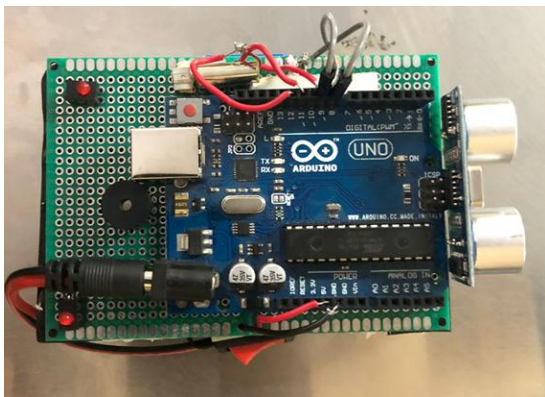


Fig.3. Front view

The Ultrasonic sensor pin VCC is connected to the Arduino pin VCC, Ultrasonic sensor pin GND is connected to the Arduino pin GND, Ultrasonic sensor pin Trig is attached to the Arduino pin 7, Ultrasonic sensor pin Echo is connected to the Arduino PIN 6. The switch used here is for selecting the mode. (Buzzer should need or not).

At the end, after all the connections are done to the Arduino board upload the code to arduino board and power the other modules using a power bank or the power supply. 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 re resent 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.

When we increase the distance between the object and the sensor the coverage angle will decrease. Sensor has coverage of 60 degree. Thus, the objective is to cover a wide angle to detect the obstacles with the help of the ultrasonic sensors to help the blind and make it easy for them to move around easily without any hassle. Hence, the distance calculation is calculated and the sensor detects and the further procedure of the buzzing sound to the user is carried out. Thus, this way Third Eye for Blind will be designed for the visually impaired people and will make it very easy and convenient as it will be a wearable device and thus will help the user in travelling and detecting the obstacles while walking very easy.

VI. ADVANTAGES AND DISADVANTAGES ADVANTAGES

Guides blind people :It helps to blind person to prevent from dangerous location. And guide them to reach there destination . The benefit of having your third eye open is that you become more aware of the existence of other realms, which can motivate you to continue your spiritual practice.

Alerts through voice based messages system:The system are used in the real time object detection. They can using this device. This device will assist the blind in navigating without the use of a stick, which is inconvenient for them. They can simply wear it as a ring or a cloth, and it will perform quite accurately with very little training.

Efficientlow cost design: This project is to provide cost effective way to allow

Low power consumption: This project consumes very less power for functioning.

Obstacle detection using UV distance finder sensor:By specifically suing the specialized boards that are designed, using them instead of Arduino and also by using high quality

ultrasonic sensors makes and gives faster response which make the device capable of working in crowded places and thus this will be implemented in the future enhancement of this device.

VII. APPLICATIONS

- It works as a navigation device for the blind people.
- This system can also be used by patients suffering with various eye ailments like cataract, exophthalmia, post eye operative situations and others.
- This system can be modified into a more sophisticated version of itself by using high intensity ultrasonic waves to be used as a navigation system for geological explorations.
- This system can be used to navigate by everyone not only visually impaired under certain circumstances, like foggy mornings with low visibility. Some winter mornings are foggy, where the visibility is very low, then this system can be used.

VIII. RESULT

With the improvement of the living standards of the people, we have become so materialistic that we have forgotten how the physically disabled people live a tough life. They undergo rigorous, indifferent behavior towards them for being physically disabled. They become dependent on other people in a way for their day to day routine chores. Blind and impaired persons always depend on other people for their regular activities. Eyes are responsible for observing and listen the outside environment; dysfunction of such prime sense organ severely affects the knowledge perceiving capability of the outside environment. Therefore, going around to places in such an environment is a very big challenge because blind people cannot depend on their own eyes and thus face many difficulties. This project will help them to overcome their obstacles.

IX. CONCLUSION

The objective of this project is Third Eye for the Blind is to design a product which is very much useful to those people who are visually impaired and those who often have to rely on others. The third eye for Blind project is an innovation which helps the blind person to move around and go from one place to another with speed and confidence by knowing the nearby obstacles using the help of the wearable band which produces the ultrasonic waves which notify them with buzz sound or vibrations. It allows the user those who are visually impaired to walk freely by detecting the obstacles. They only need to wear this device as a band or cloth on their body. Thus, this project

Arduino based obstacle detector for blind people is a new method to resolve their problems. 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. The system will be very easy to find the distance between the objects and the sensor. It can detect the objects in every directions th the blind person. Without the help of others the blind person can move from one place to other and lead their regular lives independently.

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Effective Study of Beamforming Method for MIMO Antenna Array

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Abstract:The Adaptive beam forming with Multikernel based Bayesian learning method beam forming on Uniform Linear Array (ULA) antennas for better localization. Undetermined source localization problem is solved using the Multikernel Sparse Bayesian Learning framework. Beam forming problem is considered the undetermined source localization problem and solved using the adaptive method. The Degree of Freedom (DOF) is increased using the adaptive nature of the manifold matrix while maintaining the same number of antennas. The response model that adaptively adjusts the manifold matrix in the Sparse Bayesian problem uses the Multikernel framework. MATLAB based implementation thus carried out on the ULA clearly exhibits better results over the single kernel model. The Mean Square Error (MSE) and Root Mean Square Error (RMSE) with Signal to Noise Ratio (SNR) variation is obtained to evaluate the performance of the proposed implementation. The performance obtained is found to be satisfactory and is at par with the recent previous implementation.

Keywords:Direction of Arrival Estimation, Multikernel Sparse Representation, Basis Pursuit Methods

I. INTRODUCTION

The ever-increasing need for high-fidelity communication in the modern communication frameworks the need of advanced and more efficient algorithms is of utmost priority. The signal that is received must be found for its Direction of Arrival (DOA) which needs increase in Degree of Freedom (DOF). The DOF is increased by placing the antennas in a minimum redundancy form while large number of antennas are used [1]. The concepts of beam forming and background of the modern beamforming algorithms are dealt in [2-3]. Numerous non-uniformly spaced antenna array settings are analyzed with minimum redundancy and non-redundancy is considered [4]. Instead of DOF increase by increasing the number of antennas the blind source localization methods are published in different literatures. Details on subspace-based methods are discussed along with the beamforming paradigm. Different sensor array signal processing with the parameter estimation-based problem-solving methods are discussed [5]. Covariance matching algorithm is developed for channel estimation algorithm and compared with maximum likelihood methods for its computational advantages [6]. Bayesian learning framework for the sparse solution is developed with relatively lesser basis functions [7].

Sparse regularization-based source localization method is

implemented using the inverse problem framework is investigated [8]. L1 and Lp regularization is utilized and found that it has the super resolution, robustness to noise and source correlation [8]. Sparse Bayesian approach for the approximation problem while there is a large overcomplete dictionary available is solved in [9]. The Khatri Rao approach is tested on the antenna array when the number of antennas is lesser than number of sources in the Direction of Arrival (DOA) paradigm [10]. The approach of nesting different linear arrays to improve the DOF is developed in [11]. This approach is applied on the quasistationary signals and a novel beam forming approach is developed. Implementation of the Bayesian learning framework in the compressed sensing framework while signal acquisition is carried out [12]. Parameter estimation of complex sinusoidal signals, linear chirp signal with additive and multiplicative noise is carried out using the fourth order cumulant and advanced methods [14]. Numerous Sparse based algorithms for beam forming implementations are carried out in [15-23].

This proposed work evolves the Bayesian Learning based DOA estimation method using the Multikernel based manifold matrix for higher robustness. Further the proposed work is organized with Section II discussing the Methodology involved in the Multikernel Beamforming method; Section III details the results and discussion of the implementation.

II. MULTIKERNEL BASED BAYESIAN LEARNING

The Dictionary Learning algorithms developed previously introduces numerous algorithms that are concentrating on the prior and posterior distribution formulation and convergence. This paper exploits the stochastic nature of the dictionary for implementing the adaptive dictionary-based convergence algorithm for DOA estimation. The Sparse Bayesian Learning Algorithm discussed in [24] is utilized in this implementation by introducing the Multikernel basis vectors.

Sparseness of the algorithm is controlled by the manifold matrix. Improving the stochastic nature of the matrix is the main contribution of this paper. Idea of multiple kernels cumulated to obtain sparser kernel is developed. With the implementation discussed in [24] the algorithm is enhanced by replacing the single kernel with the Multi kernel implementation.

A. Multi kernel

The Matrix Φ acts as the overcomplete dictionary. This overcomplete matrix is generated using usually a Gaussian kernel. This kernel is advanced in the proposed algorithm to make it a multikernel implementation.

In searching a or to generate manifold matrix processing time to using multi kernel using more than one kernel using is a multi-kernel .Using multi-kernel to finding manifold matrix it taking less time to achieve near to zero of the signals its help dual kernel using this is kernel is Gaussian kernel using to finding manifold matrix.

$$\sum_{i=1}^{\infty} \phi^T(x) \phi(x') \dots \dots \dots (1)$$

where $\phi(x)$ its manifold matrix

The Gaussian Kernel used for developing the manifold matrix is improved by means of introducing the Multikernel paradigm in the Sparse Bayesian Learning framework developed in [24]. The convergence of the learning is improved by introducing the more stochastic nature of the Multikernel framework. The two-dimensional manifold matrix generated for the number of antennas and the number of incidentsignals is iterated for different angular variation to obtain the DOA. The Gaussian Kernel used for the manifold matrix is generation is upgraded by using the MultiKernel manifold using multiple Gaussian kernels.

The prior and the posterior distribution for the convergence is as defined in [24]. The MSE and RMSE based convergence is carried out on the Multikernel Sparse representation based DOA estimation. The proposed method replaces the single kernel based manifold matrix with the multikernel manifold matrix. The summation of the weighted kernel tobeused for the DOA estimation using Sparse Bayesian Learning is as defined below.

$$k(\vec{x}, \vec{y}) = \sum_{i=1}^K w_i \cdot k_i(\vec{x}, \vec{y}) \dots \dots \dots (2)$$

Where $k(\vec{x}, \vec{y})$ is the term used for the generating the basis vector in the matrix. K is the number of kernels used forMultikernel basis vector.

III. RESULTS AND DISCUSSION

MATLAB based implementation of the Multikernel Sparse Bayesian learning based DOA estimation is developed and the results are arrived at as given below.The steering vectors generated from the MultiKernel.Combination is as given in Figure1. These steering vectors combine with the input signal to find the relation between them in order to know the angle with which the signal reaches the antenna. This combined signal is as shown in Figure 2.

The following Table 1 defines the parameter chosen for the DOA estimation.From the table in can be observed that the total number of antennas that are used for DOA estimation is six. And the actual angle of arrival also is provided to validate the output that is achieved after DOA estimation.Steering vectors are of stochastic in nature. This stochastic nature of the steering vectors is used to estimate the DOA from any undetermined input signal.

| Details | Configuration |
|-----------------------------|-------------------------------------|
| Number of Antennas | 6 |
| Antenna Array type | Non-uniform |
| Angle Range | $-\frac{\pi}{3}$ to $\frac{\pi}{3}$ |
| Min to Max degrees | -70 to 70 |
| Carrier frequency | 200Hz |
| Propagation velocity | 340 |
| Interval of angle Searching | 1 |
| Angles of source signals | -54.8, -28.6 -9.2, 10.5 31.4, 56.7 |

Table1. Parameters Chosen for DOA estimation

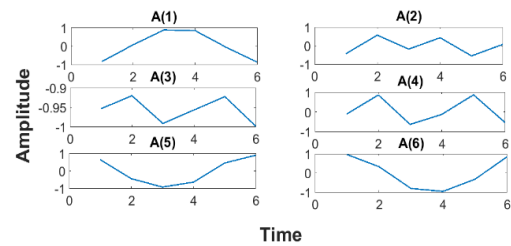


Figure 1. Steering Vectors of the Manifold matrix

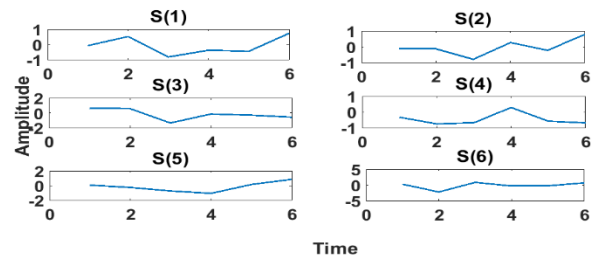


Figure 2. Source Signal Input

The Additive White Gaussian Noise (AWGN) that is introduced in the incoming wave is as given in the Figure 3.

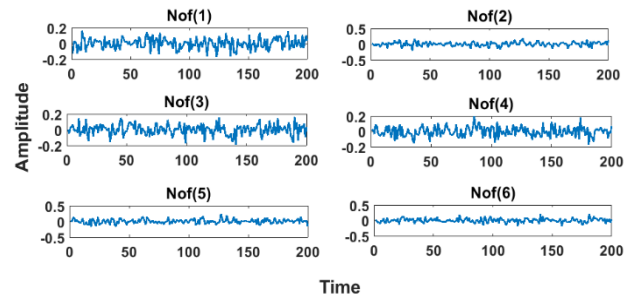


Figure 3.Noise signal

The complete wave that is received by the antenna after adding the signal with the AWGN is as given in the Figure 4. This received signal with the noise is stochastically checked for different angle of arrival.

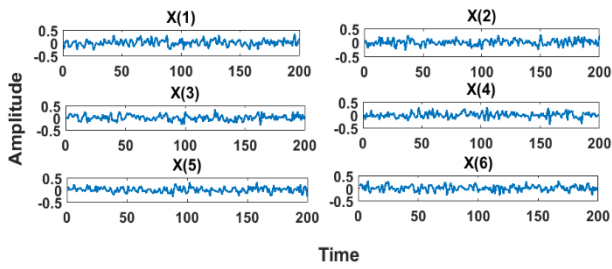


Figure4. SignalwithNoise (received signal)

The stochastic nature us furthered using the Multikernel manifold matrix generation in order to be able to acquire the source signal DOA. Manifold matrix with the convergence condition as in [24].

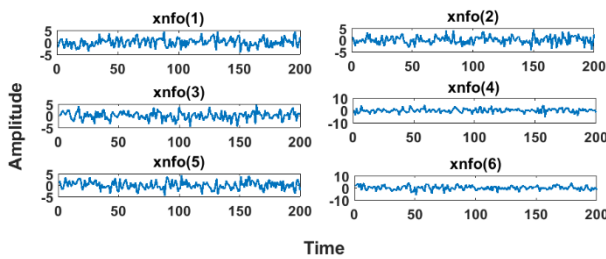


Figure 5. Signal with Manifold matrix

The signal with the manifold matrix is as shown in Figure 5. The condition for the convergence being the MSE and RMSE it is tested with different Signal to Noise Ratio (SNR) of the AWGN and results are obtained.

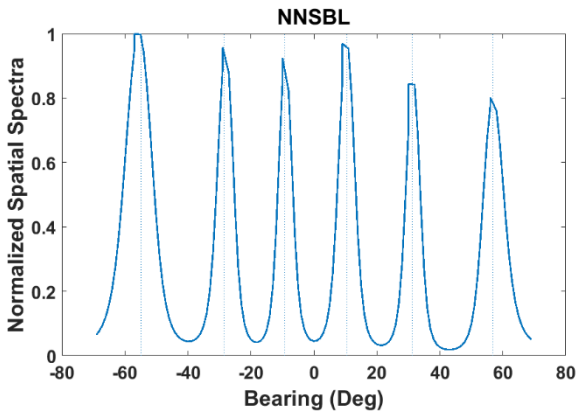


Figure 6. DOA estimated in NNSBL

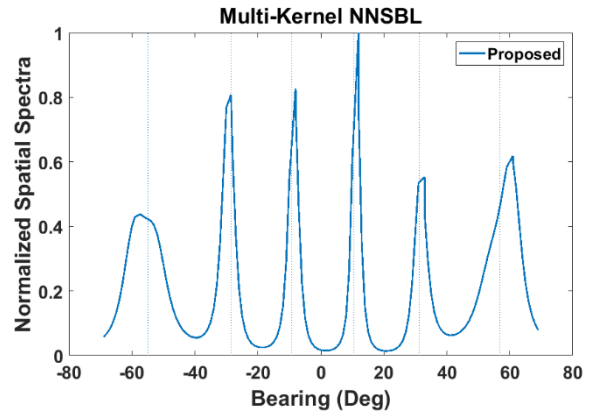


Figure7. DOA estimated in Proposed Multikernel NNSBL

The DOA estimated using both the NNSBL and the proposed Multikernel NNSBL is as shown in Figure 6 and 7 respectively. The total execution time for both the NNSBL and the proposed Multikernel NNSBL is given in Table 2.

| Comparison between Multi-kernel NNSBL and NNSBL | | |
|---|------------------------------|------------------|
| Sl.No | Algorithm type | Compilation time |
| 01 | NNSBL[24] | 0.305865 seconds |
| 02 | Multi-kernel NNSBL[proposed] | 0.293121 seconds |

Table2. Execution Time for DOA estimation

The RMSE vs SNR graph for the proposed method and the Non-Negative Sparse Bayesian Learning (NNSBL) discussed in [24] method is in the following Figures 8 and Figure 9 respectively. The execution time for the proposed method is also lesser than the previous method that is advantageous. This little improvement in time is significant while it is implemented on the real time scenario.

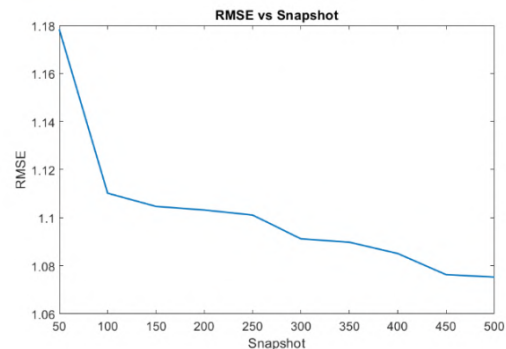


Figure 8. SNR vs RMSE for NNSBL

Observing Figure 8 and Figure 9 it can be observed that the RMSE obtained while implementing Multikernel NNSBL is reduced compared to that of the RMSE obtained from NNSBL implementation.

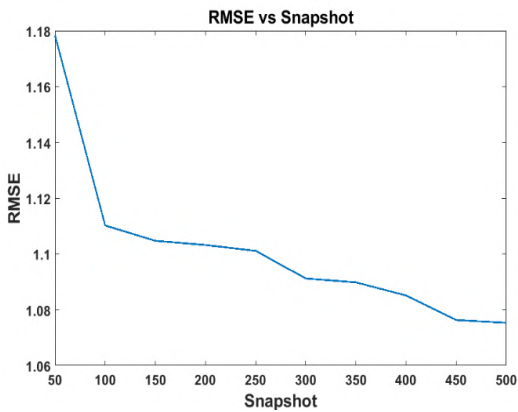


Figure 9. SNR vs RMSE for Multikernel NNSBL

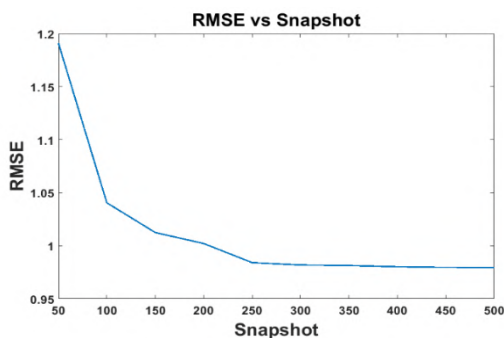


Figure 10. RMSE vs snapshot NNSBL

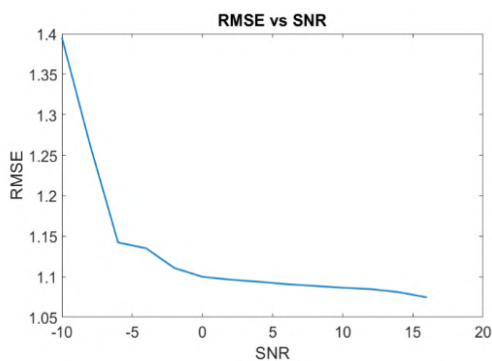


Figure 11. RMSE vs snapshot multi-kernel NNSBL

The RMSE and snapshot-based graph is obtained by using NNSBL and Multikernel NNSBL in Figure 9 and Figure 11. It can be observed from the Figure 10 and 11. The Table 3 discusses the RMSE obtained for different range of snapshots in the signal.

The objective of any new algorithm is to improve the performance of the application. This algorithm Multikernel NNSBL has improved the RMSE and execution time performance.

Table 3. RMSE vs Snapshot NNSBL and Multikernel NNSBL

| RMSE vs snapshot multi-kernel NNSBL[24] and NNSBL | | | |
|---|----------|------------|-------------------------|
| Sl.NO | Snapshot | RMSE_NNSBL | RMSE_MK_NNSBL[Proposed] |
| 1 | 50 | 1.1784 | 1.1911 |
| 2 | 100 | 1.0851 | 1.0405 |
| 3 | 150 | 1.0912 | 1.0124 |
| 4 | 200 | 1.0898 | 0.9795 |
| 5 | 250 | 1.1102 | 1.0021 |
| 6 | 300 | 1.0753 | 0.9841 |
| 7 | 350 | 1.1011 | 0.9814 |
| 8 | 400 | 1.0763 | 0.9796 |
| 9 | 450 | 1.1047 | 0.9802 |
| 10 | 500 | 1.1032 | 0.9818 |

From Table 3 RMSE vs snapshot although don't show much variation between the NNSBL and the Multikernel methods the reduction in RMSE in the Multikernel NNSBL shows a clear performance improvement. It can be observed that there is an improvement in the execution time of the proposed method.

IV. CONCLUSION

MATLAB based simulation is carried out on the DOA estimation using the Multikernel NNSBL method. The approach improves the NNSBL method by using the Multikernel based Sparse Bayesian learning. The Multikernel manifold matrix generation yielded better DOA estimation along with the lesser execution time. The proposed method is found to be at par with the recent publications. The results are found to be satisfactory. The RMSE obtained from the proposed algorithm is better than the NNSBL applied in the previous literature.

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Secure Transmission of Data between Wireless Sensors and data Analyzing Application in IoT

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Abstract—Many approaches have been proposed for the security systems in mobile android devices but due to one or the other reasons the security features are breached. In this paper we are remotely monitor all calls and tracks, and GPS location using sensor network. The information can be automatically collected via login into the system with the help of sensor network or they can be fed manually into the system to track. Mobile Spy Tracker Agent (MSTA) is the most ample remote tracking and 24-hour care system for Android handsets. By means of the Mobile spy Tracker Agent on the target phone; one is able to view mobile calling logs (such as contact number, name and duration of call). Also using GPS tracking system we can locate on a map. Any Web browser can be used to get the information of handsets registered. This system acts as a dominant apparatus to track your children and safeguard them at the time they are away from home. This system gives answers for the phone activity, their location and the mobile usage statistics. Here new technique and algorithms are proposed for providing a safety zone for the society in several aspects. The challenge is to deliver a system that should monitor and also does not affect the performance of the system.

Keywords— Sensor Network (SN), spy, mobile, tracker.

I. INTRODUCTION

Cell phone users in the present decade have increased drastically also it is seen that most of the users of the cell phone are youngsters, kids, The spy system has in recent times began to spread with the rapidity of sound and gained a countless share of popularity. They can be used in various determinations. Such as enabling

- Parentages to keep an eye on their kids.
- Firms to track the employee’s phone usage as well as to prevent frauds.
- Spouses to locate their partners. Etc

Observing the features of mobile phone, being parent we have questions arising regarding phone activity. In response to these issues program to monitor and track call and detailed information is developed. This systemization contains features such as:

GPS Tracking The location is traced out here i. e., knowing where the cell is at present and where all it had been placed. Minute recordings of location and its information allows parents to track the children at regular time and often. Logging of GPS is user defined. (By default logging interval is taken as 15 minutes).By means of the remote GPS logging on the target phone, one is able to view mobile calling logs. Also using GPS tracking system we can locate on a map.

Any Web browser can be used to get the information of handsets registered.

Call Logging Monitors all inbound, outbound and missed calls. The information could be the contacts emails, numbers, duration of call and phone location for every single call generated or received. Details are stored securely in server located in US. Users can opt out anytime and clear the details from server either through mobile or from website. Figure 1 shows the spying areas. The cyber tracking system is utilized for observing the actions that occur on the cell phone. Parentages can use Mobile Spy to observe the doings of their children with this software installed in their smartphones. Monitoring of conversations with others talks, incoming and outgoing messages etc.

Employers can also use Mobile Spy similar way with their co-workers and subordinated who have company-issued smartphones. With this the Employers can ensure that there is no misuse of investment information by employees. This is how they will be able to track where they go when away from the workplace, in case of disclosing company-sensitive information, look for disparaging SMS and chats etc.

Messages: The messaging feature enables one to use track the communication exchange happened between the parties, using this feature one can get to know the information exchanged between the two persons.

II. LITERATURE SURVEY

Tracking of calls and SMS are not available in pre-loaded software which can be viewed remotely. Some systems are available in market but those systemizations send SMS for every operation to other number, which is highly expensive as each SMS costs.

Disadvantage

Tracking of calls and SMS are not available.

Systems send SMS for every operation to other number, which is highly expensive.

Does one Really Need such security?

As parent we provide our children with cell phones. This brings in the need of Mobile Spy software. Sometimes it is needed badly [1]. For example, if a erotic killer is following your teenage daughter, you want to get information about it and very soon u can enforce law. Similarly if ones teenager is trying to be indulged in drugs then we take prior steps to safe them. One need not wait until they become hopelessly addicted.

Alike the above two examples when you have employees that use the mobile issued by your company for work purposes. In case of danger can one afford to have employees sharing company confidential ideas with your competitors? Can one bear to have employees stopping off at a tavern when they are thought to be making a delivery run? Without Mobile Spy such activity conduction could lead to disaster.

The Focal Structures of Mobile Spy

The Mobile Spy software is package full of characteristics that report the chief problem zones created by unmonitored mobile phones [2]. A Smartphone with this spy software running on it shows you:

- The past record of the examined phone’s GPS locations.
- Gives awareness of all names and contact numbers in the phone.
- Shows you command for controlling the phone remotely.
- Shows the websites where the user visits to frequently.
- Shows the plans phone’s task and calendar log the user has.
- Also call logs.

Advantage

Does not have additional costs because it doesn’t use SMS facility for providing information [5].

Data base of the user can be read, i.e., one can know the numbers and names of people communicating with your child.

III. PROBLEM

In the present Technological era it is very difficult to

Linux- Kernel:

monitor the proper utilization of mobile devices where many students, employees and other mobile users are misusing it.

There are many examples around us, when a mobile device is given to the students they see irrelevant data and then they delete the contents which they have seen, in this scenario it is very difficult to monitor or track the usage statistics of the students and not limited to students every individual misuses the device in one or the other way when he uses somebody’s device and not even bothering what could be the consequences of it.

IV. OBJECTIVES

- To ensure safety of human beings from threats.
- To study and analyze the behavior of cyber tracking system.
- To ensure the proper utilization of the mobile device.
- To track the activities of mobile usersremotely.
- To analyze the utility of the available resources.

V. PROPOSED SYSTEM

In this paper we are developing a system that can be used to track the call logs, messages, gps locations of the person whom we want to monitor 24x7, here we are adopting two ways of acquiring data, the first is by reading the sensor

network devices like spycam or any of the other sensor devices used in acquisition of information and the second way is by remotely logging into the parent system where he can view and analyze all the activities performed in the user mobile [3]. Here we are using open source operation platform Android operating system which is divided into five sections and four main layers as shown figure 1 in the architecture diagram. To operate or develop this one must know how to carry out the basic functions. One must also know all the basic concepts of Android OS [4]. Exploration of the Android architecture in detail is done here. Android architecture here means the building blocks of the Android OS.

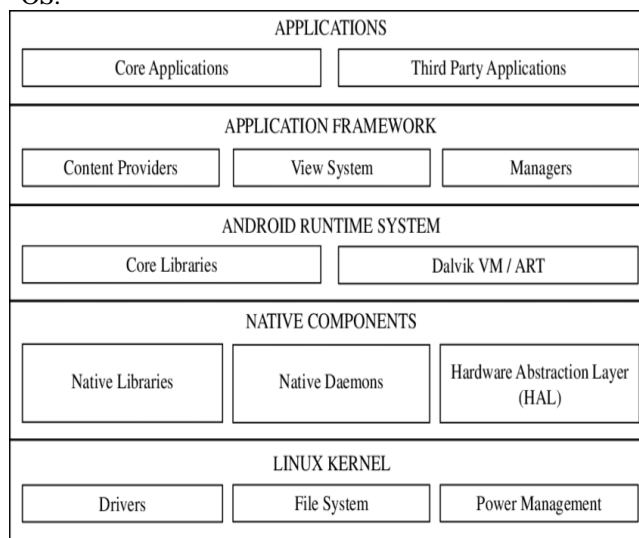


Fig: 1 Android Architecture

The elementary level is the Linux-Kernel. The total Android OS is constructed on uppermost part of the Linux Kernel with some more architectural changes further. Kernel means the core of any Operating System. With this we say Android is built upon Linux Kernel i.e Android at its core is Linux.

Libraries:

The next layer is the Android’s built-in libraries. This layer supports the device to grip diverse types of data. The libraries are inscribed using C++ or C language depending on the hardware.

Some of the essential built-in libraries include: Surface Manager:

It composes the window manager with off-screen buffering i.e., the systems can’t straight draw into the screen; as an alternative the representations go to the off-screen buffer.

Media framework :

Media framework offers different media codes permitting the tape and replay of different media arrangements.

SQLite:

SQLite is the database engine used for data storage purposes.

WebKit:

It is the browser engine. It is used to show HTML content.

OpenGL:

It is used to extract graphics content to the screen.

Android Runtime Machine:

Android Runtime consists of Dalvik Virtual machine and Core Java libraries.

Dalvik Virtual Machine:

It is a type of Java Virtual Machine used in android strategies to run systems. It is adjusted for low memory, low power during the process. But the Dalvik Virtual Machine runs .dex files. .dex files are constructed from .class file during compilation and offers higher productivity in low reserve environments. The Dalvik VM permits multiple occurrence of Virtual machine to be produced for simultaneously providing isolation, security threading support and memory management [6].

ART (Android Runtime):

Android Runtime is a new virtual machine introduced by Google for Android OS. In Lollipop, ART completely replaces the Dalvik Virtual Machine. Advantages of ART over Dalvik VM includes improved garbage collection and AOT (Ahead Of Time) compilation. These enhance the routine of systems considerably.

Systemization Framework:

These are the blocks that proposed system directly interacts with. These programs manage the basic functions of phone like resource management, voice call management etc. As a developer, just consider these are some basic tools with which building of these systemizations is done.

Important blocks of systemization framework are:

Activity Manager: Manages the activity life cycle of systemizations.

Content Providers: Manage the data sharing between systemizations.

Telephony Manager: Manages all voice calls. One can use telephony manager if they want to access voice calls in proposed systemization [7].

Systemizations

Systemizations form the first level in the Android architecture at this place our systems are going to fit into. Several standard systemizations are installed priory with every device, such as:

- Web browser
- Dialer
- SMS client system
- Contact manager

The interaction of the system with the sensor devices for acquisition of information for spying is demonstrated in the below figure

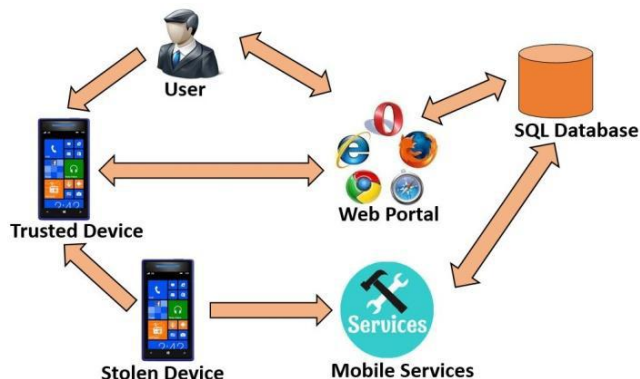


Fig: 2 User Interface

This facilitates the developer to write a system that can replace any prevailing system. That is, we are not bounded to access any particular feature i.e., practically unbounded. Thus Android serves as opening for never-ending opportunities to the developer. The Data flow diagram for the system is shown in the below figure.

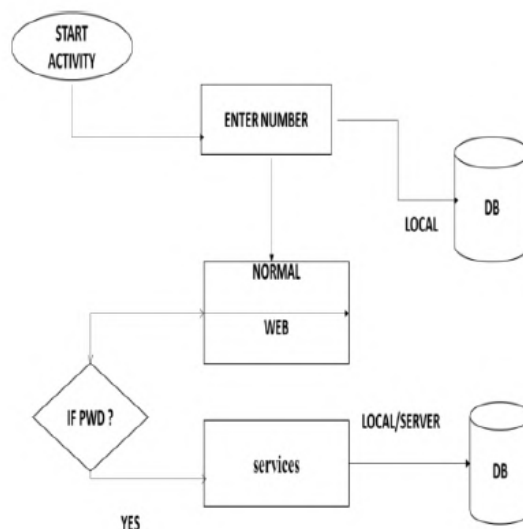


Fig: 3 Data Flow Diagrams.

VI. CONCLUSION

Encryption of smart devices against cyber tracking system with the aid of IoT is the best cyber tracking system with encryption. As seen in the related work section most of the applications include either of the three records but here all three are together so it provides completeness to the project. One can view the information and it can be viewed by the user using a browser. It changes in the tracking information and the call log information saved on a remote server. This can be accessed only by user.

Integrates the call number so one can easily know the peoples with whom your siblings are in touch with and to whom they call and Message. So the transparency will be there.

Lastly the GPS location is sometimes helpful for tracking the location and all so it's useful for security as this can be used at night time as well as when they are at an unknown place.

VII. ACKNOWLEDGEMENT

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Measurement and Reduction Methods for Electromagnetic Interference (EMI)

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Abstract- One of the most difficult issues to overcome when manufacturing any electronic equipment is EMI. To comprehend and quantify the device under test's electromagnetic compatibility (EMC), it is necessary to carefully monitor how these inevitable interferences affect the instrument's operation. Electromagnetic shielding has received significant attention in the four sections devoted to EMI reduction strategies. Various scientific methods are used to measure a material's or microwave absorber's effectiveness in reducing EMI, which are demonstrated. Spread spectrum, circuit topology modification, and EMI filters come next. This review can help students and young scientists in this field learn more about how to conduct EMI tests and the strategies that can be used to lower a system's EMI depending on the application.

Catchphrases: Testing for electromagnetic interference (EMI), the effectiveness of shields, and microwave absorbers.

I. INTRODUCTION

By far most of contemporary electronic applications utilize minuscule, little gadgets with great many latent as well as dynamic parts to all the while carry out various roles. The development of high-speed multifunctional devices that are not only compact but also electromagnetically compatible is the greatest challenge that any electronic hardware engineer or manufacturer faces, despite the fact that packing so many components onto a device that is only a few centimeters in size is a huge undertaking in and of itself. A measure of a device's immunity to the unwanted interferences present in its electromagnetic compatibility (EMC) is the name of the environment. When building the electronic circuitry, special care must be given because man cannot control these events..

1.1 Natural Sources:

EMI can be delivered by different regular peculiarities, including inestimable beams, sun oriented flares, snow, tempests, downpour, and thunder. Development of electrical

system circuits. Interference from these sources is one of the main causes of EMI in radio systems. Certain types of interference have a negative impact on systems used in telephony, radio astronomy, ground-based radar, and aerospace applications. As a result, great care must be given when constructing the electronic circuitry because man cannot control these events.

1.2 Man Made Sources:

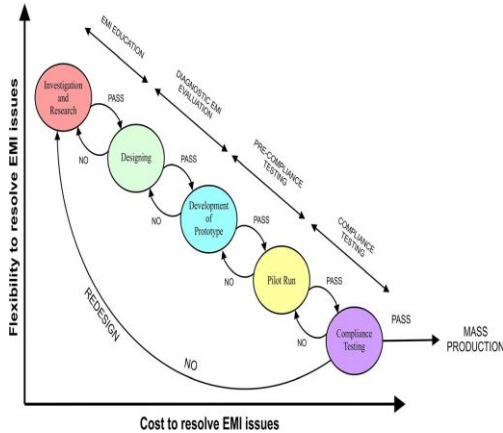
The following two subcategories can be created from this category:

(a) **Involuntary Sources:** Through conduction (via cables and wires) or radiation (via electromagnetic fields), a circuit component can influence the operation of another component in the circuit or of nearby devices. Mobile phones, computers, radios, X-ray machines, microwave ovens, medical devices, power cables, ignition systems, air conditioners, hair dryers, automobiles, thermostats, and a wide variety of other devices are frequent sources of accidental human-made interference.

(b) **Noncommercial Sources:** Radars are designed to send high strength signals under dangerous circumstances, such as during a war, to cause lethal interference. Into hostile communication and radar systems to disable them². During the Second World War, initiatives to lessen EMI's negative impacts on the first electronic systems were created. Until the 1960s, EMI reduction techniques were only used in defense applications⁴. With the rapid development of computer technology in the 1970s and 1980s, the paralyzing effects of EMI were first observed in civilian applications. As a result, the scientific and engineering community began to take it very seriously.

All modern electronic devices must be well insulated to prevent the negative effects of EMI and any spurious radiation or hazardous coupling that could cause unintentional interferences.

Measurement and Reduction Methods for Electromagnetic Interference (EMI)



As shown in Fig.1. From initial exploration and research to mass production, the creation of an electronic device involves multiple processes. During the compliance testing phase, which is based on a number of international and **Fig. 1. Electronic product development flowchart**

If they are discovered early in the product development process, troubleshoot and resolve them. This exhibits the worth of EMI estimations during the primary phases of the development of any electrical hardware. Depending on how the product will be used, several standards and test types must be met. However, if cost-effective pre-compliance EMI testing is carried out at each stage of product development, the likelihood of failing the aforementioned tests is significantly reduced. Furthermore, EMI issues can be more easily and affordably fixed if they are identified early on in

II. EMI MEASUREMENT TECHNIQUES:

There is the option of testing for compliance or EMI. testing or pre-compliance testing (with careful adherence to authorized standards' instructions) (by developing newer internal methods). In terms of hardware and software, test beds for all pre-compliance settings must closely resemble compliance test configurations. Electromagnetic Impedance (EMI): Techniques for Measurement and Reduction

national standards established by various nations, the device must pass a number of EMI tests. 6-8 in light of the fact that these tests are exceptionally expensive, assuming the item flops right now, the whole cycle should be reshaped, which drives up the expense of assembling to up to this point unfathomable levels. However, the likelihood of failing the aforementioned tests significantly decreases if cost-effective pre-compliance EMI testing is carried out at each stage of product development. Even though EMI/EMC is a crucial component of electronic engineering, there is still a lack of research and development in this field in comparison to other areas of electronic engineering and product development. There are many standards and test types that must be met depending on how the product will be used. Measurements during the first phases of the manufacturing of any electrical equipment.

the. The literature that is accessible in this field is also dispersed. Young researchers may find it challenging to completely comprehend the organization of this field because the majority of sources do not cover EMI/EMC in its entirety. Through a thorough discussion of measurement methods and strategies for reducing the EMI that an electronic system generates, this review aims to resolve this issue. There are two parts to this essay. The first part, which focuses on EMI measurement techniques, goes into great detail about EMI emission and immunity testing procedures. Techniques for EMI reduction are covered in the second part.

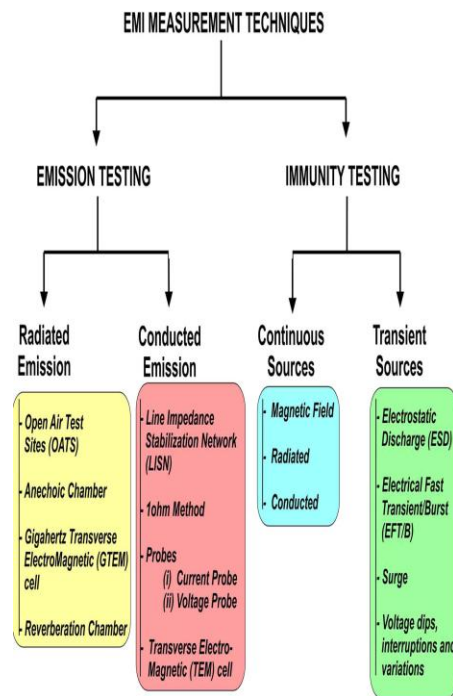


Figure 2.EMI measurement methods

2.1.1 Radiated Emission Testing

The emitter/source, which generates unwanted interference, the receiver/subsector, which responds to these interferences, and the coupling channel, which transmits the interference from the source to the receiver, are the three main contributors to EMI. EMI is thought to have occurred as a result of conducted emission if the coupling channel is of a conducting nature. Emission of radiation occurs if the coupling channel is radiating. These parts could be subsystems of a larger system that cause intersystem EMI or different systems that cause intersystem EMI. The tests and measurements of EMI are categorized as shown in Fig. 2

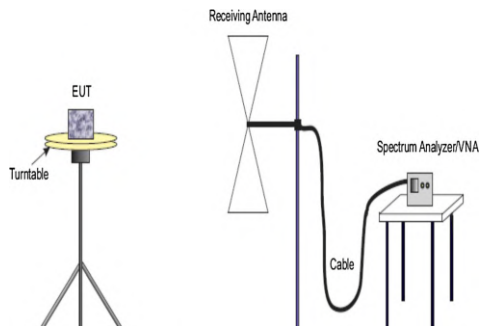


Fig.3 Setup for a radiated emission test in an anechoic chamber (modified and redrawn with the help of the data that were available in 15).

Figure depicts a typical measurement setup for radiated emission EMI (RE EMI). 3. At frequencies between 30 MHz and 1 GHz, standard radiated emission testing is carried out; 10 m and 0.3 m are the corresponding equivalent wavelengths. In an open area test location (OATS), one of the most common methods for measuring the radiated emissions of large instruments is utilized. A receiving antenna that is typically connected via cables to an EMI receiver or spectrum analyzer, a metallic ground plane that is theoretically infinite, and the EUT are typically kept at a

2.1 Tests for Emissions

Because of the conducted or radiated emissions it emits, almost every electrical device contributes to electromagnetic pollution, whether consciously or unconsciously. In the case of conducted emission, these unwanted emissions can travel as far as GHz and can be carried by ac power systems or antennas in the case of radiated emission. Op amps, resistors, capacitors, and other power cables are where they come from. As a result, emission testing is required for every electronic device in order to maintain a safe electromagnetic environment that can be used for other permitted purposes. The apparatus being evaluated acts as the emitter (EUT) in these assessments. Tests can be conducted on either radiated or conducted emissions.

The following parts provide examples of various test platforms and measurement configurations for estimating EMI due to the unwanted emissions described above.

distance of 3 m or 10 m from the receiver (unless otherwise specified). It is calculated how far the reception antenna is from the EUT's closest exterior surface.

A significant distance was chosen between the EUT and the receiver to guarantee that measurements are taken in the far field, where the radiated field is more stable, as opposed to the near field or Fresnel zone. In point of fact, 30-meter distances were approved during the initial stages of EMI testing in an OATS setting. A test arrangement that huge was defenseless against nasty weather conditions and foundation radio commotions that would truly impede the estimations' precision.

These tests can now be performed at distances of 3 m or 10 m thanks to the development of increasingly sophisticated data processing algorithms and technology. Researchers are currently debating whether or not to use a 5 m space between the EUT and the receiving aerial. Because the project is still in its early stages, the OATS measurement setup with a distance of 5 meters has not yet been defined. According to CISPR regulations, the size of EUTs that can be used for OATS testing is determined by the distance between the EUT and the aerial. The receiving antenna measures the

EMI's vertical and horizontal polarizations from the EUT's radiated emissions. It is possible to determine whether the EUT passed or failed the test by contrasting the measured field strength with the highest field strength permitted by the standard. Over-the-air (OTA) measurements can be used to sideways evaluate the radiated emissions of MIMO systems, which are becoming increasingly popular. The MIMO system's radiation performance is the primary goal of the OTA tests, but the measure that comes out of them can also be used to figure out how much the MIMO system's spurious

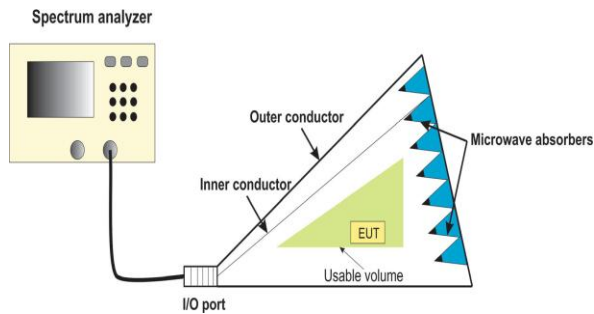


Fig.4. GTEMcell-based measurement setup for EMI testing (modified and redrawn using the data available in Ref. 25).

Anechoic Chamber:

In accordance with this specification, the IC board needs to be positioned on the wall port of the GTEM cell. 32 The GTEM cell's greatest advantage over OATS or anechoic chamber configurations is that it is significantly smaller and less expensive—making it simpler to maintain. Between 0 Hz and 20 GHz, GTEM cells can also produce results that are fairly accurate.

.GTEM Cell:Halls of Reverberation (RC) An EUT, a sending antenna, and a receiving antenna are the three most typical components of an RC, which is a metallic enclosure with a high quality factor (Q).Standing waves are generated by its metallic boundary, which in turn causes an uneven electric field inside the container. The compartment is filled with a single or several stirrers, which are metallic paddles. In order to change the chamber's boundary conditions and make the electric field statistically uniform, the orientation of the stirrers could be manipulated.

noise signals reduce receiver sensitivity.The two-stage method is one of the most effective and accurate OTA testing methods. In the primary stage, all plausible three-layered radiation designs are created in a traditional anechoic chamber for all polarizations. Using the specified base station emulator and channel model, the correct combination of all of the collected patterns is the second step. 19 The RE EMI associated with the MIMO system is then calculated using the generated grid.

$$E_{m,dB} = 20\log(g_m) + 20\log\left(\frac{|\eta_0 \cdot k_0|}{|2\pi\epsilon_0\gamma|}\right) + 10\log\left(\frac{V_x^2 + V_y^2 + V_z^2}{Z_c}\right) + 120$$

The maximum electric field strength, E_{mj} dB; the wave number, g_0 ; the free-space impedance, $\epsilon_0\gamma$; the TEM mode field; Z_c , which is the typical impedance; and V_x , V_y , and V_z , or the EUT's successively oriented output voltages in three orthogonal directions. This was done to make sure the results met all the requirements.

Fig. 5 depicts a typical EMC testing facility for reverberation. The fact that a reverberation chamber provides more precise and reliable results in a shorter amount of time than other methods, particularly for radiated immunity testing, is the main advantage of using one for EMI testing. 34 This is due to the EUT's simultaneous exposure to external pitch from all directions, as opposed to the anechoic chamber. Thus, mechanical turn of the EUT in the appropriate bearings for estimations is not generally needed. However, the orientation and directivity data are incorrect. This technology is especially cost-effective because it eliminates the need for costly microwave and RF absorbers in the chamber.

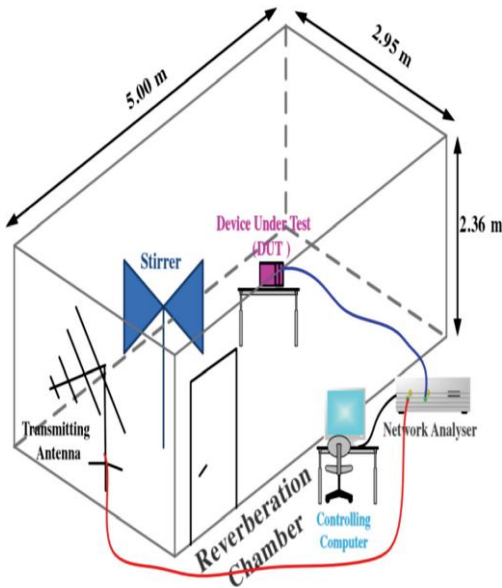


Fig. 5. Utilizing a reverberation chamber as the measurement setup for EMI emission testing

2.2 Immunity Testing

Immunity testing is the exact opposite of emission testing. Emission testing involved measuring the EUT's noise output, whereas immunity testing involved exposing the EUT to an electromagnetically hostile environment and determining whether any performance changes are present or absent. It is necessary to measure and evaluate any perceived change in the EUT's operation in relation to national or international standards. The instrument is unable to function effectively in the actual world if it fails to pass these tests. In this section, the two types of immunity measurements—continuous and transient—that are utilized for pre-compliance or compliance EMI testing are described.

2.2.1 Continuous Source Immunity Testing

Directing outflow testing is finished to figure or decide the clamor that is produced through the power lead into the fringe/stacked gadgets because of an unexpected change in voltage or current in the gear's circuitry. cell Trying for Progressing Source Resistance The motivation behind continuous neutralizer testing is to determine assuming the EUT will function as planned under nonstop commotion

sources like the telecom, sun radiation, cars, attractive fields, and the enormous microwave foundation. For a couple or a few minutes, persistent source neutralizer testing is led. Magnetic field, radiated, and carried out immunity testing are additional subcategories that fall under this testing group.

a. Sensitivity to Magnetic Fields: Magnetic fields generated by an electrical instrument's cables and lines have the potential to harm nearby instruments and other magnetically sensitive parts like parent circuit relays and monitors. Therefore, it becomes crucial to determine whether a gadget can withstand such challenges. The specification that is most frequently used to conduct the aforementioned test is IEC/EN61000-4-8. is the benchmark that is most frequently used to perform the aforementioned evaluation.

The setup includes a notification. The measuring setup for EMI-conducted emission testing that makes use of a line impedance stabilization network is depicted in Figure 5. The data from Reference 37 were used to modify and redraw the setup. The 2981 generator is a measurement and mitigation method for electromagnetic interference (EMI) that is attached to a loop antenna or Helmholtz coil. Because it is inside the antenna or coil, the EUT is constantly in a magnetic field.

b. Radiated Immunity (RI): RI testing is used to determine an instrument's resistance to electromagnetic energy in free space. The most widely used standard for radiated immunity is IEC 61000-4-3. RI tests as a rule utilize OATS, anechoic chambers, GTEM cells, and resonance chambers. An EUT, a table on which it is put, a RF signal generator that persistently produces electromagnetic signs at different frequencies, a power speaker to enhance the signs, a transmitter radio wire, like a log-intermittent radio wire or a biconical radio wire, to communicate the created signals into the chamber or cell and establish a uniform field climate, an EM field sensor to screen the field strength inside the chamber or cell, and different parts.

The measurement setup is made up of components.

The ideal separation between the antenna and EUT is either 3 or 10 meters. 52 The performance of each EUT face facing the transmitter antenna is routinely evaluated for various frequencies, signal intensities, suitable modulations, and various polarizations.

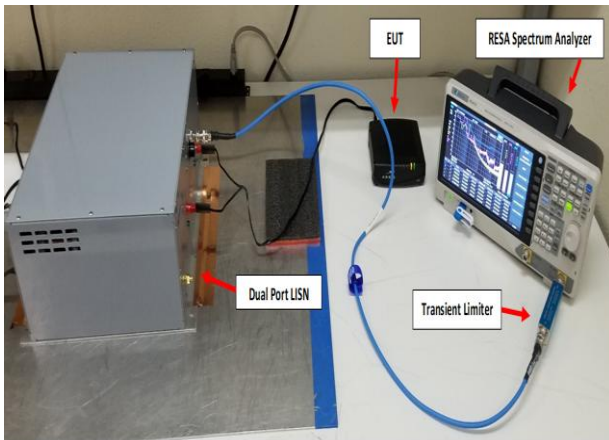


Fig 6 Block schematic for EMI immunity testing

Performing Immunity (CI) An electronic system's cables and connectors may detect radiated emissions or induced inductance and capacitance caused by the bending of power cables as false RF voltages and currents. The overall performance of the system may be harmed as a result of these currents spreading to other system parts as conducted interference. One of the extensively used standards for CI testing is IEC-61000-4-6, which is carried out in the 150 kHz to 80 MHz frequency range..

III. TECHNIQUES FOR EMI REDUCTION:

In the event that any of the EMI tests the instrument is considering fails, a variety of methods can be used to reduce the associated EMI and make it compatible with the real world electromagnetic environment. These methods are discussed in this section's four subsections: electromagnetic shielding, spread spectrum, EMI filters, and circuit topology change. As electromagnetic shielding is presumably the

method that is most frequently employed used in product design, special attention has been paid to it.

When a field strikes a shield, the majority of it is either reflected or absorbed and very little of it is transmitted. The overall result

3.1 Electromagnetic Shielding

When figuring out the structure's EMI shielding effectiveness (EMI SE), which is the ratio of EM power before and after the shielding effect expressed in decibels, all of these events

$$SE = 10 \log \left(\frac{P_{rx}}{P_{rx'}} \right)$$

are taken into account.

In this scenario, P_{rx0} represents the power that the receiver intercepts while the shield is placed in between it and the transmitter (the source of noise), and P_{rx} represents the power that the receiver intercepts when the shield is not present. The material's permeability, conductivity, permittivity, and other properties, as well as factors like the needed measuring frequency; The EMI SE is determined by the impinging wave's polarization, incidence angle, and whether the application is near-field or far-field. The EMI SE of an EMI shielding system can be evaluated in a variety of ways, some of which are outlined below: Coaxial Transmission Line Method

- Dual TEM Cell Approach
- Technique Using a Rectangular Waveguide
- Technique of Nested Reverberation Chambers
- Shielded Box Technique
- Technique of the Shielded Room
- Free-Space Technique

3.1.1 Coaxial Transmission Line Method

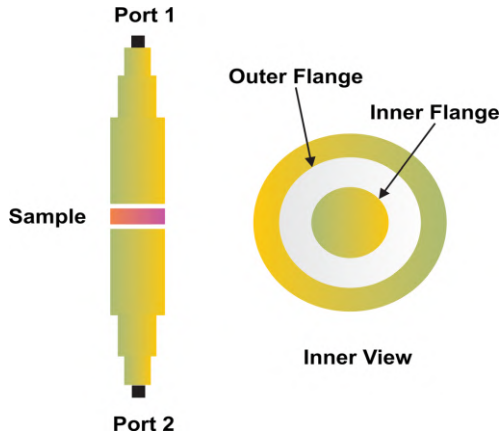


Fig. 7. Flanged coaxial transmission line fixture used in an ASTM D4935-10 setup

Substance in relation to waves that would typically pass over its surface in a plane. Based on this method, two well-known standards have been created; The sample's EMI SE is then calculated using the procedure below.

$$SE = 20 \log \left| 1 + \frac{Z_0}{2Z_L} \right|$$

where Z_0 and Z_L stand for the coaxial transmission line's characteristic impedance and the load's impedance, respectively. When perfect contact is made between the transmission line walls and the sample, this phrase is applicable. Nonetheless, it is really challenging to actually make a flawless touch. These defects cause the development of a contact opposition Z_{CR} in series with Z_L , which assumes the accompanying parts in SE assurance:

$$SE = 20 \log \left| 1 + \frac{Z_0}{2(Z_L + Z_{CR})} \right|$$

Although the method for determining a material's SE is fairly straightforward, it lacks accuracy and repeatability because the Z_{CR} can change depending on the test. These factors led to the withdrawal of the technique-based standard ASTM ES7-83 in 1988. Yet, this method is still widely used to get some imprecise lab estimates of a material's SE.

A flanged coaxial transmission line was used in place of the tapered coaxial transmission line cell to improve the above method. The SE determination process in this method involves two parts. A 13.3 cm diameter disc-shaped sample is positioned in the centre of the test fixture in the first stage, subsequently; S_{21} is gathered using a vector network analyzer. By positioning the torus-shaped sample that corresponds to the dimensions of the outer flange and the disc-shaped sample that corresponds to the dimensions of the

inner conductor, the second stage provides the reference transmission coefficient. The two samples are capacitively connected. Non-conductive screws hold the flanged coaxial line together. Non-conductive switches have a contact resistance that is coupled in parallel with the load impedance, whereas conductive switches have a contact resistance that is coupled in series with the load impedance. As a result, conductive switches should not be used. As a result, contact resistance's impact is diminished by this strategy.

The primary advantage of this approach is repeatability. The coaxial transmission line techniques yield excellent performance for the 30 MHz to 1.5 GHz frequency range. Yet there have been initiatives to expand this frequency range to 18 GHz.

3.1.2 Dual-TEM Cell Approach

The coaxial transmission line method, on the other hand, can assess a material's resistance to the dual TEM cell approach can determine a material's ability to shield utilizing near-field sources and far-field source simulation. Near-field calculations are mostly performed to assess the effectiveness of the shield against specific EMI emissions that occur in close proximity. This method is typically used to evaluate a material's SE in the 1 MHz to 1000 MHz frequency range. Two rectangular coaxial transmission lines that are stacked on top of one another and have their ends tapered for 50X impedance make up a dual TEM cell. At the intersection of the two rectangular transmission lines, there is a slot that is rectangular and can hold the sample. Through the aperture that is shielded by the sample, one of the two cells can serve as the driving cell, in this case the bottom cell, which couples the energy to the receiving cell, in this case the upper cell. The SE of a material is typically evaluated using this method.

IV. CONCLUSION

This review examines EMI's definition and history in detail at the outset, followed by an examination of its historical context. In addition, the two primary categories of EMI evaluation, immunity testing and emission testing, are discussed in detail. During EMI measurements, conducted emission and radiated emission are the two types of emissions that are taken into account. Examples of chambers used for radiated emission testing include anechoic chambers, GTEMs, and reverberation chambers. Conducting emission testing allows you to quantify the electromagnetic interference (EMI) that is produced when voltages and currents within the EUT's circuitry suddenly fluctuate. Techniques like LISN, the 1X method, the probe method, or the TEM cell method are used to achieve this.

In-depth explanations of EMI measurement techniques are provided, along with references to the pertinent, internationally approved standards for further study.

This review concentrates on the general approaches used to lessen the EMI caused by an electrical device in addition to the EMI measurement techniques listed above. Some of these

methods include using electromagnetic shields, EMI filters, changing the topology of the circuit, and the spread spectrum technique. Special consideration is given to electromagnetic shielding because it is probably the most widely used method of reducing EMI. Hypothetically and actually, numerous strategies used to evaluate the safeguarding viability of materials are examined.

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Intelligence Based Trash and Recyclable Sorting Robot Arm

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Abstract- Waste management as well as sorting is a very crucial task to make the environment green and to ensure better (re)use of the resources. Bangladesh, because of its high density population, is facing enormous challenges to manage huge amount of wastes produced every day. So the purpose of this paper is to use the advancement of Information and Communication technology (ICT) to improve the waste management system and make lives better by providing a smarter way for waste sorting and management. In this paper, an intelligent system was proposed and developed for automatically sorting the waste to be used in context of Bangladesh. A light weighted experiment was carried out to evaluate the system performance. The experiment replicated with 11 objects (waste) of different size and types. The experimental results showed that the proposed system was reliable and achieved about 82% accuracy for the categorization of different kinds of waste.

Keywords—Waste sorting, sensor, robotic arm, automation, green environment

I. INTRODUCTION

Waste materials can be classified in different categories based on their re-usable functionality, that includes,

- (a)recyclable waste like paper, metal, plastic, glass, cardboard are used to recycle and reuse;
- (b) organic waste are used to make compost for agriculture;
- c) non-disposable waste are not reusable and need to be buried as these are harmful for the environment.

To ensure the better use of these resources, to promote the cost-effective production and cultivation, and finally to make the environment green, it is utmost important to categorize and manage the wastes in to different category. Waste sorting contributes to recycling and

saving energy. The aluminum association estimates that the energy saved in recycling a single aluminum can, could be used to power a television for 3 hours. Creating new plastic from raw materials requires ten times more energy than the energy needed for recycling plastic. Environmental protection agency estimates that producing a paper product from recycled paper requires only 60 percent of the energy required to create one from fresh wood pulp. Energy

administration information reports that recycling a ton of paper can save 17 trees. However, due to lack of any efficient way of sorting the waste, most of the recyclable products are wasted. This turns out to be very harmful for the environment in the long run.

The objectives of the project are:

- Using Arduino and AI to achieve the task.
- To pick up the useful object and place it safely.
- To pick up the waste material and put it into the garbage.
- Using PI CAMERA to capture and compare capability of objects.
- Using servo motors to design a robotic ARM with a 'pick and place mechanism.

II. PROBLEM DEFINATION

Separation of dry and wet waste material, and hence reducing human efforts and increase hygiene level of society.

Waste Management and segregation is a much-needed process in metro cities and urban areas due to spreading of diseases. It is estimated that India produces 42.0 million tons of municipal solid waste annually at present. Waste lying littered in the surrounding, dumped on open lands, becomes a major problem for various types of disease-causing bacteria and viruses hence, segregation, transport, handling and disposal of waste must be managed properly to minimize the risks of the public and environment

III. RELATED WORK

Dr. Sumalya MN, Dr. Kavitha GR, Smart Robotic Arm Based Waste Segregation System, International Journal Science, Engineering and Management (IJSEM), 2020.

Waste segregation is a simple method of reducing the amount of waste dumped into our landfills. Large amount of recycle waste in different category are not segregated properly. A solution to this is Automated Waste Sorter and robot waste deliver system are intended to automate the sorting process of wet, dry and metallic waste. In this

system at first the IR sensor is used to detect the waste in front of the smart bin. Along with this we integrate a robot system to deliver the process of collecting the waste that is to be sorted by the AWS, to minimize the human interference. The robot arm system is composed of dc motors and gear drivers that is able to mechanically pick up the waste and put it at platform which consists of sensors like moisture sensor to detect dry and wet wastes, also proximity sensor to detect metallic waste and based on coding rotate the slotted bin to dump the waste based on colour coding and colours assigned for different types of wastes. Also ultrasonic sensor placed at lid of bin detects the level of waste inside bin and sends notifications to empty it once it is full via GSM module. Experimental results show that the segregation of waste into metallic, wet and dry waste has been successfully implemented using the Automated waste segregation system.

Cherry Agarwal, Bhavesh Yewale, Chaithali Jagadish, "Automatic Waste Segregation and Management", International Journal of Engineerin Research & Technology (IJERT), Vol. 9 Issues 06, June-2020.

With the increase in development of smart cities, the idea of keeping the cities clean is the utmost requirement. The amount of garbage produced is too large and the manual efforts required to process it is very tedious. With evolution of technology in every field, automated ways can be adopted to prevent the piling of the garbage. The waste segregator is designed to provide ease in the disposal of waste that is collected. The system consists of three bins, each one for wet, metal, and dry waste. The conveyer belt system detects the incoming waste and classifies it as metal, dry or wet using different sensors connected to the system and deflects it in the respective bin. The deflection procedure is carried out by the servo motors which are programmed according to the working. This facilitates in processing the different kinds of waste as per the requirement. The garbage level in each of bins is monitored using the ultrasonic sensors present in every bin. The notification is then sent to the concerned authorities for emptying the bin. The whole setup brings about automation and hence reduces the human intervention required in segregating the waste and provides successful collection of the garbage from the bin at the appropriate time. The system is driven by a microcontroller- Arduino UNO, and the sensors are programmed using the language- Embedded C.

Keywords- Dry, wet, metal, sensors, Arduino UNO, Embedded C

T.Saminathan, Akash Musipatla, P.Manideep Varma , P. Shahid Khan, G.Mahesh Kumar "IoT based Automated Waste Segregator for Efficient Recycling", International Journal of Innovative Technology and Exploring Engineering(IJTTEE),2019

This paper proposes a prototype of a municipal waste segregator, which can segregate the dumped waste immediately, leading to more recyclable paper. The Smart bin can be programmed to send information about the dumped garbage, such that respective action can be taken. Various sensors and motors are interfaced with Arduino board in this system. Index .

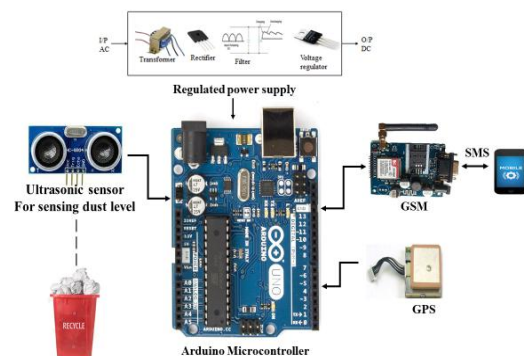
Terms: Metal sensor, Moisture sensor, Smart Bin, Internet of Things.

Robotic Arm Intelligent Grasping System for Garbage Recycling

Hongyang Fu; Dong Xu; Jiang Wu

The recycling of garbage is an effective way to protect environment. However, garbage recycling is still adopting manual sorting which is of low efficiency and may damage to the health of operators. To improve the efficiency of the garbage recycling, it is considered to use an automated robot system which integrates modern control method of robots and machine vision to replace manual sorting. Using a robotic arm and a RGB-D camera, a visual servo robotic arm grasping system was produced, which mainly depends on tools in robot operating system (ROS). The object recognition kitchen (ORK) in ROS is used to identify and locate the grasping targets. The relationship between the camera coordinate system and the robot coordinate system is established by hand-eye calibration technology. The kinematics calculation and motion planning of the robotic arm are completed with the help of ROS-Moveit!. Through experimental testing, it is estimated that the hand-eye calibration is accurate, and the robotic arm can perfectly grasp the target object.

IV. BLOCK DIAGRAM



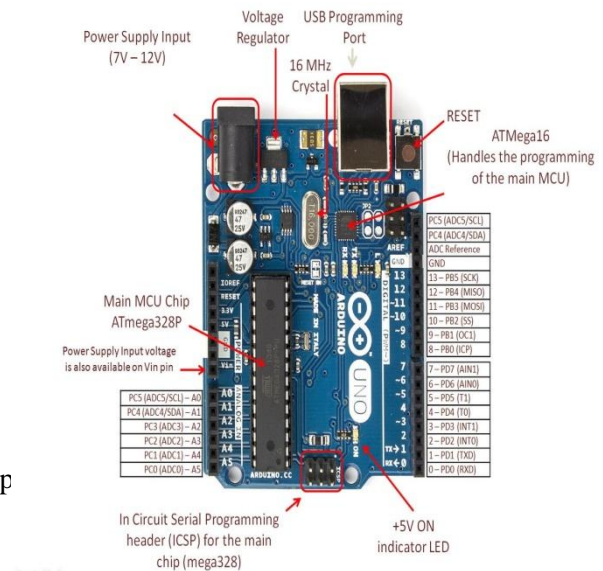
The proposed system consists of an AI model which is dumped into Arduino. When an object (garbage) is placed in front of the Pi camera it will determine if it is a valuable object or not. If the object is valuable like a cell phone, camera, etc., the robotic arm will put this item into the box safely. If it is not a valuable item like a plastic bottle, paper, etc., the arm will throw the item into the bin or garbage system. Servo motors are used to design a robotic arm with a 'pick and place' mechanism.

Microcontroller We are using PIC18f 4550 as microcontroller, which is heart of project.

- **IR sensor** For detecting the tank level. which will help us provide related information to corporation office.
- **Display** A 16*2 display is interfaced and used for displaying system progress.
- **Proximity sensor** For sensing or recognizing that waste material is present on the collection plate.
- **Moisture sensor** Depending on level of moisture the waste can be segregated. This is the one of the important sensor in this system to help and decide what type of material is present on collection plate.
- **L293DIC** This particular IC is used for controlling the motor, the rotation of motor in clock wise or anti clock wise direction.
- **Geared DC motor** These motors are particularly used to rotate the collection plate on right or left side. to let the waste material slide down for further processing.
- **GSM Module** Here any GSM module can be used to send the alert message to the municipal corporation, with location and name.

Arduino UNO

The [Arduino](#) Uno is a popularly used open-source micro-controller board that runs on ATmega 328P micro-controller. This board is developed by Arduino.cc which is an Italy based hardware company. This board contains a set of digital and analog I/O data pins that are used to interface this board with other electronic components. Arduino Uno consists of 14 digital pins and 6 analog pins.



- **Plastics** from dry waste can be used directly in recycling process same with the metallic materials
- **System** is best suited for smart city application.
- **Very much useful** in commercial places

V CONCLUSION

The existing model presents an integration of all the hardware components which have been used and developed with the Arm-11 Raspberry pi processor. The position of each and every module has been placed very carefully. Hence, contributing to the robust working of the model, Artificial Intelligence Based Trash and Recyclable Sorting Robot Arm. Secondly, with the help of highly advanced IC's like ARM1176JZF-S 1.2 GHz processor, RaspbianOS operating system and artificial intelligence, the project has been successfully implemented with a unique approach. Thus, the project has been successfully designed and tested

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Interactive Optical 3D Touch Interface With Color Detection And Holographic Light-Field Display

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Abstract - The usage of a holographic light-field (LF) 3D display and a color detection system of the scattered light from the touched 3D image is presented as an interactive optical 3D-touch user interface (UI). The described technology would improve user experience and enable advancements in fields like education, entertainment, gaming, retail, and museums, where holograms are now used, by linking the real and virtual worlds through touch-based interaction. With just one RGB camera, the suggested system uses the LF input color information to determine the location and motion of the interaction point in three dimensions. In order to demonstrate the viability of our suggested approach, a real-time interactive user interface implementation operating at a frame rate of 12 is displayed.

Key Words: Interactive display, Optical 3D-touch user interface, Holographic light-field 3D display, Holographic materials, Color detection system.

1. INTRODUCTION

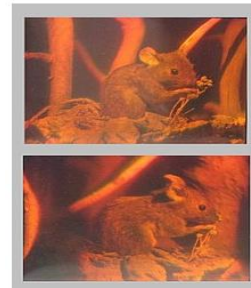
Today, touch user interfaces (UI) are such a practical and common component of two-dimensional (2D) displays that it is usually believed that all 2D displays we interact with have this functionality. On the other hand, glassless three-dimensional (3D) displays, such as head-up displays and autostereoscopic displays are constantly being developed and are used more and more in the automotive and medical sectors. The development of light field (LF) 3D displays and antenna displays, whose user interface enables interaction with reconstructed content and delivers a user experience, has received significant attention in the hunt for a natural extension to the widely used 2D touch user interfaces approach something that doesn't exist closer. The majority of 3D displays that enable 3D user interaction rely on sensors that are independent of the display and its contents. Contrary to typical 2D touch displays, which measure content and interaction on the same physical plane, this technology uses a sensor to measure both. An uncomfortable user experience might result from a clash between the content and the contact point. In a prior study, our team described a method for interacting with holographic light field (HLF) displays directly using dispersed light from the user and an RGB sensor. The study's principal notion may be seen in action thanks to an implementation that was disclosed earlier this year. Although the system used LF pictures computed outside the processing pipeline and did

not have real-time updating to enable UI implementation, it was restricted to a binary response that simply distinguished between the presence and absence of interaction. The image processing algorithm was also not designed to take into account the use of various objects and various lighting scenarios. This paper proposes an image processing algorithm that can track the finger in 3D while simultaneously determining the position and color of the scattered light in order to broaden the applicability of the previously proposed backlight detection approach. The color of light scattered perpendicular to the RGB sensor is used as a supplementary signal to offer 3D tracking of the user's finger in real time using just one sensor. The user's interaction with the 3D picture does not change how the LF image updates in response to the user's movement. By direct touch with the rebuilt LF, this method creates a new 3D interface that records the user's location in 3D space in real time. Although we use HLF in this study, this method may be used with any 3D interface that renders a real 3D image.

II. HOLOGRAPHY

2.1 HISTORY AND OVERVIEW

The holographic method was created and developed by British-Hungarian physicist Dennis Gabor, who won the Nobel Prize in physics in 1971. The method of holography enables the recording and subsequent reconstruction of a wave front. Although it has numerous additional uses, holography is best recognized as a technique for producing realistic three-dimensional images. A hologram might theoretically be created for



each wave.

Fig. 1: Two photos of one hologram taken from different angles

In order to create a hologram, the wavefront of interest is superimposed with a different wavefront (often referred to as a reference beam), resulting in an interference pattern that is captured on physical medium. It refracts to restore the original wavefront if only the second wavefront lights the interference pattern. By modelling two wavefronts and digitally joining them, holograms can also be made on a computer. The desired wavefront is then reconstructed using the generated digital image, which has been printed onto a suitable mask or film and lit with an appropriate source. Figure 1 displays two images of a single hologram taken at various angles. The Greek words holos, which means "whole," and graph, which means "writing" or "drawing," combine to form the English word holography. The first practical optical holograms capable of capturing three-dimensional objects were developed in 1962 by Yuri Denisjuk in the Soviet Union and Emmett Leith and Juris Upatnieks at the University of Michigan in the United States. Silver halide photoemulsions were the recording medium for early holograms. Because the grating they formed absorbed so much of the entering light, they were not very effective. Laser light is required to record the light field in optical holography. In the past, holography required powerful, expensive lasers, but today, academics, artists, and devoted hobbyists on a tight budget may create holograms and practise holography much more easily using low-cost laser diodes like those found in DVD recorders and other common uses. However non-laser light can also be used to observe the 3D image. Yet, in everyday life, significant image quality compromises are made in order to view and, in some cases, create holograms without the need for laser light.

2.2 FUNDAMENTALS OF HOLOGRAPHY

Holography is a method that admits the record of a light field (mostly the result of a light beginning or freed from it objects) and before reconstructed when the original light field not any more survives on account of the lack of original objects. Holography maybe thinking of as a little akin to sound record, at which point the sound field created by shaking matter to a degree harmonic implements or articulate chords is encrypted for fear that it can later be copied outside the original shaking matter. However, it is still complementary to Ambisonic visual and audio entertainment transmitted via radio waves record, place playback can copy some hearing angle of the sound field. (Shown in figure 2 & 3)

➤ LASER

In laser holography, a hologram is captured using a laser light source that is extremely systematic in its color composition and purity. Holograms can be created in a variety of ways and come in a variety of forms, but they all include the interaction of light coming from various angles to create a minuscule interference pattern that is photographed on a plate, film, or other surface. In one typical configuration, the laser beam is split into two

components, the target beam and the reference beam. A lens is used to magnify the object beam before it is utilised to illuminate it. Where this light strikes the object after being reflected or scattered is where the recording medium is found. Ultimately, the media's edges will act. The object is placed with the understanding that the margins of the medium ultimately serve as a window through which it can be seen. In order to produce the appropriate interference pattern, the reference beam must be enlarged and shine straight into the medium.

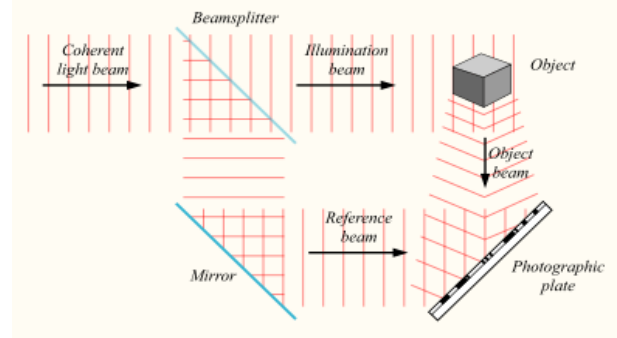


Fig. 2: Hologram recording

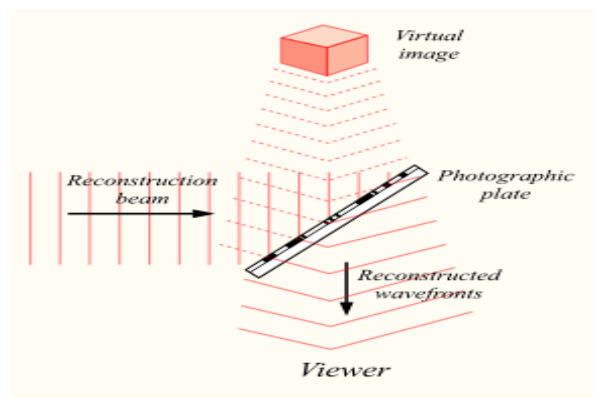


Fig. 3: Reconstructing of the hologram

Since just a small quantity of random light strikes the disc, a hologram can be made by directing a strong, indiscriminate beam of light directly onto the recording medium and the item on the opposite side. In order to create a hologram that is more adaptable, the light beam must be routed through various details that are neutral to it. The beam splitter, which is the first component, divides the beam into two identical beams with independent steering. The beam that is commonly referred to as the "light" or "object beam" is spread out by the glasses and guided by the mirrors. The recording medium is then illuminated by erroneous (reflected) light from the setup. The second beam, which is also referred to as the "reference beam," likewise penetrates the glasses but is restricted out of concern that it won't appear to alter the configuration but instead will strike the medium directly. There are numerous objects that can be utilised as storage. One of the extreme environments is a white halide photoemulsion film that is nearly identical to precision film but has considerably tiny photoreactive grains

(ideally around 20 nm wide), making it appropriate for the much greater resolution needed by holograms. Similar to white halide, the coating on this media is adhered to a transparent substrate, which is often a jar but can alternatively be flexible.

3. HLF DISPLAY-BASED INTERACTIVE 3D TOUCH USER INTERFACE

3.1 INTERACTIVE INTERFACES WITH 3D DISPLAYS: Several works in the literature have connected interactive user interfaces and 3D displays. The two most well-known techniques are the Leap Motion controller and the Kinect sensor. A more complex programme that controls the screen but displays the sequence where the presentation is simulated in a different place than the interaction must be found because the executable screens are quite small. Other LF systems put good concepts into practise utilising a common built-in interface, which is a large LF display. Although research has shown that on-screen designs that provide supplemental information in response to the user's movement improve communication, it also provides guidelines for using the Jump Movement on a visually appealing website. However, it does not believe that there is a material connection between the content and the user's hands. This issue is illustrated in Figure 4, where it is clear that if we utilise one structure for the presentation portion and a different one for the discovery portion, a disparity or enrollment error results.

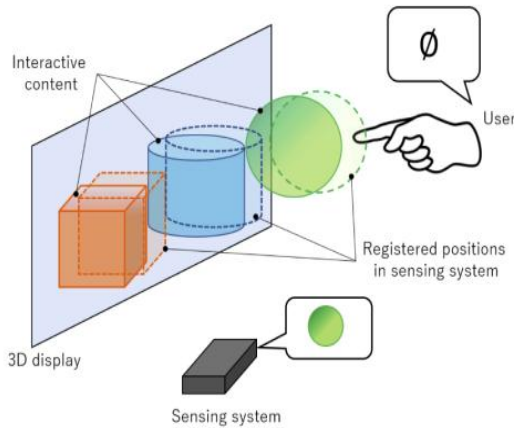


Fig. 4: The display system and the identification system are registered. Even if the user hasn't interacted with the material, the identification system registers the interaction.

3.2 LIGHT-FIELD TOUCH SENSING (LFTS):

In order to achieve an interface in which the direct interaction with the displayed material may be detected, this research has reported the notion of directly employing the light scattered by the user while touching the 3D content. A 3D user interface was built with a projection-type HLF display to give users a real-world, touchable image. The RGB sensor beneath the transparent panel

detects the diffused light from the user, which solves the matching problem and creates a more realistic UI (Fig. 6(a)). In this study, the concept of creating touch sensors by using the light from the reconstructed image as an input signal is known as "light-field touch sensing." (LFTS). A similar method using LFTS technology was also introduced, in which a system using LF for both projection and capture was recommended as the basis for an occlusion-supported hand tracking method. But the real-time tracking and updating of LF is not supported by the current LFTS systems. Additionally, the gadget used a single RGB sensor to capture a 2D projection from a 3D space. There is another way to measure depth data via LF projection, despite the fact that there are alternative approaches (such utilising a stereo camera).

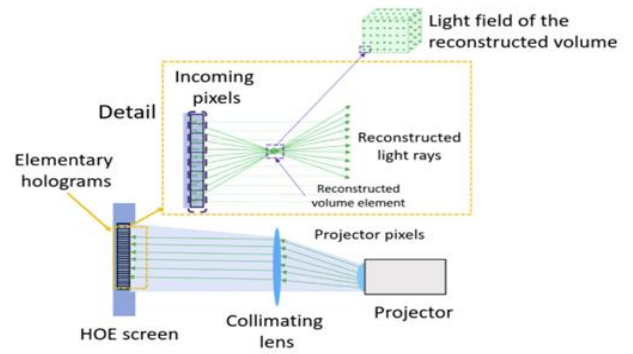


Fig. 5: Reconstruction of light rays with elementary holograms

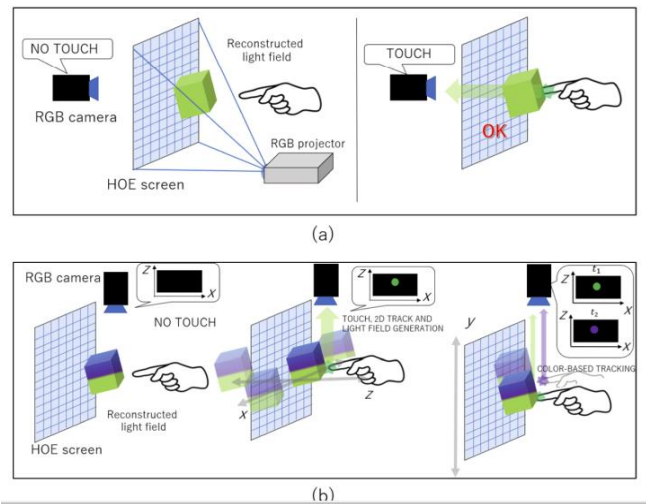


Fig. 6(a): Based on the detection of dispersed light, the front interface. The presence of the interaction has been recognised by a "OK" indicator. LF switching, tracking, and touching are all possible with the user interface proposed in 6(b).

3.3 METHOD

The recommended approach relocates the camera from the back of the HOE screen to the top of the device to reduce the amount of unwanted light that can cause false

positives. The xy plane's origin, the z-axis running parallel to the screen, and a vector perpendicular to the screen are all aligned with the middle of the HOE screen in the discussion that follows. As a result, the xz plane is captured by the camera in position b in Fig. 6. When a user touches an object that has been reconstructed by the LF screen using coordinates from a photo taken in the xz plane, it is possible to follow the user's finger in two dimensions (see Fig. 7(a)). All depth information (in this case, information about the y-axis) is lost during the imaging process, resulting in a 2D projection of a 3D scene from an RGB camera. In order to achieve 3D object localization without the usage of external motion sensors or stereo camera techniques, we propose using the LF's own color to generate an additional signal from a single RGB camera that can be used as a 3D motion sensor. If the object reconstructed by LF uses different colors in that direction, as shown in Figure 5, we may compensate for the lost information (i.e., the distance in the y-direction) by detecting the colors in that direction after shooting. In fact, a 3D location indicator can be created by combining an RGB camera and LF screen. The system's projected LF must be changed according on the user's fingerprint for an interactive 3D touch screen. The LF following the user's touch point was obtained via real-time LF reconstruction. The challenge here is that, as was already said, in order for our system to show the image appropriately, the image must be pre-distorted in accordance with the data from the lookup table (LUT). We were able to complete this operation in real time thanks to a quick Python library that helped us address this problem. Additionally, the fingerprint recognition process needs to be real-time implementation-ready. The finished product of the implementation is shown.

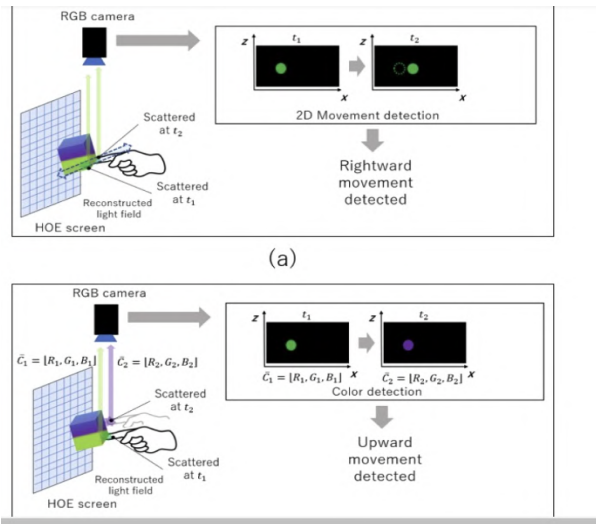


Fig. 7(a): 2D following, tracking of user fingertip position in a 2D plane using diffuse light detection. color tracking in 7(b). y-axis color detection to add an additional measuring dimension. Together, (a) and (b) use fingertip 3D tracking.

3.4 TRACKING OF INTERACTION USING 2D MOVEMENT DETECTION

The full identifying process is summarized in Figure 8. The process starts with touch event detection. The background of the camera-captured image is removed as the initial stage in touch detection. To look for scattered light, this is repeated repeatedly throughout a continuous stream of frames. Contrast stretching is used to the image when light scattering is noticed after subtraction to more accurately pinpoint the interaction location. The reduced picture is then multiplied in the captured image to determine the touch detection area, and a binary mask is created from it. The last stage is to apply image processing modules to create a high-quality mask, such as tiny declusters and erosion and dilation filters. The contours of the primary structures in the binary mask are extracted to strengthen the procedure. With strokes measuring one pixel broad, this choice identifies the loop with the greatest number of pixels, which typically correlates to the primary interaction point. The binary mask of Figure 9's secondary noise contours can be rejected in this way.

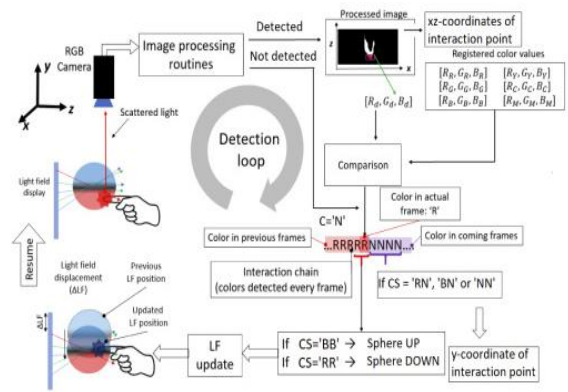


Fig. 8: Details of how color recognition is used to detect user motion

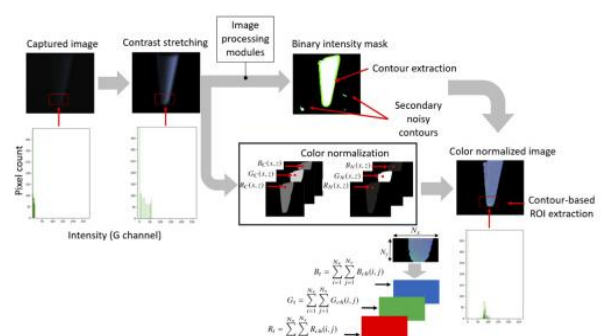


Fig. 9: Extracting color interactions using an image processing slider

The location of the detected contact area is then established using x and z coordinates. Since the camera does not move in relation to the LF display, interactive RGB detection is used to create a fixed connection between the reference frames of the RGB camera and the display earlier. Thus, the system knows the xz position on

the HLF screen where the interaction takes place using camera coordinates.

3.5. TRACKING OF INTERACTION USING DETECTION OF COLOR CHANGES

The interactive detection algorithm described in the previous section can be a good place to locate the user's finger in the xz plane. However, that method alone cannot detect finger movement elsewhere on the y-axis. We suggest a color measurement classification technique that can give the system extra details about the user's location in order to obtain a comprehensive user interface that can detect the user's direction on the y-axis. We employed a different color sphere (two-color sphere) in the top and lower portions, separated by a black area to produce a color shift in order to detect Y-axis movement. (see Figure 8). In figure 5, the sequence of the color C in two adjacent frames is denoted by CS, while the color detected in one chain is denoted as C. The system detects a red color (C = 'R') when the user emits light from the lower hemisphere (red light), indicating that the finger location is below the centre of the two-color sphere. The two-color ball then moves downward as a result. (negative y-axis). In reality, as seen in the lower portion of Figure 8, the choice is taken when CS = "RR" for robustness. The size of this change was determined to be 5-8 mm (approximately the width of a vertical finger). The mixing of red and blue light and the dark area do not result in color detection when the dark centre of the two-color sphere is moved to the point of interaction (i.e., the user's fingertip) after numerous color measurements and transfers (designated C = "N" in Figure 8). In this scenario, the system aborts the LF movement start. This cue shows where the user's fingertip should be on the y-axis in relation to how far the LF has moved. The ball will spin until it detects blue and then halt if the user scatters light from the upper hemisphere (blue light, i.e. ='BB'). In this manner, the system scans the precise y-axis location of the interaction point using the LF color sphere region. Naturally, the system identifies a change as the user moves the interaction point along this axis when either red or blue stray light is found in succeeding frames. The ball can then follow the fingertip's movement at that point. The procedure is repeated for each frame that is collected, as seen in Figure 8. While detection in the xz-plane is accomplished by choosing the interaction point that corresponds to the pixel that is closest to the screen in image 9, which is already a 2D value, this color detection enables detection of user movement in the y-axis. Changing the orientation is a very beneficial proposal to perform some fundamental movements and significantly enhance the usefulness of the user interface, even though this method does not offer the y coordinate with the accuracy that can be done in the xz plane.

4. EXPERIMENTAL ARRANGEMENTS

A schematic of the experimental setup is shown in Figure 10. The cloth HOE, which is the major element, reflects the light that is projected onto it using a commercial

projector. Glass is utilised to collimate the film projector's output, creating collimated light that can serve as the reconstruction beam for each HOE. The critical pixels are reflected together with the adjacent HOE pixels at converging angles, forming a touch image in front of the screen (Figure 4). To create LUTs that match the movie projector mirror array to each HOE center, a thorough matching method is performed to determine the movie projector's pixel area and the centre of each HOE on the screen. To convey the combinatorial concept to a film projector, combinatorial calculus is used to reconstruct the LF. LF was originally created using the treasure that was Blender, an open source 3D computer generated image operating system. The rendered perfect look is pre-curved according to HOE principles and LUTs corresponding to movie projector pixels. After the pre-falsification phase, the complete representation is discarded and the LF is reconstructed. The common part is an HOE-friendly RGB video camera that captures the off-screen area. The whole screen should be lowered. After the red tape has started, the video camera captures a frame of the arrangement and implements the invention working in 3D and then continues with the LF presentation. The process is iterative because bureaucracy is alive.

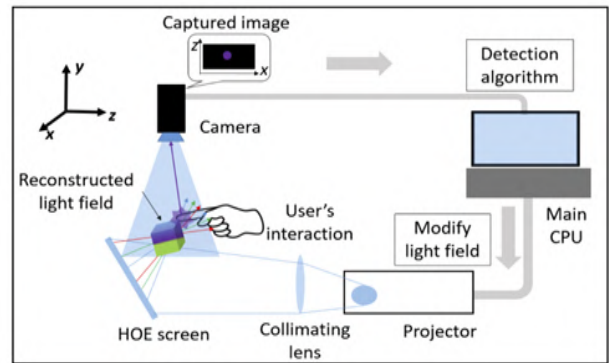


Fig. 10: Experimental Setup

4.1 SOFTWARE OPTIMIZATION

To deal with the original deadline, bureaucratic software improvements were inevitable. The initial search changes the pre-distortion phase of the entire representation of the two centers and measures the LUTs. This was accomplished by modifying the code with an LLVM sensor that gathers samples using the quick Python package Numba. It was challenging to alter the merged image to get an interesting LF because of the second plugin component. A new frame after each epoch is unlikely because Blender training proved computationally expensive and unsuitable for real-time application. Therefore, following empty arrays (angry frames), the same whole content concept was replayed, pushing it once more outside the LF recompiler, which increased performance. Table 1 includes a separate image format with a resolution of 1328 600 pixels that summarises the final planning meetings. However, the frame rate can be

increased to 12 frames per second if the captured playback volume is decreased to 1328 300 pixels.

Table 1: Processing times per frame in the interactive HLF display

| Process | Time [ms] |
|-------------------------------------|-----------|
| Image capture | 20 |
| Segmentation and contour extraction | 70 LF |
| Modification | 20 |
| Pre-distortion | 22 |
| Screen refresh | 2 |

Figure 11 provides an illustration of the interaction's output in the form of an image, showing how the fingertip glows green as it passes through the HOE screen's centre. To make sure the user actually touches the reconstructed LF, this light point is used.

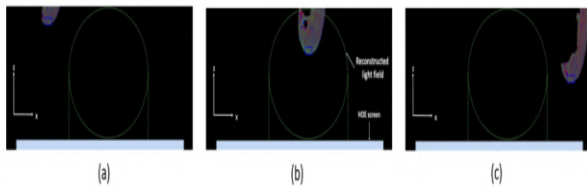


Fig. 11: An illustration of the image processing in the figure. 6 by running a finger through the LF copy. Unlike other light sources that illuminate the finger when not needed in LF region shown in a and b, the green dot is magnified and clearly visible in b.

5. APPLICATIONS

1. Art: 3D holograms may be used by artists to record sceneries and objects. It may be seen from several perspectives. Several museums across the globe study numerous holographic pieces of art.
2. Data storage: A number of academics are looking at the usage of 3D holograms as more powerful data storage systems for leisure and other computing applications. Holograms may be accessible from several angles by reflecting light, in contrast to conventional optical techniques, which can only be accessed from one aspect.
3. Security: Holograms are harder to copy than static pictures. As a result, it may be used as a sticker on credit cards, an image on money, or on papers like passports and identification cards. Nowadays, demos, presentations, and special events like weddings and birthday celebrations all employ 3D holograms as decorations.
4. Holographic Interferometry: It is a method that enables precise optical interferometric measurements of the static and dynamic motions of objects having optically rough surfaces (that is, fractions of the wavelength of light). In a transparent material, it may also be used to detect changes in optical path length, enabling, for instance, the viewing and study of fluid flows. Furthermore, outlines can be used to depict surface forms.

6. CONCLUSIONS

This study demonstrates that it is feasible to develop an interactive user interface that naturally resolves the issue of aligning the displayed content with the signal used to detect input by utilising the LF color information generated by an HLF display. More complicated operations, including writing and painting in three dimensions, may be done without constraints other than screen space thanks to the use of colors, as seen in the image. This approach is simple to use, interacts directly with on-screen material, and is quickly popularised as a user-friendly contactless interface. Its uses may be found in anything from interactive digital signs to automobiles, department store kiosks, and environments where hygiene is crucial, including hospitals, restaurants, and so on. The lack of appropriate applications has kept glass-free 3D interfaces from becoming a more widely used approach, therefore this research is also a step towards making them more prevalent. The HOE-based HLF display is a translucent display that can integrate into the surroundings and offer even more uses, however it wasn't particularly revolutionary in this study (such as a moving scenario information display). The fluctuation in diffraction effectiveness that hogels in the HOE screen can bring about when the polymer deteriorates as a result of variations in humidity and temperature was one of the issues seen in the experiment. Yet, this approach's efficacy can be raised by changing the circumstances surrounding the production of HOE screens and polymer insulation. Stronger signals can be produced by using colors with a greater signal-to-noise ratio (SNR). Despite achieving a high frame rate (12 frames per second), more complicated applications could need greater frame rates. Future research will take this issue into consideration and propose GPU-oriented programming techniques. This study serves as an example of the necessity for the interdisciplinary study of computer science, optics, and other fields to develop a user interface that may enhance user experience.

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A Framework for the Emerging Smart Infrastructure in the IOT Era

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Abstract- People are becoming more interested in utilizing the Internet to manage and monitor many devices due to the rapid growth of internet technology and intelligent embedded systems. Nowadays, there is an increasing need for automation and intelligent systems, leading to reduced human interaction and intelligent decision-making technologies. The Internet of Things (IoT) lies at the heart of the smart building idea. Essentially, the monitoring and management of household appliances are carried out through a sophisticated network of interconnected devices. The traditional homes/buildings cannot manage the appliances like the T.V., fan, lights, and others and control them remotely. In other words, they are not convenient and comfortable for elderly and disabled people because they cannot use the building appliance without help. The primary goal of this project is to design and build Internet of things based Smart infrastructure for homes. We implement and design a low cost, flexible, wireless solution to the buildings. The benefit of this system includes energy savings, home safety, and user convenience. Furthermore, this system may be used in various settings, including offices, universities, banks, residential flats, houses, streets, poultry farms, greenhouses, and other similar buildings. In a word, this method can be applied to a variety of buildings and sectors in order to optimize their operation and make them smart.

I. INTRODUCTION

People are becoming more interested in utilizing the Internet to manage and monitor many devices due to the rapid growth of internet technology and intelligent embedded systems. Nowadays, there is an increasing need for automation and intelligent systems, leading to reduced human interaction and intelligent decision-making technologies. The Internet of Things (IoT) lies at the heart of the smart building idea. Essentially, the monitoring and management of household appliances are carried out through a sophisticated network of interconnected devices. The traditional homes/buildings cannot manage the appliances like the T.V., fan, lights, and others and control them remotely. In other words, they are not convenient and comfortable for elderly and disabled people because they cannot use the building appliance without help. The primary goal of this project is to design and build Internet of things based Smart infrastructure for homes. We implement and design a low cost, flexible, wireless solution to the buildings. The benefit of this system includes energy savings, home safety, and user convenience. Furthermore, this system may be used in various settings, including offices, universities, banks, residential flats, houses, streets, poultry farms, greenhouses, and other similar buildings. In a word, this method can be applied to a variety of buildings and sectors in order to optimize their operation and make them smart.

II. Related Work

F. Al-Turjman H. Zahmatkesh and R. Shahroze "An overview of security and privacy in smart cities' IoT

communications" Trans. Emerg. Telecommun. Technol pp. 1-19 May 2019. Smart cities have brought significant improvements in quality of life and services to citizens and urban environments. They are fully enabled to control the physical objects in real time and provide intelligent information to citizens in terms of transport, healthcare, smart buildings, public safety, smart parking, and traffic system and smart agriculture, and so on. The applications of smart cities are able to collect sensitive information. However, various security and privacy issues may arise at different levels of the architecture. Therefore, it is important to be aware of these security and privacy issues while designing and implementing the applications. This paper highlights main applications of smart cities and addresses the major privacy and security issues in the architecture of the smart cities' applications. It also reviews some of the current solutions regarding the security and privacy of information-centric smart cities' applications and presents future research challenges that still need to be considered for performance improvement. This paper highlights main applications of smart cities and addresses the major privacy and security issues in the architecture of the smart cities' applications. This paper also reviews some current solutions regarding the security and privacy of smart cities' applications and presents future research challenges that still need to be considered for performance improvement.

F. Al-Turjman and M. Abujubbeh "IoT-enabled smart grid via SM: An overview" Futur. Gener. Comput. Syst vol. 96 pp. 579-590 2019.

Power quality and reliability issues are big challenges to both service provider and consumers in conventional power grids. The ongoing technological advancements in the Internet of Things (IoT) era provide better solutions to enhance the management of these challenges and enforce the measures of a

Smart Grid (SG). Advanced Metering Infrastructure (AMI) and Smart Metering (SM) technologies are enabler technologies that can modernize the conventional power grid through exposing the hidden details of electrical power by introducing two-way communication scheme during power transaction process between utilities and consumers. Throughout literature, AMI and SM technologies are widely discussed. However, few studies discuss the role of SM in power quality and reliability

monitoring in IoT-enabled SGs. Hence, the paper aims to comprehensively review the feasibility of employing SM for power quality and reliability monitoring. First, we provide a detailed overview about the SMs, wireless communication technologies, and routing algorithms as enabling technologies in AMI. Then, we categorize the existing literature works that target power quality and reliability monitoring. Finally, open research issues are outlined based on shortages in the existing literature.

S. Mahmud S. Ahmed and K. Shikder "A smart home automation and metering system using internet of things(IoT)" 1st Int. Conf. Robot. Electr. Signal Process. Tech. ICREST 2019 pp. 451-454 2019.

Internet of Things (IoT) is an augmentation of existing internet facility to deliver communication, connection and internetworking between various devices and physical objects also known as "Things". Accessibility of great speed internet makes it possible to switch and control numerous kinds of devices very easily. This paper discussed a smart low- cost home automation system which is designed using IoT. With the help of this system, all the home appliances and electronic machines can be controlled and observed through a website very easily. The metering method of a home can also be supervised using this system. Not only

the consumers but also the dealers will get the opportunity to observe the anomalies of the power distribution system by watching the metering system. Online billing system also included in the designed system.

U. D. Ulusar F. Al-Turjman and G. Celik "An overview of Internet of Things and wireless communications" 2nd Int. Conf. Comput. Sci. Eng. UBMK 2017 pp. 506-509 2017.

Innovations in technology that have enabled efficient wireless tiny devices propelled the concept of Internet of Things. It is expected that mobile data traffic will experience 8-fold growth between 2015 and 2020 and the number of mobile connected devices will reach 11.6 billion by 2020. Main factors of this exponential growth and wide acceptance are the integration of several technologies and communications solutions such as wired and wireless sensor and actuator networks, next generation communication protocols, identification technologies, and artificial intelligence for smart objects. In this work, we explore the role of the IoT in various fields, consider technological aspects, and examine the challenges and opportunities the IoT offers.

K. Singh S. Verma S. Pal and K. Pandey "A step towards Home Automation using IOT" 2019 12th Int. Conf. Contemp. Comput. IC3 2019 2019.

The aim of this paper is to develop home automation system based on IOT using Wi-Fi based

microcontroller. As scope of technology is widening every day, we are making our tech advance in mobile, robotics, Machine Learning, then why an exception for our home. Today's houses are gradually transferring from ordinary/human's input-based appliances to smart/IOT enabled appliances to be controlled remotely. At Present, existing home automation systems use technology that is limited to only that device. So, in a nutshell, we are making our devices IOT enabled not our homes. As far as this paper is concerned, NodeMCU (ESP8266) microcontroller along with Relays is used to control electrical switches remotely from the server which is built on Node.js. User can control switches using a Web Application after authenticating.

A. Verma S. Prakash V. Srivastava A. Kumar and S. C. Mukhopadhyay "Sensing Controlling and IoT Infrastructure in Smart Building: A Review" IEEE Sens. J vol. 19 no. 20 pp. 9036-9046 2019.

The increasing attention for energy efficiency in buildings stimulates the expansion of "Smart buildings". In offices and homes, building automation systems are suited to individuals, foresighting their needs. Occupants' compliance is a fundamental requirement for a successful adoption of building automation systems. An important warning regards that such "smart behaviour" of the building should match with the occupants' satisfaction and their feeling of controlling the living environments. A balance between energy efficiency and occupants' needs is required. This paper aims at providing insight on the concept of "Smart Home" considering the adaptive actions performed by occupants to restore their wellbeing.

D. Gebbran A. C. Chapman and G. Verbic "The internet of things as a facilitator of smart building services" Australas. Univ. Power Eng. Conf. AUPEC 2018 pp. 1-6 2018.

Awareness of resource consumption in the home is a key part of reducing our ecological footprint yet lack of appropriate understanding and motivation often deters residents from behaviour

change. The coming deployment of smart metering technologies, the increasing practicality of embedded devices, and the widespread use of Internet and mobile tools offer new opportunities for "greener" residents. We report on the design and implementation of a holistic interactive system that supports residents in awareness of resource use and facilitates efficient control of house systems to encourage conservation in daily activities. Initial response from two high-profile deployments in unique homes indicates this approach has great potential in engaging residents in sustainable living, but presents many challenges in how technology is integrated into the home environment.

Gustafsson, A., Gyllenswärd, M.: The Power-Aware Cord: Energy Awareness Through Ambient Information Display. In: Proc. of the 23rd Intl. Conf. on Human Factors

in Computing Systems, Extended Abstracts, pp. 1423-1426. ACM Press, New York (2005)

In order to support increased consumer awareness regarding energy consumption, we have been developing new ways of representing and interacting with energy in electric products intended for domestic environments. The 'Power-Aware Cord' is a re-design of a common electrical power strip that displays the amount of energy passing through it at any given moment. This is done by dynamic glowing patterns produced by electroluminescent wires molded into the transparent electrical cord. Using this fully functional prototype, we have been investigating how such ambient displays can be used to increase energy awareness. An initial user study indicates that the Power-Aware Cord is a very accessible and intuitive mean for better understanding energy consumption. Future work includes further development of the mapping between load and visual pattern and in-depth studies of user perception and learning over time.

Block Diagram

Energy crisis is one of the major problems that the world faces today. The energy crisis can be reduced to a certain extent by properly monitoring our energy consumption and avoiding energy wastage.

The energy meters are connected to the Arduino UNO through an optocoupler. The optocoupler sensor gives an interrupt each time the meter LED flashes to the programmed Arduino and Arduino processes this data to the ESP8266 WI-FI module then the WI-FI module sends this data to the Blynk app. This system monitors the kWh readings into the Blynk app. This design eliminates the human involvement in electricity maintenance.

In this system, an Arduino is interfaced with an energy metering circuit, current sensing circuit, WI-FI communication and a contactor to make or break power line. In this project we are connecting loads through relay and CT.

Whenever over load was detected by the system then the Arduino will send the blink notification to the user mobile then user disconnects the load by using Blynk application. Here relay works as a switch to on/off the power supply which is connected to the load.

The main controlling device of the project is Arduino which is programmed by Embedded C language.

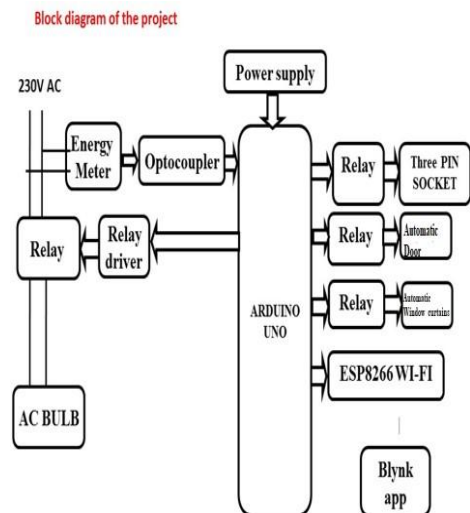
Components used:

- Power supply
- Arduino uno.
- Load (AC bulb).

- Light.
- Fans.
- Three pin socket.
- Energy Meter
- Optocoupler.
- WI-FI module.
- Relay.
- Blynk app.
- CT

Software's used:

1. Arduino IDE Studio compiler for dumping code
2. Embedded C programming.
3. Express SCH for Circuit design.



ADVANTAGES

There are several advantages of Smart City, and learning about these can help you to weigh the benefit and the disadvantages from it.

Better transportation services: A smart city has the potential to drastically improve the current level of transportation throughout a city. It will have better traffic management, the ability to track public transportations and serve its citizens better with constant information and low prices.

Safer Communication: A smart city will have the most technological advances and partnerships with the private sector will benefit society since there will be lesser criminal activity. The example of such technology is license plate recognition, connected crime centers, shooting detectors, better emergency services, and body cameras.

3. **Reduced environmental footprint:** A smart city has thousands of energy-efficient buildings that can improve the air quality, use renewable energy sources, and decrease the dependence on non-renewable energy sources. These will help to decrease the ecological impact we have on the environment.
4. **Economic development opportunities:** Investing in smart cities will lead to improving their regional and global competitiveness and attract new residents and improve business. Since the entire city will have access to an open data platform, information, etc. companies will flourish. They can make informed decisions with the available technologies and lead to economic development.
5. **Improvement of infrastructure:** Old roads, buildings, highways, bridges require massive investments to maintain their state and increase their useful life. But, with the help of smart technologies, cities will have the ability to analytically predict and identify the areas that can cause infrastructure failures before it occurs.
6. **Decrease of crime:** Since the authorities can monitor the dealings of people closely with the help of technologies, there will be a reduced amount of crime. Besides, crime increases when there are fewer jobs and more unemployed people. However, if job opportunities increase, it will simultaneously lead to a decrease in crime.

DISADVANTAGES

1. **Limited privacy:** Since the authorities or the government will have access to security cameras and intelligent systems connected through many different spaces, the citizens will have difficulty in maintaining their anonymity. Facial recognition and such things will drastically change the concept of privacy or personal space.
 2. **Social control:** The people who can track and centralise the data they gather with security cameras will have greater power. It can be a government, a private agency, or other authorities. They will have the power to control a citizen's data and can easily manipulate public opinions.
 3. **Excess network trust:** Since the citizen of these smart cities will rely almost entirely on electronics and networks, they will lose autonomy in their decision-making and could become incompetent. They would not be able to react appropriately in a scenario where these tools are not usable.
- II. **Pre-training is required:** If the people of the city don't know about technology, then they will not be able to use it. Without training, they will find it irrelevant to their daily lives and will find it difficult to utilise

it.APPLICATIONS

1. Smart Infrastructure

Digital technologies are becoming increasingly important for cities to have the conditions for continuous development; buildings and urban infrastructures must be planned more efficiently and sustainably.

2. Air Quality Management

Smart cities also are implementing tools that can capture pollution data in real time and forecast emissions. Being able to predict air pollution accurately allows cities to get to the root of their emissions problems and brainstorm strategic ways to limit the amount of air pollution they put out.

3. Traffic Management

One of the greatest challenges facing large cities is finding ways to optimize traffic. Yet, finding a solution is not impossible. For example, Los Angeles is one of the busiest cities in the world and has implemented an intelligent transport solution to control the traffic flow. Pavement integrated sensors send real-time updates of traffic flow to a central traffic management platform, which analyses the data and automatically adjusts traffic lights to the traffic situation within seconds. At the same time, historical data is used to predict where traffic can go – and none of these processes require human involvement.

4. Smart Parking

Cities are also leveraging intelligent parking solutions that identify when a vehicle has left the parking area. Sensors are built into the ground and report the location of free parking spaces via a mobile app the driver downloads. Others use vehicle feedback to precisely pinpointing the location of openings and guide waiting cars down the path of least resistance. Smart Parking is a reality today and does not require complicated infrastructure and a high investment,

making this smart city application ideal for a mid-sized smart city initiative.

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3. S. Mahmud S. Ahmed and K.Shikder "A smart home automation and metering system using internet of things (IoT)" 1st Int. Conf. Robot. Electr. Signal Process.Tech. ICREST 2019 pp. 451-454 2019.
4. U. D. Ulusar F. Al-Turjman and

G. Celik "An overview of Internet of Things and wireless communications" 2nd Int. Conf. Comput. Sci. Eng. UBMK 2017 pp. 506-509 2017.

5. H. K. Singh S. Verma S. Pal and K. Pandey "A step towards Home Automation using IOT" 2019 12thInt. Conf. Contemp. Comput. IC32019 2019.

6. A. Verma S. Prakash V. Srivastava A. Kumar and S. C. Mukhopadhyay "Sensing Controlling and IoT Infrastructure in Smart Building: A Review"IEEE Sens. J vol. 19 no. 20 pp.9036-9046 2019.

7. D. Gebbran A. C. Chapman and G. Verbic "The internet of things as a facilitator of smart building services" Australas. Univ. Power Eng. Conf. AUPEC 2018 pp. 1-6 2018.

III. RESULTS

This project helps you automatically control the home appliances through remote or mobile phone. Control on bulbs, fans, window curtain and door is shown in this project.

IV. CONCLUSION

The home automation using IoT has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet

Embedded Based Hand Talk Assisting System for Dumb People on Android Platform

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Abstract – The prototype for a gesture recognizing glove (data glove) is designed. A low-cost packaging material is used for making piezoresistive sensors. These flex sensors detect a bend in fingers and we map this data to a character set by implementing a Minimum Mean Square Error machine learning algorithm. The recognized character is transmitted via Bluetooth, to an Android phone, which performs a text to speech conversion. The motivation for Hand Talk is to compare hand configurations with sign language charts and generate artificial speech which articulates the gestured words. This technology also has further applications as a 3D mouse, virtual keyboard, control for precision control of robotic arms.

Index Terms: Robotics Arms, Flex Sensors, Hand talk, Android Phone.

I. INTRODUCTION

This system gives voice to voiceless i.e., voice is given to the person who is notable to speak. Dumb/mute people use sign language for communication purpose. Sign language uses gestures instead of sound to convey information. This language includes combining hand shapes, hand movements, facial expressions to express individual's thoughts. In this system flex sensors plays the major role. Flex sensors are attached to the glove using needle and thread. Flex sensors are the sensors whose resistivity varies with the amount of bend. In this project, Arduino microcontroller is used to take input from flex sensors and then this analogue data is converted to digital form by using micro controller.

All the data from microcontroller is sent to android phone and accordingly the android phone will speak corresponding character which has been sensed. The advancement in embedded system can provide a space to design and develop a translator system to convert the sign Language into speech. Nowadays embedded system has become an important trend in all applications. The work presented in this project mainly reduces the communication gap between

dumb and ordinary people and aims to facilitate dumb person's lifestyle. In general, deaf people have difficulty in communicating with others who don't understand sign language. Even those who do speak aloud typically have a "deaf voice" of which they are self-conscious and that can make them reticent.

The Hand Talk glove is a normal, cloth driving glove fitted with flex sensors along the length of each finger and the thumb. The sensors output a stream of data that varies with degree of bend. The output from the sensor is analog values it is converted to digital and processed by using microcontroller and then it will be transmitted through wireless communication (RF), then it will be received in the receiver section and processed using responds in the voice using speaker. In this project flex sensor plays the major role, Flex sensors are sensors that change in resistance depending on the amount of bend on the sensor. They convert the change in bend to electrical resistance - the more the bend, the more the resistance value. They are usually in the form of a thin strip from 1"-5" long that vary in resistance from approximately 10 to 50 kilo ohms. They are often used in gloves to sense finger movement. Flex sensors are analog resistors. They work as variable analog voltage dividers. Inside the flex sensor are carbon resistive elements within a thin flexible substrate. More carbon means less resistance. When the substrate is bent the sensor produces a resistance output relative to the bend radius. With a typical flex sensor, a flex of 0 degrees will give 10K resistance with a flex of 90degrees will give 30-40 K ohms. The Bend Sensor lists resistance of 30-250 K ohms. In this system we use Radio Frequency Signal to transmit the signal from transmitters to Receptors, in this project we have used microcontroller, a speech IC and also a speaker to produce the output.

II. PROBLEM STATEMENT

To solve this problem we have use two modes of operation in this system. We are measuring the actions performed by the deaf and dumb people using flex sensor attached to gloves in a hand of the user. Once the glove is placed in the hands, whenever an action for sign language is performed, the bending values are obtained and the corresponding action is identified by the microcontroller AT89c51. It activates the voice chip APR9600 and the corresponding voice is spelled in speaker and displayed in the LCD.

Hardware Required:

- Battery Power
- Flex Sensor
- Blue Tooth HC 05
- Arduino uno

III.BLOCK DIAGRAM

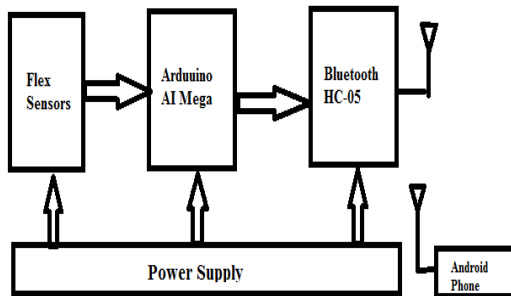


Fig 1: Block Diagram of Embedded based hand talk assisting system for Dumb peoples on Android Platform

IV.HARDWARE REQUIREMENTS

i) **Node MCU:** Node MCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. It's having 128KBytes of memory and its storage space is 4Mbytes and power is supplied through an USB and it is a single board microcontroller and also it is having 16 GPIO pins.

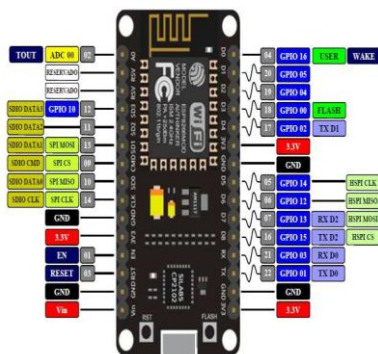


Fig 2: Node MCU

ii) **WIFI Module:** Wi-Fi is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. There are lots of WIFI Features which make it easier and simpler wireless network. Wi-Fi Technology is, in spirit, a version of Ethernet without wires in the form of a wireless local area network. Now days millions of people using this built-in feature amazing wireless technology

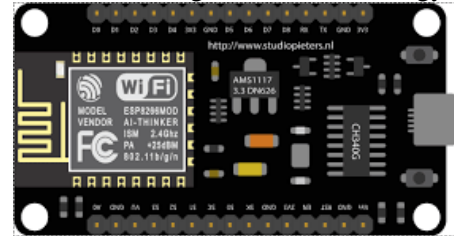


Fig 3: WI-FI Module

iii) **Flex Sensor:**

A flex sensor is a kind of sensor which is used to measure the amount of deflection otherwise bending. The designing of this sensor can be done by using materials like plastic and carbon. The carbon surface is arranged on a plastic strip as this strip is turned aside then the sensor's resistance will be changed. Thus, it is also named a bend sensor. As its varying resistance can be directly proportional to the quantity of turn thus it can also be employed like a goniometer.

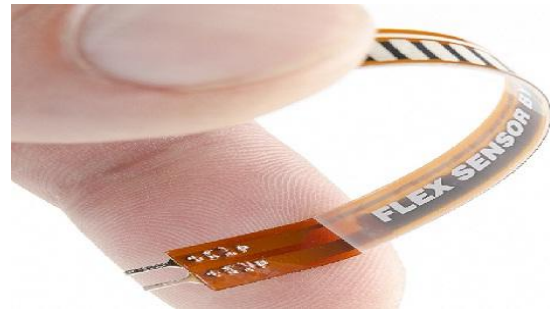


Fig 4: Flex Sensor

iv) **Bluetooth Module**

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project, etc. Just go through the datasheet for more details.

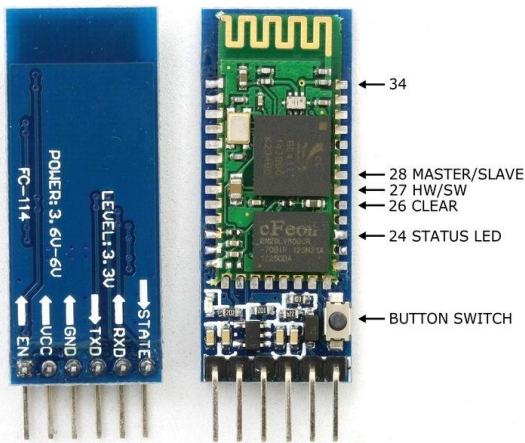


Fig 5: Bluetooth Module

v) **HARDWARE FEATURES**

- Typical 80dBm sensitivity.
- Up to +4dBm RF transmit power.
- 3.3 to 5 V I/O.
- PIO (Programmable Input/Output) control.
- UART interface with programmable baud rate.
- With integrated antenna.
- With edge connector.

vi) **SOFTWARE FEATURES**

- Slave default Baud rate: 9600, Data bits:8, Stop bit:1,Parity:No parity.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto pairing PINCODE:”1234” as default.

V.SFTWARE USED

Arduino IDE compiler for Embedded C programming.Express SCH for Circuit design. Proteus for hardware simulation.

VI.ADVANTAGES

- The normal person does not need to learn sign language as he will get know by audio and text what the dumb person is trying to say.
- It is a compact device and can be easily carried out anywhere.
- Nowadays most of the people use android mobile so it’s a good system because of availability of various features and open-source nature of android.
- People who are deaf can communicate with people who aren't.
- It is low-cost device.
- It takes less power to operate system.

VII. DISADVANTAGES

- Limited Community
- Takes time to learn.
- Fluent communication is difficult to learn
- Must be face-to-face
- Parents & teachers must learn the child's signs and they need to use sign language when interacting with the child

VIII. APPLICATIONS

1) Gesture Based Applications:

Gesture based applications are broadly classified into two groups on the basis of their purpose: multidirectional control and a symbolic language.

2)3D Design: CAD (computer aided design) is an HCI which provides a platform for interpretation and manipulation of 3-Dimensional inputs which can be the gestures. Manipulating 3D inputs with a mouse is a time-consuming task as the task involves a complicated process of decomposing a six-degree freedom task into at least three sequential two-degree tasks. Massachusetts’s institute of technology has come up with the 3DRAW technology that uses a pen embedded in phloem’s device to track the pen position and orientation in 3D.A 3space sensor is embedded in a flat palette, representing the plane in which the objects rest The CAD model is moved synchronously with the users gesture movements and objects can thus be rotated and translated in order to view them from all sides as they are being created and altered.

3)Tele presence: There may raise the need of manual operations in some cases such as system failure or emergency hostile conditions or inaccessible remote areas. Often it is impossible for human operators to be physically present near the machines [4]. Tele presence is that area of technical intelligence which aims to provide physical operation support that maps the operator arm to the robotic arm to carry out t e necessary task, for instance the real time ROBOGEST system [5] constructed at University of California, San Diego presents a natural way of controlling an outdoor autonomous vehicle by use of a language of hand gestures. The prospects of tele presence includes space, undersea mission, medicine manufacturing and in maintenance of nuclear power reactors.

4)Virtual reality: Virtual reality is applied to computer-simulated environments that can simulate physical presence in places in the real world, as well as in imaginary worlds. Most current virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays. There are also some simulations include additional sensory information, such as sound through speakers or headphones.

Some advanced, haptic systems now include tactile information, generally known as force feedback, in medical and gaming applications.

CONCLUSION

This system has improved mute person's lifestyle. At the same time, it is beneficial for a blind person and a dumb person to communicate. It will reduce the communication gap between the mute community and normal people. This project aims to develop a useful tool that uses gesture recognition for reducing the communication barrier between the mute community and normal people. This project was meant to be a prototype for checking the feasibility of recognizing gestures. This project was conceptualized to provide a voice to the voiceless and aid hearing-impaired people. This Technique was implemented successfully with accuracy at a highly optimized cost.

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Sustainable Smart Organic Farming Using IOT and ML

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Abstract-As the world is trending into new technologies and implementations it is a necessary goal to trend up in agriculture also. Many researches are done in the field of agriculture. Most projects signify the use of wireless sensor network collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in agriculture to overcome these problems. So, in order to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all factors affecting the productivity in every stage. But complete automation in agriculture is not achieved due to various issues. Though it is implemented in the research level it is not given to the farmers as a product to get benefitted from the resources. Hence this paper deals about developing smart agriculture using IoT and given to the farmers. This proposed method utilizes machine learning technology for the green development potential industry's ability to manage economic resources and increase innovative agriculture product development patterns. Thus, the key preconditions for increasing healthy food choices and promoting local and global organic farmers' potential development are straightforward suggestions for developing an effective marketing strategy.

I. INTRODUCTION

The project aims in designing a smart farm using IOT, Arduino controller. This is used to monitoring the farm conditions in thingspeak through Wi-Fi. Here we are using temperature, humidity, LDR, co2sensors.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power 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-to-DC adapter or battery to get started.

It continuously monitors the data and updates them to an IoT platform. We can increase the monitoring techniques by making use of advanced technology. In this project we are making use of technology to sense sensor data efficiency so that efficient services can be provided to the smart framings.

The main control unit in the project is ARDUINOcontroller. Temperature, humidity, LDR, Co2 sensors are input to the arduino. The arduino controller get data from sensors and this data are uploaded into the thingspeak through Wi-Fi.

The features of the project are:

- LivingfarmEnvironmental monitoring.
- Usage of arduino to achieving this task.
- Updating the parameters values on THINGSPEAK website.

II. Problem Statement

Farmers are using pesticides for better results. Pesticides can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish, beneficial insects, and non-target plants. Organic farming can take a stand to solve this problem using the techniques mentioned below.

III. RELATED WORK

1.Priyatharshini Rajaram Cardiff Metropolitan University proposed "Smart farming system using sensors for agricultural task automation" ||2015

They have proposed a novel methodology for smart farming by linking smart sensing system and smart irrigator system through wireless communication technology. The detailed modeling and control strategies of a smart irrigator and smart farming system are demonstrated in this paper. The key reason for this deprived performance is lack of agricultural task automation. The Smart sensing system provides precise results and the Smart irrigator system manages to spray the necessary nutrients according to the requirements of the crops.

2.Prem kumar final year Electronics and Communication Engineer student proposed "Automation in polyhouse using IoT"||2018

Automation in poly house avoids the manual error by the farmer. They are monitoring the temperature, humidity, soil moisture, intensity of light in the poly housefarm using various sensors. It is easily monitored by the customer through the mobile app from anywhere around the globe. These method yields more crops than the existing method .The yield product will enrich in their quality. But there is a chance of problem is occurred only through the manual error.

3. MUHAMMAD AYAZ (Senior Member, IEEE) proposed “Internet-of-Things Based Smart Agriculture toward Making the Fields Talk” ||2019

State-of-the-art IoT-based architectures and platforms used in agriculture are also highlighted wherever suitable. Finally, based on this thorough review, we identify current and future trends of IoT in agriculture and highlight potential research challenges. The focus on smarter, better, and more efficient crop growing methodologies is required in order to meet the growing food demand of the increasing world population in the face of the ever-shrinking arable land.

4. Achim Waltera proposed “Smart farming is key to developing sustainable agriculture” ||2019

They suggested that agriculture is undergoing a fourth revolution triggered by the exponentially increasing use of information and communication technology (ICT) in agriculture. These technical improvements constitute a technical revolution that will generate disruptive changes in agricultural practices. This trend holds for farming not only in developed countries but also in developing countries, where deployments in ICT (e.g., use of mobile phones, access to the Internet) are being adopted at a rapid pace and could become the game-changers in the future (e.g., in the form of seasonal drought forecasts, climate-smart agriculture).

5. Anand Nayyar proposed “A Smart IoT based gadget Agriculture Tool” ||2016

It assists farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring. This stick was developed with the combination of NodeMCU, Cloud computing and Solar Technology using Breadboard mixed with various sensors. Thingspeak.com was used to get the live data feed. The author claimed the accuracy of 98% in the data feeds extracted from the sensors.

6. Andreas Kamilaris proposed “Agri-IoT, a semantic framework for IoT based smart farming applications” ||2017

This supports reasoning over various heterogeneous sensor data streams in real-time. Framework also supports large-scale data analytics and event detection, ensuring seamless interoperability among sensors, services, processes, operations, farmers, and other relevant actors, including online information sources, and linked open datasets and streams available on the Web. For the experimentation of this project, they deployed 100-300 sensors in the field. The comparative analysis of two RDF Stream Processing (RSP) engines CSPARQL and CQELS is illustrated with the results.

7. George Xiao National Research Council Canada proposed “Printed Sensor Technologies for Monitoring Applications in Smart Farming” ||2021

Smart farming is the integration of advanced technologies such as sensors, wireless communication, Internet of Things (IoT), artificial intelligence (AI), and robots, with

traditional farming practices. Lack of nutrients and water is certainly not good for the crop yield. Over-supplying nutrients using fertilizers and water might not be good for the crop either, it also causes environmental pollution. To understand and control the factors discussed above, the adoption of sensors and new technologies has been believed to be the only viable solution. Sensors can be used to monitor the soil conditions.

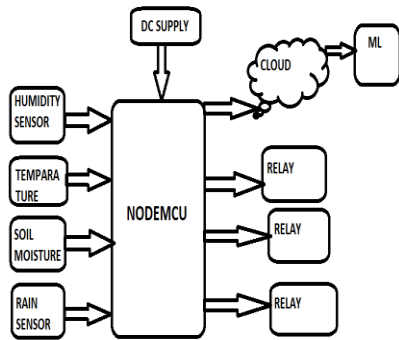
8. Dr. N. Suma, Sandra Rhea Samson proposed “IoT Based Smart Agriculture Monitoring System” ||2017

As the world is trending into new technologies and implementations it is a necessary goal. The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers themselves verify all the parameters and calculate the readings. It focuses on developing devices and tools to manage, display and alert the users using the advantages of a wireless sensor network system. The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates.

9. Achim Walter, Robert Fingerb proposed “Smart farming is key to developing sustainable agriculture” ||2017

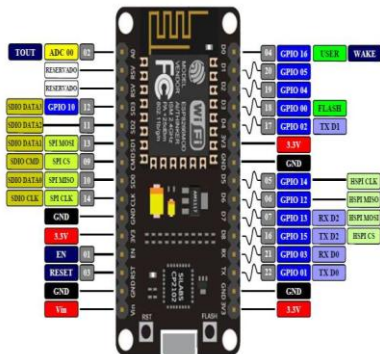
Smart farming is key to developing sustainable agriculture. Autonomous, robotic vehicles have been developed for farming purposes, such as mechanical weeding, application of fertilizer, or harvesting of fruits. The development of unmanned aerial vehicles with autonomous flight control, together with the development of lightweight and powerful hyperspectral snapshot cameras that can be used to calculate biomass development and fertilization status of crops, opens the field for sophisticated farm management advice. The technical improvements constitute a technical revolution that will generate disruptive changes in agricultural practices. This trend holds for farming not only in developed countries but also in developing countries, where deployments in ICT (e.g., use of mobile phones, access to the Internet) are being adopted at a rapid pace and could become the game-changers in the future.

IV. BLOCK DIAGRAM

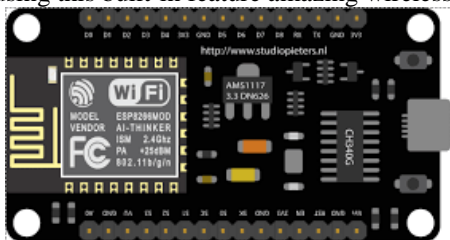


V. HARDWARE REQUIREMENTS

i). Node MCU: Node MCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. It's having 128KBytes of memory and its storage space is 4Mbytes and power is supplied through an USB and it is a single board microcontroller and also it is having 16 GPIO pins.

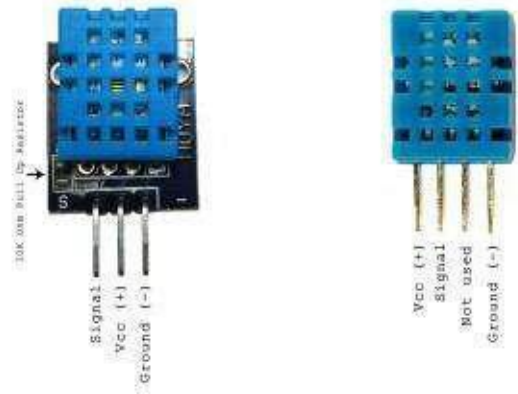


ii). WIFI Module: Wi-Fi is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. There are lots of WIFI Features which make it easier and simpler wireless network. Wi-Fi Technology is, in spirit, a version of Ethernet without wires in the form of a wireless local area network. Now days millions of people using this built-in feature amazing wireless technology



iii). Humidity sensor: Because of their low cost and small size, DHT11 humidity and temperature sensors are perfect for lots of different DIY electronics projects. Some projects where the DHT11 would be useful include remote weather stations, home environment control systems, and agricultural/garden monitoring systems. DHT11 digital

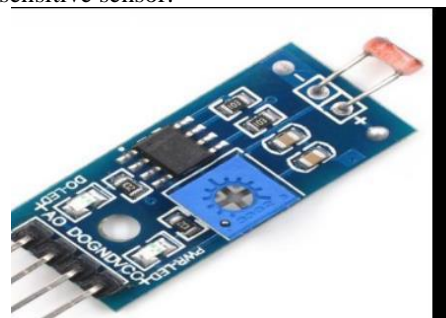
temperature and humidity sensor is a composite Sensor contains a calibrated digital signal output of the temperature and humidity.



iv). Temperature sensor: The LM35-series devices are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, The LM35 device does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4$ °C at room temperature and $\pm 3/4$ °C over a full -55°C to 150°C temperature range.

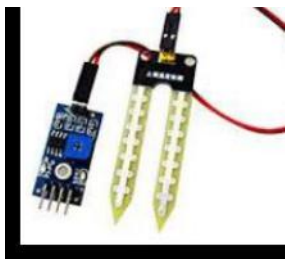


v). Light Sensor: The intensity of light in the polyhouse is measured through the Light sensor. Light sensor is the device which is used to detect the current ambient level of the light i.e. how bright or dark it is. The sensor used is INVNT_10 Lm393 optical photosensitive LDR light sensitive sensor.



vi). Soil moisture sensor: Soil moisture sensor is the device which measures the content of water in the soil. Soil moisture measurement is important to help farmers manage their irrigation systems. It consists of two probes which are

used to measure the volumetric content of water. When there is more water, the soil will conduct more electricity which means that there will be less resistance. Therefore, the moisture level will be higher so when there will be less water, then the soil will conduct less electricity which means that there will be more resistance. Therefore, the moisture level will be lower.



vii). Relay: The Single Pole Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically, you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit “receives” current, the other one doesn’t and when the coil gets energized the opposite is happening



viii). ULN 2083: The eight NPN Darlington connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays, printer hammers or other similar loads for a broad range of computer, industrial, and consumer applications. All devices feature open-collector outputs and freewheeling clamp diodes for transient suppression. The ULN2803 is designed to be compatible with standard TTL families while the ULN2804 is optimized for 6 to 15 volt high level CMOS or PMOS.



Conclusion:

Markets will grow and collapse, disruptive business models will emerge or die, but people will always need to eat and drink. For this reason, the development of such areas as food and agriculture will always be a priority, especially given the dynamics we observe in the world today. Therefore, IoT used in agriculture has a big promising future as a driving force of the efficiency, sustainability, and scalability in this industry.

Future Scope:

- In future we can add solar panel to run the project.
- In future we can add some more sensors like soil moisture sensor, water motor in this project we can control the water automatically based on moisture content in the soil.

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Smart Shopping Trolley with Automated Billing

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Abstract - Now a day, shopping has becoming a daily activity in today's world. We can see large queues in many shopping malls waiting for billing. The objective of our project is to overcome the problem of standing in queue and wasting time. To overcome the above problem, we are proposing a smart trolley billing system that will audit the purchased products and the payment is made online automatically using the RFID tag. It will automatically identify and scan the product and the final billing is made from the cart itself. So that customers are free from waiting in a long queue at checkout. This model is reasonable and profitable smart shopping cart handled by the IOT innovations. The primary goal is to provide a technology oriented, time saving and commercial oriented system for enhanced shopping experience. This system will also provide suggestions for the products based on user purchased history from a consolidate system. In this system, every product in mart will have RFID tag, and every cart will be having RFID Reader attached to it. These features will save time and make shopping easier. Overall we can gain the best shopping experience.

I. INTRODUCTION

Metropolitan cities are crowded with people in shopping malls to buy their daily needs. As the market is growing bigger day by day with variety of products and consumer taste has changed. Shopping malls are centre of attraction because of discounts in products, cashless transaction, variety of products like household, decorative, kitchen, sports, education, stationeries which are all available under one roof. So in this paper we are proposing a new technology especially in billing which saves the time of customer by effective and efficient billing using smart trolley. The shopping malls presently use RFID tags which are tagged for every product which is within trolley and scan many times. The highly time-consuming situation is observed where customers wait for long queues for only one item. RFID can scan as many as items which is infinite when we see over barcodes. The space required to install LCD, RFID Reader, and microcontroller is limited such that trolley turns out to be efficient. It's also solves key factors like insufficient information of product, pitfall in prices on items. So we came for unique solution for smart trolley. In Existing technology we need more human and material resources lot of time is wasted in scanning

the items, making the bills ready and items can be read for shorter distances only, barcodes need external power supply so in order to meet all the requirements of customer we proposed a smart trolley using RFIDS.

The proposed paper focuses on updated technology of RFIDS, Saves precious time of customers by fast canning of products, scanning of items for long distances. The exaggerated shopping trolley system assistances the consumers in reducing the significant amount of time those consumers used to expend in shopping and it contains real-time informs on the records are also provided in the store management unit. If clients wishing to eliminate the product from the cart that they have taken they can do it by the use of a key. Once buying is over, the total amount will be displayed in the LCD and billing can be accomplished by using QR code. At the exit point checking of consignment and packing of merchandise can be done. In order to make shopping to a lesser extent difficult for shoppers in malls/shops, various strategies planned for clever purchasing trolleys. The concept is designed into a smaller version of the automated self-checkout system on a shopping trolley with a user interface screen which allows customers to make payment for items scanned and placed in the trolley before leaving the exit of the store which release pressure at the tills during peak hours, advances in manufacturing, distribution and information combined with the urbanization of modern society, socio-demographical changes created the so-called new consumer, mall managers often need to track manually each stock available and sold in the large center. These challenges require innovative solutions, which served to motivate the ideas demonstrated in this paper RFID (Radio Frequency Identification) Technology is used. Every item or product is attached with a RFID tag and this product is scanned using RFID reader which is attached with a trolley. Customer purchase different items and put them in the trolley. Price of that total items and also names

will be displayed on LCD (Liquid Crystal Display) screen which is also attached with a trolley.

II. LITERATURE REVIEW

1. Automatic human guided shopping trolley with smart shopping system.

Authors: Yen Leng Ng, Cheng Siong Lim, Kumeresan A. Danapalasingam, Michael Loong.

A shopping trolley is a necessary tool for shopping in supermarkets or grocery stores. However, there are shopping trolleys abandoned everywhere in supermarkets after being used. In addition, there are also shopping trolley safety issues such as sliding down.

2. Smart Trolley using Smart Phone and Arduino.

Authors: Harpreet Singh Bedi, Nikhil Goyal, Sunil Kumar and Avinash Gupta.

Benefit to the customers: This system provides on spot scanning of the product and shows its price details on LCD. This allows customers to compare the total price with the budget in the pocket before billing.

3. Smart Trolley for a Smart Shopping.

Authors: Renjini Jose, saleh Musallam Abdullah Al Harthi, Ahmed Abdullah Awadh Koofan.

Now world is in a digital era. In all the fields, education, medical, business, even in day-to-day life, prominence of technology is more. Millennial needs everything in one touch. So that in business field, competitors are contesting harder in providing their services to people.

4. Smart Shopping Trolley Using Rechargeable Smart Card.

Authors: Sonali S. Dhokte, Bhagyashree S. Patere, Megha T. Magar, V. S. Kulkarni, Prashant S. Patil.

In today accelerating world, shopping at malls or supermarkets have become lifesaver for people, if time is concerned as one of the important factors. Innovation in technology is basically aimed towards making day to day life of people easier and faster.

5. An Elegant Shopping using Smart Trolley.

Authors: B. Arathi, M. Shona.

Objectives: In this paper a smart Trolley model is developed for an elegant shopping. Methods/Statistical

Analysis: Supermarkets are the places which will be crowded always especially in weekends. To manage these crowds various technologies are used to support.

6. Smart shopping trolley using RFID.

Authors: P.T. Sivagurunathan, P. Seema, M. Shalini, R. Sindhu.

The various items are purchased in shopping mall or markets with help of shopping trolley. This product acquisition is some difficult process. In customer convenience they have to pull the trolley for each time to collecting items and simultaneously.

7. Smart Trolley in Shopping Mall.

Authors: Rahul Chaudhari, Sunil Bhagat, Shubham Kanfode, Mayuri Taklikar, Snehal Bhajikhaye, Prof. S. P. Chaware.

Now a day shopping at big malls is becoming a daily activity in metro cities and non-metro cities. We can see huge rush at malls on holidays and weekends. The rush is even more when there are special offers and discount. People purchase different items and put them in different trolleys.

8. A Smart Trolley System using RFID.

Authors: Amruta Pokale, Kajal Pilane, Prakash D. Kshirsagar

A supermarket is a form where wide variety of product items is available. These product items can be food, beverages or any household product. The main purpose of supermarkets is to provide availability of all the products and save the time of the customers.

9. Smart Trolley for Shopping Malls.

Authors: Tanveer Maner, Gajanan Benake, Mangesh Bhosale, Sharang Mali, Saurabh Pukale.

Electronic Commerce has become extraordinarily popular the increase in wireless technologies and different communication techniques. Getting and shopping at massive malls is turning into daily activity in metro cities. There's a large rush in such places.

10. RFID and GSM Based Smart Trolley.

Authors: Mrs.R.Hemalatha, A.Krithika, S. Kowsika Nandhini, K.Mounika.

III .PROBLEM STATEMENT

The proto system aim is to eliminate all the inconveniences as possible from the systems and to make a system, which is consumer kindly, customer-friendly and high performing. The systems aim would be consumer convenience and an overall time efficiency and high performance. This goal could be achieved by using the zigbee system implemented using RFID technology. Present scenarios in shopping supermarkets are time consumption is big problem at billing section. Consumers have no idea about the present day offers in supermarkets. Sometimes, shopping is done beyond the budget of the customer. This could be achieved through the RFID technology, which is currently in its preliminary stages. At vendor side, GSM technology is implemented to know about the overall products/ high sold products in supermarkets at the end of day. By this vendor can stock the products early to supermarkets.

IV. METHODOLOGY

This project will measure the parameters of humidity, temperature, soil moisture, rainfall, and pressure and show the results on the Blynk application, making it an Internet of Things (IoT) based weather monitoring system that enables weather conditions to be checked online from any location.

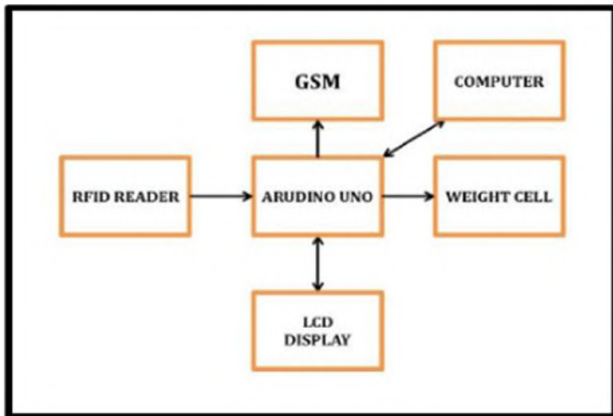


Fig.1. Block Diagram

A) RFID READER

The RFID reader retrieve the information from tag which is attached to item, The reader takes data in digital form through radio waves. The reader acts as transmitter asking the information to tags and tags as receiver pass relevant data to reader.[5] The RFID Reader can work under various frequencies firstly low frequency range(125kHz-134kHz) with distance

of 10cm-30cm,secondly high frequency range(13.56MHz) with distance of 1m,thirdly ultra high frequency(865-928MHz) up to 1.5m-2m .

FUNCTIONING OF RFID

It has RFID Reader and RFID tag which is transponder. RFID tag in conjunction with antenna and microchip transmits the data to the reader. A tag are attached to product as and when products are dropped and come in contact with reader tag transmits information. The total data of item is properly communicated to computer and finally stores the data.

B) RFID Tags

The RFID tags falls into two classes active tags and passive tags. Active tags which produce their own energy because of self battery and passive tags as the name says it depends on external energy for its operation and they are generally used because of minimum cost and available in different geometries.

C) Arduino Uno

The detailed information of product is stored in microcontroller with series of instructions in programming language. The Arduino Uno is a microcontroller which has fourteen digital input/output pins. It can be externally supplied by power through USB.

D) Weight cell

The customer with malpractice can be caught by putting weight cell at checkout point near security. If the weight of 20 items is 'x' but if final weight is 'x+y' where y is increased weight for which customer has not paid the bill.

E) Server

The information stored in microcontroller is passed to server through media of GSM. The server keeps the track of items stored in store and the bill paid by customer.

F) Liquid Crystal Display

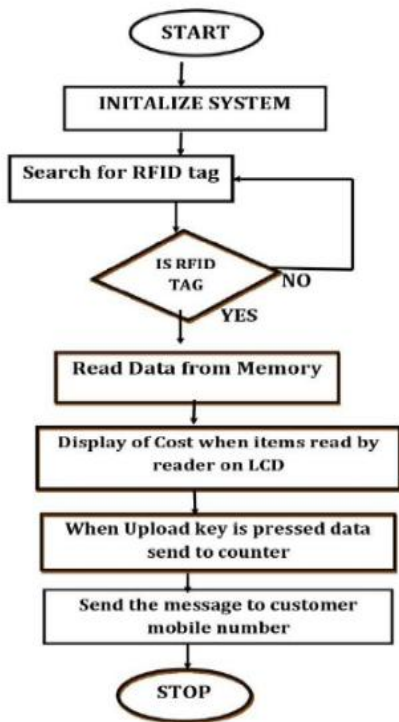
The output of microcontroller is given to LCD. It can display sixteen characters in one line. Its uses 16*2 display. The customers get the data of item as the items are dropped in trolley by displaying Item name, item quantity, item amount with spacing. When items are dropped they get added otherwise gets subtracted. The

information of purchased products will be seen on LCD with clarity and list is tabulated.

A. Working:

- STEP I: Start the program
- STEP II: Initialization of system by assigning values to flag
- STEP III: Search for RFID tags if found read data from memory otherwise repeat the task
- STEP IV: When total tags are found which are displayed on LCD
- STEP V: When items are added the cost will be cumulative else subtractive
- STEP VI: Data is fed to counter when upload key is pressed
- STEP VII: Send data to customer mobile number
- STEP VIII: Stop the task

Flowchart



V. RESULT

All the experimental parts were discussed above, in which proposed system LCD is used to display the product information in terms of cost and weight. The proposed model is easily accessible, does not require special training and convenient to use. The manpower is

decreased and will save time that the user spends in billing queue. Many users can be attended in same time which is useful for retailers and customers. Time efficiency and cost efficiency are guaranteed by this smart billing system. Smart trolley envisions simplifying the billing procedure by facilitating customers in creating a shopping session which lasts until the customer commands it to be cleared and preserves the data of each product in the basket by using RFID tags to make the entry. It also facilitates in keeping the shopping experience in budget by displaying the total cost to the customer. Emerging trend of online shopping, which cuts down the hassle, at the same time that shopping at stores introduction of environment friendly smart carts and smart baskets not only help the stores to eliminate the surge but also serve to reduce the usage of paper, the number of employees making it more economical and unnecessarily wasted in printing copies of bills. Thus the use of RFID based smart trolleys is of major significance or importance interest and The results of shopping done by customers are shown on Liquid Crystal Display in terms of cost, weight, item name and in some cases, display will guide you that product is expired where customers have to be cautious. As the RFID Reader Scans the items from RFID tag the Item name along with cost and weight are displayed this process continues as when items are added and amount of items is cumulative in process. As the items are removed the amount will be subtracted due to expiry of item or item may be disliked. Smart trolley is equipped with cell which measures the weight of purchased items such that keen observation can be done on customers if any malpractices are performed during billing time. Let us illustrate with an example when the weight of 20 items is X but the displayed weight is X+3,2X which means actual value and measured value are different. It avoids unnecessary use of paper where printouts are eliminated and they experience shopping by making budget where prices are hiked and where they are lowered these forms a tool of good saving of money.



CONCLUSION

In the present study, we have implemented successfully a feasible technology based on RFID to help customers in abundance and saves precious time especially in billing which is highly tedious task waiting for our turn. Though RFID can scan huge items at once but every item should be tagged Trolley turns to be smart with inbuilt features of tags and readers not consuming much space and thus make its very attractive for customers.

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Design of a Smart Safety Device for Women Using IOT

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Abstract -: In this generation we give equal rights to men and women. They are self-sufficient and can now work anywhere. Although we are evolved now, women's safety has long been a concern. Now here is safe for women or girls. There are various tools to stop exploitation such as paper spray, alarm, shockwave generator. However, they are insufficient to protect women and girls. Our goal is to adequately provide safety for ladies. The systems serve some addons that will notify those nearby of her location and send message to her registered contact number the folk nearby will also be notified and aware that someone is in danger as a result of the alarm sounding, so that she can quickly receive help from other and her family. In order to provide Indian women a sense of security and empowerment we are concentrating on developing an efficient, quick, and reliable method to inform the police and anybody around of any trouble or send an alert message. By using information technology, protect women from crime and sexual assault.

Keywords- : GPS module, GSM module, Node MCU

I. INTRODUCTION

If our culture does not care about the safety of women, then we be living in troubled time. More than 80% of women faced sexual harassment but only few of them reported. Women harassment includes rape sexual abuse, kidnaping and all others. Now a days some devices are available for women safety but they are not good enough for them. There are even laws to safeguard women, but they are only helpful once harassment has occurred. They still don't have a way to feel secure prior to harassment. The goal of technology is to protect women from harm and overcome all obstacles. The technology on this device assures dual alerts in the event that a woman is harassed or believes she is in risk. This gadget is incredibly simple to use and can be handled by anyone. Women can freely move anywhere without depending on anyone. Women will simply press the push button if she feels unsafe. The main gadget located in bag and handbag. The primary device location is where registered number are sending alert messages.

II. LITERATURE REVIEW

These days, women's safety is a vital concern, so this technology is very beneficial for women's safety. We have started implementing our design for "Design of a smart safety device for women using IoT" by reviewing various documentation and methodologies. The following papers were reviewed for literature.

In this project if women manipulate the handheld device by pressing buttons or otherwise. However, if it fails when she is unable to respond. If a woman is attacked from behind using this fingerprint-based method, it will also notify the police and other individuals in the area. If there isn't a fingerprint verification, the system will instantly notify the police and anyone in the area. Android application features include the ability to record the victim's audio and advise nearby others.[1]

IoT based system was developed for women's safety with an alarm to utilize in an emergency for both women and children. GPS and GSM modules are also used when the GPS is activated, the victim's location is pinpointed, and the message "Woman insecure" is transmitted from the microcontroller to the victim's approved group via the GSM module.[2]

This paper suggests that the different safety precautions offered to women and this task fall under the category of maintaining security. It is suggested to use an Arduino-based new perspective on women's security warning systems that can transmit SMS alerts to the victims' families, allowing women to proceed with their daily activities unafraid. Arduino has a built-in alert system that recognizes and notifies the authorized individual of any unauthorized instruments.[3]

This paper summarizes that no security measure can guarantee complete protection. Multiple gadgets must be carried by the user. They discovered a protection tool with all the features accessible with a single click. The ARM controller and Android application used in this study are synchronized via Bluetooth, allowing the device and smartphone to be

operated separately. This project can record audio for further inquiry, call and message registered contact numbers with the location every two minutes, and allow for live tracking using the application. It can also record audio for further investigation. This project also includes a hidden camera detector to guarantee privacy.[4]

This system serves there are four primary goals, the first of which is to use GPS and GSM to transmit the location to the saved contact numbers. Second, she can activate the buzzer so that people in the area can assist her in escaping the predicament. The primary function of this device will be to transmit the women's pulse rate to the Thing Speak cloud via Wi-Fi and store it there while also sending the same data to contacts that have been saved. The fourth is that by choosing not to kill the abuser but giving the victims an opportunity to flee the area, she can shock the abuser.[5]

This device's primary function is to function as an emergency device that will hit the panic button if it senses danger to notify the pre-provided mobile numbers, an SMS comprising the latitude and longitude coordinates will be sent. The women's position can be found by looking at the received coordinates on a Google map.[6]

III. PROBLEM STATEMENT

The level of sexual harassment in our nation is alarming. The rape of minors in gangs, on school girls on working Women are highly odd occurrences. There are several charities, apps, helplines yet even they cannot guarantee women security. Due to social stigma women are afraid to complain. There are some apps that can alert saved contacts but none of them work well. So significant modifications should be required to stop all of these crimes.

IV. METHODOLOGY

A. Hardware Components

- a) Power supply: An electrical appliance known as a power supply provides electricity to an electrical load, such as a server or laptop computer, among other electronic devices. Converting electric current from a source to the proper voltage, current, and frequency to power the load is the primary purpose of a power supply

- b) GPS Module: A satellite provides a specific location to the GPS module. When you're outside, GPS is a useful tool for locating a location. The GPS module can make use of a number of GPS satellites. In this section, we'll try to use a GPS module to access a location.

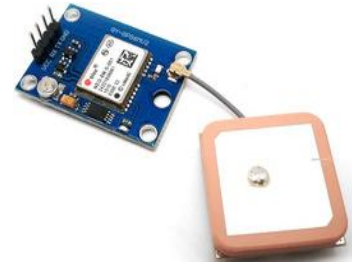


Fig. 1. GPS Module

- c) GSM Module: A sim card is used by the GSM module as an access point. It starts a stable connection with any website using related protocols. It is used to create a mobile and portable Internet of Things device that can transmit data to a specified web server and be accessed from any location in the world



Fig. 2. GSM Module

- d) ESP8266 Wi-Fi:

A self-contained SOC with an integrated TCP/IP protocol stack, the ESP8266 Wi-Fi Module allows any microcontroller to access your Wi-Fi network. The ESP8266 is capable of offloading all Wi-Fi networking tasks from another application processor or hosting an application.



Fig. 3. ESP8266 Wi-Fi Module

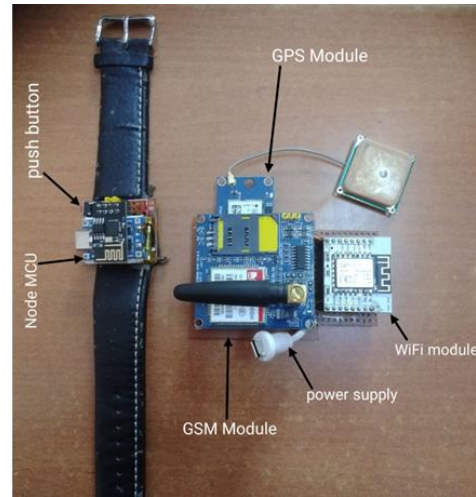


Fig: Proposed hardware design for Smart Safety device

e) Node MCU:

A cheap open source IoT platform is Node MCU. It originally included hardware based on the ESP-12 module and firmware that runs on Es-press if Systems' ESP8266 Wi-Fi SOC. Support for the 32-bit ESP32 Microcontroller was later added.

Whenever someone feels endangered, she pushes the button as soon as the device on the Node MCU receives power from the power source. Hence, we provide the Node MCU with an ESP 8266 Wi-Fi module so it can contact Wi-Fi network. In order for her family and friend to realize that she is in danger and to know where she is, a GSM module will send a message to saved contact number and a GSP module will relay the location to the same number.

B. Block Diagram

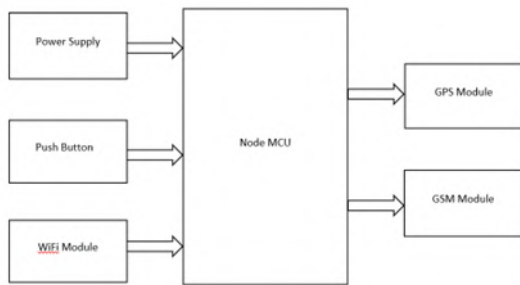


Fig: Diagram of smart safety device for women

D. Work Flow

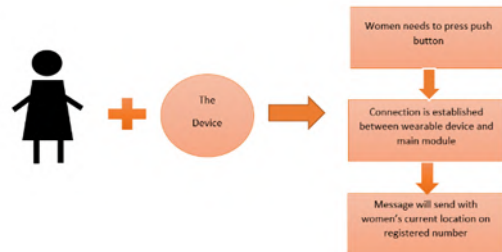


Fig: Work flow of the proposed design

C. Proposed Hardware Device

V. RESULT



Greater usage of public spaces by women; improved public knowledge and disapproval of exploitation; decrease of issue like sexual harassment of women and girls in the intervention city or neighborhood.

VI. CONCLUSION

The concept presented here is important for the safety of women. The proposed design will address the key issues that women have faced and will help to find solution through the technology. With more innovation, this idea might be used to several security fields.

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Alcohol Detection and Automatic Engine Speed Control For Drunken Driver

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Abstract—In this project, the Arduino UNO is used to create and implement an alcohol detection system with engine locking for automobiles. The device will continuously check the alcohol detection sensor's level of concentration and, if it rises above a certain level, will shut off the vehicle's engine. The method that enables an Arduino board with an alcohol sensor immediately locks the vehicle's motor. The technology then enables entering the user's numbers into the program first. And by applying the necessary voltage, the input triggers were perceived by the driver, who was intoxicated by alcohol levels over the legal limit. The concept offers a practical way to reduce accidents caused by intoxicated driving.

I. Introduction

When you open the newspaper, reading about a car accident is not unusual.

According to a 2010 WHO analysis, India actually sets the global record for the number of annual traffic accidents. India experiences approximately 1,34,000 fatal traffic accidents each year. The most alarming statistic is that alcohol intake accounts for 70% of these, according to a 2011 study. In this project, we'll cover how to use an Arduino to create an alcohol sensor. The MQ-3 sensor will be the alcohol sensor we employ. Not only is this sensor sensitive to alcohol, especially ethanol, which is the form of alcohol found.

II. Literature Review

The papers surveyed for literature are as follows:

[1] An productive resolution is provided to evolve the brainly system for car that will monitor miscellaneous parameters of overcome by alcoholic liquor constant level and will please this overcome by alcoholic liquor to the base unit has made clear in this paper, by utilizing hardware principle who's core is Arduino, alcohol sensor mq3 the whole control method has the

advantage of breadth of view and extreme reliability future outlook concerning this system search out control the accident and providing beneficial analyses about the accidental car, through reducing the accidents happen on account of drunk driving. This arrangement influences innovation to the existent science in the car and also upgrades the security lineaments, hence trying expected an effective incident in the car manufacturing.

[2] All types of vehicles need to establish an ignition interlock device or breath alcohol ignition interlock device installed in order to prevent drunk drivers. It is a form of breath analyzer that can determine how much alcohol a driver has consumed, but because it is a prototype module, a basic alcohol detector is employed in this project work, and the findings are determined to be satisfactory. Currently, it is useful for our traffic police employ breath analyzers that often need the motorist to blow into a mouthpiece in order to detect intoxicated drivers.

[3] In this paper an active resolution to resolve the issue like drunk and drive demands a direct bright whole for car that monitors the alcohol consumption for drunken driver. Here the information is alcohol sensor and if the driver is drunk intoxicating the engine will be secured certainly by turned off the engine and an warming idea is presented on the LCD display and having level of alcohol to the webpage by utilizing ESP8266 Wi-Fi module on NodeMCU board.

[4] A persuasive answer is provided to cultivate the inventive system for automobiles that will monitor

miscellaneous parameters of car in constant and will this overcome by alcoholic liquor to the base unit has made clear in this place paper, by utilizing hardware Who's core is Arduino alcohol sensor mq3.the whole control order has the advantage of limited book extremere liability. Future purview concerning this system search out control the accidents and providing beneficial analyses about the accidental car,with reducing the rate of accidents happen on account of drunk driving this scheme leads innovation to the existent electronics in the car and also helps the security face, hence trying expected an effective happening in the car manufacturing.

[5] Many procedures and methods are employed to prevent accidents brought on by drivers who have consumed too much alcohol. There are typically several various approaches, some of which include locking the steering, using an ignition interlock, using a vehicle interlock system, and many others. The technique involves a number of factors, some of which include cost, look, application of the approach, and many others. In this paper study, we have made every effort to identify the ideal threshold at which we can impose restrictions on the driver in the event that excessive alcohol consumption has him unconscious. On a daily basis, traffic accidents can be avoided in this way. Utilizing such a method, the rate of traffic accidents can reduce.

Problem Statement

Accidents caused by intoxicated driving are a significant contributor to fatalities on Indian roadways. This occurs as a result of inebriated drivers being able to seize control of a car. In our proposal, we propose to address this issue by developing a system that shuts off the car's engine automatically whenever a certain amount of alcohol is found in the driver's breath. The microcontroller immediately stops the vehicle's engine when alcohol is found, and a siren is blown to notify people in the area that something is wrong with the vehicle.

Block Diagram

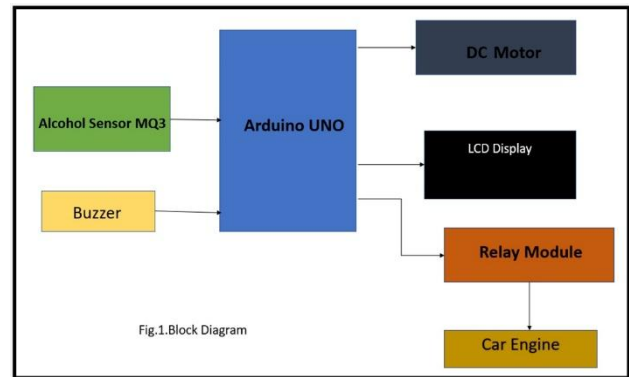


Fig.1 Block Diagram

Working

This project makes use of a small Arduino Uno board, and it develops microcontroller programmers. Because it focuses on preventing drunk driving, it also includes a DC motor, an Arduino board, an LCD display, a relay module, a buzzer, and a resistor. The LCD display is used to show the amount of alcohol present in the driver's breath while the MQ3 sensor is used to detect alcohol. Arduino is used for programming and interface purposes. When a driver tries to operate the vehicle while overly intoxicated, this sensor is mounted on the fitted in car steering. sensor senses the presence of alcohol and when the percentage level is above the stated value a signal will be send to Arduino. Of that signal the engine working will stop.in this project we have set the percentage level of alcohol is 35% or a 40%.

Components

1 Arduino-

Arduino is a original floor(open-beginning) based on an smooth-to-use fittings and operating system. It resides of a motherboard which is compute (refer to as a microcontroller)and a more prepared spreadsheet called Arduino /IDE (integrated Development Environment),that is used to compose and transfer the calculating rule to the physical board.



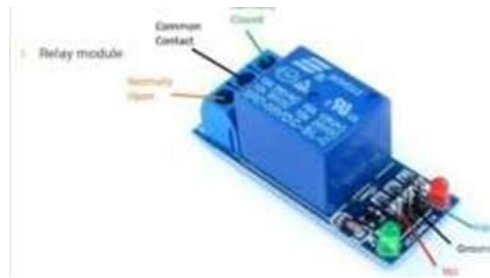
2Alcohol MQ3 Sensor-

Alcohol MQ 3 sensor is sensing the when a drunk person breathes near the alcohol sensor it detects the ethanol in his breathe and provides an output based on alcohol concentration



3 Relay-

A transmit is an electromagnetic switch that is to say used to excite and disgust a circuit by a reduced capacity signal, or place various circuits must be conditional individual signal. We know that most of the extreme end modern request schemes have relays for their productive active.



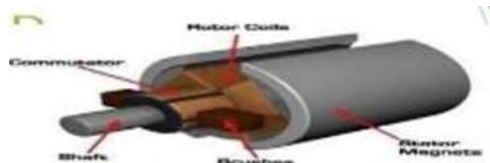
4 LCD Display-

LCD display used to display the message. driver is drunken or not and he drunk then how many percent drunk the drink and display the percentage of LCD display.



DC motor-

gear motor is used with 12 volt, 100rpm and weight 125gms



Buzzer-

Buzzer is a output audio signal



Result

When a driver is drunk and he is start car and he is breathing the concentration on his breathe and alcohol sensor detect and buzzer is blow next display the message in LCD display how many percent alcohol is drink in driver, then relay module control the power signal or controlled the engine speed.

Expected Outcome

The goal of the research is to create a system that can detect the presence of alcohol in the driver's exhaled air and shut off the vehicle. The microcontroller receives information about alcohol from the alcohol sensor, warns users of the condition it has detected using a buzzer, and switches off the vehicle's motor automatically using a relay

Conclusion

We have provided an extraordinarily capable method of dealing with the issue and have developed a smart system for cars to reduce the amount of accidents Sbrought on by drunk driving. People are beginning to realize how important car security is on a daily basis. The structure's ultimate goal is to reduce the negative effects of alcohol consumption. By enhancing personal safety, this technology contributes to the automotive industry's

convincing advancement in the reduction of accidents related to driving.

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ALCOHOL SENSING AND AUTOMATIC ENGINE LOCKING SYSTEM”

OTP Based Ration Distribution System Using RFID and GSM

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Abstract - Public distribution system provides food for the below poverty section at low price, which is distributed by the Indian government. Each family is using this benefit as per the card. Different food grains like rice, sugar and oil is fixed quality for every month based on the total number of people in each family. The Indian government is offering different facilities for poor people by providing ration. Due to more corruption in ration distribution system such facilities do not reach up to poor people. Every family had valid ration card to buy the commodities from the ration shops. This commodity is collected at once in every month at ration shop. The commodities will distribute by shopkeeper through the weighting system with the help of human intervention. In such cases we can noticeable drawbacks which people can suffers, firstly the inaccuracy in imprecise weighting of commodities due to human errors and then secondly, sometimes consumer may miss the commodities, such commodities will misuse by the shopkeeper when there is no monitoring of such commodities. Then the shopkeeper will sell the commodities in the market and make a profit without intimation to government and consumers.

Index Terms: Public Distribution system, Indian Government, Ration Distribution System, Commodity.

I. INTRODUCTION

In this aim is to increase the security to the system and reduce the corruption and above mentioned drawback. This system also eliminates the human intervention while providing ration due to system is automatic and

all the dispensed commodities are updated in the government server.

In this an automatic Ration Materials Distribution Based on GSM (Global System for Mobile) and RFID (Radio Frequency Identification) technology instead of ration cards smart cards are used. When people come to ration shop they have to scan their RFID card, these cards are magnetic and have information of the beneficiary. After

scanning card it is verified through database to see if it is valid or not. Whenever the user logs in system they send an OTP to registered number for security purpose. If it's valid then the beneficiary selects material and quantity. In this way we can create transparency in this process.

Shopkeeper acts as bridge between government and consumer. So in this proposed system we are trying to enhance the security and reduce the corruption in the ration shops.

II. PROBLEM STATEMENT

The goal of this project is to provide more transparency to the consumer and reduce the corruption. The government suffers corruption in present situation like ration forgery, black marketing etc. The major drawback is that the weight of the materials may be inaccurate due to human mistakes and there is no transparency about ration material distribution. This proposed system helps to reduce the corruption and the commodities will reach to the needy people accurately. Dispensed commodities will update in government portal in time to time manner after dispensing materials.

In ration shop they have to scan their RFID card, these cards are magnetic and have information of the beneficiary. After scanning card it is verified through database to see if it is valid or not. Whenever the user logs in system they send an OTP to registered number for security purpose. If its valid then the beneficiary selects material and quantity.

Ration card is very important for every house and it is used in various fields, it acts as a proof for details of family members, it helps in getting a gas connection, it can be used as a proof of address for various purposes etc. People having a ration card can buy various groceries such as rice, wheat, coconut oil etc. specified for them from the ration shops. Present ration system has two imperfections, one the

weight of the material may be inaccurate due to human mistakes and the other one is if the materials are not bought till the end of the month, ration shopkeepers will sell it to others at higher rates without the notice of the customers and the government. In this project, we have proposed an Automated Ration Material Distribution System based on Radio Frequency Identification (RFID) technology instead of traditional ration cards to get ration materials.

III. BLOCK DIAGRAM

Components

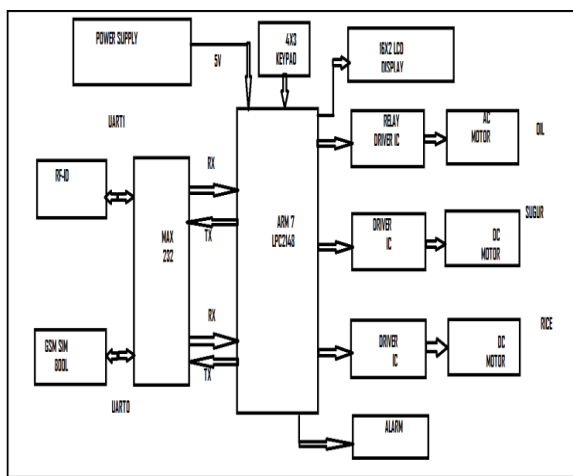


Fig.1. Block diagram of IoT based ration distribution system using RFID and GSM Module

- Power Supply
- 4*3 Keypad
- 16*2 LED Display
- PIC Microcontroller.
- RFID reader and tags.
- GSM SIM900.
- Relay motor.
- AC Motor with relay.
- DC motor with driver.
- Alarm.
- Reset button.
- Crystal oscillator.

IV. SOFTWARE USED

1. Arduino IDE compiler for Embedded C programming.
2. Express SCH for Circuit design.
3. Proteus for hardware simulation.

V. ADVANTAGES

1. No corruption: As in PDS system the shopkeeper acts as bridge between government & consumer. The commodities will be distributed by shopkeeper

through the weighting system with the help of human intervention. In such cases we can noticeable drawbacks which people can suffers, the inaccurate weighting of commodities due to human errors. So in this proposed system corruption in the ration shops can be reduced.

2. No illegal process: Sometimes consumer may miss the commodities, such commodities will misuse by the shopkeeper when there is no monitoring of such commodities. Then the shopkeeper will sell the commodities in the market and make a profit without intimation to government and consumer.

3. Time saving approach: As in PDS system card holders has to wait to receive the ration, because long queue of peoples so it takes more time.

4. Maintains data properly: All the dispensed commodities are updated in the government server.

5. Completely automated system: This system eliminates the human intervention while providing ration due to system is automatic.

6. Elimination of duplicate & bogus ration cards: In this system we introduce smart cards instead of ration cards.

VI. DISADVANTAGES

1. System is very complex.
2. High cost.
3. In case of power failure we need to use an alternate power source.

VII. APPLICATIONS

1. The ration items will be effectively delivered to the valid ration card holders who are below poverty line.
- 2.
3. The main advantage here is that the beneficiaries get their rightful entitlement in terms of quantity.
4. The government services are reached to poor people effectively and also the corruption in PDS can be reduced or avoided to a great extent.

VIII. CONCLUSION

Ration forgery is basically concerns to the food distribution department; it is just a smart card for the customers to get food item at low price. Ration forgery is particularly for family having four to five members, however there may be quite enhances where ration is delivered to payee and fake record are noted down. Regarding the delivery by commission agent, if the commission agent is a medium then there will be chances of getting betrayed by him however he can get commission from us without having any security. Therefore the purpose system is more secure and transparent than normal existing system. The entry of wrong data in ration distribution system can be

prevented by the use of smart card and also additional security is provided by the biometric confirmation. The commission agent is only responsible for entering the quantity of the commodities. The updating and deducting is done by the server. The database is helpful for sending the messages to the payee about ration delivery the sending process is done by automatic system. This process is made the transparency in public distribution system.

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Design A Sport Game For Visually Impaired Using AI

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Abstract-A Loud-ball ("L-Ball") is a prototype ball designed by a researcher using an electronic circuit that produces non-stop sound intensity during play. This study focuses on prototype design by considering the selection of mechanically strong lightweight electronic components, such as batteries and buzzers. Sport is an inherent, low-cost way of encouraging dynamic and spatial training for disabled persons. It increases community social boundaries and diversity with higher participation. Compared to their peers with normal vision, visually impaired children urgently need sports activities. This is because visual impairment limits their involvement in play, which noticeably delays their physical development. Several electronic vision aids have been developed. However, most are designed to improve mobility skills for the visually impaired, including robotic devices, such as sensor blind stick, and distance measuring glasses.

I. INTRODUCTION

Loud Ball (L-Ball). Loud ball is an electronic audio ball that sounds continuously, making its position easily detected by the visually impaired. This sport is played by adapting to the goal ball game. Due to the school setting's needs, several factors have been modified, including the playing field, equipment, number of players, and other rules suitable for blind students. In this research loud ball (L-ball) refer to innovations in the ball and field

II. BACKGROUND

A field study conducted by researchers found the balls used by visual impairment students at school basically used the sound by a small bell inside the ball. However, the sound emitted from the ball is very limited, the ball will sound when it is moved. This makes it difficult for students with visual impairments to find a missing ball that not emitted makes a sound.

III. OBJECTIVES

A Loud-ball ("L-Ball") is a prototype ball designed by a researcher using an electronic circuit that produces non-stop sound intensity during play. This study focuses on prototype design by considering the selection of mechanically strong lightweight electronic components, such as batteries and buzzers.

IV. METHODS

The L-ball prototype design uses the main electronic components is a lithium battery and piezoelectric buzzer. Then, the sound intensity measured at different distances by

the researchers for the ability of electronic components to emit sound from inside the ball. Impact measurements are also carried out to ensure that the electronic components inside the ball do not dislodge during the use of the ball.

V. PROBLEM STATEMENT

Impaired people also have some desire to learn the games, play them. They also need a life where they can feel like a normal person. It's also important for these physical as well as psychological activities. So the aim of this project is that everyone should be physically fit despite of these inabilities. AI is able to spot things most coaches would overlook while

making accurate, real-time information available to them. Coaches and athletes can now track their performances in real-time, making decisions on the move without having to wait for results after the game has ended

VI. BLOCK DIAGRAM

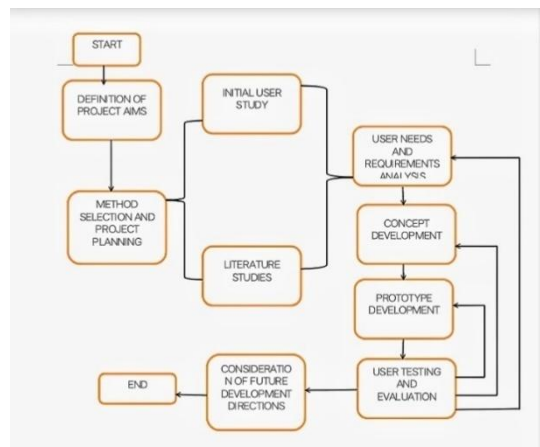


Fig.1.Flow Chart

VII. COMPONENTS

A. BALL

Material: Polyurethane(PU) microfiber synthetic leather; $\theta=8.59$ inch/22.22.5cm; Ball mass:14.16 ounce or 0.40-0.45 kg; Technique: hand-stitched.

B. PIEZOELECTRIC BUZZER

White; $\theta=23$ mm; Cable length=100mm; Sound level=85.95Db. Voltage range=3V-4V,max 10Ma. A piezo buzzer works by applying an alternating voltage to the piezoelectric ceramic material. The introduction of such an input signal causes the piezoceramic to vibrate rapidly, resulting in the generation of sound waves.

Fig.2. Buzzer

C. BATTERY

Type=polymer; Length=35mm; Width=20mm; V=3.7volt; Capacity=620mAh A battery is a device that stores chemical energy and converts it to electrical energy. The chemical reactions in a battery involve the flow of electrons from one material (electrode) to another, through an external circuit. The flow of electrons provides an electric current that can be used to do work.

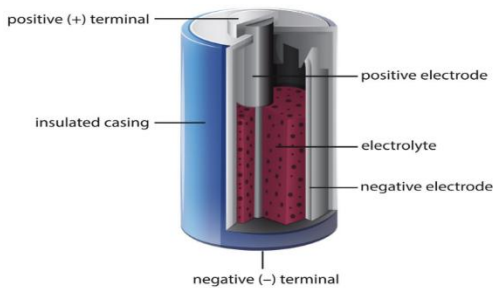


Fig.3.Battery

D. DC MOTOR

$\theta=5.5$ mm; Massa=3 gram; Height=2.1mm; A=0.5A; VDC=50 vdc.A current-carrying conductor gains torque and develops a tendency to move. In short, when electric fields and magnetic fields interact, a mechanical force arises. This is the principle on which the DC motors work.

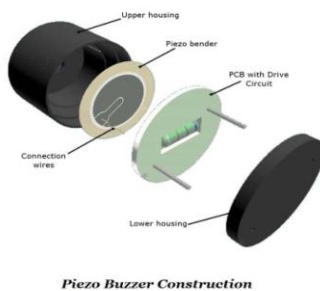


Fig.4. DC Motor

VIII. HARDWARE REQUIREMENTS

L-Ball: Designing A Novel Sports Electronic Audio Ball for Visual Impairment Student



Fig.5. Block Diagram

The major building blocks of this project are:

- Battery
- Piezoelectric buzzer
- Power connector
- On/off switch

Software's used:

- Arduino IDE compiler for Embedded C programming.
- Express SCH for Circuit design.
- Proteus for hardware simulation.
- The L-Ball was assembled to plant the electronic audio circuit that produces sounds from the piezoelectric buzzer, battery, and power connector. The circuit was assembled using soldering iron. It is attached to the ball's inner panel and protected by thin sponges. The ball was then coated by foam and inner tubes for increased softness and weight to roll. The next stage was ball hand-stitching by professionals and ball pumping. Before measuring the sound, level emitted from the buzzer, the sound level meter applications were tested for validity and calibration. This was to ensure that the applications were valid and reliable in measuring the sound level.

Features:

- Produces sound even when the ball is stationary
- The battery is rechargeable

IX.APPLICATION

Sport is an inherent, low-cost way of encouraging dynamic and spatial training for disabled persons.

- It increases community social boundaries and diversity with higher participation.
- Compared to their peers with normal vision, visually impaired children urgently need sports activities.



- This is because visual impairment limits their involvement in play, which noticeably delays their physical development.
- Several electronic vision aids have been developed.
- Used for blind people to let them play.

X. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- It improves cardiovascular health such as decreasing resting heart rate and blood pressure.
- Sport is used as an integration factor for people that have physical and psychological impairments. 3. Balance is an important factor for the visually impaired as it helps to encourage their integration in space.
- Goal ball is a sport specially designed for the visually impaired.
- It infers many effects on the improvement of motor skills such as rapidly changing direction, stopping, landing and jumping which may confer excellent balance properties.

DISADVANTAGES

- Cost of the project is More.
- Proper training should be provided to blind person.

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Advanced Security System for Bank Lockers

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Abstract-Biometrics measure individual's unique physical or the characteristics to recognize their identity. The physical characteristics are fingerprint hand, face, iris etc., and the characteristics are signature, voice keystroke patterns etc. Biometric system operates in verification mode or identification mode. In the verification mode system validates person's identity by comparing the captured biometric template which is prestored in the system data base. In the identification mode, the system recognizes an individual by searching entire template data base for match and the system performs one to many comparisons to establish the individual identity or fails if the subject is not enrolled in the system data base. Global system for mobile communication (GSM) is mainly used for sending or receiving data such as voice and message. In our security system GSM plays important role. Through the use of GSM the user will get the message if an unauthorized person will try to open the lock. We are implementing this bank locker security system using fingerprint, password and GSM Technology based security system which provide most efficient and reliable security system than the traditional system.

Keywords Bank, security, Data,Biometrics

I. INTRODUCTION

The present scenario of the bank locker system is the key system in order to secure the belongings of a person. There will be two keys. One key will be there with the customer and the other key will be there with concerned bank person. To open the locker both the keys must be inserted. So, the drawback of the present bank locker system is,

- Both the bank employees and user must have to present with the keys to open the locker.
- There is possibility of losing the key which makes the system insecure.
- The keys can be duplicated.
- The system is unable to match with today fast pacing digital world.

In the real world, people are more concerned about their safety for their valuable things like jewellery, money, important documents etc. So, the bank lockers are the safest place to store them. The arrival of fast-growing technologies makes users to have high security systems with, electronic identification options. These identification technologies include bank lockers and ATM as well as other intelligent cards, user IDs and password-based systems, and so on. But, unfortunately these are not protected due to hacker attacks, thefts, and forgotten passwords. In spite of all these faults or failure and malfunctions or crash these systems are still

existing; however, the fingerprint and image capture identification is the most efficient and reliable solution.

II. LITERATURE REVIEW

[1] Title: Smart Banking Security System Using Pattern Analyzer || Author: P. Sugapriya, K. Amsavalli || 2015

Banking is one of the sectors where technology and advancements in technologies have not been utilized to the fullest potential. Be in security system or access systems or even in material handling in banks. For example in the security systems even today very old practices are followed that can be made lot better using technologies like opm CV which is early usable and aho easy to implement at a consumer level. In this present age, safety has becomes an essential ne for most of the people especially in the rural and urban areas. Some people will try to cheat or steal the property which may endanger the safety of money in the bank, house, and office. To overcome the security threat, a most of people will install bunch of locks or alarm system

[2] Title: Biometric and GSM Security for Lockers || Author: Sagar S.Palsodkar, Prof S.B. Patil || 2012

In this review paper we will develop biometric (finger or face) and GSM technology for bank lockers. Because in this system bank will collect the biometric data of each person for accessing the lockers because in this system only authenticated person recover the money, documents from the lockers. So the biometric and GSM security has more advantages then other system. Because biometric is stored individual identity of a person and GSM is used for sending and receiving message. In the real world, today people are concern about their safety for their valuable things like stock certificate, heirloom jewels etc.so the bank lockers are the safest place to protect them. Because in day by day life we need to seek new security system because there are some problems in the traditional bank lockers like loss of key, theft alarm dose not required, duplicate key could be generated, so we will develop biometric and GSM based security system to improve maximum level security.

[3] Title: Bank Locker Security System based on RFID and GSM Technology || Author: R.Ramani , S.Selvaraju, S. Valarmathy, P Niranjana || 2012

The main goal of this paper is to design and implement a bank locker security system based on RFID and GSM technology which can be organized in bank, secured offices and homes. In this system only authentic person can be recovered money from bank locker. We have implemented a bank locker security system based on RFID and GSM technology

containing door locking system using RFID and GSM which can activate, authenticate, and validate the user and unlock the door in real time for bank locker secure access. The main advantage of using passive RFID and GSM is more secure than other systems. This system consists of microcontroller, RFID reader, GSM modem, keyboard, and LCD, in this system The RFID reader reads the id number from passive tag and send to the microcontroller, if the id number is valid then microcontroller send the SMS request to the authenticated person mobile number, for the original password to open the bank locker, if the person send the password to the microcontroller, which will verify the passwords entered by the key board and received from authenticated mobile phone. if these two passwords are matched the locker will be opened otherwise it will be remain in locked position, This system is more secure than other systems because two passwords required for verification. This system also creates a log containing check-in and check-out of each user along with basic information of user.

[4] Title: Enhancing ATM Security Using Fingerprint And GSM Technology || Author: Ashish M. Jaiswal and Mahip Bartere || 2014

The main objective of this system is to propose a system, which is used for ATM security applications Here Bankers will collect the customer finger prints and mobile number while opening the accounts then customer can see the ATM machine. When the customer enters ATM and after inserting card he must place finger on the fingerprint module then he get automatically generated 4-digit code every time as a message to the mobile of the authorized customer through GSM modem connected to the microcontroller. The code received by the customer should be entered by pressing the keys on the touch screen, after only that he will be able for further transaction. This proposal will go a long way to solve the problem of account safety.

[5] Title: Fingerprint and GSM based Security System. || Author: Gayathri and Selvakumar || 2014

The main purpose of this paper is to design and implement high security system. Security is a prime concern in our day-to-day life. Perhaps the most important application of accurate personal identification is securing limited access systems from malicious attacks. Access control system forms a vital link in a security chain. The fingerprint and password based security system presented here is an access control system that allows only authorized persons to access a restricted area. We have implemented a locker security system based on fingerprint, password and GSM technology containing door locking system which can activate, authenticate, and validate the user and unlock the door in real time for locker secure access. Fingerprints are one of many forms of biometrics, used to identify individuals and verify their identity. This high security system based on fingerprint, password and GSM technology which can be organized in bank, secured offices and homes.

[6] Title: Fingerprint Identification in Biometric Security Systems. || Author: Mary Lourde R and Dushyant Khosla || 2017

Conventional security systems used either knowledge-based methods (passwords or PIN), and token-based methods (passport, driver license, ID card) and were prone to fraud because PIN numbers could be forgotten or hacked and the tokens could be lost, duplicated or stolen. To address the need for robust, reliable, and foolproof personal identification, authentication systems will necessarily require a biometric component.

The word "biometrics" comes from the Greek language and is derived from the words bio (life) and metric (to measure). Biometric systems use a person's physical characteristics (like fingerprints, irises or veins), or behavioral characteristics (like voice, handwriting or typing rhythm) to determine their identity or to confirm that they are who they claim to be. Biometric data are highly unique to each individual, easily obtainable non-intrusively, time-invariant (no significant changes over a period of time) and distinguishable by humans without much special training.

Enrollment and authentication are the two primary processes involved in a biometric security system. During enrollment, biometric measurements are captured from a subject and related information from the raw measurements is gleaned by the feature extractor, and this information is stored on the database. During authentication, biometric information is detected and compared against the database through pattern recognition techniques that involve a feature extractor and a biometric matcher working in cascade.

III. PROBLEM STATEMENT

In present days world safety plays an essential role everyone has valuable accessories like gold, documents, or cash. In current days most of the banks are using key locker system which is a very oldest method. Whenever a person needs to open the locker, he needed to be verified as a customer by the bank officers. To open the locker, he needs to wait for the officials to open the universal key. It leads to time consuming or wasting of time. If they use pin/pattern system the person needs to remember that pin or pattern, whereas some of the person's cannot be able to remember that pins/patterns, this may lead to some problems to the users. The pin/pattern can be hacked. If any illegal member (or) some security pin/pattern forgotten people accessing the locker means, then it will not alert the bank officials where as in our project the buzzer will alert the bank officials by the alarm if an illegal member access the locker. So, we needed the improvement of security for these lockers to be ensured and to be updated to the current technology. We often hear or examine in newspaper that some pretend character has get admission to the locker of some other man or woman and have stolen cash to overcome this type of frauds, we are attempting to enhance the financial institution locker protection by means of this project.

IV. METHODOLOGY

1. Registration of the users is done by taking the required information of the user. The fingerprints used in authentication are taken and are stored in the database.
2. The primary authentication is done by using fingerprint i.e.; the fingerprint is matched with those in the database
3. The further instructions are given clearly on the LCD display and image captured and sent to the owner smartphone.

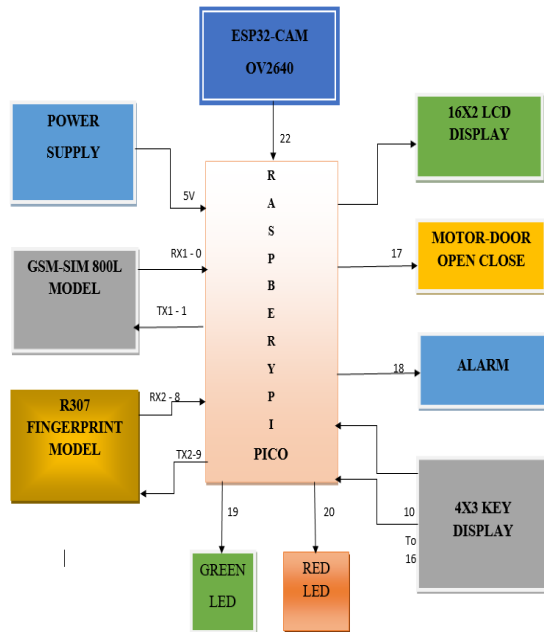


Fig.1. Block Diagram of Advanced Security System for Bank Locker Model

4. A Onetime password (OTP) is sent to the corresponding mobile number in the data base through GSM service.
5. Enter the OTP through the keypad.
6. The locker can be accessed after all the security checks are passed correctly and the locker door is opened automatically.
7. After the work has been completed if any key is pressed with help of keypad, the locker door will be closed.

CONCLUSION

In present days world safety plays an essential role everyone has valuable accessories like gold, documents, or cash. In current days most of the banks are using key locker system which is a very oldest method. Whenever a person needs to open the locker, he needed to be verified as a customer by the bank officers. To open the locker, he needs to wait for the

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IOT Based Aquaponic System

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Abstract - Agriculture is the art of nurturing the plants and cultivation of soil for the production of food. In India the major amount of food production is depended on the agriculture. But now days use of chemicals like sulphur dioxide and fluorine etc. for protecting the plants against the pesticides and also the use of other chemicals for the fast growth of the plants have caused damage to human health as well as soil pollution. The soil pollution results in the decreased fertility of soil which affects the growth of the plants. So the solution for this is the growing the plants without using soil and with the help of only water. The development and growth of the plants with the help of only water is called as Hydroponic system. As the plants require nutrition's for their growth, instead of using other sources we are using the natural fish extract by fish farming which is called as Aquaculture. As the plants are growing with the help of water and fish extract it is called as Aquaponic system. When the pH level of water exceeds more than it's desired level it becomes harmful for the aquaculture and also for the plants as well the variation in the temperature, humidity, TDS causes harm to the aquaponic system so by using pH sensor, TDS sensor, DHT11 sensor all the required parameters are managed and monitored with the help of the IOT. All the parameters are displayed on the Blynk app.

I. INTRODUCTION

A college campus or any other particular facility is just Agriculture is the art of nurturing the plants and cultivation of soil for the production of food. In India the major amount of food production is depended on the agriculture. It contributes about 17% to the total GDP of India and also plays a very important role in providing the employment to over 60% of the population. Now days we can see that for the fast growth of the plants, people are using chemicals which are the harmful for the human health and also causing the soil pollution and as well the agriculture food production is decreasing due to the narrower lands. So, we have introduced this system Aquaponics by combining aquaculture and hydroponics. The proposed system mainly aims for the development and growth of the plants with chemical free and produce large amount of food naturally with the help of fish extract. The Aquaponics term is the combination of the two terms Aquaculture and Hydroponics. Aquaculture

refers to the farming in the water, breeding and harvesting the fishes for the commercial, recreational, and scientific purposes. The hydroponic system is the technique in which plants are grown with the help of water-based nutrients, instead of soil-based nutrients. So, the fish fertilizers offer a source of burn-free nitrogen, along with the other primary nutrients of phosphorus and potassium. Phosphorous is used by plants to help form new roots, make seeds, fruit and flowers. It's also used by plants to help fight disease. Potassium helps plants make strong stems and keep growing fast.

By using combination of Aquaculture and hydroponics, user will be benefited by the following

- In the proposed system the water is substituted for the soil, so there might be a misconception that it may require lots of water for the growth of the plants but it requires less water even than the soil based farming.
- This system requires less space and also when the system is built in the vertical manner it requires 90% less place than the traditional farming.
- The plants growing here are not dependent on any climatic changes, instead they can have their own microclimates. So that farmers are not affected by the environmental changes.
- Here the plants receive direct nutrients to root so produces high yield and also the crops grow faster.
- It requires no soil, additionally few plants require some particular soil preferences for a particular type of soil, with hydroponic system there is no concern for soil and also for the type of the soil.
- In the traditional farming method, the ethylene gas is used to artificially ripen food that has been picked too early, with the help of aquaponics we can grow fresh fruits and vegetables etc. naturally which consists of the higher nutrients and better taste too. It produces the high quality of food.

II. LITERATURE REVIEW

[1] Title: IoT fuzzy logic aquaponics monitoring and control hardware real-time system || Authors: Adnan Shaout, Spencer G Scot || 2017.

The author Adnan Shaout, Spencer G Scot have made research on the Aquaponics is a growing field in which fish and plants are grown together and mutual benefit each other. Fuzzy logic is used to evaluate the inputs and automatically provide the proper output The system will monitor water temperature, pH, air temperature, and luminance. The system will control a light, heater, and alarm. The Arduino Uno R3 board was selected to be the hardware

[2] Title: An autonomous aquaponics system using 6LoWPAN based WSN || Authors: N Hari Kumar, Sandhya Baskaran, Sanjana Hariraj, Vaishali Krishnan||2016.

The authors N Hari Kumar et.al stated that Aquaponics is a groundbreaking food production technique that combines both traditional methods of aquaculture and hydroponics to grow both fish and crops in a single integrated system. Aquaponics system uses fish wastes to provide essential nutrients to the plants. In return plants serve as a bio-filter for the fish in a symbiotic relationship. The purpose of this paper is to showcase how to build an efficient Internet of Things (IoT) application for aquaponics in order to create an autonomous, self-regulating system with the help of Wireless Sensor Network (WSN). An open standard of WSN called 6LoWPAN is being used in this system which helps us to construct a global infrastructure. The designed aquaponic system is composed of sensor devices that can sense and collect information of the various dimensions of the water quality involved and store it in a cloud database. This means that the human intervention would be considerably less when compared to the traditional methods of aquaponics. In addition to the traditional technique, with the help of Next-Gen Telco technologies, i.e., using their high bandwidth and low latency, infected fishes are detected automatically on time and treat them to ensure the balance in our aquaponics ecosystem. In this paper we propose an end-to-end system to enable "Connected Aquaponics" which includes WSN and Next-Gen Telco to increase the crop yield and provide organic sustainable food to the world community.

[3] Title: Enhancing aquaponics management with IoT-based Predictive Analytics for efficient information utilization || Authors: Divas Karimanzira, Thomas Rauschenbach || 2019.

The author Divas Karimanzira et.al stated that the modern aquaponic systems can be highly successful, but they require intensive monitoring, control and management. Consequently, the Automation Pyramid (AP) with its layers of Supervisory Control and Data Acquisition (SCADA), Enterprise Resource Planning (ERP) and Manufacturing Execution System (MES) is applied for process control. With cloud-based IoT-based Predictive Analytics at the fore marsh, it is worth finding out if IoT will make these technologies obsolete, or they can work together to gain more beneficial results. In this paper, they discussed that the enhancement of SCADA, ERP and MES with IoT in aquaponics and likewise how IoT-based Predictive Analytics can help to get more out of it. An example use case of an aquaponics project with five demonstration sites in different geographical locations will be presented to show the benefits of IoT on example Predictive Analytics services. Innovative is the collection of data from the five demonstration sites over IoT to make the models of fish, tomatoes, technical components such as filters used for remote monitoring, predictive remote maintenance and economical optimization of the individual plants robust. Robustness of the various models, fish and crop growth models, models for econometric optimization were evaluated using Monte Carlo Simulations revealing as expected the superiority of the IoT-based models. Our analysis suggest that the models are generally tolerant to the temperature coefficient variations of up to 15% and the econometric models tolerated a variation of for example feed ration size for fish of up to 4% and by the energy optimization models a tolerance of up to 14% by variations of solar radiation could be noticed. Furthermore, from the analysis made, it can be concluded that MES has several capabilities which cannot be replaced by IoT such as responsiveness to trigger changes on anomalies. It act as proxy when there is no case for sensors and reliably ensure correct execution in the aquaponics plants. IoT systems can produce unprecedented improvements in many areas but need MES to leverage their true potential and benefits.

[4] Title: Urban aquaponics farming and cities-a systematic literature review ||

Authors: Rahmita Wirza, Shah Nazir || 2021.

The author Rahmita Wirza et.al discussed that an aquaponic system is considered to be a sustainable food production solution that follows circular economy principles and the biomimetic natural system to reduce input and waste. It is the combination of two mainly productive systems, a recirculating aquaculture system consists of fish and crustaceans farmed in a tank and hydroponic cultivation consists of vegetable cultured in medium other than soil. Both these systems are well-known around the globe by their performance of production, quality, and verified food safety. An aquaponic system is an industrious mechanism which incorporates impeccably with sustainable growth of intensive agriculture. The existing literature regarding the aquaponic production covers different species of vegetables and fish, a variety of layouts of system, and climate conditions. However, there is a lack of knowledge that can systematically present the existing state-of-the-artwork in a systematic manner. To overcome this limitation, the proposed research presents a systematic literature review in the field of urban aquaponics. This systematic literature review will help practitioners to take help from the existing literature and propose new solutions based on the available evidence in urban aquaponics.

III. WORKING PRINCIPLE

- Firstly, the pipes designed for the hydroponic plants placed on the top and the pipe consist of one inlet and one outlet.
- Water is supplied through the inlet and the outlet is supplied to aquarium.
- The Aquarium consists of the fishes like Tilapia, Koi, pacu and carp.
- The main reason for using these specific fishes is they are resiliency against diseases and parasites and endure a wide range of water temperatures, 1-32°C (34-90°F), which is excellent, especially if we live in a place where the temperature fluctuates.
- The plant seeds are initially kept in a container with some water and cocopeat growing into sapling.
- The hydroponic pipes are connected to fish tank, Fishes will leave some extract and that is circulated to hydroponic plants pipes with the help of motor, The plants will get nutrients for its growth from fish extract water.
- The sensors are used to test the proper functioning of the system. For fish's acceptable pH range would be 6.5 to 9.0.
- Fish can become stressed in water with a pH ranging from 4.0 to 6.5 and 9.0 to 11.0, which may be harmful for fish life.
- So, here we are using pH sensor, the glass electrode inside the pH probe measures the difference in pH between the pH electrode and aquarium water.
- The pH level of water is displayed on the Blynk app through IOT, by this we can take safety measurements by Adding peat moss, driftwood, and almond leaves, to naturally lower the pH and baking soda can be added to naturally increase the pH level of water as soon as we see the change in pH levels.
- Along with the specific pH level the fishes also need a stable environment which have the same level of TDS.
- Different fishes require water with different TDS. 400PPM~450PPM TDS in the water are recommended for most freshwater fish living. The concentrations too high would cause the death for fish and permit a high volume of algae bloom.
- The low level of TDS in the water will affect fish growth. So, the TDS sensor is used, it measures the conductivity of the solution and estimates the TDS from that reading, readings are displayed on the Blynk App.
- If the TDS level of water is not suitable for fishes, we can take safety measures like changing the water frequently, using reverse osmosis water or deionized water.
- The best temperature for fish depends on the species, but in general, tropical fish are most healthy in the range of 75-80°F (24-27°C).
- Koi, Tilapia, Pacu, Carp fishes can tolerate temperature from 20-27°C, 24-32°C, 15-35°C, 20-25°C respectively.
- DS18B20 Sensor The waterproof sensor is selected to measure the temperature of the aquarium water. It provides temperature measurements in Celsius.
- DHT11 is used to check the environmental temperature.
- Rain is essential for the agriculture but sometimes can also lead to bacteria, fungus.
- Here rain sensor is used and it is activated by the rain fall.
- Moisture sensors are used to understand the root zone of a crop and the ultrasonic sensors are used to measure the water level.

IV. BLOCK DIAGRAM

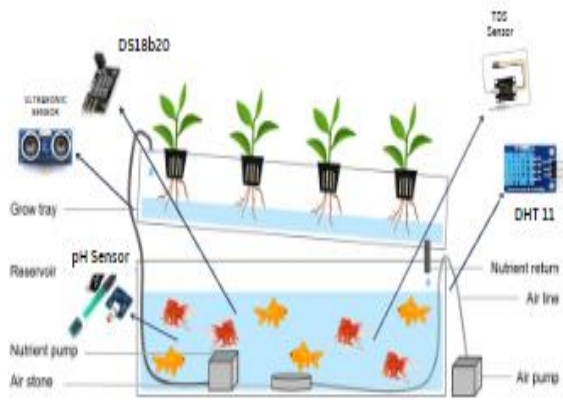


Fig1: Aquaponic System Block Diagram

Figure Labels: pH sensor, Ultrasonic sensor, Moisture Sensor, Rain Sensor DS18b20, DHT11, TDS Sensor, Node MCU.

DATA FLOW DIAGRAM

A data flow diagram (DFD) maps out the flow of information for any process or system. The below data flow diagram represents the flow of the complete aquaponic system with IOT.

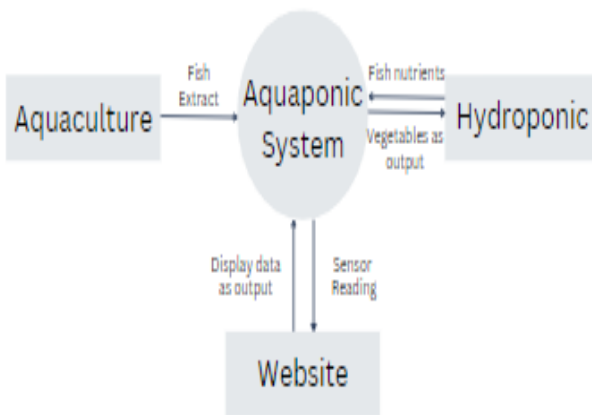


Fig2: Data Flow Diagram

V. IMPLEMENTATION DESCRIPTION

The fish is fed with fish food in fish tank to leave extract, The fish tank has sensor like TDS to check the solvents(extract) in water and has pH sensor to check the pH of the water. The fish extract is rich in Nitrates and nitrites which is required by the plants. And the extract contains magnesium, phosphates, carbohydrates, sulphates in a very small amount which is also needed for plants, The fish extract in the fish tank will be sent to the hydroponic pipes with help of motor. The ultrasonic sensor is kept to determine the water level and DS18b20 sensor is placed inside the aquarium to determine the water temperature. DHT11 Sensor is placed outside the aquarium to determine surrounding temperature and humidity. And all the details are displayed on the Blynk App.

VI. ADVANTAGES

- Produces fresh and organic fish and vegetables with aquaponics
- Plants grow faster and taste better with aquaponics
- Aquaponic systems are easy to build and cheap to run
- It requires 6x less space than traditional farming
- It requires 90% less water than classical farming
- Aquaponic systems are easily expandable for commercial purposes
- It's sustainable and eco-friendly way of food production
- Aquaponics is an efficient way to produce out of season products
- It's employing the whole family in sustainable farming

VII. RESULT



Fig3: Aquaponic System Result

VIII. CONCLUSION

This system is developed to avoid the use of artificial fertilizers and chemicals that is used to grow the crops. The farmers who face this issue of growing natural food will get solved using this system. The fish extract used here is natural nutrient for the growth of the plants. In future the farmer will make profit out of this and the loan issues might get resolved to certain extent.

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IOT Based Baby Monitoring System for Smart Cradle

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Abstract- In the age of modernization, A Parent's life undergo various changes due to child monitoring. Our project focuses on the relevant problems faced by parent in monitoring and nurturing their child while working. This project aims at reducing the challenges faced by parent by developing an IOT based Smart Cradle monitoring System that will assist Parent in monitoring their child. This cradle is equipped with a swinging mechanism which swings automatically on detection of baby crying sound. This proposed smart cradle has been integrated with a camera to provide continuous surveillance to parents. An arduino, sound sensors, wetness sensor, swinging mechanism along with other electronic components are used to upgrade existing cradle to meet the present day requirements. This project is quite efficient and reliable which can deliver result better than conventional cradle.

I. INTRODUCTION

As we are very well familiar with the hurdles faced by Parents to nurture their infant and especially in case if both the Parents are working. To give 24 hours of time in such cases is next to impossible. Thus, we need to develop something unique that can help Parents to have a continuous surveillance on the Baby/ Infant and can notify about the same. Thus, we have come up with an idea to design a Smart Cradle System using IOT which will help the Parents to monitor their child even if they are away from home & detect every activity of the Baby from any distant place of the world. The process of having and raising a baby is faced with many difficulties, and with the busy world around its hard even to assign a full time or part time baby sitter.

The baby monitoring system is equipped with sensors that monitor the levels of humidity and temperature. The system also senses the presence of a third person in the room or in the baby's proximity. The system also detects if the baby is uncomfortable and plays sounds to sooth the baby. The limitations of the existing system range from being slow, to not having real time updates are all taken care of in this baby monitoring system. The system has a live video and audio relay to the parents and the parents are also provided with the master control of turning on or off the system. This System has a Raspberry pi at its heart to which all the sensors are tethered. This System can be effectively put into

use for shorter periods of time when the baby is asleep or doesn't move much.

II. RELATED WORK

Title: Smart Baby Cradle

Authors: Aniruddha Patil; Nitesh patil and Anjali Mishra[2018]: In this system the cradle has motor which will rotate the mobile toy and noise sensor detection which will sense the noise when the baby is crying or making loud noise. Automatic swing of cradle is performed when baby cries loudly. A camera will be used to track the baby inside the cradle. A GSM module to communicate with a remote device that is operated by parents.

Title: IOT Based Baby Monitoring System for Smart Cradle
Authors: WahebA. Jabbar, Senior Member, IEEE; Hiew Kuet Shang, Saidatul N. I. S. Hamid1; AkramMember, IEEE and Mohammed A. H. [2017]:

The system consists of a baby cradle that mechanically swings employing a motor once the baby cries in keeping with the sound device signal. Additionally, a mini fan mechanically opens to supply a cool temperature encompassing to the baby supported the temperature device. The oldsters will observe server cloud, like close temperature and remote switches, through the web.

Title: Survey on Digital Age- Smarter Cradle System for Enhanced Parenting

Authors : Sharmadha Senthil Nathan, Shivani Kanmani, Shruthi Kumar, Madheswari Kanmani [2018]:

The system consists of automatic Rocking of the Baby Cradle, Detection of wet condition and detection of Temperature in Baby Cradle System. Cry analyzing system that detects the baby cry voice and consequently the cradle swings until the baby stops crying. The speed of the cradle may be controlled as per the user need.

Title: Automatic Cradle System for Infant Care(2021)

Authors : Siddharth Sharma, Swapnil Bhatnagar- This piece of work minimizes the effort of humans and especially the mother's stress level in a hectic day. This equipment which is an automatic cradle for infant care which comprises of sensors, motor and a moving cradle. The working is easy and allows to be mobile from one place to another.

Title: Design of smart cradle system using iot (2022)

Authors: Marie R. Harper and Maxine R. Blea - developed the first automatic rocking cradle which swings side by side on a horizontal axis which replicate the motion same as achieved by human oscillation of cradle. Spring motors are used to provide oscillatory motion to crib. Springs motors are attached to the crib of cradle that produce motion same as human efforts.

Title: Internet of Things-based Baby Monitoring System for Smart Cradle

Authors: Akram A. Almohammed, Roshahliza M. Ramli - smart cradle with a baby monitoring system over IoT has been designed and fabricated to monitor a baby's vital parameters, such as crying condition, humidity, and ambient temperature.

III. PROBLEM STATEMENT

As we are very well aware of how parents face issues to look after their infants. Especially, when both the parents are working. It is impossible for a parent to give 100% attention to the infant. Thus, to overcome problems like this we need to develop a system which could help Parents to have a watch on the Baby and can get message alerts about the same. Thus, we have proposed a system to design called Smart Cradle System which would help a parent to look after the infant by monitoring from any place. It is an efficient and basic prototype to take care of a child.

IV. METHODOLOGY

This project will measure the parameter of Raspberry Pi, Temperature (LM 35), Humidity Sensor, Sound Sensor, MCP3008 (ADC IC), USB Camera, SD card, Monitor making it an Internet of Things (IoT).

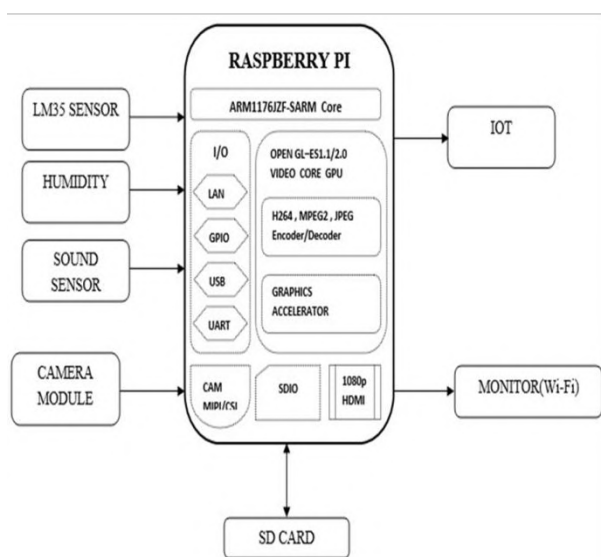


Fig.I .Block diagram

A. LM35 SENSOR

LM35 sensor uses the basic principle of a diode, as the temperature increases, the voltage across a diode increases at a known rate. By precisely amplifying the voltage change, it is easy to generate an analog signal that is directly proportional to temperature.

B. RASPBERRY PI

The Raspberry Pi (Opens in a new window) is a tiny computer about the size of a deck of cards. It uses what's called a system on a chip (Opens in a new window), which integrates the CPU and GPU in a single integrated circuit, with the RAM, USB ports, and other components soldered onto the board for an all-in-one package

C. SOUND SENSOR

This is a multipurpose sound sensor which can be used to sense sound and audio. The sensor provides a digital output when the measured sound increases beyond a set threshold. This threshold level can be adjusted using an onboard potentiometer.

D. SD CARD

The minimum capacity required is 8GB to 32GB, which is Raspberry Pi's largest supported size by default, though higher capacities can be formatted to work with the units. To install the official Raspbian OS we need at least an 8GB micro SD card whereas Raspbian Lite a minimum 4GB is required.

E. USB CAMERA

A USB webcam is a camera that connects to a computer, usually through plugging it in to a USB port on the machine. The video is fed to the computer where a software application lets to view the pictures and also transfer them to the Internet.

F. HUMIDITY SENSOR

Humidity sensors work by detecting changes that alter electrical currents or temperature in the air. There are three basic types of humidity sensors: capacitive, resistive and thermal. All three types will monitor minute changes in the atmosphere in order to calculate the humidity in the air.

G. MCP 3008 (ADC IC)

The MCP3008 is an 8-Channel 10-bit ADC IC, so it can measure 8 different analog voltage with a resolution of 10-bit. It measures the value of analog voltage from 0-1023 and sends the value to a microcontroller or microprocessor through SPI communication.

V. WORKING

A. Interfacing and working of sound sensor with arduino

To detect the sound of baby during we need a sound sensor to detect the noise. A sound sensor is a electrical component used to detect the sound present in the near environment. A sound sensor has a microphone (50KHz- 100KHz) and a processing circuitry which converts analog sound waves into electrical signals. This electrical signal act as input to LM393 which is a High Precision Comparator that converts electrical signal into digital signal and send it to output pin. A sound sensor has 3 Pin:

1. VCC- This pin is used to provide power to sensor. Its operational voltage range is 3V – 5V.
2. GND - This Pin is used to ground the connection.
3. OUT – At this Pin final digital signal is obtained which is connected to arduino to feed it. When no noise is detected voltage across this pin is High and when noise is detected voltage across this pin becomes low. This pin can be connected to any of the 14 digital pin in arduino. Connect VCC pin of sound sensor to 5V on the arduino and GND pin to ground on arduino, OUT pin to digital pin 7 on the arduino. To detect the sound of baby accurately we need to calibrate the sensor by rotating knob or screw present at the top of the sensor, rotating screw in clockwise direction will decrease the sensitivity and rotating in anti clockwise will increase the sensitivity. Once sensor become calibrate to measure the sound of baby when crying accurately connection is done as mentioned above and sound sensor is ready to use.

B. Interfacing and working of servo motors with arduino

Servo motors are used to produce oscillation motion because it is quite efficient, powerful and its parameters are easily adjustable to user need such as speed. Servo motors can be controllable by providing series of pulses to the signal lines. A conventional; servo motor expects pulse signal at every 20 milliseconds (i.e signal should be 50 KHz).

1. If the pulse is high for 1ms, then the servo angle will be zero
2. If the pulse is high for 1.5ms, then the servo angle will be at its center position.
3. If the pulse is high for 2ms, then the servo angle will at 180 degree.

To replicate the swinging elevation of crib same as human swinging we need to fix the pulse at 1.5ms to avoid over elevation angle which increases the chances of baby to fall out from crib.

C. Interfacing GSM module and working with arduino

GSM (SIM900 GSM shield) module is used to send notification on parent phone and receive commands from parents with the help of cloud server. The Tx pin of GSM module is connect with RX of arduino which is pin 0 and RX pin of GSM module with TX pin of arduino which is pin 1.



Fig 1: Side view of cradle

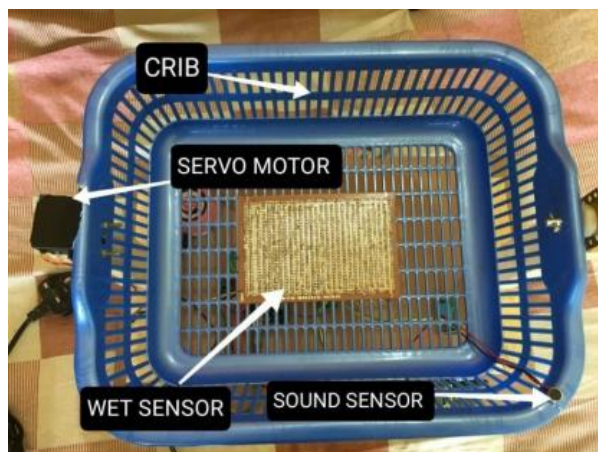


Fig 2: Top view of cradle



Fig 3: Full view of cradle

V. ADVANTAGES

- Easily handle the baby:-we can handle the baby's care as well as some other work .
- Cost efficient :-It will be minimum cost .
- Ensures safety :-It is safety and secure for baby's.
- Minimum manual work :- we do not have to sit near baby and look after it every time.
- Baby stays healthy :- It will check the baby's moisture , temperature ,baby's movement .
- Reduce the parents work :- Now a days parents are busy in their own life, this proposed cradle will reduce the parent work .

VI. DISADVANTAGES

- It is suitable just for babies that are one year old or younger.
- Virtually every baby monitor can be hacked. But the type of monitor that you use will greatly determine how hard or easy it is for a hacker to do so. Internet-connected baby monitors are indeed potentially vulnerable to hackers anywhere on earth.
- It does not allow parents to hear the baby's voice and talk to them.

VII. CONCLUSION

Growth of technology has been rapidly increased. Since technology has been developed greatly it can contribute to the society various way. Automated cradle is the best example where working parents have lot of workload already and they have to care of baby as well. Cradle system assures them that their baby is safe and secure inside the cradle. Cradle which is less expensive and more secure and have more features. As health of small baby is always factor for which parents are always worried. So that cradle

system is built for that purpose that baby will be healthier. This automatic baby cradle would let the working mother to do household works besides taking care of baby at the same time..

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A Study and Analysis of Various SRAM's for Improvement of Performance

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Abstract: Today's semiconductor market is expanding at a rapid pace. Every day, smaller mobile and portable gadgets are released, and the need for longer battery life increases. Given these parameters, researchers must give serious consideration to the issue of leaking power in stand-by mode. Memory is a crucial component of most of these gadgets, and its size decreases in tandem with the overall size of the device. Since the heat generated by static random access memory is a major consideration in many electronic applications, several strategies have been devised to reduce power consumption in certain parts of the circuit. In this paper, we offer a new approach to designing SRAM arrays that significantly reduce latency. Using SRAM, a sensing amplifier, and a row and column decoder, an 8x8 SRAM array architecture will be built. The power lost due to leakage is reduced with this layout. Tanner is an electronic design automation (EDA) tool used for determining schematic solutions and analyzing power dissipation, delay, and PDP (power delay product). Industry-standard library files may be used to perform analyses on the models of design and the outcomes. Earlier SRAM arrays' and the presented SRAM array's power consumption, PDP, and latency may be compared.

KEYWORDS: Static Random Access Memory (SRAM), Tanner EDA, Power Delay Product (PDP).

I. INTRODUCTION

Today's mechanically interconnected world generates vast quantities of data, which need the creativity inherent in routine application in order to handle and store. Memory is an integral part of every electronic device, since it is used to store programme instructions or numerical data.

The SRAM cell is a popular memory that stores data via bi-stable latching. Static RAM is distinct from dynamic RAM, which has to be updated at regular intervals, thus the name. While SRAM does retain some data even when the power is off, it is still volatile in the traditional sense.

A static random access memory (SRAM) cell is a memory cell used in high-speed applications like caches and buffers. SRAM is preferred over DRAM, another kind of memory cell, since it processes data at a quicker rate. DRAM cells are made of capacitors, whereas SRAM cells are made of transistors. For Artificial Intelligence (AI) applications like autonomous cars and the Internet of Things, designers of Very large-scale integration (VLSI) systems, microprocessors, and Static Random Access Memory (SRAM) are increasingly concerned with balancing low power consumption with fast throughput.

Because of its low power consumption and high activity rate, SRAM is used as backup memory in high-performance computers and workstations. Leakage current accounts for

more than 40% of power consumption in high-quality ICs. SRAM cluster in SOC (System on Chip) contributes to a significant amount of leakage, and therefore designing a low leakage and low power consuming memory square is appealing. Additionally, the memory cell's write/read bit strength is of convey, and the defer grows with decreasing inventory voltage supply. The cell's leakage power, power utilisation, and stability may all be improved using an equitable approach.

With the widespread use of networks of sensors in wireless communication and the rising popularity of wearing and portable electronic components, there is a pressing need for ICs with low power consumption. If the integrated circuit's operating frequency is not very important, the supply voltage may be lowered to near/sub-threshold levels to minimise power consumption. Static random access memory devices rely heavily on the embedded chips, which include crucial components that use a lot of power.

However, in a typical six-transistor design, the noise margin is severely compromised with static read, and write enable severely reduces capacity. Leakage current with read bitline also has significant effects. The most popular 6T SRAM cell has the drawback of maintaining crucial Read Noise Margin (RNM) and Write Noise Margin (WNM) when the technology is shrunk. To get around this, 7T, 8T, and 9T SRAM cells were developed to cast and achieve better results than the standard 6T cell.

SRAM memory's reliability, durability, and noise margin are all negatively impacted by the performance deterioration that occurs when down scaling reaches the nanoscale (10 nm node and beyond). Leakage current increases as a result of smaller memory cells, which come about as a result of using lower technology nodes. Leakage in SRAM cells has several sources, including junction leakage current, gate leakage current, and sub-threshold leakage current. In less advanced technology, sub-threshold leakage predominates. Among these are a number of methods for reducing leakage power and increasing cell stability that have been developed by different researchers. Multi-threshold complementary metal-oxide-semiconductor (MTCMOS) is a well-known method for reducing leakage power.

By reducing the length of the static current, leakage power is reduced. Maximum voltage is given to the circuitry during the dynamic mode, and reduced voltage is provided during the restore mode to avoid the data maintenance fatigue. There are a plethora of low-power, low-delay methods for creating memory cells. Condensed dynamic power is used in conjunction with the programmable

voltage level-upper (SVL-U) technique and transmission gate logic in the SRAM cell.

II. LITERATURE SURVEY

Authors A. Pulla Reddy, G. Sreenivasulu, R. Veerabhadra Chary, and others. et. al., [1] introduces Nanometer Technology Write and Read Assist Methods for SRAM Memories. The performance, power consumption, and size of the chip will all be affected by the write aid methods used to enhance the SRAM cell's write capability. The noise margin of an SRAM cell is especially important while operating at lower voltages. The cell stability may be enhanced with the use of read assist approaches, which were studied across a wide process, voltage, and temperature range. In addition to improving the readability and stability of SRAM bit cells, these read assist approaches will have an effect on performance, power consumption, and space utilisation.

Some examples of these people are Amit Namdev, PareshRawat, and others. A Comparison of n-T SRAM Cells in the Nanometer Range is presented by et al. in [2]. In this article, we have modelled and compared the performance of several SRAM cell topologies in 65nm and 45nm technology, looking at metrics such cell power consumption, latency, and SNM. Using the HSPICE simulator, the authors of this work examine the performance of 4T, 6T, 7T, 8T, and 9T SRAM cells built using 65nm and 45nm technology in terms of power consumption, delay, and power dissipation potential (PDP) at a frequency of 100MHz and a supply voltage of 1V.

Dr. H. Mangalam, Kowsalya.M. et. al., [3] provides a Stability Analysis and Performance Evaluation of SRAM Cells. The traditional 6T-cell, 7T-cell, 8T-cell, 9T-cell, and the 10T-cell implementations of SRAM are all examined, and their relative performance is compared. The use of 9T and 10T cells is said to increase area by 13% and 30%, respectively; nonetheless, the read-disturb free functioning of these topologies improves cell stability, which is useful as process technologies continue to scale down.

Researchers V. Rukkumani, M. Saravanakumar, K. Srinivasan, et al. As an alternative to the traditional circuit, 8 transistor (8T) and 10 transistor (10T) designs are tested, to enhance the power efficiency under different temperature settings, in a Design and Analysis of SRAM Cells for Power Reduction Using Low Power Techniques [4]. Initial designs of 8T and 10T SRAM circuits include write driver logic, and static and dynamic power consumption estimates are made. Then, several precharge temperatures and charging recycle temperatures are tested.

J. As Ramesh, P. Brundavani, et al. et. al., [5] provide a Transmission Gate (TG)-based Design for a High-Performance SRAM Cell that Consumes Minimal Power. To achieve low power memory operation, a TG-primarily based 10T SRAM that exploits voltage swing cells of 0.09 um feature size in CMOS is envisioned. In this study, we evaluate the proposed TG-VS SRAM cell against the state-of-the-art SRAM cell in terms of power consumption and latency at varying temperatures. The Tanner EDA

(Electronic Design Automation) tool in a 90nm CMOS environment is utilised to realise the suggested TG-SRAM cell.

By Vema Vishnu Priya, G. Ramesh, and others. In this project, first a low power 7T SRAM Cell is constructed, and then it is built with "Self-controllable Voltage level" circuit for keeping low power consumption and great performance. This work is presented by et al. [6]. When the load circuits are active, the dc voltage provided by a self-controllable voltage level (SVL) circuit may be increased to their maximum, and when they are in standby, the dc voltage supplied can be decreased. By using a 7T load circuit and a small chip size, this SVL circuit may significantly cut the standby leakage power of CMOS logic circuits.

I. Manju, S. Sumathi, C. Preethi, Dr. A. Senthil Kumar, and others. al., [7] propose using a Schmitt trigger to enhance the read/write stability of an 8T SRAM cell. Using Schmitt-trigger based SRAM bit cells helps improve the consistency of read and write operations. In order to improve read-stability and write-capability over the standard 6T cell, the Schmitt trigger architecture is applied in an 8 transistor SRAM cell in this article. Tanner EDA tool is used to apply the design and see the outcomes.

C. S.Rambabu, RamyaShruthi, and others. In order to improve read stability and write ability, al., [8] designs an Efficient SRAM for Ultra-Low Voltage Application based on ST. Bitcells in ultralow-voltage static random-access memories (SRAMs) based on Schmitt-Trigger (ST) technology are analysed. The ST-based SRAM bitcells reconcile the inherent tension between read and write operations in a standard 6T bitcell. When compared to a regular 6T bitcell, the ST operation improves both read- and write-stability.

A.Jain, S.Akasha, and Co. al., [9] recommends 45nm technology optimisation for a low-power 7T SRAM cell. In this work, we propose a low-power SRAM cell. A regular 6T-SRAM cell has had extra circuitry added to it in the proposed SRAM architecture in order to boost its performance. In order to increase stability, power dissipation, and performance over earlier designs for low-power memory operation, a seven-transistor (7T) cell with a 45nm feature size in CMOS is presented. The effects of process changes are studied at length, and the CADENCE simulation reveals that the 7T SRAM cell can handle fluctuations in the manufacturing process quite well.

A. Christianity; M. Hasan et. et, [10] provides a comprehensive analysis of leakage in a 10T SRAM cell. This study describes a method for constructing an SRAM cell that consumes less power and takes unpredictability into account. Because the cell's tail transistor and read buffers are coupled in series, a stacking effect is created, resulting in reduced power dissipation. This study investigates how ordinary 6T, 9T, and ST10T (Schmitt trigger based) SRAM cells fare when subjected to process, voltage, and temperature (PVT) fluctuations, and compares the findings.

According to Pal, Antardipan, and Zhang (2020), a fast Static Random-Access Memory (SRAM) with low power consumption, minimal data loss, and low noise is in high demand. When it comes to portable, low-power, battery-operated electrical systems for the elite and the ultralow-power, the efficiency of SRAM is crucial. This article

highlights the requirements and directions for advancement by analysing the factors affecting the overall speed and total energy utilisation of a conventional 6T SRAM cell/cluster with 6 FETs. Two access field-effect transistors (FETs) are suggested to be replaced by light-effect transistors (LETs) in a crossover 6T static random-access memory (SRAM), and electrical word lines are planned to be replaced by optical waveguides (OWGs). The potential for this hybrid SRAM to outperform standard 6T SRAM in terms of exchange rate and, by extension, total energy consumption is explored. When the access FETs are changed out for LETs, simulations of a 64 KB model mixing SRAM display reveal a drop in read deferral and read energy utilisation by a factor of 7 and 34, respectively; and a decrease in compose postponement and compose energy utilisation by a factor of 4 and 6, respectively. This crossover architecture and its usage of the LETs there are also rapidly evaluated for their potential implications on the fringe and support circuits. According to G Poornima (2019), the annual decline in the size of the chip centre may be attributed to the development of new technologies and the decline of major centres of innovation. In comparison to previous endeavours, the new challenges have more stringent and comprehensive performance goals. Plans, resources, and optimised coverage areas are all part of the execution goals. Each new microchip centre design may need the development of supplementary procedures. Through cell shrinking, logic optimisation, clock tuning, CTS, and the addition of double and quad cores, the major goal is to increase Timing just as Power to get a greater quality of plan. Each project has a predetermined operating frequency and voltage. Regardless of what happens with the plan, the Action Factor remains constant. The optimisation solutions discussed here focus on lowering the circuit's dynamic capacitance and shielding it from power losses. In this work, the author really puts into practise the techniques it discusses.

According to Mehra, Krishan, and Sharma (2019), in the semiconductor industry, the memory section plays a crucial role on chip throughout the design stages of advanced framework. We have been dealing with memory planning for some time now, but the cycle still requires annual tweaks. After putting in some time and effort to design CMOS-based SRAM, we branched out and gave multi-gate semiconductors like FinFET-based SRAM a go. For the time being, we are focusing on the final bullet point since, as the number of semiconductors increases, so does the area on the chip; this is why we are also working to reduce power consumption. Although the size of semiconductors may be reduced by technological scaling, this will have an effect on the erratic behaviour of SRAM cells. The SRAM cell is being developed at the cutting edge of technology. One major concern with operating SRAM in a boundary region is that the cycle variation effects will lead to semiconductor jumble and ruin the static commotion boundary.

FinFETs have been used in a wide variety of ingenious ways in both complex and basic circuit designs, as discussed by Surwadkar, Tushar, and Purkayastha (2019). The two FinFET gates allow for effective short-channel impact management without resorting to extreme measures like reducing the door oxide thickness and increasing the channel doping depth. Limit voltages may vary depending on the biasing of the DG device. It may also be abused to

reduce the number of semiconductors needed to implement logical capabilities. This research project's goals are twofold: to discover the most efficient power mode and to learn more about the several FinFET rational configuration styles, such as SG, IG, LP, and IG/LP. It was determined that spilled power might account for as much as 50% of the total power consumption in CMOS devices. We look at ways to successfully overcome this challenge by using a mixture of circuit planning techniques and rational level optimisation, since waste power consumption was shown to consistently account for a larger fraction of total power on average. It thinks about using IDDG-FETs in a cutting-edge CMOS design, with a focus on free door FinFET. Memory is a crucial aspect of most electronic systems, but a major challenge with memory design is the execution of devices like speed and power scattering. Record Terms-FinFET, HSpice Simulation, NAND door, and Power dispersion by Alberto Wiltgen (2013). In this study, we consider the effects of different configurations on the performance of SRAM cells during read and write operations, and we calculate the static-noise-margin (SNM) for each cell design by keeping an eye out for the telltale arcs of butterfly trademarks. Since a single bit is used for both reading and writing, the 7T SRAM cell implemented in 45nm CMOS technology is shown to have lower power dissipation and power delay product in the final analysis. Each component of the hardware is designed and tested independently using Cadence Virtuoso and Phantom. As innovation hubs grow in size, issues like crosstalk, challenges in utilisation, and dependability in essential memory, as well as increased energy with yield and time effects, become more pressing. Alioto, M.; Di Cataldo, G.; and Palumbo, M. (2007). To deal with rising dissatisfaction rates due to problems, we provide a scalable approach for error correction in massively shared memories. Rapid memory uses, such as a reserve, often make use of SRAM. Large, power-hungry, and heat-radiating electronic devices were unreliable in the past (L.Saranya, 2018), and for good reason. As a result, efforts were made to reduce the bulk and heat produced by these devices. Because of this, something new emerged; the so-called VLSI innovation. SRAM is widely used in on-chip memories, fast processors, CPU cache memory, and hard drive cushions, however optimising its power consumption is a major challenge for VLSI developments. According to Saranya, L., and Chakrapani, Arvind (2018), Power Optimisation is now one of the major challenges in cutting-edge VLSI developments because of the prevalence of small devices in daily life. The superiority of static random access memory (SRAM) in VLSI design techniques that operate in the submicron or Nano range has led to its widespread adoption in recent times. The semiconductor scaling will increase the safety of the SRAM cell while reading and writing. Some SRAM cells that can operate at a lower voltage and with less delay have been designed. When compared to Dynamic Random Access Memory (DRAM), SRAM is preferred because of its simple design, low power requirements, short access time, speed, and consistent quality. For embedded CPUs with little storage space, SRAM is the go-to kind of memory. This article presents a new area of study that is predicted to bear fruit: the generation of memories using SRAM cells that have been improved with respect to cycle boundaries, in particular power, thickness, territory, and deferral. Today, there is growing need for fast-developing circuits that use less energy (Bodapati, Dr., & Sharma, 2017). To systematically reduce the size of the components in microelectronic

circuits, low power consumption is becoming more important. In this study, we provide a technique for low-power device arrangement, which is now a fundamental subject of Research because of the rising need for convenience devices. As key amassing components in modern circuits, Flip Flops are discussed in this paper along with a couple of strategies for low power use in a limit part. This paper provides a blueprint for reducing power consumption in a mechanical accumulating component, such as a Flip Flop or a Latching System. Both the GDI (Gate scattering input) and the modified GDI techniques are used. Common low-power techniques have been linked to the design of low-power, advanced-limit components. There are two types of domino logic circuits that are used as test cases: a 16-digit domino logic multiplexer and a 4-bit 4-yield domino logic pass on generator. These circuits are also related to and investigated with respect to three different spillage decrease techniques: the Standard Single (low) limits voltage (Single-Vt), the double edge voltage (twofold Vt), and the variable body biased keeper (VBBK). The findings demonstrate that the suggested AVL multiplexer provides the lowest spillage by virtue of multiplexer. According to Syed, Munaf, and Lakshmanan (2017), memories are the most crucial component of any automated system. Power optimisation at the intelligent level is one of the key tasks to restrict power as conservative devices and installed frameworks are emerging, making low power utilisation extremely fundamental to the structural framework plan. This review article is based on the same advancing technology that has led to a dramatic increase in the usage of SRAM cells while designing the underlying architecture on the basis of CMOS technology. This article focuses on the research in terminology of how special types of SRAM are envisioned to meet low power, elite, postponement, and territory. In order to achieve the highest possible operating frequency in the sub threshold region, MortezaNabavi et al. (2016) suggest a specific ratio of pMOS to nMOS width. This optimal value may be obtained by restricting the inverter's logical deferral and simulating several CMOS entries at the sub edge region to discover the highest current over capacitance ratio. The simulation findings demonstrate that the optimum PMOS to NMOS width proportion yields the highest recurrence of activity independent of the graceful voltage. In order to assign responsibility and identify problems in SRAM-based FPGAs, Liang H et al. (2016) suggested using the BIST technique. This article demonstrates the FPGA BIST architecture, which suffers from CLB and connectivity flaws. This weakness includes both open and closed faults in the wire channel. Specifically, there are several parties to blame for PSs that remain on or off, and for LUTs that remain at either 0 or 1. The XC4000-arrangement channel flaws have been tested using BIST structure and shown to execute adequately in terms of problem inclusion, test time, and space. By comparing and contrasting with this architecture, the suggested FPGA BIST architecture is able to assess flaws in CLBs.

III. SRAM ARRAY DESIGN WITH IMPROVED DELAY

New SRAM array architecture with reduced latency is shown. This SRAM has been optimized to use less power and has a negligible power delay product and power dissipation rate. The given SRAM will be used to create an

8×8 SRAM memory array, the standard for use in today's cache memories. During a read cycle, the value stored within an SRAM cell is discovered by the sensing amplifier, which then outputs that value. Each read cycle only accesses one row of data, hence only one sensing amplifier is needed for each column of cells in the SRAM array. Data from a memory is read with the help of a component called a sense amplifier, which is responsible for amplifying the small voltage swing from a bit line representing a data bit (1 or 0) within a memory cell to recognizable logic levels. The memory cells are too tiny to quickly discharge the bit lines, hence the data storage is slow. In a typical read/write cycle, the Address Decoder, a crucial digital block in SRAM, consumes up to 50 percent of the chip's overall access time and a significant portion of the total SRAM power. Column and row decoders are the two components of the memory address decoder. The ideal memory cell has a compare-and-contrast word line, which the row decoder should choose. The optimal memory cell layout calls for the column decoder to choose the correlating bit line. It has been revealed that both pull-up and pull-down networks would use two PMOS transistors and two NMOS transistors in the circuit architecture. The given PMOS7 and NMOS5 transistors perform the roles of footer and header, respectively, while the rest mode rational state is maintained by the NMOS6 and PMOS8 transistors. One of the transistors corresponds to the rest transistors and stores the aforementioned data while the device is in sleep mode (when both PMOS7 & NMOS5 transistors may be switched OFF). Since the resistance range is so large between supply & ground, connecting more transistors in series reduces the leakage current. Both PMOS1 and PMOS2's outputs are linked to NMOS1 and NMOS2's inputs, while NMOS1 and NMOS2's outputs are also connected to PMOS1 and PMOS2's inputs. If the loss of current is reduced, the static power will naturally follow suit. Similar methods are used in current approaches, however, the planned methodology uses far less space for its SRAM cells. Memory cells, a sense amplifier, and a decoder for rows and columns make up the SRAM array. Using the supplied memory cell and some careful examination, an 8 by 8 memory array was created. The decoder and sense amplifier are built inside the array of SRAM cells illustrated here. The difference between two information signals of memory cell architecture is detected using the sense speaker. Using this introduced SRAM cell, we plan a memory array. An examination of the output response of the proposed 8-bit SRAM memory array is shown below.

IV. RESULT ANALYSIS

Here, we analyse the results of the provided SRAM array. Tanner EDA tool is used to implement the SRAM array. An important part of the memory array is the sense amplifiers, which have the following settings: $In1 = 0$, $In2 = 0$, $In3 = 0$, $In4 = 0$, and for the column decoder, $In5 = 0$, $In6 = 0$, $In7 = 1$, and $In8 = 0$. The equation for static power is

$$P_{static} = I_{leakage} * V_{dd} \quad (1)$$

$$Current = \frac{q}{t} \quad (2)$$

$$Current = \frac{cv}{t} \quad (3)$$

$$t = \frac{cv}{I} \quad (4)$$

$$t = cV_{dd} / K(V_{dd} - V_T) \quad (5)$$

The dynamic power dissipation equation is given as

$$P_{dynamic} = \alpha CV_{dd} V_{swing} f \quad (6)$$

Where α is activity factor, V_{swing} is voltage swipe at output knob, c is capacitance f is frequency and V_{dd} is supply voltage.

The delay speaks to the propagation delay, is characterized as the normal between low-to-high progress delay (t_{plh}) and high-to-low change delay (t_{pnl}) and it is expressed as

$$t_{pd} = \frac{t_{plh} + t_{pnl}}{2} \quad (7)$$

In this case, we take into account an exact graph of writing activity, which includes both t_{plh} and t_{pnl} . For instance, the t_{pnl} is determined by the differentiation between high information voltages and low yield voltages, and the t_{plh} is established by the reverse. The average of t_{plh} & t_{pnl} is ultimately used to calculate the lag.

Comparison of power consumption between the given SRAM array and a standard 6T SRAM array is shown in table 1.

Table 1: POWER DISSIPATION COMPARISON

| Different SRAM arrays | Power dissipation (mW)for 1v | Power dissipation (mW) for 2v | Power dissipation (mW)for 3v |
|-----------------------|------------------------------|-------------------------------|------------------------------|
| Conventional SRAM | 350.8 | 723.4 | 967.4 |
| Presented SRAM array | 0.024 | 0.033 | 0.42 |

Table 1 shows that the power consumption of the current SRAM array is much lower than that of previous SRAM arrays. The delay with power delay product of the given SRAM array and the prior SRAM array are shown in Table 2.

Table 2: Delay and POWER DELAY PRODUCT COMAPRISON FOR PRESENTED AND EARLIER SRAM ARRAYS

| Different SRAM Array designs | Delay in nanoseconds(ns) | Power delay product in Joule |
|------------------------------|--------------------------|------------------------------|
| Earlier SRAM | 0.00671 | 6.74×10^{-3} |
| Presented SRAM array | 0.0087 | 3.2×10^{-9} |

As a result, the provided SRAM has lower latency and PDP than previous SRAM designs. Presented SRAM design delay is compared to older SRAM design in Fig. 1.

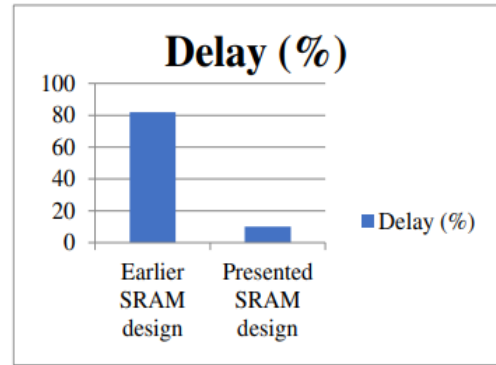


Fig. 1: DELAY COMAPRISON GRAPH

V. CONCLUSION

New SRAM array architecture with reduced latency is shown. Tanner, an electronic design automation tool, is used for this SRAM design. You may use this SRAM array if you need more reliable reads and lower power consumption. The SRAM cell is introduced first. The sensation values of 0 through 100 are programmed into an 8x8 SRAM memory array using this cell. The original SRAM layout Proposed SRAM Architecture Delay (%) Delay (%) Power dissipation comparisons are shown in Table 1. Time & Power Delay Product Table 2 COMPARISON OF SRAM AV Arrays, Both New and Old Fig. 1: This SRAM cell uses a DELAY COMAPRISON GRAPH amplifiers and a row and column decoder to minimise the dynamic power consumption compared to prior SRAM designs by charging or releasing the bit line during the write process. The power dissipation, latency, & Power delay product of the provided SRAM cell are used to evaluate its efficiency. The provided SRAM design is evaluated against other SRAM designs in terms of performance. The findings show that the current SRAM design is superior to previous SRAM designs in terms of latency, power dissipation, and PDP.

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Forest Fire Alarm System Using IOT

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Abstract - According to a report, 80% of fire-related costs could have been avoided if the fire had been discovered sooner. The solution to this problem is a fire indicator and observing framework powered by IoT that is built on Node Mcu. In this project, we built a fire detector using Node Mcu that is connected to a temperature sensor, a smoke sensor, and a signal. The temperature sensor measures the temperature, while the smoke sensor measures any smoke produced by a fire or a heat source. Arduino's buzzer serves as a warning signal. At whatever point the fire started, it consumes nearby protests and emits smoke. A fire warning could also be issued due to a little amount of smoke produced by oil or lighting used as part of a party.

Index Terms: NodeMCU, FireSensor, Smoke Sensor, Buzzer, Temperature Sensor, Humidity Sensor

I. INTRODUCTION

Emergency circumstances now often result in significant material and personal losses. When unfavourable natural occurrences and atmospheric pollution brought on by human activity go beyond a certain point of normality and impact ecosystems and the people as a whole, they are classified as catastrophes. Lack of security or control measures, emergency plans, and alert systems, which can improve the choices for forecasting their occurrence or managing their course once they have occurred, can cause the effects of these catastrophes to be intensified. The term "existing system" refers to the system that is being developed. "IOT Based Forest Fire Detection & Prediction" is an intelligent system that closely monitors many natural conditions to forecast a forest fire, allowing us to take preventative measures and limit the damage the fire would cause. Natural catastrophes like forest fires

can be disastrous, causing both property destruction and fatalities. The method employs a variety of natural characteristics to detect forest fires in an effort to prevent or mitigate their effects. The system has Wi-Fi connectivity, thus using IOT, anyone may simply access the data it has collected from anywhere.

II. LITERATURE REVIEW

Existing system is the system that is being developed for "IOT Based Forest Fire Detection & Prediction," which is an intelligent system that closely monitors many natural conditions to forecast a forest fire so that we may take precautions and limit the harm the forest fire causes. Natural catastrophes like forest fires can be disastrous, causing both property destruction and fatalities. The method employs a variety of natural characteristics to detect forest fires in an effort to prevent or mitigate their effects. The system features Wi-Fi connectivity, making it simple to use IOT to retrieve the acquired data from any location.

[1]The system monitors a variety of environmental elements, such as flame, temperature, humidity, and Smock, to find forest fires. The system is made up of various sensors that each collect data for a distinct characteristic in order to gather information about sensors. The device contains a DHT11 digital temperature humidity sensor for detecting changes in temperature and humidity. It is a sophisticated sensor module made up of resistive components for detecting humidity and temperature. The wooded area is constantly being monitored by sensors.

[2] surveying in a typical setting [No wildfire]

At the time 'X' and if the temperature is 'T', the arrangement of the other sensors is at the normal state, which is when there is no forest fire. This is represented by the output of the TSS (Temperature Sensor setup). These initial readings from the setup will serve as the baseline information or value for subsequent observations. Since the setup is a continual monitoring procedure, there may be some peaks or very tiny variations in the temperature sensed by the TSS arrangement due to physical factors like lightning or the temperature of the forest rising during the summer, but these minute variations can be disregarded.

[3] Survey results during a forest fire: "Temperature of the environment goes very high and also other sensor values are deviates more from the normal temperature readings and standards set values," according to the basic observation during a forest fire. This criterion increases the likelihood that a forest fire will be discovered using temperature sensors and other sensor values. Since the surrounding temperature and other sensor values increase during a forest fire, the value or output from the TSS arrangement deviates further from the initial and fundamental reading. The temperature will then be "T+N" (a value that has grown by N) at the time interval "X+nth." Since this is a "continuous monitoring system," the elevated temperature is picked up by ground station monitoring devices. The circuitry has been designed in this manner. The circuitry was designed so that when the temperature threshold value of the TSS setup was exceeded or deviated from, the circuit sent all sensor data and values to the control room where the forest fire had actually started.

The Node-MCU, which processes and saves data, is connected to all of the sensors. The system offers Wi-Fi functionality, which is helpful for IOT access to the system and its data.

III. PROBLEM STATEMENT

A significant devastating fire that spread throughout a forest or area of woods and caused harm to the environment, people, animals, and property. Lightning is one of the main causes. Falls of Sparks from Rock. Volcanic eruptions or any other deliberate manual ignition by humans have the following drawbacks: A forest fire increases the risk of soil erosion, forest fires almost invariably result in the death of people and animals, uncontrolled flames can lead to localised air

pollution, and homes can be destroyed without being compensated.

IV. METHODOLOGY

A. Block Diagram

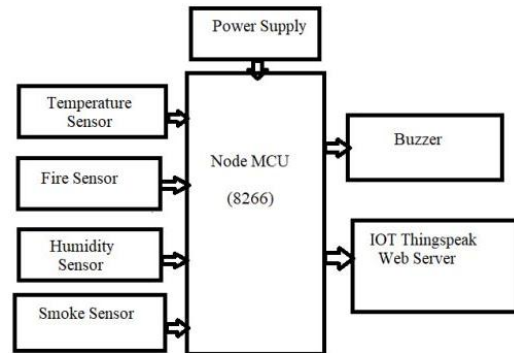


Fig. 1 System Block Diagram.

V. Flowchat

A. HARDWARE REQUIREMENTS

1. Micro-controller(Node MCU)
2. Temperature sensor
3. Humidity Sensor
4. Flame Sensor
5. Buzzer
6. Smoke Sensor
7. Power supply

B. SOFTWARE REQUIREMENTS

1. Arduino IDE
2. Virtual Firebase

VI. WORKING PRINCIPLE

The overall system “Forest fire Detection and prediction over IOT” consists of several sensor Modules

- 1) Temperature Sensor - Analog temperature sensor gives Temperature value

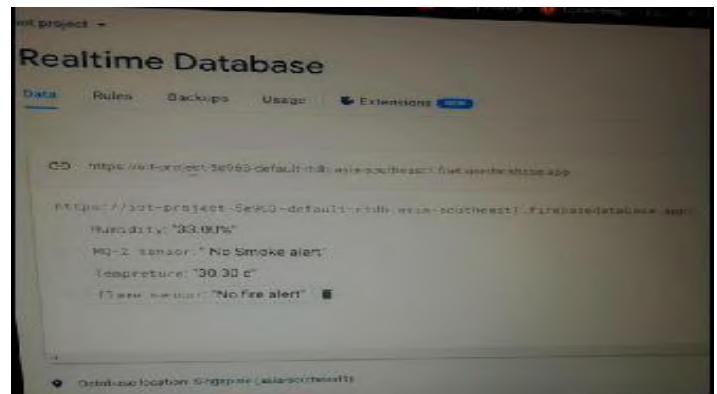
- 2) Humidity Sensor - Digital Humidity sensor gives moisture value
- 3) Flame Sensor-This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation.
- 4) Smoke Sensor-A smoke detector is a device that senses smoke, typically as an indicator of fire.
- 5) Buzzer -A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. • NODE MCU Controller is used to control all the system • This whole sensor values uploaded to the open source cloud Things peak. In that cloud we can visualize the values in form of plots – live updated values • Using that cloud API, we can predict the scenario if it is exceeding the preset values it automatically sent mail to users.

A) SITUATION 1 (CASE1): During Normal situation [No forest fire] At the time interval ‘X’ and if the Temperature is ‘T’ and other sensors value which is the output of the TSS(Temperature Sensor setup) and other sensors output, arrangement at the normal condition that is when there is no forest fire. This will be the initial readings from the setup and these readings will be the reference data/value for further observations. Since the setup is continuous monitoring process there will be some spikes/slight variation in the temperature sensed by the TSS arrangement because of physical reasons like temperature of the forest going high during summer, possibly lightning etc but such slight variations can be neglected

B) SITUATION-2 (CASE2): During the forest fire: The Basic observation during the forest fire is that the “Temperature of the environment goes very high and also other sensor value are deviates more from the normal temperature readings and standards set values”. This criteria boost’s up the probability of finding the forest fire using temperature sensors and other sensors value. Since during the forest fire, the surrounding temperature and other sensors value goes high the value/ output from TSS arrangement deviates more from the initial and basic reading.

Then at the time interval ‘X+nth’, the temperature will be ‘T+N’ (N-increased value). Since this is a ‘continuous monitoring system’, the increased temperature is detected at monitoring systems of the ground station. The circuitry is developed in such a way that when the output of the TSS arrangement is increased/ deviated from fixed threshold value of temperature, the circuit triggers the GPS module to send the co-ordinates to the satellite and then satellite transmits these co-ordinates as a data to the ground station where it is decoded to know where exactly the forest fire has occurred.

VII. RESULT



VIII. SCOPE OF PROJECT

One of the most significant and necessary resources, as well as the guardian of the natural balance of the planet, is the forest. However, forest fires do occasionally happen as a result of some uncontrolled human behaviour in social situations and anomalous environmental elements. One of the worst calamities was thought to be a forest fire. Recent events include the Amazon Rainforest Fire. The world's largest rainforest, the Amazon, is in danger of being completely wiped out. The rainforest, which produces about 20% of the planet's oxygen, has been burning for more than 16 days, greatly reducing the number of trees and biodiversity. Using an IOT-based forest fire monitoring and prediction system, we can anticipate and prevent forest fires. The primary goal of the application is to determine the closest woodland.

IX. CONCLUSION

The system was created to use free open source cloud and IOT to monitor forest fires such as Thingspeak. Here, the sensor data is transferred to the cloud utilising the well-known HTTP Protocol, which is widely used online. temperatures, flames, humidity, smoke, and When a sensor delivers information to Thingspeak's cloud, we monitor it and, depending on the situation, use the cloud API to LCD Display to the appropriate user. As a result, the system offers many benefits, including being portable and affordable, as well as meeting the requirements for cloud-based monitoring..

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Joint Secure Transmit Beamforming Designs for Integrated Sensing and Communication Systems

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Abstract -Beamforming design has been widely investigated for integrated sensing and communication (ISAC) systems with full-duplex (FD) sensing and half-duplex (HD) communication. To achieve higher spectral efficiency, in this project, we extend existing ISAC beamforming design by considering the FD capability for both radar and communication. We develop a joint artificial noise (AN)-aided transmit beamforming design scheme, which utilizes residual available power to generate AN for disrupting malicious receptions as well as satisfying the requirements of both legitimate transmissions and radar target detection. Extensive simulations verify the advantages of the proposed joint beamforming designs for ISAC systems on secure transmissions and the effectiveness of the developed algorithms.

Index Terms - *Index Terms—Integrated sensing and communication (ISAC), physical layer security (PLS), multi-user multi-input single output (MU-MISO), artificial noise (AN), interference exploitation.*

I. INTRODUCTION

With rapid development of commercial wireless communications, it is envisioned that an explosive number of intelligent devices will be connected and will cooperate with each other in future networks. A consequent pressing problem is to satisfy the heterogeneous requirements of reliable sensing and efficient communication among these wireless terminals.

On the other hand, the continuous and aggressive use of frequency spectrum in wireless communication systems, e.g., millimeter-wave (mmWave), results in overlapped spectrum with conventional radar systems. These motivate the development of frameworks for sensing-communication integration. In particular, integrated sensing and communication (ISAC), also known as dual-functional radar-communication or joint radar-communication, has become an appealing technique to address the aforementioned issues and has attracted considerable research interest. It has been shown in the literature that

ISAC can significantly enhance the spectral efficiency and reduce implemental cost by sharing spectral resources and reusing expensive hardware architectures. Also, joint design of communication and sensing can help improve the performances of both functionalities. Effective transmit beamforming design is a key to unlock the potential in both multiple-input multiple-output (MIMO) communication systems and MIMO radar systems.

Motivated by this, many works have studied transmit design in multi-antenna ISAC systems by focusing on joint beamforming optimization. Specifically, for conventional MIMO radar systems, a commonly adopted strategy of probing signal design is to manipulate the transmit beampattern through optimizing the covariance matrix of the transmit signal, aiming to maximize the spatial power steered towards desired directions or to minimize the matching error between the transmit signal and a dedicated beampattern. Leveraging this strategy, the authors advocated the reuse of transmit signal for both multi-user communication and radar sensing in ISAC systems. Specifically, the beamforming was optimized by minimizing the beampattern matching error, taking into account individual signal-to-interference-plus-noise ratio (SINR) requirements of communication users. As an alternative, studies considered similar problems while introducing a dedicated radar signal to facilitate the downlink ISAC. They introduced extra degrees of freedom (DoF) to the transmitted signal deliberately to achieve enhanced sensing accuracy. On the other hand, the authors investigated the problem of maximizing the transmit beampattern gain towards the sensing directions in ISAC, while guaranteeing the minimum required SINR of communication users. By imposing the constraint of transmit beampattern gain for sensing, the

problems of communicationspectral efficiency maximization and energy efficiency maximization were addressed for ISAC. Note that these works only design the transmit beamforming while the reception of radar echo is not considered.

The main function of a radar system is to estimate the channel parameters, e.g., delay and Doppler frequency, of a target from the received radar echo signal. With the consideration of radar echo reception in ISAC systems, the associated scenarios are divided into two cases, as illustrated .

The first case corresponds to downlink ISAC, where the radar sensing reuses the resources of downlink transmission and the BS acts as a radar transceiver and a communication transmitter. The transmitted downlink ISAC signal is known to the BS and can be used in receive processing for sensing. In this case, the authors investigated the Cramér-Rao bound (CRB) minimization of target parameter estimation for ISAC. The authors considered the tasks of point target detection in ISAC systems. In these works, they acquired explicitly the radar SINR for target detection by applying a linear receive beamformer to the echo signal. More concretely, given a fixed radar receive beamformer, the optimizations of the transmit signals were investigated where a minimal radar SINR requirement for accomplishing the target detection is constrained. An alternating optimization (AO)-based algorithm was proposed to iteratively update the transmit waveform and the radar receive beamformer.

The second scenario considers integrating sensing with uplink communication where the BS can be regarded as a radar transceiver and a communication receiver. The authors developed an advanced receiver architecture for uplink ISAC, which separates the radar echo and communication signals by performing interference cancellation techniques. Sensing-assisted physical-layer security transmission was investigated in where the BS transmits a downlink radar signal to localize and jam a potential aerial eavesdropper while receiving the uplink communication signal

II. OBJECTIVES

To investigate an advanced FD communication-based ISAC system, where the BS receives and transmits signals from multiple uplink users and downlink users reusing the same time and frequency resources.

To jointly design the transceiver beamforming at the FD BS and the transmit power at the single-antenna uplink users.

To detect both the sensing target and multiuser uplink signals with low complexity, multiple linear receive beamformers are employed at the BS and the corresponding radar and uplink communication SINRs are mathematically obtained

III. PROBLEM STATEMENT

The problems are formulated under two criteria: power consumption minimization and sum rate maximization. The downlink and uplink transmissions are tightly coupled due to both the desired target echo and the undesired interference received at the BS, making the problems challenging. To handle these issues in both cases, we first determine the optimal receive beamformers, which are derived in closed forms with respect to the BS transmit beamforming and the user transmit power, for radar target detection and uplink communications.

IV. LITERATURE SURVEY

J. Chu, R. Liu, Y. Liu, M. Li, and Q. Liu, "Joint transmit beamforming design for secure communication and radar coexistence systems," in Proc. IEEE Wireless Commun. Network Conf. (WCNC), Austin, USA, Apr. 2022 [1] Integrated sensing and communication (ISAC), which allows individual radar and communication systems to share the same spectrum bands, is an emerging and promising technique for alleviating spectrum congestion problems. In this paper, we investigate how to exploit the inherent interference from strong radar signals to ensure the physical layer security (PLS) for the considered multi-user multi-input single-

output (MU-MISO) communication and colocated multi-input multi-output (MIMO) radar coexistence system. In particular, with known eavesdroppers' channel state information (CSI), we propose to jointly design the transmit beamformers of communication and radar systems to minimize the maximum eavesdropping signal-to-interference-plus-noise ratio (SINR) on multiple legitimate users, while guaranteeing the communication quality-of-service (QoS) of legitimate transmissions, the requirement of radar detection performance, and the transmit power constraints of both radar and communication systems. When eavesdroppers' CSI is unavailable, we develop a joint artificial noise (AN)-aided transmit beamforming design scheme, which utilizes residual available power to generate AN for disrupting malicious receptions as well as satisfying the requirements of both legitimate transmissions and radar target detection. Extensive simulations verify the advantages of the proposed joint beamforming designs for ISAC systems on secure transmissions and the effectiveness of the developed algorithms.

A. R. Chiriyath, B. Paul, and D. W. Bliss, "Radar-communication convergence: Coexistence, cooperation, and co-design," *IEEE Trans. Cogn. Commun. Netw.*, vol. 3, no. 1, pp. 1-12, Mar. 2017.[2] In this paper, we investigate the physical layer security of multiuser multi-input single-output (MU-MISO) communication and colocated multi-input multi-output (MIMO) radar coexistence systems, in which the strong radar signals are exploited as inherent jamming signals to disrupt malicious receptions. The transmit beamformers of communication and radar systems are jointly designed to ensure the secure transmission by minimizing the maximum eavesdropping signal-to-interference-plus-noise ratio (SINR) on multiple legitimate users, while satisfying the quality-of-service (QoS) of legitimate transmission, the requirement of radar target detection, and the transmit power constraints of radar and communication systems. An efficient fractional programming (FP) and semi-definite relaxation (SDR) based algorithm is proposed to solve the non-convex optimization problem. Simulation results verify the advancement of the proposed joint transmit beamforming on secure transmission for radar and

communication coexistence systems and the effectiveness of the associate design algorithm

F. Liu, C. Masouros, A. P. Petropulu, H. Griffiths, and L. Hanzo, "Joint radar and communication design: Applications, state-of-the-art, and the road ahead," *IEEE Trans. Commun.*, vol. 68, no. 6, pp. 3834-3862, Jun. 2020 [3] For the sake of enhancing the exploitation of the permanently allocated, but potentially under-utilized spectral resources, sharing the frequency bands between radar and communication systems has attracted substantial attention. More explicitly, there is increasing demand for sharing both the frequency band and the hardware platform between these two functionalities, but naturally, its success critically hinges on highquality joint sensing and communications. In this paper, we firstly overview the application scenarios and the research progress in the area of communication and radar spectrum sharing, with particular emphasis on: 1) Radar-communication coexistence; 2) Dual-functional radar-communication (DFRC) systems. In the remainder of the paper, we propose a novel transceiver architecture and frame structure for a DFRC base station (BS) operating in the millimeter wave (mmWave) band, using the hybrid analog-digital (HAD) beamforming technique. We assume that the BS is serving a multi-antenna aided user equipment (UE) operating in a mmWave channel, which in the meantime actively detects multiple targets. Note that part of the targets also play the role of scatterers for the communication signal. Given this framework, we then propose a novel scheme for joint target search and communication channel estimation relying on the omni-directional pilot signals generated by the HAD structure. Given a fully-digital communication precoder and a desired radar transmit beam pattern, we propose to design the analog and digital precoders under non-convex constant-modulus (CM) and power constraints, such that the BS can formulate narrow beams towards all the targets, while pre-equalizing the impact of the communication channel. Furthermore, we design an HAD receiver that can simultaneously process signals from the UE and echo waves from the targets. By tracking the angular variation of the targets, we show that it is possible to recover the target echoes and mitigate the potential interference imposed on the UE signals by invoking the successive

interference cancellation (SIC) technique, even when the radar and communication signals share the equivalent signal-to-noise ratio (SNR). The feasibility and the efficiency of the proposed approaches in realizing DFRC are verified via numerical simulations. Finally, our discussions are summarized by overviewing the open problems in the research field of CRSS.

N. C. Luong, X. Lu, D. T. Hoang, D. Niyato, and D. I. Kim, "Radio resource management in joint radar and communication: A comprehensive survey," *IEEE Commun. Surv.Tut.*, vol. 23, no. 2, pp. 780-814, 2nd Quart. 2021 [4] Joint radar and communication (JRC) has recently attracted substantial attention. The first reason is that JRC allows individual radar and communication systems to share spectrum bands and thus improves the spectrum utilization. The second reason is that JRC enables a single hardware platform, e.g., an autonomous vehicle or a UAV, to simultaneously perform the communication function and the radar function. As a result, JRC is able to improve the efficiency of resources, i.e., spectrum and energy, reduce the system size, and minimize the system cost. However, there are several challenges to be solved for the JRC design. In particular, sharing the spectrum imposes the interference caused by the systems, and sharing the hardware platform and energy resource complicates the design of the JRC transmitter and compromises the performance of each function. To address the challenges, several resource management approaches have been recently proposed, and this paper presents a comprehensive literature review on resource management for JRC. First, we give fundamental concepts of JRC, important performance metrics used in JRC systems, and applications of the JRC systems. Then, we review and analyze resource management approaches, i.e., spectrum sharing, power allocation, and interference management, for JRC. In addition, we present security issues to JRC and provide a discussion of countermeasures to the security issues. Finally, we highlight important challenges in the JRC design and discuss future research directions.

J. A. Zhang, M. L. Rahman, K. Wu, X. Huang, Y. J. Guo, S. Chen, and J. Yuan, "Enabling joint communication and radar sensing in mobile networks -

A survey," *IEEE Commun. Surv.Tut.*, vol. 24, no. 1, pp. 306-345, 1st Quart. 2022 [5] Mobile network is evolving from a communication-only network towards one with joint communication and radar/radio sensing (JCAS) capabilities, that we call perceptive mobile network (PMN). Radio sensing here refers to information retrieval from received mobile signals for objects of interest in the environment surrounding the radio transceivers, and it may go beyond the functions of localization, tracking, and object recognition of traditional radar. In PMNs, JCAS integrates sensing into communications, sharing a majority of system modules and the same transmitted signals. The PMN is expected to provide a ubiquitous radio sensing platform and enable a vast number of novel smart applications, whilst providing non-compromised communications. In this paper, we present a broad picture of the motivation, methodologies, challenges, and research opportunities of realizing PMN, by providing a comprehensive survey for systems and technologies developed mainly in the last ten years. Beginning by reviewing the work on coexisting communication and radar systems, we highlight their limits on addressing the interference problem, and then introduce the JCAS technology. We then set up JCAS in the mobile network context and envisage its potential applications. We continue to provide a brief review of three types of JCAS systems, with particular attention to their differences in design philosophy. We then introduce a framework of PMN, including the system platform and infrastructure, three types of sensing operations, and signals usable for sensing. Subsequently, we discuss required system modifications to enable sensing on current communication-only infrastructure. Within the context of PMN, we review stimulating research problems and potential solutions, organized under nine topics: performance bounds, waveform optimization, antenna array design, clutter suppression, sensing parameter estimation, resolution of sensing ambiguity, pattern analysis, networked sensing under cellular topology, and sensing-assisted communications. We conclude the paper by listing key open research problems for the aforementioned topics and sharing some lessons that we have learned

A. Liu et al., “A survey on fundamental limits of integrated sensing and communication,” *IEEE Commun.Surv.Tut.*, vol. 24, no. 2, pp. 994-1034, 2nd Quart. 2022 [6] In the upcoming sixth generation (6G) of wireless communication systems, reconfigurable intelligent surfaces (RISs) are regarded as one of the promising technological enablers, which can provide programmable signal propagation. Therefore, simultaneous radio localization and mapping (SLAM) with RISs appears as an emerging research direction within the 6G ecosystem. In this paper, we propose a novel framework of RIS-enabled radio SLAM for wireless operation without the intervention of access points (APs). We first design the RIS phase profiles leveraging prior information for the user equipment (UE), such that they uniformly illuminate the angular sector where the UE is probabilistically located. Second, we modify the marginal Poisson multi-Bernoulli SLAM filter and estimate the UE state and landmarks, which enables efficient mapping of the radio propagation environment. Third, we derive the theoretical Cramer-Rao lower bounds on the estimators for the channel parameters and the UE state. We finally evaluate the performance of the proposed method under scenarios with a limited number of transmissions, taking into account the channel coherence time.

V. PROPOSED SYSTEM

Firstly extending existing ISAC beamforming design to a general case by considering the FD capability for both radar and communication and focusing on the optimization of the coupled downlink and uplink transmissions. With the employment of linear receive beamformers, the SINRs of radar sensing and communication of the FD ISAC system are mathematically formulated and two different problems are constructed aiming to improve the system power efficiency and spectral efficiency, respectively.

Derive the optimal receive beamformers to maximize the SINR of target detection and the SINRs of uplink communication, respectively, which are obtained as closed-form expressions with respect to the BS transmit beamforming and the user transmit power.

For each of the two considered problems, we first obtain an equivalent problem that involves the optimization of only the BS transmit beamforming and the user transmit power based on the closed-form receivers. Subsequently, an iterative algorithm is proposed to find a high-quality solution by applying the techniques of rank relaxation and successive convex approximation (SCA). We prove that the adopted relaxation is tight.

For the problem of power minimization, we further consider a special case of HD uplink communication-based ISAC in the absence of downlink users, while the downlink signal is adopted for target detection only. Instead of applying the SCA-based algorithm as in the general case, we propose an AO-based algorithm to iteratively update the receive beamformers and the other variables, whose solutions are obtained by calculating closed-form expressions and by solving a second-order cone programming (SOCP), respectively. Numerical results verify that this newly proposed method significantly reduces the computational complexity compared to the SCA-based method with almost the same performance.

VI. METHODOLOGY

1: Initialization:

Initialize $\{\{V^{(0)}_l\}_{l=0}, \{p^{(0)}_k\}_{k=1}\}$, iteration index $i = 0$, and convergence accuracy ϱ .

2: repeat

3: Set $i = i + 1$.

4: Solve (27) with $\{\{V^{(i-1)}_l\}_{l=0}, \{p^{(i-1)}_k\}_{k=1}\}$ and update $\{\{V^{(i)}_l\}_{l=0}, \{p^{(i)}_k\}_{k=1}\}$.

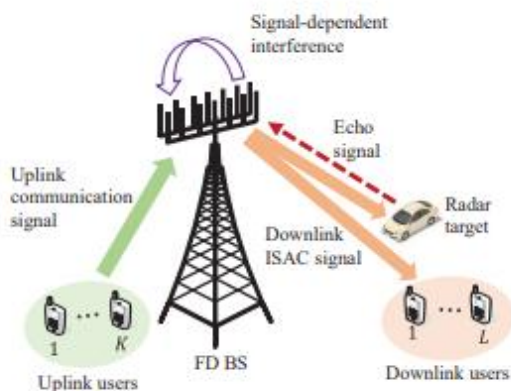
5: until Convergence.

6: Calculate the transmit beamforming and the uplink transmit power according to [28].

7: Calculate the receive beamformers according to [11] and [12], respectively.

8: Output: $u, \{w_k\}_{k=1}, \{v_l\}_{l=1}, V_0$, and $\{p_k\}_{k=1}$.

A. SYSTEM ARCHITECTURE



Fig; ISAC system

Consider an ISAC system as shown in Fig, where a dualfunctional FD BS equipped with two uniform linear arrays (ULAs) receives the communication signals from K singleantenna uplink users and sends a downlink ISAC signal via the same time-frequency resource. The downlink ISAC signal transmitted from an N_t -element ULA is adopted for simultaneously communicating with L single-antenna downlink users and performing target detection on a point radar target. The radar echo signal and the uplink communication signals are received at the BS through the receive ULA with N_r elements.

CONCLUSION

In this paper, we investigated the joint optimization of an FD communication-based ISAC system under the criteria of transmit power minimization and sum rate maximization. For each design problem, we first derived the optimal receive beamformers in closed-form expressions. Then, we developed an effective algorithm to optimize the BS transmit beamforming and the user transmit power based on the SCA technique. Moreover, we also considered a special case for the power minimization criterion and provided a low-cost solution, which enjoys much lower computational complexity compared to the SCA method while achieving almost identical performance. Simulation results verified the effectiveness of the proposed algorithms and showed the tremendous advantages of our considered FD

communication-based ISAC system over the previous frameworks that integrated sensing with HD communication. The performance gains are most notable when the residual SI power is low and the sensing requirement is less restrictive.

FUTURE SCOPE

For future studies, a more effective algorithm on suppressing SI is worthy investigating. Moreover, it would be interesting to extend the SI cancellation technique in digital domain to full domain in view of more accurate residual SI model and saturation caused by analog SI.

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Plant Disease Detection Robot

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Abstract- An automated system has been developed to determine whether the plant's leaf is healthy or disease affected. The normal growth of the plants, yield and quality of agricultural products is seriously affected by plant diseases. This paper aims to develop a computer vision based automatic system for the diagnosis of diseases in plant leaves. Automatic disease detection using computer vision approach involves the segmentation using k mean clustering and feature extraction of diseased area of the leaf, textural descriptors using gray level co-occurrence matrix (GLCM). Color moments are extracted from diseased and non-diseased leaf images resulting in feature values. CNN and BRNN are used for classification. Classified leaves with diseases result to display on android APP using Bluetooth. And also pesticides are sprayed on the detected unhealthy leaves using centrifugal motor pump.

I. INTRODUCTION

The plant diseases detection is very important technology for agriculture; in this paper propose to plant diseases detection section using image processing technology and monitoring section using android APP. The image processing technology has four steps, the first step is image preprocessing, second step segmentation and third one feature extraction and fourth step is classification. Next the monitoring section using embedded platform. The embedded unit using hardware components is ARDUINO and LCD, Bluetooth, and motor.

An automated system has been developed to determine whether the plant's leaf is healthy or disease affected. The normal growth of the plants, yield and quality of agricultural products is seriously affected by plant diseases. This paper aims to develop a computer vision based automatic system for the diagnosis of diseases in plant leaves. Automatic disease detection using computer vision approach involves the segmentation using k mean clustering and feature extraction of diseased area of the leaf, textural descriptors using gray level co-occurrence matrix (GLCM). Color moments are extracted from diseased and non-diseased leaf images resulting in feature values. CNN and BRNN are used for classification. Classified leaves with diseases result to display on android APP using Bluetooth. And also pesticides are sprayed on the detected unhealthy leaves using centrifugal motor pump.

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diseases detection section using image processing technology and monitoring section using android APP. The image processing technology has four steps, the first step is image preprocessing, second step segmentation and third one feature extraction and fourth step is classification. Next the monitoring section using embedded platform. The embedded unit using hardware components is ARDUINO and LCD, Bluetooth, and motor.

II. PROBLEM DEFINITION

Plant health condition assumes a crucial job to acquire great benefit for the ranchers. Legitimate checking of plant health is required at various phases of plant development so as to anticipate malady influencing plants.

It will be the most useful thing for farmers to maintain the health of plants. Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification.

Related Work

Plant Disease Detection Robot Vignesh M1, Yogeswaran A2, Ragunath S3, Rohan babu D4 Volume: 08 Issue: 01 | Jan 2021 www.irjet.net

Abstract

Identifying the disease is the only way to prevent the losses in the yield and quantity of the agricultural products. The plant disease means nothing about the disease which can be identified by seeing physical abnormalities of the plants (eg. Shrinking of leaves). Improper maintenance or verification of plant disease can lead to huge loss for the farmers. Health monitoring and disease detection on plants is very critical for sustainable agriculture. It is very difficult to identify the disease manually for large areas. It requires more manpower who are experts in plant diseases and it also requires more processing time. It will be the most useful thing for farmers to maintain the health of plants. Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. Our Robot has solar connectivity for power supply which will have an uninterrupted power source. The image which is captured undergoes processing as a result we receive a SMS via mobile phones. The SMS contains the detailed information about the disease as well as the solution for the disease. It will be more comfortable to maintain and protect large areas of plants and their productivity.

Plant Disease Detection using Internet of Thing (IoT) Muhammad Amir Nawaz¹, Tehmina Khan², Rana Mudassar Rasool³, Maryam Kausar⁴, Amir Usman⁵, Tanvir Fatima Naik Bukht⁶, Rizwan Ahmad⁷, Jaleel Ahmad⁸ Article in International Journal of Advanced Computer Science and Applications · January 2020

Abstract

This paper presents the idea of internet of things (IOT) innovation to percept data, and talks about the job of the IOT innovation in farming infection and bug nuisance control, which incorporates rural ailment and bug checking framework, gathering sickness and creepy crawly bother data utilizing sensor hubs, information preparing and mining, etc. A malady and bug irritation control framework dependent on IOT is proposed, which comprised of three levels and three frameworks. The framework can give another approach to get to horticultural data for the farm. In this paper a computerized framework has been created to decide if the plant is ordinary or infected. The typical development of the plants, yield and nature of horticultural items is truly influenced by plant illness. This paper attempt to build up a robotized framework that identifies the nearness of disease in the plants. A mechanized ailment recognition framework is created utilizing sensors like temperature, moistness and shading dependent on variety in plant leaf wellbeing condition. The qualities dependent on temperature, mugginess and shading parameters are utilized to distinguish nearness of plant sickness.

Android Based Plant Disease Detection Using Arduino Veena Krishnan , N. KumaresanJETIR May 2019, Volume 6, Issue 5 Abstract.

In this paper an automated system has been developed to determine whether the plant's leaf is healthy or disease affected. The normal growth of the plants, yield and quality of agricultural products is seriously affected by plant diseases. This paper aims to develop a computer vision based automatic system for the diagnosis of diseases in plant leaves. Automatic disease detection using computer vision approach involves the segmentation using k mean clustering and feature extraction of diseased area of the leaf, textural descriptors using gray level co-occurrence matrix (GLCM). Color moments are extracted from diseased and non-diseased leaf images resulting in feature values. CNN and BRNN are used for classification. Classified leaves with diseases result to display on android APP using Bluetooth. And also pesticides are sprayed on the detected unhealthy leaves using centrifugal motor pump.

Ananthi, S. Vishnu Varthini, Detection and Classification of plant leaf Diseases International of Research in Engineering and Applied Sciences, Volume 2 and Issue 2 February 2012 ISSN: 2249-3905

Abstract

The early detection of diseases is important in agriculture for an efficient crop yield. The bacterial spot, late blight, septoria leaf spot and yellow curved leaf diseases affect the crop quality of tomatoes. Automatic methods for classification of plant diseases also help taking action after detecting the symptoms of leaf diseases. This paper presents a Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm based method for

tomato leaf disease detection and classification. The dataset contains 500 images of tomato leaves with four symptoms of diseases. We have modeled a CNN for automatic feature extraction and classification. Color information is actively used for plant leaf disease researches. In our model, the filters are applied to three channels based on RGB components. The LVQ has been fed with the output feature vector of convolution part for training the network. The experimental results validate that the proposed method effectively recognizes four different types of tomato leaf diseases.

H.Al-Hiary, S. Bani-Ahmad, M.Reyalat, M.Braik and Z.AIRahamneh, Fast and Accurate Detection and Classification of Plant Diseases, International Journal of Computer. Applications (0975-8887), Volume 17-No.1.March 2011 3

Abstract

We propose and experimentally evaluate a software solution for automatic detection and classification of plant leaf diseases. The proposed solution is an improvement to the solution proposed in [1] as it provides faster and more accurate solution. The developed processing scheme consists of four main phases as in [1]. The following two steps are added successively after the segmentation phase. In the first step we identify the mostly green colored pixels. Next, these pixels are masked based on specific threshold values that are computed using Otsu's method, then those mostly green pixels are masked. The other additional step is that the pixels with zeros red, green and blue values and the pixels on the boundaries of the infected cluster (object) were completely removed. The experimental results demonstrate that the proposed technique is a robust technique for the detection of plant leaves diseases. The developed algorithm's efficiency can successfully detect and classify the examined diseases with a precision between 83% and 94%, and can achieve 20% speedup over the approach proposed in [1].

Dheeb Al Bashish, Malik Braik, and SuliemanBani-Ahmad, A Framework for Detection and Classification of Plant Leaf and Stem Diseases, International Conference on Signal and Image Processing pp. 113-118. (2010)

Abstract

We propose and evaluate a framework for detection of plant leaf/stem diseases. Studies show that relying on pure naked-eye observation of experts to detect such diseases can be prohibitively expensive, especially in developing countries. Providing fast, automatic, cheap and accurate image-processing-based solutions for that task can be of great realistic significance. The proposed framework is image-processing-based and is composed of the following main steps; in the first step the images at hand are segmented using the K-Means technique, in the second step the segmented images are passed through a pre-trained neural network. As a testbed, we use a set of leaf images taken from Al-Ghor area in Jordan. Our experimental results indicate that the proposed approach can significantly support accurate and automatic detection of leaf diseases. The developed Neural Network classifier that is based on statistical classification perform well and could successfully detect and classify the tested diseases with a precision of around 93%.

N.Valliammal , Dr.S.N.Geethalakshmi ,”Hybrid Method for Enhancement of Plant Leaf Recognition”, World of Computer Science and Information Technology Journal (WCSIT), Vol. 1, Issue 9, pp. 370-375, INDIA. 2011.

Abstract

Image pre-processing methods are intended to enhance some image features important for further processing including edge detection or object recognition. Preprocessing is very crucial in image processing applications for noise removal and also for suppressing or highlighting other attributes. This study seeks to preprocess medicinal plant leaf images by enhancing the quality of the images using a combined Homomorphic filter and Contrast Limited Adaptive Histogram Equalization. The study also segments the image from its background using the OTSU global thresholding algorithm. Image enhancement and segmentation performance metrics are further used to determine the efficiency of the proposed method. It was realized from the experiment using MATLAB that the proposed method outperformed the Contrast Limited Adaptive Histogram Equalization in terms of the Peak Signal to Noise ratio, Mean Square Error, Mean Absolute Error for the image enhancement and Jaccard Index, DICE Index and Matthews Correlation Coefficient metric for the image segmentation.

Arunkumar beyyala1, Sai priya beyyala1, “Application for diagnosis of diseases in crops using image processing”, International Journal of life Sciences Biotechnology and Pharma Research, Vol. 1, Issue 2, April 2012.

Abstract

The techniques of pattern recognition are widely applied to agricultural science and it has immense perception especially in the plant protection field, which eventually leads to crops management. We propose artificial intelligence technique for automatic detection and classification of sugarcane leaf diseases using image processing technique. Images of the infected sugarcane leaves are captured by digital camera, those images are preprocessed using image histogram equalization, filtering, color transformation and segmentation techniques to detect infected part of the leaves. Then the infected leaf has been used for the classification purpose using Support Vector Machine classifier. This can be achieved by getting the diseased part of a leaf based on the K means clustering method to segment the leaf area and affected area. In conclusion, diseases are classified by calculating the GLCM texture feature of affected area. The methods progressed in this system are both feature analysis and segmentation technique applied on number of diseased sugarcane plants.

K. Padmavathi, “ Investigation and monitoring for leaves disease detection and evaluation using image processing”, International Research Journal of Engineering Science, Technology and Innovation (IRJESTI), Vol. 1, Issue 3, pp. 66-70, June 2012.

Abstract

Image segmentation is useful in different applications. From the segmentation results, it is possible to identify regions of interest and objects in the scene, which is very beneficial to the subsequent image analysis. This system identifies leaves disease of plants and also determines the stage in which the

disease is. The system has various image processing techniques. At first, the images are captured and processed for enhancement. Then image segmentation is carried out to get disease regions. Later, image features such as shape, colour and texture are extracted for the disease regions. These resultant features are given as input to disease classifier to appropriately identify and grade the diseases.

Stephen Gang Wu, Forrest Sheng Bao, Eric You Xu, Yu – Xuan Wang Yi – Fan Chang[2007] A Leaf ecognition Algorithm for Plant Classification Using Probabilistic Neural Network, IEEE 7th International Symposium on Signal Processing and Information Technology.

abstract

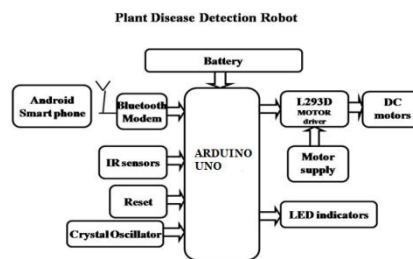
In this paper, we employ probabilistic neural network (PNN) with image and data processing techniques to implement a general purpose automated leaf recognition for plant classification. 12 leaf features are extracted and orthogonalized into 5 principal variables which consist the input vector of the PNN. The PNN is trained by 1800 leaves to classify 32 kinds of plants with an accuracy greater than 90%. Compared with other approaches, our algorithm is an accurate artificial intelligence approach which is fast in execution and easy in implementation.

D. A. Devi and K. Muthukannan. Analysis of segmentation scheme for diseased rice leaves. In Advanced Communication Control and Computing Technologies (ICACCCT), 2014 International Conference on, pages 1374–1378, May 2014.

Abstract

For any automated image analysis process, the segmentation is an important task because all subsequent tasks in image processing heavily rely on the quality of image segmentation. It determines the eventual success or failure of the analysis. The problem in image segmentation occurs when an image has a varying gray level background. There are several algorithms and methods are available for image segmentation, but there is a need to develop a unique method for it. In this paper, some of the image segmentation algorithms are compared to segment the diseased portion of rice leaves.

III. BLOCK DIAGRAM



The major building blocks of this project are:

1. Regulated Power Supply.
2. PIC Microcontroller.
3. Bluetooth.
4. DC Motors.
5. IR Sensors.

6. Crystal oscillator.
7. LED indicators.
8. LCD display.

Software's used:

1. PIC C Compiler software for Embedded C programming.
2. PIC KIT 2 Programmer for dumping code into Micro controller.
3. Express SCH for Circuit design.

Explanations :

- The controlling device of the whole system is done using PIC Microcontroller.
- The robot can be controlled through our mobile phone over Bluetooth communication.
- The Bluetooth receiver module in our system gets the input from our mobile phone and gives the same input to the microcontroller.
- The microcontroller accordingly controls the robot.
- The IR sensors measure the plant growth if there is any abnormal condition in the growth of the plant it will display on LCD.
- As mentioned, Using IR sensor we can know the plant disease by measuring the plant growth

Advantages

- High Accuracy
- Low complexity
- Detection of images been classified without any noise
- Crop diseases are an important problem, as they cause serious reduction in quantity as well as quality of agriculture products.
- An automatic plant-disease detection system provides clear benefit in monitoring of large fields, as this is the only approach that provides a chance to discover diseases at an early stage.
- Plant disease resistance is crucial to the reliable production of food, and it provides significant reductions in agricultural use of land, water, fuel and other inputs.
- Plants in both natural and cultivated populations carry inherent disease resistance, but this has not always protected them.
- Diagnosis is one of the most important aspects of a plant pathologist's training.
- Without proper identification of the disease and the disease-causing agent, disease control measures can be a waste of time and money and can lead to further plant losses.
- Proper disease diagnosis is therefore vital.

Disadvantages

- In order to obtain superior results in the detection of plant disease, DL methods require a greater amount of data.
- This is a drawback since currently available datasets are usually small and do not contain

enough images, which is a necessity for high-quality decisions.

- Losses due to postharvest disease can be disastrous, especially when farms are a long way from markets and infrastructure and supply chain practices are poor.
- Require long training time.
- Difficult to understand learned function.
- Large nos. of support vectors are used for training in classification task.

Applications

- **Bio-Farm**
Bio-farming is a system of crop and livestock production with the help of crop rotation, crop residues, organic waste, green manure and through biological pest.
- **Bio-Pesticides**
Biopesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals. For example, canola oil and baking soda have pesticidal applications and are considered biopesticides. As of August 31, 2020, there were 390 registered biopesticide active ingredients.

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Tomato Plant Leaf Diseases Detection Using Machine Learning

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Abstract-The tomato is a significant crop in India and has a wide range of economic effects. It has been noted that the spread of illnesses has slowed agricultural progress in the present. Many farmers use past expertise to identify diseases, while others seek assistance. Farmers regularly employ traditional methods to identify illnesses. So, there is a chance that a disease could be misdiagnosed if the symptoms are quite similar. Therefore, it is crucial to adopt innovative approaches for the disease's automatic diagnosis and management. So, a machine vision system that can automatically, precisely, and more affordably identify disease from photographs of tomato leaves is needed.

Keywords: ML, CNN, ResNet-50.

I. INTRODUCTION

Due to serious tomato leaf diseases that could affect tomato output, India's tomato crop has been steadily declining over time. This results in a significant decrease in both productivity and income for many tomato growers. In order to utilize pesticides and other medical equipment to sprinkle medications over plants and protect their harvests from illnesses in early phases of production, farmers will need to become aware of the plants that are contaminated and unhealthy in the early stages of their growth. By uploading images of the tomato leaf to the web app, this initiative will assist the farmers in distinguishing between healthy and diseased tomato leaves. In India nowadays, agriculture provides a significant portion of people's income. Modifications to the agriculture sector are needed to boost India's GDP. Compared to the agricultural business, every other industry has access to certain cutting-edge technologies. Due to farmers' failure to identify plant leaf diseases and implement preventative measures, around 42% of farm produce is wasted. We have

developed a method to solve this problem in this research, and it may be used to identify the disease from input photos of plant leaves.

II. LITERATURE REVIEW

The health of plants can be severely damaged by diseases, which has an effect on their growth. The performance of yields, both in terms of quality and quantity, is significantly lowered when these various diseases attack plants. Around 20–30% of all agricultural losses are attributable to disease-affected plants. Using deep learning, the suggested system anticipates leaf diseases and classifies those ailments. Although there are many applications for machine learning algorithms, feature engineering is still the main challenge. Deep neural networks have made promising results for plant pathology possible without time-consuming feature engineering [1]. The accuracy of image classification is greatly improved by deep neural networks. The many deep learning techniques used by researchers to identify plant diseases are presented in this section. By addressing the issue of early identification of tomato leaf diseases, we are saving farmers' money through this research. Our objective is to create a reliable and accurate model that will aid in resolving the aforementioned problem. By selecting the suitable algorithm and hyper-parameter tuning, we are developing a CNN model that will enable us to completely eliminate the issue. In the problem of, the Convolution Neural Network has given excellent results. Deep learning algorithms have been used in numerous studies in recent years to diagnose plant leaf diseases. In their research, the authors use a Multilayer Perceptron

and Ada boosting techniques to construct a classifier based on the extraction of morphological characteristics [2].

III. DATA COLLECTION

The dataset utilized in the study was obtained from the Kaggle directory [16]. The dataset for this study is divided into 10 directories, each of which contains 1000 photos. These directories are listed below.

1. Leaf with Bacterial Spot: There are 2127 photos of tomato leaves with bacterial spots on them in this directory. Leaf with Bacterial Spot.
2. Leaf with Early Blight: This directory contains 1000 images of tomato leaves with the disease.
3. Leaf with Late Blight: There are 1909 images of tomato leaves in this category that have Late Blight on them.
4. Leaf with Mosaic Virus: There are 373 images of tomato leaves with the mosaic virus on them in this subfolder.
5. Leaf with Septoria Spot: There are 1771 images of tomato leaves in this category that have Septoria Spot on them.
6. Leaf Mold: There are 952 images of tomato leaves in this directory that have leaf mould on them.
7. Yellow Leaf Curl Virus: This directory contains 3209 images of tomato leaves that have the yellow leaf curl virus on them.
8. Two Spotted Spider Mites: There are 1676 images of tomato leaves with spider mites on them in this category.
9. Healthy leaf: This subfolder contains 1591 photos of tomato leaves.
10. Target Spot: There are 1404 images of tomato leaves in this directory that feature the target spot bug.

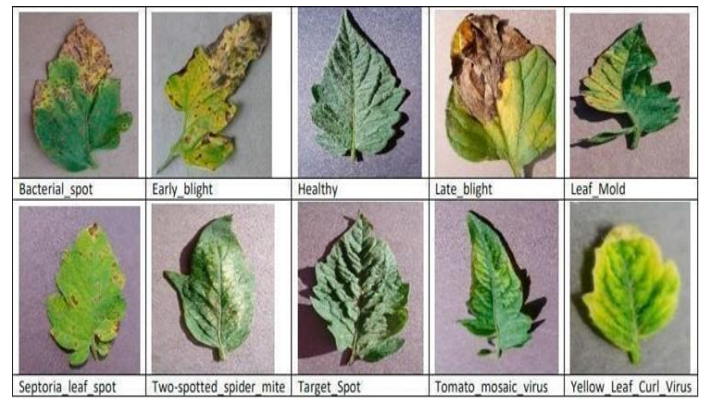


Fig. 1 Class wise sample image of the dataset

IV. MACHINE LEARNING ALGORITHM

A. Convolutional Neural Network

Convolutional Neural Network, usually referred to as CNN, is a kind of deep learning that's primarily utilized for image analysis. Deep feedforward artificial neural networks have a class known as CNNs (ANN). This neural network makes use of the existing. It predicts the potential labels that might be assigned in the future using the dataset that was provided for training. any type of data in order to combat the dimensionality curse, this neural network makes use of its advantages. Image identification, picture categorization, image captioning, and object detection are a few areas where CNNs are widely used. The main strengths of CNNs are to provide an efficient dense network which performs the prediction or identification etc. efficiently. CNNs are the most popular topic in the pool of deep learning, which is indeed very vast, and this is usually because of the ConvNets. Immense datasets are applied to CNNs, it is even considered that larger the data, greater the accuracy will result, otherwise other operations such as transfer learning shall be applied to expand the data. CNN has the ability to independently identify distinctive aspects from photos without any human participation. The Cats and Dogs dataset, from which each feature is selected automatically and the images are drawn, is the most popular dataset from which CNN selects the features [2].

B. ResNet-50

While the Resnet-50 architecture is built on the aforementioned paradigm, there is one key area in

which it is different. In this case, the building block was changed into a bottleneck design due to worries about the amount of time needed to train the layers. This employed a three-layer stack in place of the previous two layers. In order to create the Resnet 50 architecture, each of the Resnet34's 2-layer bottleneck blocks was changed to a 3-layer bottleneck block. Comparing this model to the 34-layer ResNet-50 model, the accuracy of this model is noticeably higher. ResNet's-50 layers produce 3.8 billion FLOPS. ResNet-50 is a particular form of artificial neural network that is an artificial neural network (ANN). Remaining neural networks employ skip connections or shortcuts to go beyond difficult layers. The bulk of ResNet-50 models employ batch normalization in addition to double- or triple-layer skips with nonlinearities (ReLU). The skip weights can be learned using an additional weight matrix; these models are known as Highway Nets. DenseNets are models with several parallel skips. The Resnet sort of Resnet model from Keras consists of 48 convolutional layers, one Max Pooling layer, one Average Pooling layer, and one layer. The number of floating point operations is 3.8×10^9 . The most practical Resnet model is this one. It can also be utilized for computer vision applications as object detection, object localization, and image classification. This system can also be used for non-computing vision jobs to add depth and cut down on computational costs [3].

C. Inception

An inception network is a type of deep neural network that has an architectural structure made up of repeating elements called Inception modules. The focus of this study is, as was previously said, on the technical details of the inception module. Let's clarify the topic of this essay before delving into the Inception module's technical intricacies. Background information on the fundamental concepts and notions that served as the basis for the Inception module's architectural designs and the name's etymology. Specifications for each Inception module component. Images displaying the Inception module's internal architecture and structure. calculation of the multiplier operations performed by each Inception module component. calculation of the

number of multiplier operations within each component of the Inception module. When creating the Inception network, the researchers followed a few guiding concepts and notions. High performance deep learning networks must be enormous. For a neural network to be referred regarded as vast, it must include numerous more layers and units inside those layers. The capacity to extract features at multiple scales is advantageous to convolutional neural networks. The biological human visual cortex functions by identifying patterns at various scales, which combine to produce sensations of larger objects. Multi-scale networks can therefore learn even more as a result. It takes into account the Hebbian Principle, which states that neurons that fire together, wire together. The aforementioned recommendations have a few technical flaws in actual use.

V. PROPOSED METHODOLOGY

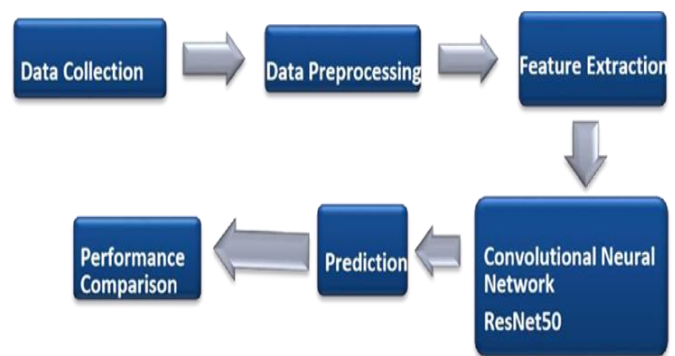


Fig. 2 Proposed Methodology Architecture

Suggested Approach Data is initially gathered through a website called "Kaggle" in its rawest form. Then, this unprocessed data is pre-processed, with the data being initially scaled for CNN and ResNet-50 before being enhanced online to avoid overfitting. Following pre-processing the data, the necessary characteristics are retrieved in accordance with the requirements, and the data is then divided for training and testing purposes. Amass a sizable collection of tomato plant leaf photos that includes both healthy and leaves affected by various diseases. These photos can be found in existing databases or through field surveys. The acquired dataset was preprocessed by shrinking the photos to a predetermined size, making the images grayscale, and enhancing the dataset with various distortions, such as rotations, flips, and blurs. This stage is essential for

improving the photos' quality and strengthening the model's resistance to various alterations. Use a variety of feature extraction methods, including Histogram of Oriented Gradients, Scale-Invariant Feature Transform, and Convolutional Neural Networks, to extract features from the preprocessed images. These traits can be used to illustrate the distinctive qualities of various types of illnesses and healthy leaves. Train a classification model, such as Support Vector Machines, Random Forest, or Convolutional Neural Networks, using the extracted features. This step involves splitting the dataset into training and validation sets, selecting the appropriate model and hyperparameters, and fine-tuning the model using techniques such as cross-validation and early stopping. Use a different test dataset to assess the trained model's performance using multiple performance metrics, including accuracy, precision, recall, and F1-score. This stage aids in evaluating the model's generalizability and determining whether any improvements are required. Use the trained model to create a web- or mobile-based application that farmers and plant pathologists may use to identify diseases in tomato plant leaves. The programme needs to be accurate, user-friendly, and available to a variety of users. To ensure that the model keeps working well on new datasets and in various situations, update the model frequently with fresh data and retrain it as appropriate [4].

ResNet-50 predicts with 88.44% accuracy, which is inferior than the Convolutional Neural Network model's 94.1% accuracy, demonstrating that our CNN model is more accurate. When we compare the output of the processed data on different proposed models, we learn that these models perform best when they are combined. The graph above, which illustrates the results of the algorithms used in the proposed model, demonstrates that ResNet50, which has the shortest bar and an accuracy of 88.44%, is less accurate than CNN, which has the longest bar and a maximum accuracy of 94.10%.

VI. RESULT ANALYSIS

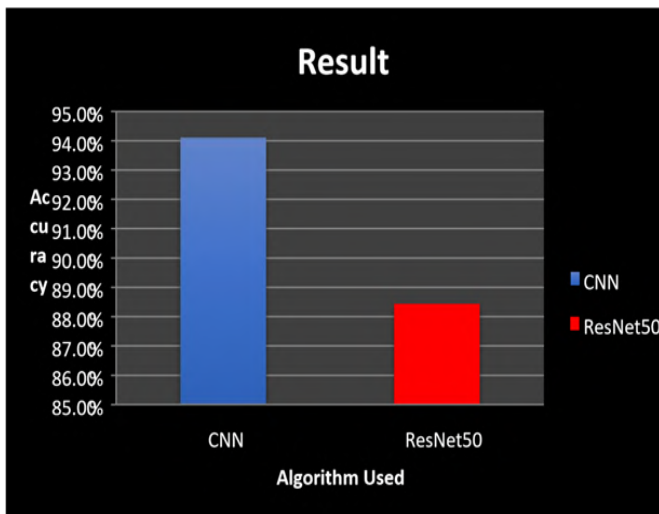


Fig. 3 Accuracy of the Proposed Model

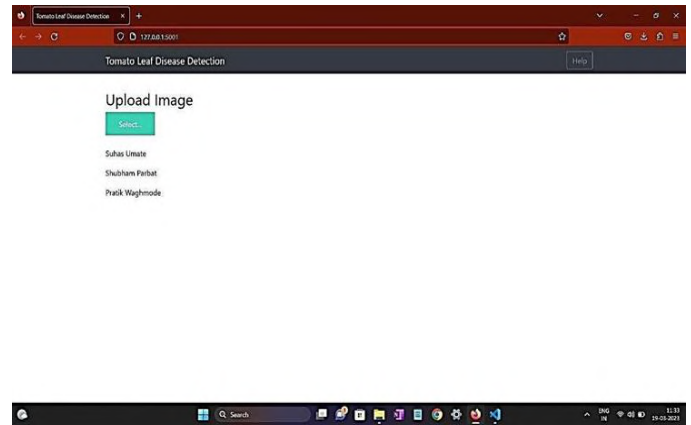


Fig. 4 Snapshot of GUI

Figure 4 shows that we have to upload image from user as an input. After clicking upload button the image get uploaded on our project. After successfully updating the image user can see predict button on screen.

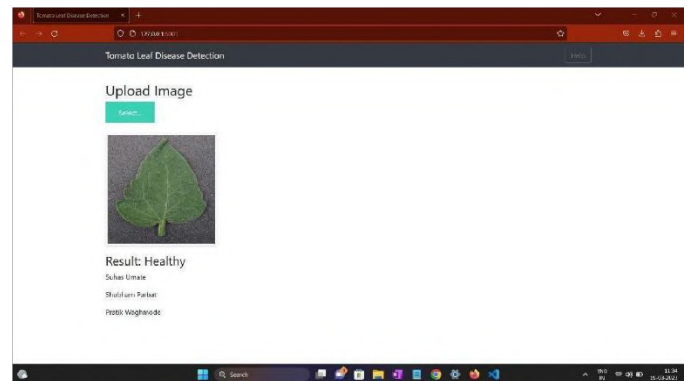


Fig. 5 Prediction Page

Figure 5 shows that user have to click on predict button to get an output. After clicking predict button the algorithms work on the image for predicting the output. After the execution process the output gets displayed on the screen. The output consists of status of tomato plant

leaf whether it affected or not. If the tomato leaf infected by any disease, then it will give output as disease name otherwise it gives output as 'Healthy'

VII. CONCLUSION

Agriculture industry is an essential sector on which the bulk of the Indian population relies. Thus, identifying illnesses in these crops is crucial for a nation's economic development. One of the crops that is produced in large quantities in India is the tomato. We have discovered and classified 10 distinct diseases in our experiment. In order to categorize tomato leaf diseases and assist farmers in determining the type of disease, the project uses a convolutional neural network model. Today, timely diagnosis and identification of illnesses that damage the leaves is crucial since they seriously harm both the quantity and quality of agricultural yield. In the model presented in this paper, photos were pre-processed before being fed into the CNN machine learning method and the ResNet-50 pre-trained model for image processing and prediction. The obtained results demonstrated that the CNN algorithm achieved the maximum level of accuracy. The ResNet-50 Model's accuracy is acceptable, but we can adjust the applied parameters in the future to further improve the accuracy.

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A Study of 7T SRAM for Low Power Application

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Abstract - With the increase in demand for low power memory, this is achieved by reducing the leakage currents. Power dissipation mainly occurs due to leakage currents of different forms such as Sub threshold & Gate leakage etc. and need to reduce these currents. This work mainly aims study of low power 7T SRAM Cell by employing Improved Self Controllable Voltage Level(I-SVL)circuits

Index Terms: Low Power, Leakage current, Static Random Access Memory (SRAM), Self Controllable Voltage Level (SVL),Upper Lower SVL (UL-SVL),Improved SVL (I-SVL).I.

INTRODUCTION

The usage of portable electronic gadgets based on battery operation is rapidly increasing due to demand in our day today life. These portable handheld devices needs memory in the form of SRAM (Static Random Access Memory) as these are faster and need not be refreshed. SRAM cell normally made up of two inverters that are cross coupled and each of these stores data in reverse direction. Additionally consists of MOSFETs to control the writing and reading operation in as ingle cell. While designing any memory the major problem is concerned with the power dissipation, reducing this power dissipation is greater challenge and in turn optimizes the design to a large extent. The complexity of the cell increase with the improvements in the design of SRAM to optimize power, speed, area & stability. This complexity comes in the penalty of high power consumption (static, dynamic), area etc.To design microprocessor with higher speed, cache memories have to build in terms of SRAM

Typical SRAM made up of latch circuit with two operating points which are stable. Six MOSFETS arranged in a way as two invertors connected back to back followed by the two access transistors. Bit information with in an SRAM is stored using four MOS Transistors which behave like two inverters that are cross coupled in nature. The storage cell indicates '0' & '1' using two states that are stable. Along with this two

additional MOS Transistors called as access transistors

serve to control the accessibility of a cell during the time of read/write operation. The organization of the paper is as follows: The Section II provides details about earlier work consisting of Basic 7T SRAM cell, 7T SRAM cell using Upper Lower SVL (UL-SVL) technique. Section III, brings out the proposed method of 7T SRAM cell by applying Improved SVL (ISVL) technique to reduce leakage current via tool cadence virtuoso.

II SUMMARY OF THE CONTRIBUTED PAPERS

A. Broadband Circularly Polarized Filtering Monopole Antenna for C-Band Applications [1]

In this paper a CMOS two stage operational amplifier has been presented which operates at 1.8 V power supply at 0.18 micron (i.e., 180 nm) technology and whose input is depended on Bias Current. The op-amp provides a gain of 63dB and a bandwidth of 140 kHz for a load of 1 pF. This op-amp has a Common Mode gain of -25 dB, an output slew rate of 32 V μ s, and a output voltage swing. The power consumption for the op-amp is 300 μ W.

B. Design of 7T sram cell for low power applications

In this paper. As the technology of memory on Systems-on-Chip (SoC) is shrinking, the compact devices and embedded systems are emerging, so the low power consumption is very essential for the VLSI system design. Static Random Access Memory (SRAM) contains more than 70% area of the SoC. A standard 6T SRAM cell has two bitlines for read and write operation thus it consumes more power. There are many techniques for power reduction like scaling of supply voltage (VDD) and threshold voltage (Vt), multi- VDD, multi- Vt etc. Scaling of voltages affects adversely on the stability of the SRAM cells. In this paper a dual-Vt 7T (seven transistor) SRAM cell is proposed and compared with the standard 6T SRAM cell on the basis of read delay, write delay, leakage power consumption and Static Noise Margin (SNM) (during hold, read and write). This proposed cell uses single bitline for read and write operation. Thus it also improves the access time of

the cell. The consumption of leakage power is reduced by 61.50%. Write delay is reduced by 66.67%. All the simulation work is carried out using the Eldo SPICE tool of Mentor Graphics on 65nm technology at 27°C.

C. Novel 7T sram cell for low power cache design

In this paper, Low-power on-chip cache is a crucial part in many applications. Conventional write operation depends on discharging/charging large bit lines capacitance which causes high power consumption. We propose a 7T SRAM cell that only depends on one of the bit lines during a write operation and reduce the write power consumption. HSPICE simulation shows that at least 49% write power saving, higher stability, and no performance degradation with additional 12.25% silicon area

D. Low-Power Cache Design Using 7T SRAM Cell

In this paper, On-chip cache consumes a large percentage of the whole chip area and expected to increase in advanced technologies. Charging/discharging large bit lines capacitance represents a large portion of power consumption during a write operation. We propose a novel write mechanism which depends only on one of the two bit lines to perform a write operation. Therefore, the proposed 7T SRAM cell reduces the activity factor of discharging the bit line pair to perform a write operation. Experimental results using HSPICE simulation shows that the write power saving is at least 49%. Both read delay and static noise margin are maintained after carefully sizing the cell transistor

E. TFET-Based Robust 7T SRAM Cell for Low Power Application

In this paper, TFETs have emerged as the potential candidate for future ultralow-power applications. However, the unidirectionality and poor drive current are the biggest hurdles for their deployment in static random-access memories (SRAMs), as they critically impact the write operation. In this article, first, we propose a new device structure with dual-pocket double-gate tunnel FET (DP-DGTFET) based on the earlier p-n-i-n device (SP-DGTFET). The proposed device shows improved characteristics in terms of I_{ON} , I_{ON}/I_{OFF} , and SS with comparable IOFF. The SRAM cells designed using the proposed device significantly improve the write margin (WM). The DP-DGTFET-based outward access-6T (O-6T) cell enhances the WM as high as 18× compared with its SP-DGTFET counterpart at $V_{dd} = 0.7$ V. Subsequently, a novel 7T SRAM cell is also proposed to further enhance the circuit performance particularly in terms of write-ability. The proposed cell utilizes separate

read buffer and column voltage collapse write assist to enhance the read and write stabilities. We also investigate the feasibility of these pocket devices for several other configurations of SRAM cells. The proposed 7T cell designed using new dual-pocket device offers 8× higher WM, 1.3× smaller write delay, similar RSNM and read delay while consuming 2.2× smaller write power, and similar read power compared to the existing 7T cell (at $V_{dd} = 0.5$ V). The proposed cell also successfully eliminates half-selected disturb that occurs in the selected column due to voltage collapse. The proposed cell, therefore, could be a good choice for applications that demand high stability and low power requirement.

F. Design of SRAM cell for low power portable healthcare applications

In this paper, Biomedical applications such as body area networks (BANs) require the design of power-efficient SRAM cells for the extended battery lives of BAN sensor nodes. In this work, we have proposed a bit-interleaving supporting, robust, low-power single-ended 9T (SE9T) bitcell. Design metrics of our bitcell are compared with several bitcells such as the 7T, FD8T and SEDF9T cells for their comparative analysis. The proposed cell shows 2.87×/3.36× higher RSNM than that of 7T/FD8T and 1.05×/1.5×/7.0× higher WSNM than that of 7T/FD8T/SEDF9T, 1.15×/1.06× and 1.54×/1.38× lower distribution in T_{RA} and I_{READ} , respectively, compared to 7T/FD8T. In addition, the proposed cell shows 1.15×/1.22× shorter T_{WA} when compared to SEDF9T/7T. Furthermore, SE9T cell consumes 10.80×/17.81× lower write power than that of SEDF9T/FD8T and 1.52×/18.37× lower read power than that of 7T/FD8T. It also exhibits 1.04×/2.92× lower leakage power dissipation than that of FD8T/7T. All these developments are obtained at a cost of 2.5× longer T_{WA} , 1.73×/1.73× longer T_{RA} when compared to FD8T and 7T/FD8T, and 1.64×/1.06× higher write power/read power than 7T/SEDF9T @ $V_{DD} = 700$ mV.

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A Study of Two Stage Operational Amplifier

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Abstract - A method for fabricating and implementing a two stage CMOS operational amplifier using microwind and cadence is discussed in this paper. The proposed CMOS op-amp is designed for 1.8v power supply. Op-Amp is basically a DC-coupled high gain electronic voltage amplifier having differential input signal and, generally a single-ended output waveform. Operational amplifier are basically utilized to perform mathematical operations such as addition, subtraction, multiplication and division in many linear, non-linear and frequency-dependent circuits. Op-amp is widely utilized as a building block in integrated circuits because of its versatile nature. Various performance parameters such as gain, phase margin, gain bandwidth, common mode rejection ratio, power dissipation etc.

Index Terms: CMRR, Slew rate, common mode gain, open loop gain, CMVR, ICMR, PSRR.

I. INTRODUCTION

The operational amplifier (Op-Amp) is surely one of the maximum beneficial gadgets in electronic industry. Op-Amps are most useful electronic devices these days, used drastically for signal conditioning, filtering and for execution of mathematical operations. Op-Amp is basically differential amplifier and output signal is nothing however difference of the two input signals implemented at the excessive impedance terminals magnified by using a steady benefit.

The design of Op Amps basically considers, supply voltage and channel lengths of transistor with era of CMOS technology with trade off among velocity, energy, gain and some other parameters which signifies the performance.

As the power supply voltage, transistor channel length is continuously decreasing then the designing of high performance analog integrated is becoming most essential. Metal oxide semiconductor (MOS) has been

very successful technology as compared to other transistor like bipolar junction transistor (BJT) reason being it can be scaled down for higher performance. For higher performance MOS size can be reduced to micrometer or nanometer. What advantage we take by reducing the size is that number of transistors can be integrated is more on the same size of wafer and we can get faster amplifier than earlier transistor. It gives direction to continuous growth of the processing capacity per chip and operating frequency.

In most of the electronic circuit the operational amplifiers is the most common building block. As we reduce the transistor channel length and power supply designing of operational amplifier possesses big challenge. Due to different aspect ratio, there is a trade-off among speed, power, gain, and the other parameters. The implementation of a CMOS op-amp that combines a considerable dc gain with higher unity gain frequency has been a most difficult problem. There have been several circuits proposed to evaluate this problem. The purpose of the design methodology in this paper is to propose accurate equations for the 2 stage CMOS op-amp.

For this simple analysis with some meaningful parameters (such as gain, bandwidth, phase margin, etc.) is performed.

The method handles wide variety of specifications and constraints. In this, we formulate the CMOS op-amp design problem and their aspect ratios. The model we present can be applied to wide variety of amplifier structures, but in this paper, we apply the method to a specific two stage CMOS op-amp.

This paper describes analysis and design of 2-stage CMOS operational amplifier (Op Amp). The designed circuit operates at supply voltage. The performance parameters such as: gain, phase margin, GBW, ICMR, Slew Rate, Offset, CMRR, output swing etc. also have been analysed after simulation which is carried out using micro wind, LTspice.

To design an operational amplifier (op-amp) the fundamental knowledge on differential amplifier is needed because of their formation mechanism inside the op-amp. As the amplifier has two input terminals so one input voltage is applied to one terminal and the other voltage is applied to the other input terminal and the output of the circuit is the amplified version of the potential difference between the two terminals [V+] & [V-]. The output voltage can be analysed by connecting each input terminal to 0 V ground using superposition theorem. The differential amplifier is a basic element in most of the electronic circuits.

The trend towards low voltage low power silicon chip systems has been growing due to the increasing demand of smaller size and longer battery life for portable applications in all marketing segments including telecommunications, medical, computers and consumer electronics. The operational amplifier is undoubtedly one of the most useful devices in analog electronic circuitry. Op-amps are built with different levels of complexity to be used to realize functions ranging from a simple dc bias generation to high speed amplifications or filtering. With only a handful of external components, it can perform a wide variety of analog signal processing tasks. Op-amps are among the most widely used electronic devices today, being used in a vast array of consumer, industrial, and scientific devices. Operational Amplifiers, more commonly known as Op-amps, are among the most widely used building blocks in Analog Electronic Circuits.

Op-amps are linear devices which has nearly all the properties required for not only ideal DC amplification but is used extensively for signal conditioning, filtering and for performing mathematical operations such as

addition, subtraction, integration, differentiation etc. Generally, an Operational Amplifier is a 3-terminal device. It consists mainly of an Inverting input denoted by a negative sign, ("") and the other a Non-inverting input denoted by a positive sign ("+") in the symbol for op-amp. Both these inputs are very high impedance. The output signal of an Operational Amplifier is the magnified difference between the two input signals or in other words the amplifier differential input. Generally, the input stage of an Operational Amplifier is often a differential amplifier

II SUMMARY OF THE CONTRIBUTED PAPERS

CMOS operational amplifiers (op-amp) are fundamental parts in analog and mixed-signal circuits. Op amp designers must make the trade-off between numerous electrical characteristics, e.g., noise, output swing, power consumption, stability, gain, band width, slew rate, short-circuit current and so on. Therefore, it is necessary to derive a design procedure based on a specific architecture.

As early as the end of the 20th century, scholars began to study the design methodology of the op amp. The differential pair with active current mirror as the first-stage, common-source amplifier as the second-stage is widely used to derive the design method. According to the design flow mentioned in, the result can be matched with the design goal. And folded-cascode op amps were also widely studied as common circuit structures. The width to length ratio of the corresponding transistor can be calculated according to the requirements of the operational amplifier. In addition, some common operational amplifier structures such as symmetrical op amps, telescopic op amps, and three-stage op amps have also been studied.

With the rapid development of integrated circuit technology, the power supply voltage of the chip is continuously decreasing. To ensure adequate dynamic range, op amps with rail-to-rail input and output capabilities are becoming a design trend. As one of its implementations, the circuit architecture proposed. It combining the folded-cascode input stage and the class AB output stage becomes a common basic architecture.

In the modern era of electronics industry use of MOS has become substantial. Nowadays it is possible to

integrate millions of transistors on an integrated circuit (IC) economically due to its high integration density and relatively simple manufacturing process. Due to an increasing trend towards reduced supply voltages and transistor channel length the demand for high performance analog integrated circuits is increasing. There is a large demand of CMOS technology in the market due to its properties of scaling i.e. CMOS circuits can be reduced to micrometer or even nanometer region for higher performance.

Operational amplifier is the basic component used in many electronics circuits. As the aspect ratio changes, there is a trade-off among speed, gain, power and other parameters. CMOS OP-AMPS with considerable dc gain and higher unity gain frequency is the main challenge we are facing.

we propose design of high- gain two stage CMOS op-amp alongside accurate equations. Here analysis derived using important parameters (gain bandwidth, phase margin, slew rate, etc.) is performed. In this paper to achieve stability in two stage op-amp circuit design we have used pole splitting miller compensation technique. Handling a wide variety of specifications and constraints we tackle the CMOS op-amp design problem and its aspect ratio. This method can be applied to a number of amplifier structures, but in this paper, we implement this method to the design of a two stage CMOS op-amp. The effect of variations in channel width and length on performance of two stage op-amp is discussed.

With the increasing level of integration, testing of analog and mixed signal blocks has substantially contributed to the overall cost of the IC. Analog circuit have been tested for critical specification such as linearity, common-mode rejection ratio, signal to noise ratio, slew rate, ac gain that result in long testing time, poor fault coverage, high cost. Hence, we need to explore and investigate some cost effective, robust test method without any additional signal generation circuit.

Two-stage operational amplifiers often prove inevitable in applications such as hearing aids for isolating the gain and swing requirements, with the first stage providing a high gain and the second stage providing a large output voltage swing. In the process of frequency compensation of classical two stage CMOS op-amp,

one of the dominant poles must be moved towards the origin so as to place the Gain Crossover frequency well below the Phase Crossover frequency. Various techniques have been reported earlier from which emphasize a single effective low frequency dominant pole which provides a proper phase margin at the cost of -3 dB bandwidth of open loop gain.

Operational Amplifiers (Op-Amp) are an essential block in the modern integrated systems. They are used in wide variety of circuit topologies such as data converters, filters, and voltage regulators.

However, continued scaling in CMOS processes has continuously challenged the established paradigms for operational amplifier design. As CMOS technology continues to evolve, the supply voltages are decreasing while at the same time the transistor threshold voltages are remaining relatively constant. Making matters worse, the inherent gain available from the nano-CMOS transistors is dropping.

Several frequency compensation techniques such as Miller and cascode compensations are used to design the stable two-stage op-amps. The main drawbacks of Miller compensation scheme are the low speed and low power supply rejection ratio (PSRR) compared to the cascode compensation. Cascode compensation scheme achieves higher speed and higher PSRR compared to Miller compensation at the cost of complex design and analysis procedure.

To increase the open-loop DC gain, frequency compensated two-stage op-amp could be used. Among possible compensation alternatives proposed for two-stage op-amp, cascade compensation has been extensively analysed and employed. This is due to the fact that it usually leads to lower power consumption, higher speed and higher power supply rejection ratio (PSRR) when it is compared with more traditional methods such as Miller compensation. However, these advantages are at the cost of more complexity in the optimization and robustness of cascode-compensated structures. Perhaps, the main reason for such complexity is the increase in the order of the system up to three when the compensation is applied to a two-stage op-amp. Folded cascode Op-Amp has medium dc gain. Compared to single-stage amplifiers, two-stage ones have higher dc gain and swing but because of their extra poles and zeros, if they do not compensate

properly, they can easily become unstable. Due to the mentioned issues we decided to design a two-stage op-amp based on miller compensation. Since, we would like to use the 50 nm technology MOSFETs, the cascode and miller compensated op-amps, could not satisfy our conditions, hence we proposed a novel method for compensating the two-stage op-amps. This method employs the miller compensation technique in an indirect way.

Two-stage op-amps are used widely in industry to achieve both high DC gain and high output voltage swing simultaneously. To avoid instability when applying negative feedback, the frequency response of these amplifiers should be properly shaped using a frequency compensation technique.

There are several alternatives proposed so far to stabilize closed-loop two-stage amplifiers. For a particular amount of power consumption, each of these techniques makes a special trade-off between the stability and bandwidth.

In most general-purpose op-amps there is a single ended output. Usually an op-amp produces an output voltage a million times larger than the voltage difference across its two input terminals. For most general applications of an op-amp a negative feedback is used to control the large voltage gain. The negative feedback also largely determines the magnitude of its output ("closed-loop") voltage gain in numerous amplifier applications, or the transfer function required. The op-amp acts as a comparator when used without negative feedback, and even in certain applications with positive feedback for regeneration. An ideal Op-amp is characterized by a very high input impedance (ideally infinite) and low output impedance at the output terminal(s) (ideally zero). To put it simply the op-amp is one type of differential amplifier. This section briefly discusses the basic concept of op-amp. An amplifier with the general characteristics of very high voltage gain, very high input resistance, and very low output resistance generally is referred to as an op-amp. Most analog applications use an Op-Amp that has some amount of negative feedback. The Negative feedback is used to tell the Op-Amp how much to amplify a signal. And since op-amps are so extensively used to implement a feedback system, the required precision of the closed loop circuit determines the open loop gain of the system.

Two-stage CMOS is the most common configuration utilized when designing Op-amps. The 1st stage is defined by a differential input and single-ended output, and the 2nd stage is considered as an inverted output stage. The gain of both stages is achieved between 40dB to 100dB. The addition of an RC network to the system results in frequency compensation, while removing the feed forward path from the 1st stage to the Op-amp, allows Op-amp to degrade the stability. During the designing stages, a well-known fault diagnosis method was utilized to check the designed Op-amps status. Output results of previous studies illustrated that the load capacitance increased up to 100PF can improve the frequency of PSRR. Designing a CMOS Op-amp with high unity-gain bandwidth, DC gain, and output swing requires a two-stage amplifier. The problem with this configuration is reduced speed due to the extra poles and zeros. The result is found in cascade frequency compensation.

This system displays greater speed and PSRR than miller compensation, adding a capacitor between the low impedance node of the 1st stage and output node of the 2nd stage. A potential advantage of this system is that the energy production takes place near the consumer, which can minimize the power losses in the distribution lines. Two-stage Op-amps are selected in this study because of their improved DC gain and ample output swing. Another method to improve frequency compensation is adding a miller capacitor to the Op-amps and using the objective function to obtain the threshold for the sale of reactive energy. The issue of feedforward signal path that creates (RHP) zero in the Op-amp is addressed by designing a series resistor or voltage/current buffer with a miller capacitor.

Important definitions

Open loop gain: When there is no positive or negative feedback given in the circuit then obtained gain is known as open loop gain. An ideal op-amp has infinite open loop gain.

Common mode gain: When same voltage is applied on both the terminals of operational amplifier, the ratio of output to input voltage calculated is known as common mode gain of operation amp.

Common mode rejection ratio: Common mode rejection ratio (CMRR) is the ratio of common mode to differential mode gain. In a perfect world this proportion would be endless with common mode a voltage being completely dismisses.

$CMRR = \text{Differential gain} - \text{Common mode gain}$

Slew rate: When there is step change in input then corresponding to that rate of change in output voltage is known as slew rate of the operation amplifier.

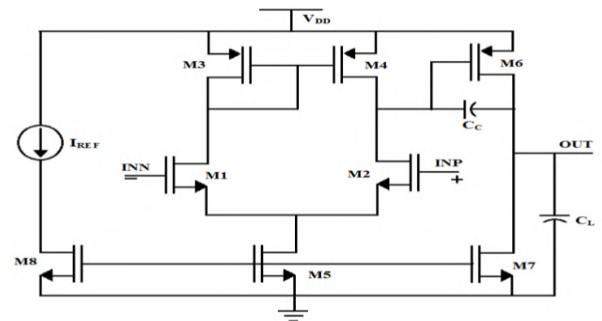
Common mode voltage range (CMVR): The scope of common mode signals applied at input of operational amplifier for which its operation remains linear is known as CMVR (common mode voltage range).

Input common-mode range (ICMR): ICMR is the range of common-mode voltages over which the differential amplifier continues to sense and amplify the difference signal with same gain.

Power supply rejection ratio (PSRR): PSRR is the ability of an amplifier to maintain its output voltage as its DC power supply voltage is varied.

$PSRR = (\text{change in } v_{cc}) / (\text{change in } v_{out})$

DESIGN METHODOLOGY



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Arduino-Based Smart Dustbin

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Abstract - The main goal of the project is to create a smart dustbin that will aid in keeping our environment clean and eco-friendly. Swaach Bharat Mission has inspired us. As technology advances, we are developing a smart dustbin using Arduino to help clean the environment. This smart dustbin management system is based on a microcontroller-based system with ultrasonic sensors on the dustbin. If dustbins are not kept clean, they can pollute the environment and harm our health. In this proposed technology, we created a smart dustbin using an ARDUINO UNO, an ultrasonic sensor, a servo motor and a battery jumper wire. After connecting all of the hardware and software, the Smart Dustbin programme will be launched. When someone approaches within a certain range, the dustbin lid will wait for the user to place garbage and close it. Whether it's properly running or not. It will benefit society by improving health and hygiene, and it will benefit business by making it affordable to as many people as possible. So that everyone, from the poor to the wealthy, can benefit from it.

INDEX TERMS: ARDUINO, MICROCONTROLLER, IOT, CIRCUITRY

I. INTRODUCTION

The rate increasing population in our country has increasing rapidly and also we have increase in garbage which have increased environmental issue. Dustbin is a container which collects garbage's or stores items which recyclable or non-recyclable, decompose and non-decompose. They are usually used in homes, office etc, but in case they are full no one is there to clean it and the garbage are spilled out. The surrounding of a dustbin is also conducive for increasing the pollution level. Air pollution due to a dustbin can produce bacteria and virus which can produce life harmful diseases for human. Therefore, we have designed a smart dustbin using ARDUINO UNO, ultrasonic sensor which will sense the item to be thrown in the dustbin and open the lid with the help of the motor. It is an IOT based project that will bring a new and smart way of cleanliness. It is a decent gadget to make your home clean, due to practically all offspring of home consistently make it grimy and spread litter to a great extent by electronics, rappers and various other things. Since the smart dustbin is additionally intriguing and children make fun with it so it will help to maintain cleanliness in home. It will be applied

for various type of waste. Dustbin will open its lid when someone/object is near at some range then it will wait for given time period than it will close automatically. Here lid will close when you don't want to use and it will only open when it required.

II. METHODOLOGY

SMART DUSTBIN USING ARDUINO is an IOT based project. Here we are using arduino for code execution, for sensing we used ultrasonic sensor which will open lid and wait for few moment. It will bring drastic changes in tern of cleanliness with the help of technology. Everything is getting with smart technology for the betterment of human being. So this help in maintaining the environment clean with the help of technology. It is a sensor based dustbin so it would be easy to access/use for any age group.

Our aim is also to make it cost effective so that many numbers of people can get the benefit from this. And it should be usable to anyone and helpful for them.

To complete our project, we require some software as well as some hardware.

Required Software:

1. ARDUINO IDE

Required Hardware:

1. ARDUINO UNO
2. ULTRASONIC SENSOR
3. SERVO MOTOR
4. 9V BATTERY
5. DUSTBIN

6. JUMPER WIRES

• PROCEDURE:

SERVO MOTOR CONNECTION SETUP:

Now, let me take you through the actual setup and build process of the Smart Dustbin using Arduino. First, I will start with the mechanism to open the lid. As you might have already guessed, I have used a Servo Motor for this purpose. In order to open the lid, I have fixed a small plastic tube (like an empty refill of a ball-point pen) to the servo horn (a single ended horn) using instant glue. For this mechanism to be able to open the lid of the dustbin, it must be placed near the lid.

In this the actual setup of dustbin design and build the system by using Arduino. Starting with the mechanism of opening the lid of dustbin, for this purpose Servo motor has been used. To open the lid, I have attached a small plastic tube (like an empty refill of a ball-point pen) to the servo horn (a single ended horn) using instant glue.

ULTRASONIC SENSOR CONNECTING:

After successfully servo motor is placed now it's time for sensor, so HC-SR04 Ultrasonic sensor is placed at the front of the dustbin.

WIRING UP THE COMPONENTS: The final

step in the build process is to make the necessary connections using long connecting wires as per the circuit diagram and securing these wires so that they don't hang around. All the wires from both the components i.e. Ultrasonic Sensor and Servo Motor are connected to respective pins of Arduino. This finishes up the build process of the Smart Dustbin. In Arduino Code has been submitted, and with all hardware and software

connection in Dustbin. We will run our dustbin, wait its working or not.

CIRCUIT DIAGRAM:

The circuit diagram of smart dustbin is shown in given below. Arduino Uno board consist ATmega328 P microcontroller, it is important component of UNO board. In this other components are present like a power supply, ultrasonic module and servo motor etc.

The ultrasonic sensor echo pin and trigger pin is connected to pin digital pin D7 and D8. The

+Vcc pin is connected to +5V supply and GND pin is connected to ground pin of arduino Uno board. The control (PWM) pin of servo motor is connected to digital pin D9 of arduino. Hence, servo motor is used to open the cap of dustbin.

For this project and components used, the preset level of distance between dustbin and hand is fixed to 40 cm.

Ultrasonic Sensor: This sensor is used in to locate the distance between the smart dustbin and hand/object come near to it. The principle behind finding distance of obstacle is sonar wave. It only detects obstacle when Trigger pin receive high pulse for the period more than 10 us. When this sensor verifies the presence of hand (obstacle) it starts to send eight cycles of ultrasonic burst at 40KHz and then it waits for reflected ultrasonic signal.

Ultrasonic sensor module has two drums. One of the drums is used for transmitting the pulse of ultrasonic and the second drums are for receiving the ultrasonic signal.

When ultrasonic detect/sense object, the echo pin of module is set high. Waiting period of reflected pulse is completely dependent upon the location of obstacle. When the echo signal is obtained, we can calculate the distance by using the formula

$$\text{Distance (in cm)} = (\text{duration}/2) / 29.1$$

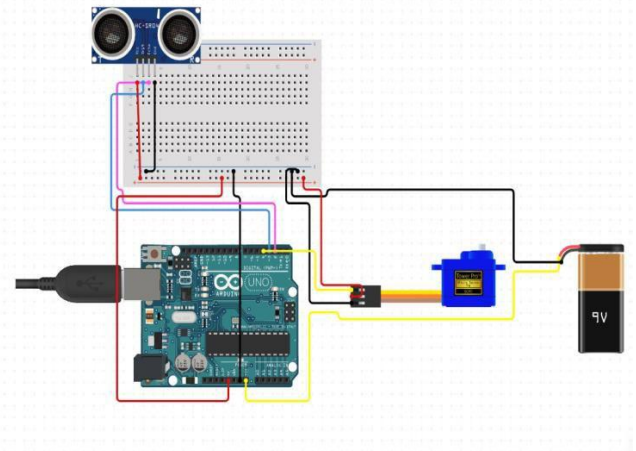


Fig .1 Circuit Diagram

Initially, the cap of dustbin is switched back to zero-degree position (Close) by the servo motor. The controller keeps on monitoring the signal receive from ultrasonic module. When ultrasonic module detects an obstacle, the controller check if it crosses a threshold distance value set for open the cap of dustbin.

As soon as that happens, the controller triggers the servo motor when then open the cap for limited line (as set in code part). For this system prototype set time is given for 2 second.

Here in this project also used an ON/OFF switch, in order to activate and de-activated the smart dustbin whenever require as per situation. A pull-up resistor of 10K is connected in series of switch as shown in circuit diagram in order to solve the de-bouncing problem.

We can also use Arduino NANO instead of Arduinouno. Do not have to change source code because the board use identical pin for controlling servo motor, switch and ultrasonic sensor.

The simplest part of the project smart dustbin using arduino is software part because it is clean, simple and easy to understand. The program check the distance had also used “Servo.h” inbuilt library function for servo operation. It can assume

any value of motor rotation using “myServo.write(angle)” function but here we had only use two state of position (1) zero degree and (2) 180°.

A. Working:

After wiring and attaching all the devices and setting up to the Smart Dustbin, now observe all the important setup whether they are well connected or something missed.

After connection set up now next step is to submit/upload code in Arduino and supply power to the circuit.

When system is powered ON, Arduino keeps monitoring for any things that come near the sensor at give range.

When Ultrasonic sensor detect any object for example like hand or others, here Arduino calculates its distance and if it less than a certain predefines value than servo motor get activate first and with the support of the extended arm of the lid.

Lid will open for a given time than it will automatically close.



ADVANTAGES:

Following are the advantages of using Smart dustbin:

- A reduction in the number of waste collections needed by up to 80%, resulting in less manpower, emissions, fuel use and traffic congestion.
- A reduction in the number of waste bins needed.
- Maintain environment hygiene (i.e. no overflowing of waste and less unpleasant odor).

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CONCLUSION

Here we are going to make an evolution changes toward cleanliness. The combination of intelligent waste monitoring and trash compaction technologies, smart dustbins are better and shoulders above traditional garbage dustbin. It is equipped with smart devices like sensor Arduino etc. Lid of the dustbin will automatically open when an object comes near to the dustbin and after certain time period it will close the lid.

For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it. Believe this will bring something changes in term of cleanliness as well technology. So our next work will be adding one more sensor which will sense whether our dustbin is full or not. And there will be a display will be added so that user can notify that dustbin is full or not.

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Real Time Drone Detection System Using Web Based GUI

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Abstract - The commercial unmanned aerial vehicle (UAV) industry, commonly known as drones, has seen tremendous growth over the past few years, making these devices highly accessible to the public. This phenomenon immediately raised safety concerns, as these devices can intentionally or unintentionally cause serious hazards. In order to protect critical sites, academia and industry have proposed several solutions in recent years. Due to its robustness, computer vision is widely used for autonomous drone detection compared to other proposed solutions such as RADAR, acoustics and RF signal analysis. Among these computer vision-based approaches, we see a preference for deep learning algorithms due to their efficiency. In this paper, we present an autonomous drone detection system that uses only camera power. With this approach, we are able to build an efficient pipeline where the initial detection of small aerial intruders is on the main image plane with the help of state-of-the-art neural networks.

I. INTRODUCTION

The exponentially increasing availability of drones to the public poses a major threat to general safety and privacy. Drone sales continue to increase every year and are expected to become much more widespread in the future. To emphasize the importance of this topic, we can cite several drone incidents in recent years as examples: an alarming security incident around the White House, the mysterious appearance of several drones for several days around nuclear power plants in France, a terrifying near-drone collision. airliner and drone near LAX airport, and the intrusion of a drone by an opposition party during the German chancellor's campaign alerted security officials. Drones are also perfect tools for illegal smugglers due to their low visibility. For example, recently US officials busted drug cartels smuggling drugs from Mexico, and Chinese police uncovered the illegal trafficking of smartphones from Hong Kong to mainland China. Prisoners have tried many times to use drones to smuggle items in and out of the prison. Due to their potential to carry high explosive loads, they become a more significant concern for the public and officials. Many more reported security incidents involving drones can be found in recent years.

II. EXISTING SYSTEM

Based on the above examples, it can be said that the detection and elimination of drones from lethal consequences is in the first place. This task has been intensively researched by academia and industry for the commercialization of anti-drone systems. Some systems on the market and architectures designed by researchers offer autonomous UAV detection and identification using either RF signal detection (used for communication between the device and the ground operator), acoustics, RADAR, LIDAR

Disadvantages

1. Cannot differentiate between drone and not-drone object.
2. Expensive hardware and complicated Software.
3. Not highly accurate.

III BACKGROUND STUDY

Unmanned aerial systems (UAS), or drones as they are most commonly known, can be found using drone detection technologies. A variety of technologies are used to detect drone activity in airspace. The capabilities of each technique vary with respect to drone size and detection range. RF sensors can be used to track RF controlled drones, while radar detection can be used to track GPS pre-programmed drones flying in a certain direction. To verify a drone threat, visual detection technology such as Pan, Tilt and Zoom (PTZ) cameras can be used to obtain images of a suspected drone.

Remember that each type of technology has unique advantages and disadvantages. Organizations looking to address drone threats should be aware of the limitations of each technology. Certain environments are better suited to certain detection systems than others. However, you can reliably detect and track most drones by layering and using multiple technologies.

1. The use of radio frequency (RF) technology for drone detection
2. Using radar to find drones
3. Using visual tracking, find drones

IV PROPOSED SYSTEM

In the proposed system, we will use state-of-the-art neural networks to locate the exact coordinates of any drone in a given camera image in real time

Advantages

1. Can differentiate the background from drones and only drones.
2. Not expensive and open source
3. More accurate than the existing system
4. Availability of Web based GUI makes the system easy to use

Software Requirements:

- Python 3.6 or >
- All the OS which can afford python 3.6 or > like windows 10, mac os, etc
- Necessary python modules

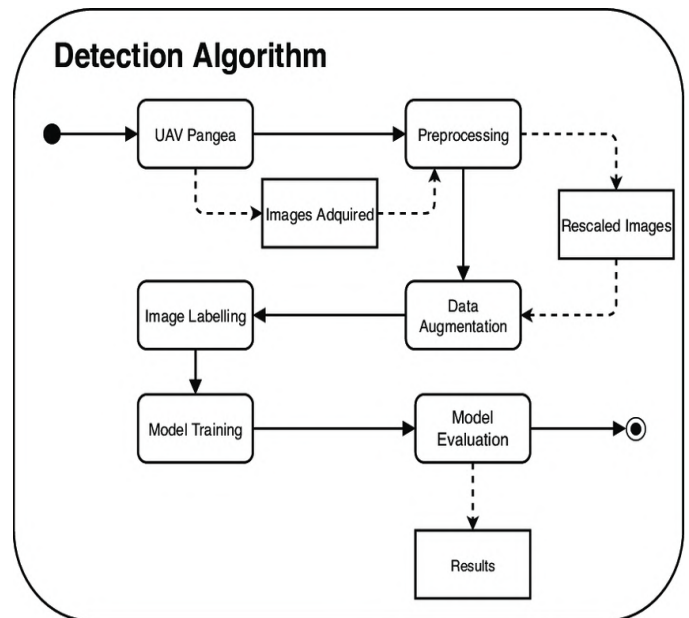
Hardware Requirements:

- Processor: Intel i3 eq or >
- RAM: 8 GB or >
- ROM: 64 GB or >

Modules

- Interacting with camera
- Image frame acquisition
- Processing input frame
- Algorithm prediction
- Output visualization

Architecture Diagram



V STRUCTURED DESIGN

Structured design conceptualizes a problem into several well-organized elements of a solution. It's something about essentially solving a design. The advantage of a structured design is that you can better understand what is being done and how the problem is being solved. Structured design, the designer facilitates further focus on the problem.

Structured design is primarily based on a divide-and-conquer strategy. In this strategy, the problem is divided into a number of small problems, until the whole problem is solved, the small problems will be solved one by one.

Small problems are solved by solution components. The structured design emphasizes that these modules are properly arranged to achieve a precise solution.

These modules are organized hierarchically. They communicate with each other. A well-structured design always follows some rules for communication between multiple modules:

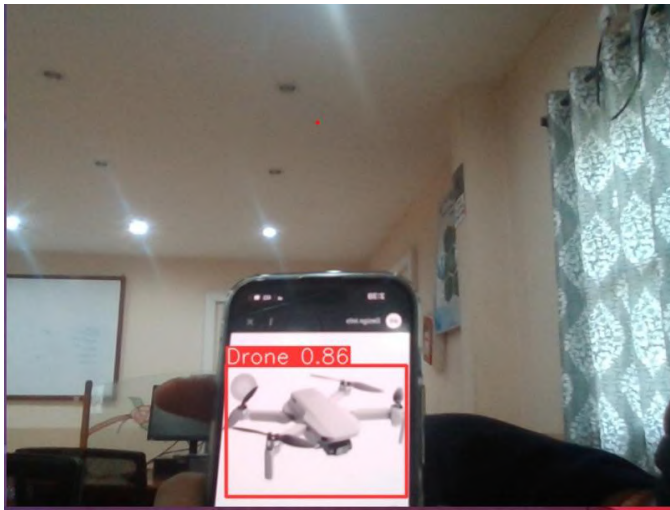
Cohesion – grouping of all functionally related elements.

Connection of communication between different modules.

Well-structured design with high cohesion and low binding.

CONCLUSION

The Project is being implemented. In our system, we will be using a State-Of-The-Art Neural Networks to locate the exact co-ordinates of the any drone in the given image frame form the camera in real time.



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Digital identity: Mathematical framework based on Elliptic curve cryptography and Modified ElGamal security protocols

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Abstract—Today's digitalization has a significant impact on daily living. Digitalization makes a lot of things simpler. A lot of data is shared across the open network in this digitalization. Security of such data is crucial when dealing with sensitive information. The main security objectives are data confidentiality, sender identity verification, and non-repudiation. Elliptic Curve Digital Signature Algorithm (ECDSA) and modified ElGamal encryption techniques are used in this project to present a digital signature algorithm. The results show that the performance of the proposed MEC is better than the traditional EC in terms of execution time and expansion rate. Whereas, the security of the proposed MEC is analogous to the traditional EC, which is based on the difficulty of solving the discrete logarithm problem.

Keywords— Elliptic Curve Digital Signature Algorithm (ECDSA), ElGamal encryption, MEC, Discrete Logarithm.

I. INTRODUCTION

The purpose of cryptography is to design and analyze protocols that prohibit third parties or the general public from reading private communications. The three prevalent categories of cryptography are symmetric cryptography, asymmetric cryptography and protocols. Now days lot of information go through the internet using different means. Some of the information are highly confidential and we cannot compromise with its security. So, we use lot of different techniques and algorithms to make our data as much secure as possible. And these techniques and algorithms are collectively called as Cryptography. In Cryptography, for the communication, a sender gives some code to his message. This process is called "encryption". After getting that code, receiver decodes it. This is known as "decryption". One can find various algorithms according to the types of cryptography. In general, there are three types of Cryptography: 1. Symmetric Key Cryptography (Secret Key Cryptography) 2. Asymmetric Key Cryptography (Public Key Cryptography) 3. Hash function Like secure exchange of messages, the exchange of documents

requires special security measures to safeguard the information from unauthorized access. For that cryptography gives solutions in form of 'Digital Signature'. Digital signature schemes are designed to provide the digital counterpart to handwritten signatures. A digital signature is a number dependent on some secret, known only to the signer (the signer's private key) and additionally on the contents of the message being signed. Signatures must be verifiable — if a dispute arises as to whether an entity signed a document, an unbiased third party should be able to resolve the matter equitably, without requiring access to the signer's private key. Disputes may arise when a signer tries to repudiate a signature it did create, or when a forger makes a fraudulent claim. There are mainly three stages in Digital signature as follows: (1) Key Generation (2) Signature Generation (3) Signature Verification Suppose there is a Sender A and a Receiver B: - Sender (A) end: - → Sender A inputs hash function, it generates a fixed binary value to a signature. → Signature is formed with the help of private key encryption. → Signature along with the original message is sent to the Receiver B. Receiver (B) end: - → When B receives the message from A Signature is decrypted with public key. When the received message from the decryption is matched with the original message and results to be same, we can say that the message has been properly received from source to destination without losing its contents and provides all internet security requirements i.e., integrity, confidentiality, non-repudiation, and authentication etc

II. RELATED WORK

Iswari NM.[23],RSA is an algorithm for public-key cryptography and is considered as one of the great

advances in the field of public key cryptography. RSA security lies in the difficulty of factoring large number into prime factors. The inventor of RSA Algorithm suggests prime number that is used to generate the keys have more than 100 digits' length for security reasons. Elgamal algorithm also is one of public key cryptography algorithm. The security of this algorithm lies in the difficulty of calculating discrete logarithm. In this paper, the author proposes key generation algorithm that is considered safe from the combination of the RSA and Elgamal algorithm. Based on the experiment that has been done, the computing time required for the proposed algorithm is relatively short, compared to the original RSA algorithm.

Inam S, Ali R.[24], developed a new ElGamal-like public key cryptosystem based on the matrices over a grouping. The underlying hard problem for this cryptosystem is the conjugacy search problem. That is, we have replaced the exponentiation of elements by conjugacy. This makes the key generation step more efficient. We also talk about different security aspects against known attacks. The proposed scheme is found to be secure against known plaintext attack when encryption uses a different.

Ordonez AJ, MedinaRP, Gerardo BD [25], presents a modification of the ElGamal Encryption Algorithm which allows multiple senders to encrypt a plaintext message using multiple private keys intended for a single recipient for decryption. This provides a solution to situations requiring an extra level of security through multiple monitoring and multiple controls. The additional private keys used by the process also improve the complexity of the algorithm which limits the chance of breaking the algorithm using brute force or systematic attack

Okeyinka AE [26], the Elgamal and RSA algorithms are two of the cryptographic techniques that are actively in use for securing data confidentiality and authentication. The energy usage analysis of the two algorithms has been investigated and it was established that RSA is more energy efficient than Elgamal. The goal of this study is to carry out computational speeds analysis of the two algorithms. The methodology employed involves implementation of the algorithms using same programming language, programming style and skill, and programming

environment. The implementation is tested with text data of varying sizes. The results obtained reveal that holistically RSA is superior to Elgamal in terms of computational speeds; however, the study concludes that a hybrid algorithm of both the RSA and Elgamal algorithms would most likely outperform either the RSA or Elgamal. It is therefore recommended that efforts at designing a new algorithm from the study of these two algorithms should be considered.

III. PROPOSED SYSTEM

This project presents a Modified ElGamal Cryptosystem (MEC) to increase the efficiency by speeding up the execution time and reducing the expansion rate in the file size after the encryption process. It is based on three main processes respectively as follows:

- Key Pair Generation Algorithm.
- Encryption Algorithm.
- Decryption Algorithm

Key pair generation

The key pair generation steps are similar to the traditional EC. The receiver has to consider the following steps to generate the public and private key pair:

- Generate a large random prime number (P).
- Select a primitive root (G), where $1 < G < P-1$.
- Select an integer (X), where $(1 \leq X < p)$.
- Calculate $Y = G^X \text{ mod } P$.

Encryption algorithm

In the encryption process of the proposed MEC is discussed

1. The Unicode is used in our proposed scheme to be able to deal with the characters of all available languages across the globe such as English, Arabic, Kurdish, etc.

Decryption algorithm

This section explains the decryption process of the proposed MEC in details.

IV. METHODOLOGY

Key Generation

- i. Generate a large random prime number (p).
- ii. Choose a generator number (a).

- iii. Choose an integer (x) less than (p - 2), as the secret number.
- iv. Compute (d), where $d = a^x \text{ mod } p$.
- v. The private key is given as (x) and the public key as (p, a, d).

Encryption and Decryption

Represent the plaintext as an integer m, where $0 < m < p - 1$.

Encryption is achieved using the public key (p, a, d).

- i. Choose an integer k such that $1 < k < p - 2$.
- ii. Compute y, $y = a^k \text{ mod } p$.
- iii. Compute z, $z = (d^k * m) \text{ mod } p$.
- iv. The ciphertext is given as $C = (y, z)$.

Decryption is achieved using the private key (x).

- i. The receiver obtains the ciphertext $C = (y, z)$.
- ii. Next, r is computed as follows: $r = y^{p-1-x} \text{ mod } p$.

The plain text is recovered as follows: $m = (r * z) \text{ mod } p$.

Signature Generation

This is accomplished first by generating the hash m of the message M, with the private key given as (x).

The signer should then perform the following:

- i. Choose a random integer K with $1 \leq K \leq (p - 1)$ and $\text{gcd}(K, p - 1) = 1$.
- ii. Compute the temporary key: $h = a^k \text{ mod } p$.
- iii. Compute K - 1 the inverse of K mod (p - 1).
- iv. Compute the value $s = K^{-1}(m - xh) \text{ mod } (p - 1)$.
- v. The signature is (h, s).

Any other user who receives the message M and signature (h, s) can carry out verification using the public key (p, a, d) by computing the following:

- i. The hash m for the message M;
- ii. $V_1 = a^m \text{ mod } p$;
- iii. $V_2 = d^h h^s \text{ mod } p$;
- iv. The signature is valid if $V_1 = V_2$.

The SHA-256 Hash Function

SHA-256 (secure hash algorithm, FIPS 182-2) is a cryptographic hash function that processes input blocks of 512 bits with a digest length of 256 bits. It is a keyless hash function. The SHA-256 follows the same model as SHA-1 and begins by defining

several constants [25,26,27,28,29]. Several operating systems frequently use hash methods to secure passwords. **Figure 3** illustrates how hashing assesses a file’s authenticity. **Figure 4** shows the hashing algorithms involving rounds of the hash function such as a block cipher

The SHA-256 Algorithm

The algorithm for the SHA-256 hash function is given below:

1. Append a single bit, whose value is set to 1, to the input x.
2. Compute the smallest r such that $(b + r) \text{ mod } 512 = 448$. Append r-1 bits, whose values are set to 0, to the result of step 1.
3. Compute the 64-bit value $b \text{ mod } 2^{64}$ and append this value to the result of step 2.
4. This yields a string of length that must be a multiple, m, of 512 bits and, thus, may be represented as $16 * m$ 32-bit blocks.

V. SYSTEM ARCHITECTURE

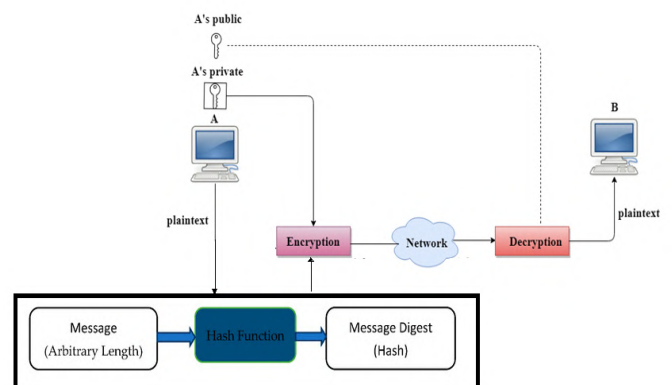


Figure 1: System Architecture

VI. IMPLEMENTATION

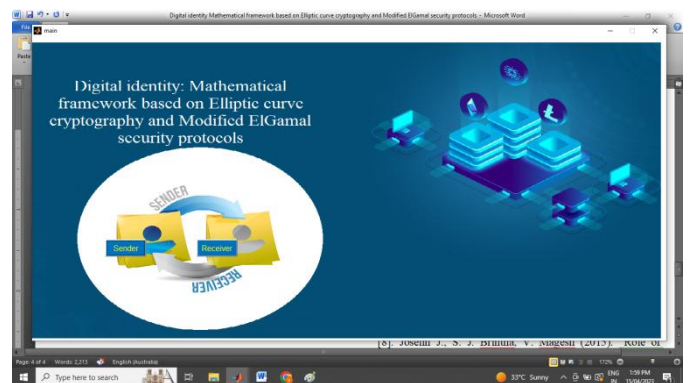


Figure 2: Main



Figure 3: Sender Registration

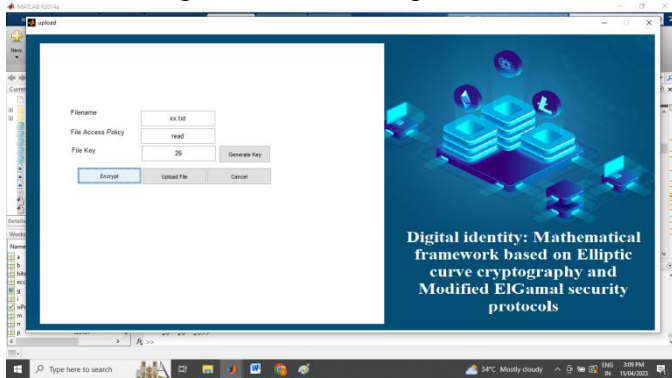


Figure 4: Upload file

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|---|
| <p>EI-Gamal Cryptography algorithm</p> <p>Enter the prime no. for p: 13</p> <p>Public key is (11,39)</p> <p>Private key is (11,39)</p> <p>Enter the message: Hello</p> <p>ASCII equivalent of message</p> <p style="text-align: center;">72 101 108 108 111</p> <p>The encrypted message is</p> <p style="text-align: center;">38 38 38 38 38</p> |
|---|

Table 1: EI-Gamal Encryption Cryptography algorithm
EI gamal cryptography works in 3 steps/stages

- a. Key generation
- b. EI-gamal encryption
- c. EI-gamal decryption

A. EI gamal key generation:

1. Select a large prime number ‘p’
2. Select encryption key ‘e₁’ to be primitive root of mod p
3. Select decryption key ‘d’ such that 1 ≤ d ≤ p-2
4. Select encryption key ‘e₂’ such that

$$e_2 = e_1^d \pmod p$$

1. Form the set i.e public key (e₁, e₂, p) to be announced publicly
2. Private Key ‘d’ to be kept secret.

B. EI gamal key encryption:

1. Select a random number ‘r’
2. Compute the first part of ciphertext ‘c’₁, c₁ = e₁^r mod p
3. Compute the second part of ciphertext ‘c’₂, c₂ = (e₂^r * PT) mod p

C. EI gamal key decryption:

1. Calculate the PT

$$PT = (c_2 * (c_1^{p-1-d})) \pmod p$$

VII. CONCLUSION

This project proposes a MEC to overcome the drawbacks of the traditional EC. Some modifications are performed to the traditional EC to decrease the size of the cipher text and to speed up the execution time. Where, this is accomplished via using addition operation instead of the multiplication in the encryption process. Based on the experimental results, the proposed scheme reduces the expansion rate in the traditional EC by 89%. As well as, it accelerates the execution time which makes the proposed scheme performs better than the traditional EC. So, our goal is achieved and the efficiency of ElGamal Cryptosystem is increased significantly. While, the security of the proposed scheme is not affected which is the same of the security for traditional EC that is based on the difficulty of solving the discrete logarithm problem.

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Automatic Floor Cleaning Robot

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Abstract- Automatic floor cleaner is an automated machine that facilitates the user to keep their place clean and hygienic. Many industries are working in the automation field to make autonomous cleaners. This paper deals with the development of automatic floor cleaner. Now a day's major emphasis is given on the field of robotics for decreasing human efforts. Our aim is to construct a floor cleaner which will be fully automatic providing dry and wet cleaning as well as UV sterilization. The current market is occupied by cleaners with only one or two functionality. For its cost reduction and simplicity, we are using Arduino. The cleaner will be a step for providing comfortable life by resolving problems in traditional floor cleaning methods.

I. INTRODUCTION

Robots have turned out to be an important part of day-to-day life due their effectiveness in assisting humans in various applications. In this paper, we are considering one of those applications in the form of cleaning. Considering this, we are proposing an Arduino controlled model that performs the required operation of cleaning. The main aim of this project is to develop a low maintenance, cost effective, versatile prototype robot that can perform dry as well as wet cleaning. It can operate in autonomous mode and is designed with some additional features like UV sterilization, vacuum cleaner. All these features turn out to be handy in improving the life style of humankind

It simultaneously executes sweeping and scouring jobs, detects obstacles, and also includes an automated water spray. Features of Floor Cleaning Robot:

1. Robotic vacuums are quite simple to use.
2. Operation With No Hands.
3. Easy to maintain.
4. Establish a cleaning schedule.
5. It helps you save time and effort.
6. Wi-Fi accessibility.
7. Capable of handling small spaces

II. LITERATURE REVIEW

ManreetKaur,PreetiAbrol,"Design and Development of Floor Cleaner Robot".In International Journal of Computer Application,July 2014.

With the advancement of technology, robots have gotten more attention of researchers to create lifetime of mankind easy. The actual project presents the look and development of Floor Cleaning Robot using IEEE Standards. Developing Bluetooth controlled mobile robot. Scan the obstacles ahead of the robot and to avoid collision when the robot is in motion. Raspberry Pi3 is that the main component wont to control the cleaning robot. An ultrasonic sensor which transmits the ultrasonic waves from its sensor head and again receives the echo waves and sends its output to the Raspberry Pi3. The ultrasonic sensor is connected with the servomotor, which helps within the rotation of ultrasonic sensor. The ultrasonic sensor measures the space between the robot and therefore the obstacle ahead of it. The Pi3 model will stop the robot immediately and also the buzzer are actuated. The moping operation will be started or stopped at any point of your time as per the need. The moping brush is actuated by the DC motor fixed thereto. Signal to the present motor is fed by the controller. An LCD displays each and each operation applied by the robot. Buzzer is an audio signalling device that provides the indication of operating status of the robot.

Jens-steffenGutmann,KristenCulp,MarioE.Munich and Paolo Pirjanian."The Social Impact of aSystematic Floor Cleaner".In IEEE international workshop on advance robotics an its social impacts,Technische University munchen,Germany May 21-23,2012.

Abstract:

Mint is an automatic cleaning robot that sweeps and mops hard-surface floors using dusting and mopping cloths. Thanks to the Northstar navigation technology it systematically cleans and navigates in people's homes. Since it first became commercially available in mid 2010, hundreds of thousands of Mint cleaners are nowadays in use at home. In this paper we investigate the product's social impact with respect to the attitude of customers towards a systematic floor cleaner and how such a robot influences their lifestyle. We first report feedback from users owning the product, and demonstrate how Mint changed their everyday life at home. We then evaluate the results of a survey launched in 2012 that addresses the technical understanding of the product and what impact it has on the social life of their users. Our findings suggest that Mint, on average, saves more than one hour of people's time per week, floors are cleaner leading to healthier homes and lives, systematic cleaning is seen as an

important feature, and modifications to the environment to support the navigation of the robot are largely accepted.

Uman Khalid¹, Muhammad Faizan Baloch¹, Haseeb Haider¹, Muhammad Usman Sardar¹, Muhammad Faisal Khan^{1,2}, Abdul Basit Zial and Tahseen Amin Khan Qasuria¹, “Smart Floor Cleaning Robot (CLEAR)”.

Abstract

With the advancement of technology, robots are getting more attention of researchers to make life of mankind comfortable. This paper presents the design, development and fabrication of prototype Smart Floor Cleaning Robot (CLEAR) using IEEE Standard 1621 (IEEE Standard for User Interface Elements in Power Control of Electronic Devices employed in Office/Consumer Environments). Subject robot operates in autonomous mode as well as in manual mode along with additional features like scheduling for specific time and bagless dirt container with auto-dirt disposal mechanism. This work can be very useful in improving life style of mankind. Index Terms—Autonomous roaming, manual control, power status indications, power controls, power efficient, cleaning robot

Joseph L. Jones, Newton E. Mack, David M. Nugent, Paul E. Sandin, “Autonomous floor-cleaning robot,” U.S. Patent 6883201 B2, April 6, 2005.

Abstract

Households of today are becoming smarter and more automated. Home automation delivers convenience and creates more time for people. Domestic robots are entering the homes and people’s daily lives, but it is yet a relatively new and immature market. However, a growth is predicted and the adoption of domestic robots is evolving. Several robotic vacuum cleaners are available on the market but only few ones implement wet cleaning of floors. The purpose of this project is to design and implement a Vacuum Robot which has two cleaning modes Autonomous and Manual mode and manual mode is via phone application. Vacuum Cleaner Robot is designed to make cleaning process become easier rather than by using manual vacuum. The main objective of this project is to design and implement a vacuum robot prototype by using Arduino Mega, Laser TOF sensor, servo motor, motor driver L298N, Ultrasonic Sensor, and Vacuum suction unit and to achieve the goal of this project. Vacuum Robot will have several criteria that are user-friendly

Michael Dooley, James Philip Case, and Nikolai Romanov, “System and method for autonomous mopping of a floor surface,” U.S. Patent 8 892 251 B1, November 18, 2014.

A mobile robot configured to travel across a residential floor or other surface while cleaning the surface with a cleaning pad and cleaning solvent is disclosed. The robot includes a controller for managing the movement of the robot as well as the treatment of the surface with a

cleaning solvent. The movement of the robot can be characterized by a class of trajectories that achieve effective cleaning. The trajectories include sequences of steps that are repeated, the sequences including forward and backward motion and optional left and right motion along arcuate paths.

Harvey Koselka, Bret A. Wallach, David Gollaher, "Autonomous floor mapping apparatus," U.S. Patent 6741054B2, May 25, 2004.

Abstract:

This paper aims to develop an autonomous floor-cleaning robot that is deployed for indoor uses. The proposed method is developed based on the execution of two fundamental processes, including map building and navigation using ROS. In which the perception of the environment relies on the LiDAR, which is installed on top of the cleaning machine. Firstly, The LiDAR data is used to construct a grid map and introduces the concept of grid occupancy. Then, an algorithm is developed for path planning and trajectory tracking automatically. Furthermore, the essential information of the cleaning machine is published on the MySQL server using TCP/IP communication protocol that can be used to visualize and monitor the cleaner robot in real-time.

III PROBLEM STATEMENT

Since there are lots of problems happened during floor cleaning process, like human as well as systematic error may be happened during cleaning of floor. So to clean every Corner of Floor we are designing the robot who can do work regarded cleaning manually as well automatically.

IV METHODOLOGY

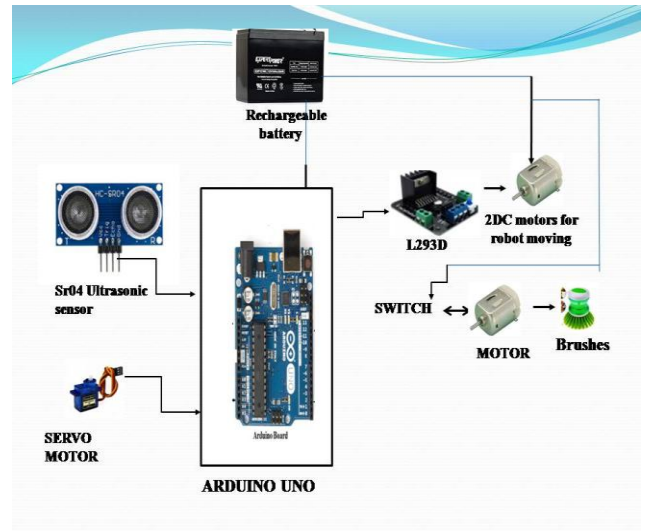


Fig 1 block diagram

The main blocks of this project are:

1. Arduino UNO.
2. DC motor .
3. SR04.

4. SERVO MOTOR.
5. Rechargeable Battery.
6. LED indication.

Software's used:

1. Arduino IDE compiler for Embedded C programming.
2. Express SCH for Circuit design.
3. Proteus for hardware simulation.

APPLICATIONS

Floor cleaning machines are generally used in cleaning of floors in residential, commercial, and industrial sectors such as medical, automotive, electronics, and other manufacturing plants for floor cleaning.

IV RESULT

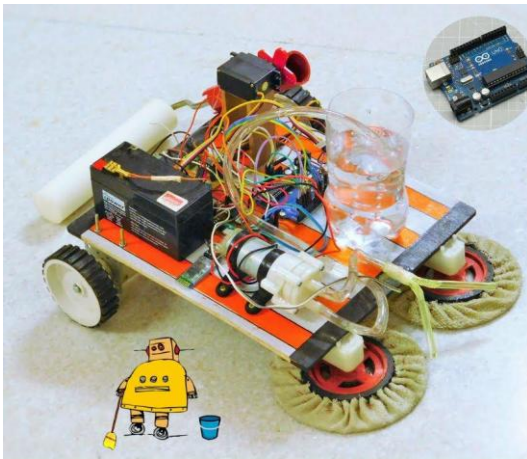


Fig.2 Setup of Proposed System

V CONCLUSION

Nowadays, it is difficult for individuals to discover time to clean their place and they decide to assign a person to clean the place. So, we decided to build a smart and automated cleaning robot which vacuums, mops and dries the floor automatically with just a press of single button. This eliminates the labor and no need of allocating separate time for cleaning the place. The initial process of the build was to design and make an effective chassis, then the sensors, the microcontroller, motor drivers, motors and its specification were decided and at last the wheels for the movement. Further, the components were assembled as per the design and testing and calibration of the device were carried out. The main motive is to build the robot as economic and easy to use for the society. This robot is capable to clean homes, schools, offices, factories completely

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Implementation of 25 Level H-Bridge Multilevel Inverter Based Grid Connected Photo Voltaic System By Using DMPC Method

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Abstract–Exceptional In this undertaking, a direct model predictive control for the novel H-Bridge staggered inverter topography based lattice related photovoltaic system (GCPS) is presented. The direct predictive control method has a couple of advantages over the normal control strategies, including optimality, ability to manage diverse control destinations, and direct control of semiconductor switches instead of the modulator. The essential control goals in the GCPS are to remove the most limit energy from the photovoltaic (PV) structure and inject the current into the organization with least full scale symphonious turning (THD) or close to fortitude force factor. The DMPC performs well similar to these control targets. The entire grid connected photovoltaic system with the proposed controller is imitated in Simulink MATLAB and the results are differentiated and the current GCPSs in the composition. The use of fewer semiconductor switches while keeping a comparative number of yield voltage levels made the proposed grid connected photovoltaic system useful, less over the top, and simpler in arrangement. Likewise, its voltage.

I. INTRODUCTION

1.1 DC TO DC CONVERSION

Dc - dc convertor extract potential out of dc origin then converts the potential reserve affected one more dc potential measure. Those make use of addition diminishing potential volume. It is generally used in cars, convenient server versatile DVD. A couple tool need an certain count potential move a tool. a much force receptacle obliterate tool force are bound to impotent move a tool. a convertor extract an power of cell along with cube through potential level, correspondingly a convertor, step-ups a potential source. As case, it very well feasibly major progress through force an enormous cell an 24 to 12 potential pass an transmission.

a fixed The low voltage got from the pv cell or clusters should be ventured up altogether to be basically either as an independent application or ventured up transformed for matrix association framework. The ordinarily utilized converters are course or interleaved support converter to acquire the necessary high voltage acquire. Despite the fact that the necessary high addition is accomplished by falling and interleaving, it brings about high wave current and generally higher misfortunes which confine the activity at high proficiency and high increase. Further, these geographies brought about steady expense and intricacy of the control circuit. Transformers or coupled inductor were utilized in

disengaged geographies with required go's proportion to accomplish the necessary voltage acquire. These geographies are cumbersome as they utilize transformers. Transformer with high turns proportion isn't liked because of high spillage at the auxiliary which causes exchanging misfortunes at the yield. This kind of converters experiences restricted exchanging recurrence, expanded transformer misfortunes and expanded voltage stress. Transformer-less geographies were proposed in, where coupled inductor and exchanged capacitors were utilized to get the necessary high change proportion. These geographies utilize more segments and complex attractive components to give the necessary voltage acquire. Thusly, these converters are not broadly utilized in power transformation. The staggered dc-dc converter turns into a decent contender for this application, in light of the fact that there are no attractive segments vital, and furthermore due to its bidirectional nature. Customary staggered dc-dc converters typically yield voltage for a given info voltage, this may turn into a downside of these converters in view of certain applications, like cross breed vehicles, a variable dc transport voltage is ideal so the inverter can generally be worked at its most productive dc voltage. In this work, a staggered dc-dc transformation framework that can yield variable voltage with various dc sources is proposed.

The utilization of staggered change requires just low voltage gadgets, as every gadget obstructs just a single voltage level. This work proposes a three level dc-dc converter geography. The three level converters, joins the multi info and yield will be either added or duplicated or might be same as information. The primary benefit of this converter are I) transformer-less high transformation proportion, ii) exchanged based plan iii) constant information current and particularity have carried out dc-dc power change framework where in it comprise on three change modules.

1.2 INVERTER

Device which changes direct current to alternating current.

Potential, give repetition next to wide energy oversee depend on scheme certain tool instead equipment. Inverters didn't carry some power, compulsion occur before dc source origin. a power inverter vessel arise completely voltaic energy exist combine related to automatic results (like rotating tool) voltaic

equipment. Stable inverter in junction use affecting role over a swap revolution.

Because of high innovation advancement, the interest and the nature of electric force is higher than previously. In light of the progression of semiconductor, the determination of force gadget and force transformation strategy is advanced. One of the force converter which can change DC to AC is called inverter.

Force electronic inverters are getting mainstream for different modern drives applications. As of late, inverters have even become a need for some executions, for example, engine controlling and power frameworks. The idea of using various little voltage levels to perform power transformation was licensed by a MIT scientist more than twenty years prior. The staggered inverter framework is promising in AC drives, when both diminished consonant substance and high force are required. Staggered inverters have been for the most part utilized in medium or high-power framework applications, like static responsive force remuneration and movable speed drives. A staggered inverter accomplishes high force appraisals, yet additionally empowers the utilization of environmentally friendly power sources.

1.3 MULTILEVEL INVERTER

A staggered inverters come about force voltaic gadget that supply toward permit wanted exchanging potential drop near submit use different under magnitude dc potential while info. Phrase staggered set about 3level inverter handover in 1981. Multi level inverter find direction feat based on force exchanging gadgets, capacitor, voltage sources. Staggered inverter carry on accepting progressively new reflection due to those elevated potential activity capacity, less trade reverse, increase effectiveness cheap fuzz attractive intervention. Nowadays, stun inverter getting development famed over influence administration, while stun inverter receptacle satisfy enlarge need influence category influence feature linked diminished consonant twisting. A staggered inverter enjoys a few upper hands above traditional 2level inverter manipulation increases exchanging recurrence beat spread balance. more attractive climax for staggered inverters. they can produce yield voltages with bottom dv/dt , extract load stream by less contortion, make more modest normal mode voltage and they can work with a lower exchanging recurrence. Staggered inverter they suitable in more potential use in view of they role blend relent potential sine wave by higher level symphonious scale reach excessive potential restricted greatest gadget rating.

Staggered converters have been essentially utilized in medium-or high-power framework applications, like static receptive force remuneration and flexible speed drives. In these applications, because of the restrictions of the presently accessible force semiconductor innovation, a staggered idea is typically a remarkable choice until now turn on less repeat swap permit potential or potentially current dividing among the force semiconductors. Then again, less-power shell < 10 kW, staggered convertor has been rivaling excessive repetition

batter range tweak convertor used in inflated virtual major consequence. Besides, less price force control superconductor advances, just as the current interest on superior inverters needed by environmentally friendly power frameworks, have expanded the utilizations of staggered converters. For the specific instance of independent RES (SARES), it is of sound judgment that it ought to be equipped for providing rotating flow (AC) power, accordingly giving similarity standard machines that are modest and broadly accessible. Also, due the discontinuous idea of practically all sustainable power sources, most single-shopper SARES incorporate an energy stockpiling gadget that is normally executed by lead-corrosive battery banks. Renewable ability spring, exemplar, solar cell, breeze, vitality part receptacle. Effectively conform staggered inverter frame as strong uses. In examination with customary two-level converters and by expanding the quantity of DC voltage sources (levels), the littlepotential tread guide by creation high force feature sine wave, lower symphonious parts, lower voltage appraisals of gadgets, lower exchanging misfortunes, higher effectiveness, and furthermore decrease of dv/dt weights on the heap and gives the chance of working with low speed semiconductors.

There are three fundamental kinds of staggered inverters: diode-clasped (nonpartisan clipped), capacitor-cinched (flying capacitors), and fell H-connect inverter. Here, we are utilizing fell H-connect inverter in light of its different benefits and helpful properties.

1.3 CASCADED H-BRIDGE INVERTER

The fell H-connect inverter has attracted colossal interest because of the more noteworthy interest of medium- voltage high- power inverters. here inverter utilizes small number H-connect inverter associated in order to allow sinusoidal relent voltage. Each cell repress one h-connected as well as give voltages created along staggered inverters are truly amount of relative multitude of voltage produced next to each cell for example assuming these are k cells over h-connect staggered inverter amount to submit voltage level are $2k+1$. here sort based inverter enjoys benefit while that need shorter number of parts although differences with further 2 kinds of inverter consequences its basic force and price are likewise fewer. The fell inverters employ arrangements line of unique phase filled-connect inverter to develop amaze phase brace including isolated dc source. Fell H-connect cell inverters utilize the most un-number of force electronic gadgets. Nonetheless, they require secluded force sources in every cell which thus requires an enormous segregating transformer.

The benefits are the arrangement structure permits an adaptable, modularized circuit format and bundling because of the indistinguishable construction of every H-connect, no extra cinching diodes or voltage adjusting capacitors are important, exchanging repetition for inward voltage levels is conceivable due to the stage voltage is the amount of the yield of each extension. Staggered transporter based pulse width modulation strategy is utilized to create a 25 level stage

voltage. The inverter can be utilized in crossover electric vehicles and electric vehicles.

II. OBJECTIVES

This proposed project presents a novel staggered DC-AC inverter. The proposed staggered inverter creates 25 levels AC yield voltage with the proper entryway signals plan. To simulate and observation 25 level of novel h bridge multilevel inverter using 10 switches based GCPS. At input side, a renewable energy source, here, solar panel rating 12V, 5Watt will be used, which will be later converted using DC to DC conversion. MATLAB/SIMULINK 2018 version used for simulation work on multilevel inverter

III. PROBLEM STATEMENT

Over the last decade power conversion devices havattracted a great deal of attention. One such power device is the multilevel DC-AC inverter. Multilevel inverter systems are used to transform low level DCvoltages at input to multiple high-level AC voltages at output. Multilevel inverters are utilized in power change applications because of benefits, for example, low EMI, low voltage weight on gadgets, and less consonant mutilation. The logic beyond the imprudent growth of grid connected pv system are enlarge in demand of energy , environmental sake of renewable energy, price reduction of pv panels. In few multilevel inverter harmonic contented will be high and in consequence total harmonic distortion will be increases. This decreases the efficiency of the inverter. in diode clipped staggered inverter the exorbitant cinching diodes are required when the quantity of levels in high, it utilizes 2 (m-1) exchanging gadgets where ‘m’ is the quantity of level s that is 8 switches, (m-1) (m-2) diodes that is 12 diodes and (m-1) capacitors that is 4 capacitors for creating 5 level yield and it is hard to do genuine force stream control for the individual converter on the grounds that the transitional DC levels will in general cheat or release without exact checking and control.

IV. LITERATURE SURVEY

1 Vargil kumar Eate, Anil kumar yarlagadda, Y.S Kishore Babu, Abanishwar Chakrabortthi. A modified seven level cascaded h bridge inverter[1]

As of now MLI widely utilized in order to get high-voltage applications with theirs execution especially superior to the of normal 2 inverter because of limited symphonious bending, lower electromagnetic obstruction and bigger DC interface voltages. All things considered certain deficiencies are

confronted, for example, including number of parts and voltage adjusting issue. To beat those, a 7 level half and half inverters had been proposed. This geography need a minor numbers force switch that brings about abatement multi-layered creation, amount to price and load of inverters. At last here we have the option that produce close to sinusoidal voltage along with roughly central recurrence exchanging. The reproduction and the trial aftereffects of a changed fell 7 level H-connect inverter with as well as excluding LC channel been introduced.

2 Atif Iqbal & Mudsir Ahmed Memon, Mohamed shah, Adil sarwar, Saad Mekhilef A New multilevel inverter topology with reduced switch count[2]

Staggered Inverters are another group of converter dc-ac transformation for the moderate & high voltage including force applications. Here 2 new geographies for flight of stairs yield voltage ages have been proposed with lesser number of switch prerequisite. and principal geography requires 3 dc voltage sources and 10 changes to combine 15 levels over the heap. The augmentation of primary geography had been proposed as the 2nd geography thus comprise of 4 dc voltage source and 12 changes accomplish 25 levels at yield. The two geographies, aside from having lesser switch include show the benefits as far as decreased voltage stress across the switch. Moreover, a definite relative investigation of the two geographies has been introduced in the paper to show the highlights of the proposed geographies.

3 Krismadinata Chaniago, Jeyraj selvaraj, Nasrudin A rahim Single phase seven level grid connected inverter for photovoltaic system.

Here it presents solitary stage 7 level inverter for matrix associated photovoltaic frameworks, with a novel pulse width-balanced control plot. 3 reference flags are indistinguishable from one another with a counterbalance is comparable to the sufficiency of the three-sided transporter signals are utilized to create the pulse width signal. The inverter equipped for delivering 7 degrees of yield voltage levels (V_{dc} - $2V_{dc}/3$ - $V_{dc}/3$ - 0, $-V_{dc}$ $-2V_{dc}/3$ $-V_{dc}/3$) from the dc supply voltage.

4 W. P. Hew, S. Mekhilef, R. A. Ahmed, “new multilevel inverter topology with minimum number of switch.

The two kinds of staggered inverters, known as balanced and uneven staggered inverter. The two sorts are viable and proficient for improving the nature of the inverter yield voltage. First and foremost, we portray momentarily the primary pieces of the inverter at that point exchanging technique and operational standards of the proposed inverter are clarified and operational geographies are given. The proposed geography decreases the quantity of switches, misfortunes, establishment region and cost of converter.

MODES OF OPERATION FOR 25 LEVELS

MODES OF OPERATION

According to the switching states of the MOSFET’s used in my designed hardware for fell H-connect staggered inverter is presented in figure and they operate different modes which are following.

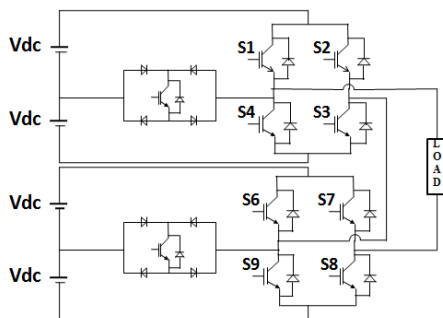


Fig 1 H-bridge circuit diagram

Mode one : here method of activity switche S1, S3, S6 and S8 are turned on where as leftover switches are killed and produce the positive pattern of yield voltage which is equivalent to $V_{DC}=20V$ which is appeared in the beneath figure 2

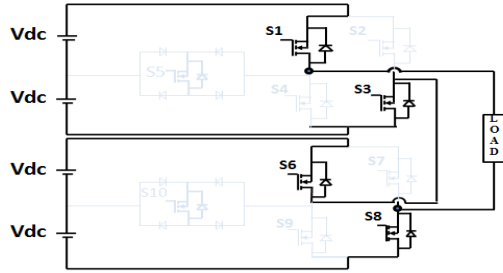


Fig 2 Mode one operation when switch S1, S3, S6 and S8 are on Mode 2: In this method of activity switches S1 and S6 are turned on where as the leftover switches are killed and produce the positive pattern of yield voltage which is equivalent to $V_{DC}/2=10V$ which is appeared in the beneath fig 3

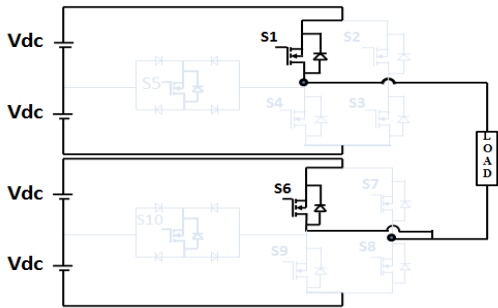


Fig3 Mode 2 operation when switch S1 and S6 are turned on Mode 3. In this method of activity every one of the switches are killed and creates zero yield voltage which is equivalent to $0V$ which is appeared in the underneath fig 3.4

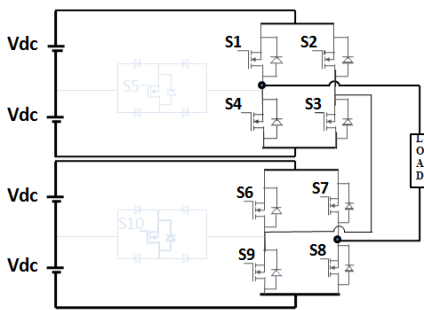


Fig4 Mode 3 operation where all switches are turned off Mode 4: In this method of activity switches S2, S3, S4 and S7, S8, S9 are turned on where as the excess switches are killed and produce the negative pattern of yield voltage which is equivalent to $-V_{DC}/2= -20V$ which is appeared in the beneath fig 5

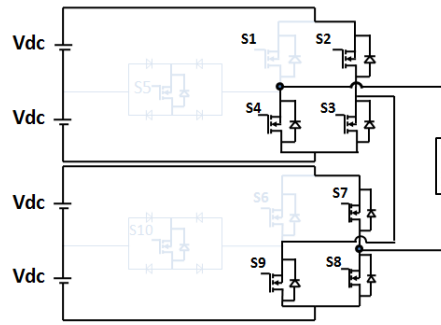


Fig 5 Mode 4 operation where switch S2, S3, S4 S7, S8, S9 remain on **Mode 5:** in this method of activity switches S2, S4, S7 S9 turned on where as remaining switches turned off and produce the negative cycle of output voltage which is equal to $-V_{DC}= -40 V$ which is shown in the below fig 6

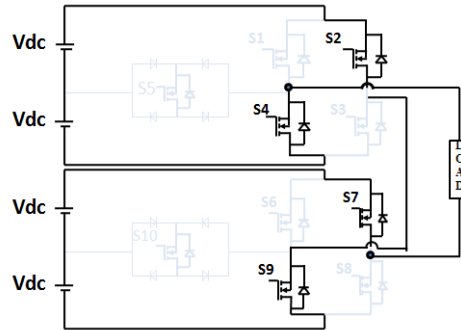


Fig 6 Mode 5 operation where switches S2, S4, S7 and S9 are turned on

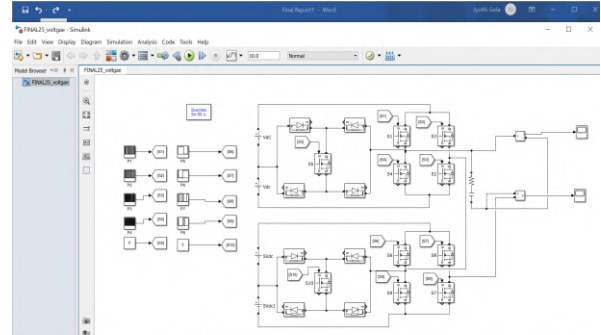


Fig1 Simulink model of 25 level asymmetric multilevel inverter

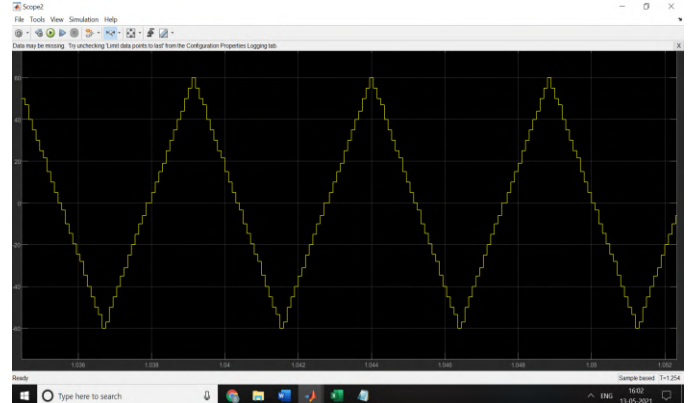


Fig2 Simulink model of 25 level asymmetric multilevel inverter output

CONCLUSION

This project presents a new an immediate model prescient control plot for framework current is introduced for the novel H-Bridge multilevel inverters based grid connected ps. The proposed framework offers a high effectiveness when contrasted with the announced frameworks in writing. Reenactment results likewise show that the proposed framework has an equivalent/better execution as far as total harmonic distortion and force extraction. The proposed geography has been talked about in subtleties with the fundamental unit with setup creating 5, 7 levels and 4S-25L producing 25 Levels, Finally a few trial results demonstrate the reasonableness and functionality of the proposed geography with various kind of stacking blends thinking about the difference in exchanging mixes.

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3. Modelling of fuzzy logic controller of a maximum power point tracker based on artificial neural network machine learning application 2017 16th IEEE conference on 18-21 december 2017. By Samir moulahoum, Rabah Benkercha, Ilhami colak.
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IOT Based Smart Irrigation Monitoring System

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Abstract- IoT sensors have the ability to provide information about agricultural fields and then take action based on user input, making smart agriculture an emerging concept. The goal of this project is to create a smart agriculture system that makes use of the benefits of cutting-edge technology like Arduino, the Internet of Things, and wireless sensor networks. The initiative attempts to utilize developing technology, such as the Internet of Things and smart agriculture employing automation. Keeping an eye on environmental conditions are the key element in increasing the production of productive crops. This paper's feature entails the creation of a system that can track temperature, humidity, and wetness using sensors and an Arduino board, and in the event of any disparity, send alerts via SMS and the application that was created.

I. INTRODUCTION

An developing technology idea known as "smart farming" gathers information from many agricultural areas, ranging in size from tiny to vast, and its surroundings. Employ sophisticated electronic sensors to collect data. Experts and local farmers examine the data obtained to make short- and long-term predictions about weather patterns, soil fertility, the current quality of crops, the amount of water needed for the upcoming week to a month, etc. The Agricultural Parameters use IOT technology and a system that accepts these objects to compile and distribute information. "The Internet of Things (IoT) enables objects to be chosen and maybe forced remotely across existing configurations, create open gateways for all the additional obvious merge of the vast globe into computer-based systems, as well as recognizing improved capability, precision, and a cash-interconnected preferred position. IOT expands with sensors and actuators specifically when Improvement has evolved into an occurrence of the entire extra-large category of electronic physical structures, which also includes advancements like clever grids, beautiful

dwelling, cunning movement, and intelligent urban groupings. All are specifically unique because to its introduced figuring arrangement, yet they can nevertheless communicate with one another under the current Internet infrastructure.

II. LITERATURE REVIEW

Boomika M., Keerthana B., Nivetha P., Mathivatahni M., and Niranjana "Agriculture IOT Based Smart Security and Monitoring Devices" A clever approach of automate farming. The method is referred to as smart agriculture. It is possible to eliminate hazards to the crops by minimizing human interaction by implying an automated system. The main focus will be on creating an environment that is good for plants. These automated agricultural systems will aid in controlling and upholding a secure environment, particularly in agricultural areas. Real-time monitoring of the environment is crucial to smart farming. The hardware system will be controlled by software with a graphical user interface, and it will be housed in a totally isolated environment with sensors for humidity and temperature. A controller will oversee the controllers. a master station that will speak to the software used for human interaction. The system will give farmers a clever user interface. The level of production can be raised compared to the current situation thanks to this clever approach. With the help of this technology, agriculture will be smartly solved, and farmer-related problems will be effectively resolved. The environment won't act as a hindrance to the development and growth of any plant and can solve the issue of farming produce scarcity.

2. Madhuri B. Jadhav and Dr. Sanjay N. Patil "IOT-Based Smart Agricultural Monitoring System" In India,

people's primary source of income is agriculture. It has a significant impact on the nation's economy. Today, however, there is a migration of individuals from rural to urban areas. agricultural impediment. The only way to boost crop productivity is by keeping an eye on the environmental aspect. There are no elements that significantly lower productivity. Hence To solve these issues, automation in agriculture is required. irrigation system that runs automatically, saving the farmer's time, money, and energy. Conventional farmland irrigation methods necessitate manual labour. Human interaction can be reduced with watering that is automated using a "IoT Based Smart Agricultural Monitoring System." Crops are continuously monitored using the Internet of Things (IoT) and the convergence of sensors, educating farmers about crop development and harvest timing on a regular basis to increase crop output and ensure that products are delivered to customers in the proper location. and the appropriate moment. Thus, we use IoT-based smart agriculture solutions to solve this issue. For the purpose of gathering and processing field data, this project comprises sensors for temperature, humidity, soil moisture, and rain detection. To remotely manage and monitor sensor data, these sensors are integrated with well-known web technology to create a wireless sensor network.

III. PROBLEM STATEMENT

To create an autonomous irrigation system that turns a motor pump ON/OFF by detecting soil moisture content using the Internet of Things (IOT).

IV. METHODOLOGY

A. Block Diagram

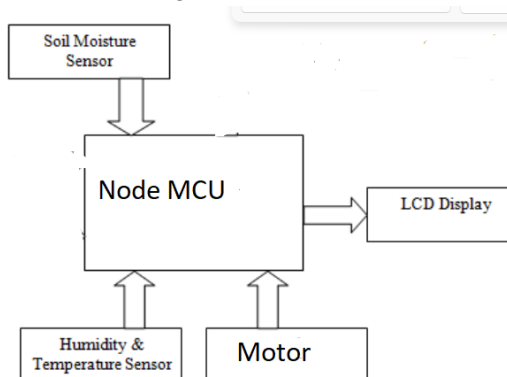
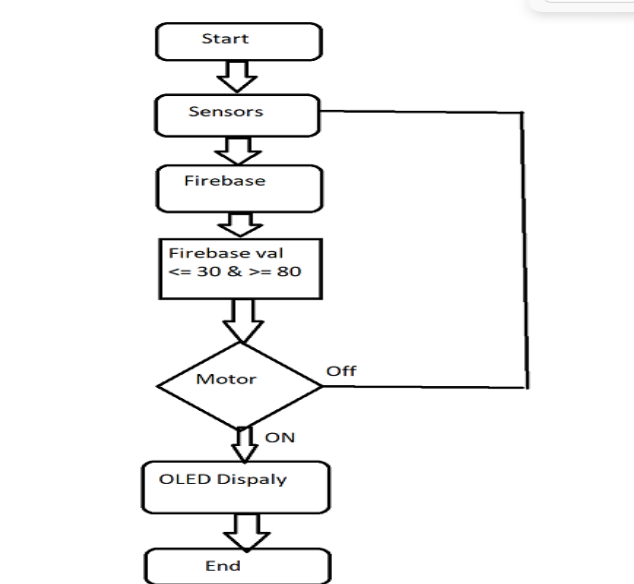


Fig. 1 System Block Diagram.

B. Flowchart



V. WORKING PRINCIPLE

The ESP8266 is used in an IoT-based smart irrigation system that automates watering of plants based on environmental conditions including temperature, humidity, and soil moisture. The ESP8266 is a low-cost Wi-Fi chip that can connect to the internet and communicate with other devices. An overview of an ESP8266-based smart irrigation system's operation is shown below:

Sensing: The system uses sensors to identify environmental factors like as temperature, humidity, and soil moisture. The sensors are attached to the ESP8266.

Transmission of data: Using Wi-Fi, the ESP8266 communicates the data it collects from the sensors to a cloud computing service like Firebase.

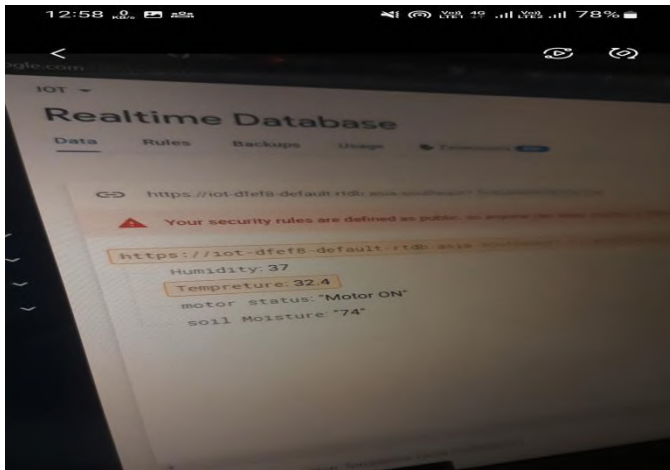
Data transmission: The ESP8266 gathers data from the sensors and sends it over Wi-Fi to a cloud computing platform, like fire-base.

Data analysis: Based on the parameters needed for watering the plants, the cloud-based platform analyses the data and sends the orders back to the ESP8266.

Actuation: Using instructions from the cloud-based platform, the ESP8266 manages the irrigation system. Based on the information gathered from the sensors, it may turn on or off the water pump and change the flow rate and length of watering. In conclusion, an ESP8266-based smart irrigation system combines sensors, a cloud-based platform, and the ESP8266 chip

to enable automated and effective plant watering depending on environmental factors.

VI. RESULT



VII. SCOPE OF PROJECT

Hardware, software, and cloud-based technologies are needed for IoT-based smart irrigation systems to monitor and control soil moisture, temperature, and other environmental factors. The system has to have wireless connectivity, be processed and analyzed using machine learning methods, have a user interface that is simple to use, and be tested in a real-world environment. To guarantee that the system continues to function properly and efficiently, maintenance and support are required.

VIII. CONCLUSION

In conclusion, an IoT-based smart irrigation system project entails a wide range of tasks that needs proficiency in user interface development, cloud-based data processing and analysis, IoT technologies, hardware design, and field testing and validation. The project's goal is to develop a system that optimises plant growth and water use, minimizes water waste, and offers a user-friendly interface for remote monitoring and control. An IoT-based smart irrigation system project shows significant promise for enhancing agricultural output while safeguarding natural resources in light of the

growing demand for sustainable agriculture and water conservation.

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A Monitoring System for Agriculture Using IOT

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Abstract - As new technologies has been introduced and utilized in modern world, there is a need to bring advancement in the field of agriculture. Various Researches have been undergone to improve crop cultivation and have been widely used. In order to improve the crop productivity efficiently, it is necessary to monitor the environmental conditions in and around the field. The parameters that has to be properly monitored to enhance the yield are soil characteristics, weather conditions, moisture, temperature, etc. Internet of Things (IOT) is being used in several real time applications. The introduction of IOT along with the sensor network in agriculture is the new way of farming. Online crop monitoring using IOT helps the farmers to stay connected to his field from anywhere and anytime. Various sensors are used to monitor and collect information about the field conditions.

Index Terms: IoT (Internet of Things), Temperature and Humidity sensor, ESP32 module, LDR sensor, Soil moisture sensor.

1 INTRODUCTION

Agriculture uses the IoT features to help managing crops production. By optimizing the quality of the crop through applying required nutrients and reduce the harmful impact on the environment due to the application of access pesticides. IoT innovation helps in gathering data regarding a situation like climate, temperature. and richness of soil monitoring crop through internet by farmer empowers discovery of weed, level of water, Creature interruption into the field and farming. Internet of things (IoT) is a promising technology which provides efficient and reliable solutions towards the modernization of several domains. IoT based solution are being developed to automatically maintain and monitor agriculture farms with minimal human involvement. The article presents many aspects of technologies involved in the domain of IoT in agriculture. Data collected through sensors gives information about different environmental condition to monitor the whole system properly. Monitoring the environmental conditions or crop productivity is not only the factor for the evaluation of crop but there are many other factors which effects the crops productivity.

II. LITERATURE REVIEW

[1] “Smart farming IoT in Agriculture.” By Rahul Dagar, Sunil Kumar Khatri.

IOT represents the future of communication and computing. These days IOT is used in every field like smart homes, smart traffic control smart cities etc. The area of implementation of IOT is vast and can be implemented in every field. This paper is about implementation of IOT in agriculture. IOT helps in better crop management, better resource management, cost efficient agriculture, improved quality and quantity, crop monitoring and field monitoring etc.

[2] “Security and privacy for green IoT based Agriculture”.By Mohamed Amine Ferrag.

This paper presents challenges on security and privacy issues in the field of green IOT-based agriculture. We start by describing a four-tier green IOT-based agriculture architecture and summarizing the existing surveys that deal with smart agriculture. The current survey, we highlight open research challenges and discuss possible future research direction in security and privacy of green IOT based agriculture.

[3]“IoT based smart agriculture monitoring system” By Dr.N.Suma, Sandra Rhea Samson, G.Shanmugaprya, R.Subhashri.

The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers they themselves verify all the parameters and calculate the readings.It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural.

III. PROBLEM STATEMENT

The earlier Monitoring System described in literature has drawbacks. In this situation, it is crucial to develop an effective and low-pass weather monitoring system that can measure variables like temperature, soil moisture, humidity, wind speed, and wind direction.

IV. METHODOLOGY

When power supply is ON, the input module of three sensors(DHT11,soil moisture) start to activate.When sensors get ON it will read the data from soil and from surrounding. According to the values that are detected by sensors motor will turn ON/OFF.If moisture below threshold value, then the motor is turn ON. If moisture level is high, then it will stop the motor and water supply will also stop. If water level is low in tank, then it will also have detected by the ultrasonic sensor.All the values that are collected from the sensor is send via ESP32 Wi-Fi module to Thing speak website. Thing speak will create the graph for the data received by Wi-Fi module and, then whole information will be visible on the Android app. User can easily control the motor manually by using Android app.

speaking cloud server. Thing speak will create the graph for the data received by Wi-Fi module and, then whole information will be visible on the Android app.

B RESULT

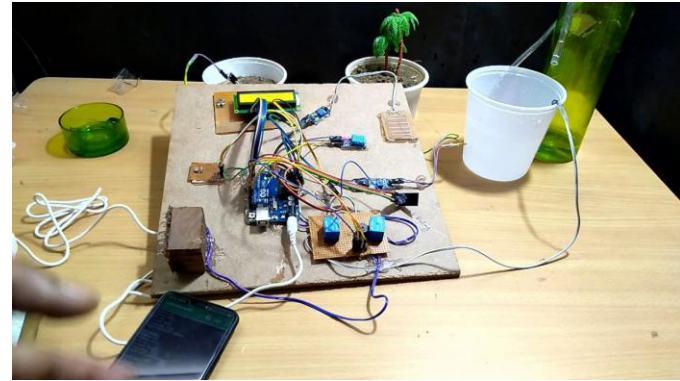
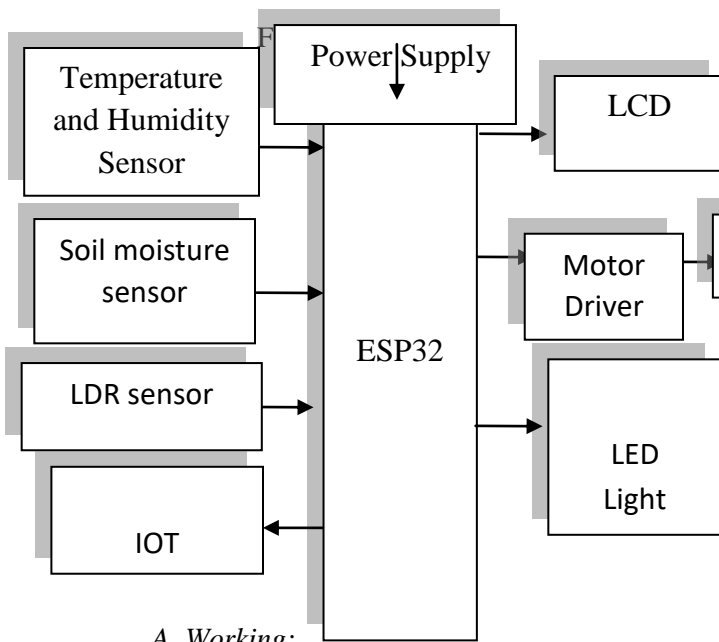


Fig.3 Setup of Proposed System



The block diagram consist of the ESP32 Microcontroller chip, DC motor, Light emitting diode(LED), Liquid crystal display(LCD), Motor driver, Temperature and humidity sensor, soil moisture sensor, LDR Sensor.

ESP32 Microcontroller chip is the main component of the project as it control and monitor the parameters. All the values that are collected from sensor is send via ESP32 Wi-Fi module to thing

CONCLUSION

The project “A Monitoring system for agriculture IoT” has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly using highly advanced IC’s and with the help of growing technology the project has been successfully implemented.

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Analysis of ECG Signal using RNN for detecting different Heart Abnormalities

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Abstract - In this article, Recurrent Neural Networks (RNN) is applied to classify normal and abnormal heartbeats in ECG. This article's major goal was to make it possible to automatically differentiate between regular and irregular heartbeats. The Arrhythmia database like MIT-BIH is used to classify the ECG beat classification. The procedure used is performed using a large amount of standard data, ECG time series data, as input to a long-term memory network. We divided the dataset into two set training and testing. The Our method has demonstrated the effectiveness, accuracy and capability of detecting ECG arrhythmias and has also made quantitative comparisons with various RNN models

Index Terms: ECG, RNN

I. INTRODUCTION

ECG is a crucial and reliable diagnostic tool for identifying abnormal cardiac problems [1]. The bioelectrical activity of the heart is captured in an electrocardiogram (ECG) signal [2]. Through the use of the proper treatments, early identification of heart disease (abnormalities) can increase lifespan and quality of life. The human observer would look for changes or irregularities in the ECG signal to diagnose cardiac illness in the past [3-5]. The accuracy and effectiveness of signal automation and pulse rating must therefore be improved [6].

An electrocardiogram is a valuable indication of the state of human health. It contains comprehensive information about the physiological processes that take place in the human body and thus can be considered as a promising tool for diagnosing health [6]. However, at present it is mainly used in medicine only for the diagnosis of cardiovascular diseases [3-4].

The purpose of this article is to apply RNN Long Short-Term Memory Network for effective detection of arrhythmia from ECG signals. The ECG signal consists of 16 types of heartbeats, which are divided into two groups, normal and arrhythmia. Arrhythmia heartbeat

left bundle branch block heartbeat (LBBB), right bundle branch block heartbeat (RBBB), atrial escape beat, nodal (junctional) escape beat, atrial premature heartbeat, abrupt atrial premature heartbeat, nodal (junctional) premature Beating time, supraventricular premature ventricular beat, ventricular escape beat, fusion of ventricular and normal beat, fused beat, paced beat and fusion of normal beat, unclassified beat.

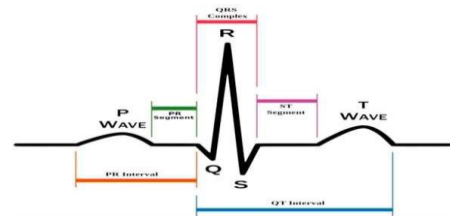


Figure1: ECG

Cardiologists, despite years of experience trying to differentiate between normal and arrhythmic heartbeats, have repeatedly failed due to human nature, opening the door to discovery and innovation in this field of biotechnology. - Various machine learning and deep learning models have been deployed to detect arrhythmias, some of which have surpassed cardiologists. We will then discuss the various machine learning models that have been applied to detect arrhythmias in order to gain a better insight into the models and gain insights into what would happen to this area of research. Should and will be appropriate.

To avoid the manual task of detecting arrhythmic heartbeats in ECG, we applied machine learning algorithms to automatically detect irregular heartbeats and then diagnose the detected heartbeats for further analysis by pathologists. To be taken to the heart. To some extent, this dissertation can make the work of

doctors easier and can be considered for further growth and development.

II. LITERATURE REVIEW

Written papers classify beats using technologies with variations in various parameters and using nonlinear dynamic tools [2] and as a result, these papers are repeated with different parameters and number of positions. Uses moving neural networks where accuracy changes. Number of neurons and positions in the hidden layer.

Specific methods are available for robotized identification and ECG detection. It is recommended to implement Self Organizing Maps (SOM), Support Vector Machines (SVM), Multi Layer Perceptron (MLP), Markov Models, Fuzzy or Neurophysical Systems and various procedures. [19 -20]. To date, few analysts have taken steps to implement SVM and another specific classification for diagnosing cardiac beats. Various strategies have been introduced over the years to develop a motorized framework to fully organize ECG information. These include the Violet Transform [29-30] direct vector quantization [31] and the potential neural network [32] and the fuzzy crossover neural system algorithm [33]. Sleep, etc. [34] proposed two differentiation strategies for the ECG feature, applying two management strategies. With a managed learning strategy; And other learning with unlabeled information. Sugiura et al [35] developed an ambiguous rational method for identifying ECG arrhythmias and isolating ventricular arrhythmias. Acharya et al. [26] used cardiac rate changeability (HRV) as the primary flagship and implemented ANN and physio-ratio connections for the grouping of four ECG arrhythmias. Kohli etc.

The three strategies associated with SVM-based arrhythmia management: one-against-one, one-against-all, and ambiguous choice. This article presents the contradiction of better accuracy with a variety of techniques against all strategies. Magic etc. ANN has developed three different models for diagnosing heart failure. In this article, the RNN model is developed to classify arrhythmias in the heartbeat.

The majority of recent research in this area also focuses on the detection of various heart diseases. For example, ECG signals are successfully applied for arrhythmia classification [5-7], myocardial ischemia detection [8-10], coronary artery disease detection [11-13], etc. A comprehensive overview of the current

situation in ECG signals processing and interpretation. Given in the book [14].

In [15], the authors show that ECG signals change shape for many non-cardiac diseases, such as pulmonary embolism, diseases of the central nervous system (CNS), myasthenia gravis, muscle spasms, hypothermia and hypothyroidism. - Another study [16] pointed out that in addition to CNS diseases, changes are also proposed for some esophageal diseases. It was also shown that drugs, poisons and electric shocks have a significant effect on the wave of ECG signals. In another article, [17] the authors presented a study showing a link between Friedreich's ataxia and electrocardiographic results. These papers were important for understanding the information function of the heart, but the proposed methods could not be extended to detect other diseases as they rely on a specific form of ECG abnormalities. This problem was largely solved by Uspensky in [1-2].

In his work, he developed a set of 216 features that were extracted from further electrocardiograms and used for disease classification. The proposed solution has been tested on a set of 30 diseases and has shown excellent performance. However, this method is still a weakness. First, it does not answer the question of whether the proposed features will work well on new diseases. Another problem is that the features were created manually, and thus some of the information contained in the source data may be lost.

III. PROPOSED MRTHOD

In this article, we have used recurrent neural networks to advance the classification and diagnosis of arrhythmic beats. The effectiveness of heart rate classification using RNN depends on the accuracy, specificity, and percentage of sensitivity. The work already done in the field is also compared in detail and important aspects are also taken into consideration. An important segment of artificial neural networks (ANN) came into being when there was a need to work on sequential data such as handwriting recognition and speech recognition. This class of ANNs is called recurrent neural networks because they can use their internal memory to process and classify arbitrary series of inputs, and these connections form a direct cycle between units.

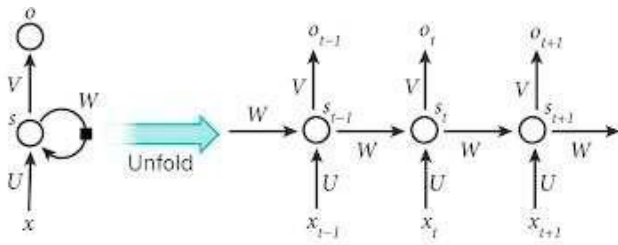


Fig. 3. Recurrent Neural Network

The field of in-depth learning is very interesting and so it has been used by various researchers to increase and enhance the measurement of performance and accuracy. RNN and CNN are two very interesting areas of deep learning and so they have been applied to ECG arrhythmia classification but CNN when applied to ECG cuts the heartbeat into pieces of fixed length which is ultimately classified. Reduces performance. The RNN aspect can be improved as performance can be improved by providing craftsmanship features to the classifier. Here, using RNN, we feed the current beat and the last beat, the basic key features of the beat, to learn accurately and automatically.

3.1 Recurrent Neural Network

Recurrent neural networks have come into being because of their highly dynamic behavior, while multilayer feed forward networks have static maps. RNNs have been used in a number of fields and are associated with interesting applications in the field of memory, optimization and generalization. Time series data is best classified using RNNs where feedback and current values are fed back into the network and as a result the output also contains markings of the values in the memory which increases the efficiency of the layout and provides better results. Traditional feed forward networks. In this article, three layers of RNN are used with 9 repetitions with 128, 256 and 100 neurons in each layer, respectively. A dropout of rate 0.2 is added after each layer. The activation loss used was linear with MSE as a function.

3.2 Gated Recurrent Unit

A gated recurrent unit consists of two gates, a reset gate, and an update gate. The former gate determines how to connect the new input to the previous memory and the latter gate specifies how much of that memory should be used for enclosing. In this article, three layers of RNN-GRU are used with 5 repetitions with 64, 128 and 100 neurons in each layer, respectively.

A dropout of rate 0.2 is added after each layer. The activation loss used was linear with MSE as a function.

3.3 Long Short Term Memory Network(LSTM)

LSTM is a specific type of recurrent neural network (RNN) architecture. LSTM was designed to model temporal sequences and the long-range dependencies and memory backup of RNN play a very important role and so they are turned to be more accurate and effective than conventional RNNs. The method is applied after pre-processing of the data where we remove the unwanted and missing and null signal values.

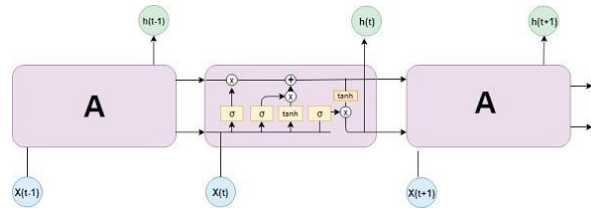


Figure 3. Architecture of LSTM(A)

In this paper, three layers of RNN-LSTM have been used with 64, 256 and 100 number of neurons in each layer respectively with 5 iterations. A dropout of rate 0.2 has been added after each layer. The activation used was sigmoid with MSE as the loss function.

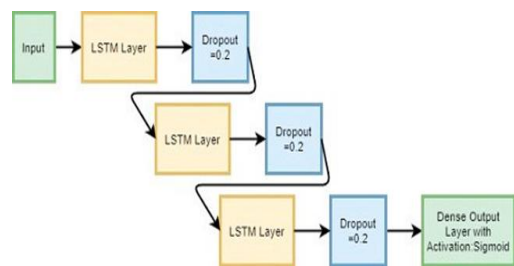


Figure 3. Architecture of LSTM (B)

IV. PROBLEM STATEMENT

The earlier Monitoring System described in literature has drawbacks. In this situation, it is used big data source for more accuracy of the model.

4.1 Dataset Description

The MIT-BIH arrhythmia database is used to evaluate the performance of BAT classification. For training and testing purposes, the most popular, MIT-

BIH arrhythmia dataset was used. It has 47 records of 30 minutes and 40% of the records were for heart patients. The records contained a variety of signals based on the different locations of the leads: ML2, V1, V2, V4 and V5. [19] First, 70-30 pieces of data were distributed. ML2 signals were selected and for each record, the signal was divided into 720-720 lengths. Since the sampling rate was 360, 360 segments before the R-Peak value and 360 segments after that ensured that there would be approximately 3 beats per segment and the central beat rating against 15 possible arithmetic labels.

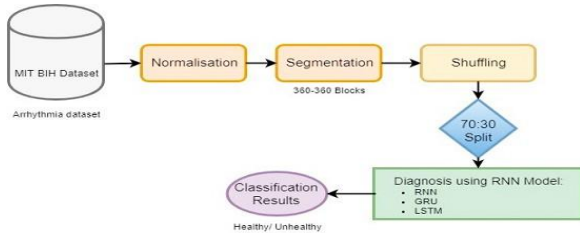


Figure 6. The proposed ECG Arrhythmia Detection Steps

| | | |
|----------------|---------------|----------------|
| | True Negative | False Positive |
| True Negative | 15800 | 1290 |
| False Positive | 1800 | 9180 |

Table 01: Confusion Matrix

| | Algorithms | Accuracy | Sensitivity | Sensitivity |
|-------------------------|------------|----------|-------------|-------------|
| ECG Classification | RNN | 85.4 | 80.6 | 80.6 |
| ECG Classification | RN GRU | 82.5 | 78.9 | 78.9 |
| LSTM ECG Classification | RN LST M | 88.1 | 92.4 | 92.4 |

Table 2: ECG Arrhythmias Classification Results

4.2 Performance Measurement using Confusion Matrix

Performance appraisals are based on the performance of three key measurements on the RNN models:

classification accuracy, specificity and sensitivity. These measurements are described using the Confusion matrix. The real positive is present when arrhythmia occurs and was detected correctly and therefore the algorithm should work correctly and for accuracy the percentage of true positive should be higher than other values. Rating accuracy refers to the total number of beats that have been correctly rated, whether it was a normal beat or arrhythmia. For binary classification, accuracy = (True Positive + True Negative) / (True Positive + True Negative + False Positive + False Negative).

Classification sensitivities can be referred to:

$$\text{Sensitivity} = \frac{\text{real positive}}{\text{true positive} + \text{false negative}}$$

The rating feature can be referenced:

$$\text{Attribution} = \frac{\text{True Negative}}{\text{False Positive} + \text{True Negative}}$$

V.CONCLUSION AND FITURE WORK

The RNN LSTM showed accuracy of 88.1% when we take the number of iterations to be 5 and hidden layers to be 3 and there are 64, 256 and 100 neurons per hidden layer respectively which shows better Detection of arrhythmia as compared to RNN and GRU because RNN has 85.4% accuracy and GRU is 82.5% which is less than LSTM accuracy. The model has been implemented directly using the signals from the MIT BIH database and no pre-processing has been done. Therefore, the complexity of our implemented model is much less than the traditional machine learning algorithm. In this article, binary classification of arrhythmia has been made and the results can be improved by increasing it to multi-classification. Since not much has been done in this area of binary classification (detection of arrhythmia), our proposed model meets this and allows for more work to be done in this area. The accuracy of the rankings can be further enhanced by increasing the number of positions. The article shows that long-term memory gives the best results in the binary classification of ECG arrhythmias and further work can be done on classification using Convolution Neural Networks on the data set MIT BIH for classification process. The number of distances and the number of neurons in the hidden layer can be further increased for the classification process.

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A Study of USART Controller

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Abstract - A USART (universal synchronous/asynchronous receiver/transmitter) is hardware that enables a device to communicate using serial protocols. It can function in a slower asynchronous mode, like a universal asynchronous receiver/transmitter (UART), or in a faster synchronous mode with a clock signal. A USART is still common in embedded and industrial systems, however. Many control systems still use serial communications to control equipment; programmable logic controller; robotics; and heating, ventilation and air conditioning systems. A USART is also part of most microcontrollers to communicate with peripheral systems. Internet of Things devices may have a USART to communicate with other devices.

Index Terms: USART, UART, FIFO, APB, RS - 232, Asynchronous, Synchronous, USB.

I. INTRODUCTION

A universal asynchronous receiver/transmitter (UART) is a microchip that performs serial-to-parallel conversion of data received from peripheral devices and parallel-to-serial conversion of data coming from the CPU for transmission to peripheral devices. The UART chip has control capabilities and the ability to send an interrupt request to the processor that can be tailored in a way that minimizes the software management of the communication link between a computer and a peripheral device.

The UART controller handles the asynchronous serial communication between a computer and a peripheral device connected to the serial port of the computer and converts data from serial to parallel and vice-versa. This allows the computer to talk to modems and other serial devices. A UART is essentially a microchip that conditions the data coming in and out of serial ports such as the computer's RS232 serial port terminal.

In serial communication, each bit of data is sent one at a time on a transmit wire. This is serial

communications interface. If the sender and the receiver don't agree on how the data is sent, such as the order and length of time of each bit, then the data becomes garbled, and they won't understand each other. Asynchronous and synchronous are two different ways to standardize how serial data is sent. In asynchronous mode, only one data line is used to send data from the transmitter to the receiver. There is no shared synchronization signal from the sender to the receiver. So, the receiver has no way to know how fast or slow the data is coming. To circumvent this, both the sender and receiver must be manually configured beforehand to use the same data rate. A common shared baud rate is 9,600 bits per second. In synchronous mode, a data and a clock line are used to send the data. The controller a clock signal, which synchronizes the controller and the peripheral at the same data rate. Because the clock signal keeps the devices in sync, the two devices don't need to be configured ahead of time to use the same bit rate.

II. SUMMARY OF THE CONTRIBUTED PAPERS

[1] An Approach For Designing A Universal Asynchronous Receiver Transmitter (UART)

In this paper, UART is presented which includes three modules which are the baud rate generator, receiver and transmitter, and hardware descriptive language UART simulation can be tested before it can be loaded on programmable device. UART (Universal Asynchronous Receiver Transmitter) is used for short-distance, low speed, low-cost data exchange between computer and peripheral. They provide a means to send data with a minimum of wires. The data is sent bit-serially, and no clock signal is sent along with it.



Fig. 1. UART Frame Format

The fact that a clock is not transmitted with the data complicates the design of a UART. The two systems (sender and receiver) have separate, unsynchronized, clock signals. The programmable logic devices can be used for such application by developing core for UART. By using hardware descriptive language UART simulation can be tested before it can be loaded on programmable device. In this project we present UART which includes three modules which are the baud rate generator, receiver and transmitter.

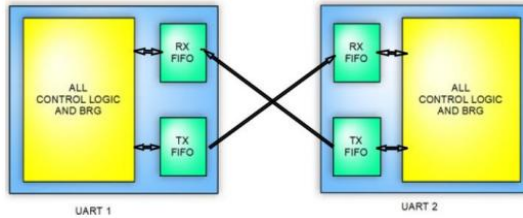


Fig. 2. Generic double UART Block Diagram
 [2] Implementation of a Multi-channel UART - channel UART Controller Based on FIFO Technique and FPGA

In this paper, designing of a chip or we can say system on a chip in contact with Field Programmable Gate Array (FPGA) is now a days trend in the design or digital design industry. It is because of it has lots of advantages as compare to discrete electronics hinge products . It has lots of or many Advantages some of the are higher speed , Power consumption is low ,Size is small and Cost is low and-so forth.

Universal Asynchronous Receiver and Transmitter(UART) is a protocol which is categorized as serial communication protocol. Predominantly, these type of protocols are use to allows short distance ,reduces cost and well founded for the full duplex communication. These are basically it swaps the data between the peripherals to processors of the well founded transmission of data. Throughout opposed versus parallel communication, serial communication is substantially more cost-effective although the system's complexity increases. For something like the design of either a UART that is performed in Verilog HDL, it may be quickly racially segregated upon an FPGA to achieve the highest level of data reliability as well as blunder data.

[3] HDL Implementation of Universal Asynchronous Transmitter

In this paper, serial communication uses a single data line instead of the 8 bit data line of parallel

communication not only makes it much cheaper but also enables two computer located in to different cities to communicate over the telephone. Universal Asynchronous Receiver Transmitter (UART) is a kind of serial communication protocol; mostly used for short-distance, low speed, low-cost data exchange between computer and peripherals. Serial data communication uses two methods, asynchronous and synchronous.

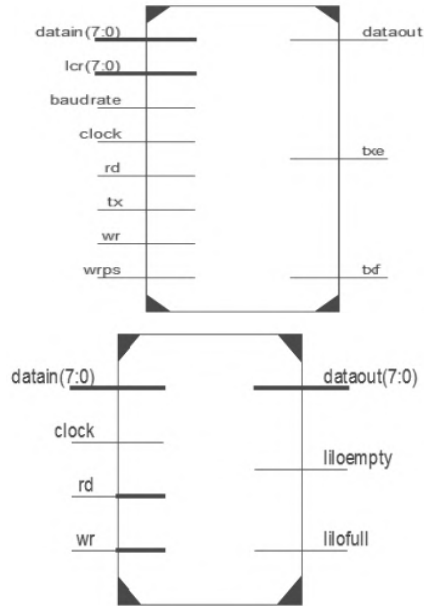


Fig 16 bytes LIFO

The synchronous method transfers a block of data (character) at a time, while the asynchronous method transfers a single byte at a time. It is possible to write software to use either of these methods, but the programs can be tedious and long. For this reason, there are special IC chips made by many manufacturers for serial data communications. These chips are commonly referred to as UART i.e Universal Asynchronous Receiver Transmitter. Asynchronous serial data communication is widely used for character- oriented transmissions, while block oriented data transfer use the synchronous method. In asynchronous method, each character is placed between start and stop bits. This is called framing. In data framing for asynchronous communications, the data such as ASCII characters, are packed between start and stop bits.

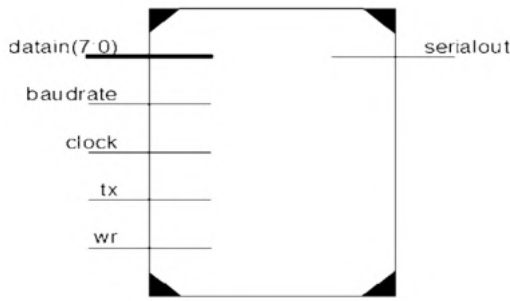


Fig RTL View of serial to parallel converter

The start bit is always one bit, but the stop bit can be one or two bits. For asynchronous serial communication, peripherals chips and modems can be programmed for data that is 7 or 8bits wide. The UART implemented with VHDL language can be integrated into the FPGA to achieve compact, stable andreliable data transmission. In recent years the researchers have proposed various UART designs like automatic baud rate synchronizing capability, recursive running sum filter to remove noisy samples, predictable timing behavior to allow the integration of nodes with imprecise clocks in time-triggered real-time systems.

The UART chip can also be designed with embedded Built-In-Self- Test (BIST) architecture using FPGA technology. UART allows full- duplex communication in serial link, thus has been widely used in the data communications and control system. UART is an asynchronous serial communication device. The transmitter and receiver communicate each other by separate clocks.

[4] Intelligent UART Module for Real-Time Applications

In this paper, UART is realized as generic extension module [10] and communicates with the process or core over a very slim interface. The extensions are mapped to the top address space of the data memory. For the processors the extension modules are only storage positions which can be accessed with simple load and store instructions. Therefore, from the pro-cessor’s point of view it makes no difference, whether the extension is a simple sensor, actuator, a complex floating-point unit or a UART. Fig 3 shows the generic interface of these extension modules.

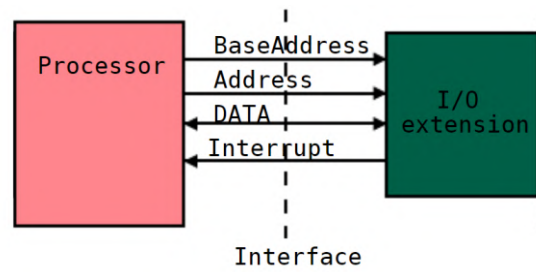


Fig 3. Interface of extension modules

Our UART provides the following mechanism to handle the problems while interfacing with other devies:

Temporal predictability: The arithmetic error problem is solved by enhancing the functionality of the baud rate generator.

Support for automatic synchronization: Setting the Sync flag in the command register causes the module to listen for the synchronization pattern.

Support for reduced software complexity: The fusion of a timer and a UART leads toa powerful communication module for real time application.

High flexibility: Although the design of the UART is optimized for real time applications, the module can be used as a simple timer or like a conventional

UART module.

CONCLUSION

Communication protocol plays a big role in organizing communication between devices. It is designed in different ways based on system requirements, and these protocols have a specific rule agreed upon between devices to achieve successful communication. Embedded systems, microcontrollers, and computers mostly use UART as a form of device-to-device hardware communication protocol. Among the available communication protocols, UART uses only two wires for its transmitting and receiving ends.

Despite being a widely used method of hardware communication protocol, it is not fully optimized all the time. Proper implementation of frame protocol is commonly disregarded when using the UART module inside the microcontroller. By definition, UART is a hardware communication protocol that uses asynchronous serial communication with configurable speed. Asynchronous means there is no

clock signal to synchronize the output bits from the transmitting device going to the receiving end.

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Battery Management System for Electric Vehicle

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Abstract - A Battery Management System (BMS) is used to monitor and control the charging and discharging of rechargeable batteries thereby providing a more cost-effective operation. The Battery Management System ensures that the battery is safe, dependable and increases the life of the battery without entering into a damaged state. In order to ensure that the battery is in a healthy condition, the battery and cell voltage, current and temperature is monitored on a real time basis. To obtain these parameters, different sensors are used with microcontrollers. The esp32 iot module is programmed so that these parameter are converted to a readable format. The State of Charge (SOC) plays a crucial part in evaluating the battery pack's remaining capacity whereas the state of health (SOH) indicates the battery health. The fault status of the battery is also monitored. If there is a rise in temperature or current above their respective threshold values, the BMS ensures that the load cuts off from the supply. Hence, the battery always operates within the Safe Operating Envelope (SOE).

I. INTRODUCTION

Electric vehicle (EV) are playing a key role because of its zero-emission of harmful gases and use of efficient energy. Electric vehicles are equipped by a large number of battery cells which require an effective battery management system (BMS) while they are providing necessary power. The battery installed in an electric vehicle should not only provide long lasting energy but also provide high power. Lead-acid, Lithium-ion, metal hydride are the most commonly used traction batteries, of all these traction batteries lithium-ion is most commonly used because of its advantages and its performance. The battery capacity range for an electric vehicle is about 30 to 100 KWH or more. Battery management system (BMS) makes decisions based on the battery charging and discharging rates, state of charge estimation, state of health estimation, cell voltage, temperature, current etc

II. LITERATURE REVIEW

[1] A. Hariprasad, R Sandeep, V. Ravi, O. Shekhar, Vignan Institute of technology, "Battery Management

System in Electric Vehicles", International Journal of Engineering Research & Technology (IJERT). Vol. 9 Issue 05, May-2020

Observations:

- Batteries are charged and discharged under the monitoring of a battery management system, which helps electric vehicle operations become more cost-effective.
- Voltage, current, and temperature are monitored using a variety of approaches by the battery management system to maintain the battery safe, dependable, and to prolong battery life.
- By addressing the battery's charge, health, life, and maximum capacity, the authors of this research have discovered potential answers and upcoming difficulties.

[2] Karima El Hammoumi, Rachid El Bachtiri, Mohammed Boussetta, Maha Khanfara-USMBA University Fez, Morocco

Observations:

- The battery management system (BMS) is necessary for photovoltaic installations with storage as they optimize the use of batteries, protect them against damage and prolong their life.
- In this paper they present a hardware platform for the experimentation of battery storage station.
- This platform contains a BMS for lead-acid batteries built around an Arduino Mega. The software of BMS allows, in addition to the functions of battery management and load control, to store the data in an excel sheet for later use

This study creates a mobile application that can deliver real-time weather data for a specific region. Despite [3]

[3]Muhammad Nizam, Hari Maghfiroh, Rizal Abdulrozaq Rosadi and Kirana D.U Kusama putri, “Battery management system design (BMS) for lithium-ion batteries”, AIP Conference Proceedings 2217, 14 April 2020

Observations:

- The performance of BMS to monitor voltage values had a root mean square error (RMSE) of 0.00706 or an accuracy of 99.29%,while the average value of relative standard deviation(MRSD) was 0.258% or 99.74%
- The protection feature can function well to overcome problems such as over charging and excessive temperature
- Balancing works well in setting the battery voltage value at 4.2v

[4]Nathan Scharich, Brandon Schniter, Anthony Herbert and Md. Shafiul Islam, “Battery Management System Using Arduino”, 2017 IEEE Technology & Engineering Management Conference (TEMSCON)

Observations:

- The battery management system provided accurate readings within less than five percent error. Frequent adjustments of the potentiometers might have improved the test results. Error could have introduced due to improper readings thereby affecting the average current.
- There are many possible improvements from the internal makeup of the battery point such as adding more sensors to read voltages and current.

IV. METHODOLOGY

The coulomb counting method, also known as amperehour counting and current integration, is the most

common technique for calculating the SOC. This method employs battery current readings mathematically integrated over the usage period to calculate SOC.

- * The coulomb counting method then calculates the remaining capacity simply by accumulating the charge transferred in or out of the battery. The accuracy of this method resorts primarily to a precise measurement of the battery current and accurate estimation of the initial SOC.

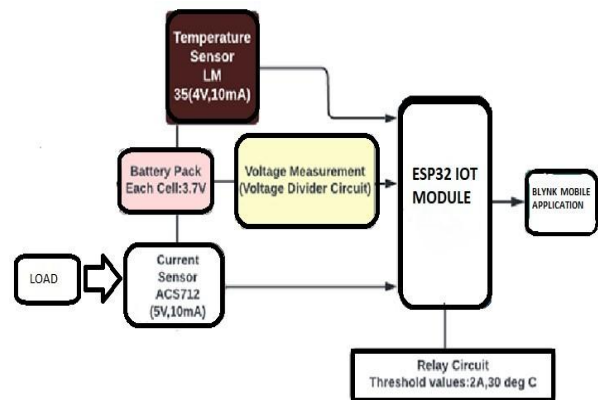


Fig.1. Block Diagram

A. Working:

For e vehicle battery monitoring system we are using esp32 iot controller module which is connected with voltage sensor module and current sensor module and this data is sent through iot cloud Blynk app in the mobile. the voltage sensor module send the DC voltage from the battery and convert back using suitable analogue signals which are connected to the GPIO 34 of the esp32 controller and the load current is sensed by ACS 712 current sensor which sense the current flows through the load and convert to a suitable analogue Signals and this is connected to the GPO 35 pin of ESP 32. For the purpose of monitoring the temperature across motor battery for the charging it's very important to monitor the temperature

variation in these sections we are using dht11 sensor which sense the temperature and continuously monitoring the temperature level in the blink app using iot cloud. The dht 11 is connected to GPIO 21 of esp 32.

V. RESULT

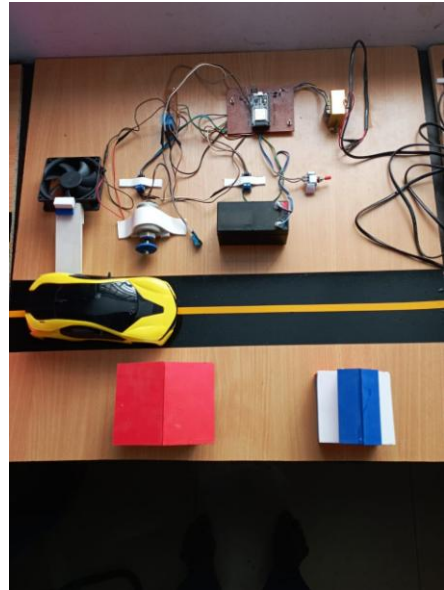


Fig.3 Setup of Proposed System

The voltage current and temperature readings are monitor in the blink mobile app using iot cloud platform and for this we are using iot Wi-Fi module which is constructed on esp32 using a local Wi-Fi Hotspot and the user Blynk mobile app all the complete data will be displayed .A DC power supply system, which maintains constant voltage irrespective of fluctuations in the main supply or variation in the load, is known as Regulated Power supply.

The **7805 IC** referred to fixed positive voltage regulator, which provides fixed voltage 5 volts. The **7805** regulator is known as fixed voltage regulator. Fixed – Voltage regulator design has been greatly simplified by the introduction of 3- terminal regulator ICs such as the 78xx series of positive regulators and the 79xxx series of negative regulators, which incorporate features such as built-in fold back current limiting and thermal protection, etc.

These ICs are available with a variety of current and output voltages ratings, as indicated by the ‘xxx’ suffix; current ratings are indicated by the first part of the suffix and the voltage ratings by the last two parts of the suffix. Thus, a 7805 device gives a 5V positive output at a 1mA rating, and a 79L15 device gives a 15V negative output at a 100mA rating. 3-terminal regulators are very easy to use. The regulators ICs typically give about 60dB of ripple rejection, so 1V of input ripple appears as a mere 1mV of ripple on the regulated output.

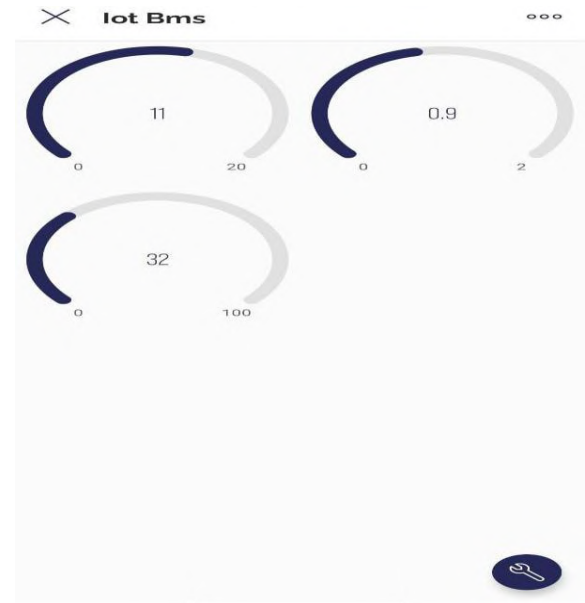


Fig.4 Result on Blynk App

CONCLUSION

This work first introduced the background of electric vehicles, lithium-ion batteries and the BMS. The details of the BMS, including its definition, objectives, functions and topologies were then discussed. The literature on battery modeling and BMS hardware

system design were reviewed in the following section. The limitations of early battery models and the disadvantages of other BMS hardware systems were also reviewed. The objectives and outline of this thesis were then presented. An improved battery model was proposed in this work by considering the self discharging effect, the

temperature effect and the fading-capacity effect observed in all batteries. The model was simulated using Matlab/Simulink, and the simulation results were discussed. A novel BMS hardware system based on the design of a TI BMS was introduced. It improved the original system by adding a user interface, a thermal management system and a current-monitoring function. The experimental results of this improved system were subsequently discussed. Finally, the results from a simulation based on an actual Thundersky battery were compared with the results from the experiments on the BMS hardware system.

FUTURE SCOPE

- * The rising rate of Electric Vehicle manufacturing companies leads to the increase in the need for a very efficient Battery Management System at cheaper prices . Hence, there is development being made every single minute with regard to BMS in order to increase its reliability and ensure its safe operation in the most efficient manner.
- * The further implementation could be to connect the BMS with the internet. In this way one can access all the data related to the battery from a remote location. All the updates regarding the maintenance of battery, charging time, estimated time to full charge, etc., can all be obtained in our very own mobile phones.

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Design and Analysis of Ring Slot Triangular Microstrip Antenna for Wireless Communications

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Abstract— An annular ring slot based microstrip triangular frequency-reconfigurable patch antenna with switchable frequency is reported. The reported antenna which consists of two PIN diodes is a simple low profile structure. At the top of the antenna, a simple microstrip line is used, whereas the bottom side of the antenna is designed by annular ring slot on triangular patch. PIN diodes are used to create shot circuit or open circuit across the ring slot to produce three reconfigurable frequencies,

GHz, 3.8 GHz and 4.4 GHz. All frequency bands of the antenna exhibit stable radiation patterns, good impedance matching and required gains. The size of the proposed reconfigurable antenna is 43.3 x 37.5 mm². All performance parameters of proposed antenna are obtained using commercially available method of moment based simulator, IE3D and verified by the measured results. The measured results are found the close similarity with the simulated results.

Keywords— Annular ring slot, Frequency reconfigurable, Microstrip feed line, PIN diodes.

I. INTRODUCTION

Microstrip antennas are widely utilised in wireless and satellite systems due to the fact that they have the benefits of being easy to fabricate, having a low weight, and having a tiny size. When compared to rectangular or circular patch antennas, triangular patch antennas have superior radiating qualities at a given cut-off frequency [2]. [Note: These days, reconfigurable microstrip antennas have attracted a lot of interest in the field of wireless systems due to the frequency or polarisation specific capabilities that they can perform. An antenna that is capable of being reconfigured can have its different features changed, including its radiation pattern, polarisation, operational frequency, and directivity, amongst many other aspects [3]. Because a reconfigurable antenna lowers the cost of a system in which numerous antennas are utilised for radiation at different frequencies, the demand for such an antenna has increased as a result of the aforementioned causes. The reconfigurable antenna is an ideal candidate for cognitive radio because it possesses the ability to communicate at a specific frequency while simultaneously monitoring the spectrum [4-5].

An electrical length of antenna slot controlled by connecting or disconnecting the several parasitic elements to the radiating patch is reported in [6]. Reconfigurability is obtained by inserting the P-I-N diodes or RF MEMS in the antenna is presented in [7]. Frequency reconfigurable antenna provides the reconfigurability in selectable frequency band

only, which allows the minimum number of unwanted signals and noise as compare to wideband antenna. The reconfigurability can also be achieved by defecting the ground plane of the antenna geometry. Defecting the ground plane of the antenna improves the current distribution. For the switching operation, PIN or varactor diodes are mostly used inreconfigurable antennas [8].

In this article, the design and development of a frequency-configurable annular ring slot microstrip patch antenna is presented for further research and development. The ring slot parameters of the antenna can be changed by adjusting the switching states of the antenna's two PIN diodes in order to get the desired effect. Altering the length of the ring slot causes a change in current distribution, which in turn causes the antenna to resonate at a variety of different frequencies. The states of the PIN diodes can be used to control the resonant frequencies of the proposed antenna, which are 3.40, 3.80, and 4.40 GHz respectively. The suggested frequency reconfigurable antenna has dimensions of 43.3 x 37.5 mm² respectively. On a substrate made of RT/duroid 5880 (with a height of 1.57 millimetres and a radius of 2.2 millimetres), the antenna is constructed and optimised using a technology known as moment-based simulator, IE3D. The results of the antenna's design are then measured to ensure accuracy.

II. DESIGN AND DEVELOPMENT OF ANTENNA

Fig. 1 depicts the plan for the frequency-adjustable antenna that has been proposed. The two parts of upper and lower transmission lines are depicted in the top view of the layout (Fig. 1a), which is an overhead perspective. The bottom aspect of the layout, which is represented by figure 1b, comprises of an equilateral triangular patch with a centre annular ring slot. The annular ring slot is made up of two PIN diodes, and these diodes are what are responsible for making the slot either short circuited or open circuited depending on the state of the PIN diode. By either open circuiting or short circuiting the slots, the current distribution within the triangular patch may be altered, causing the antenna to resonate at a variety of different frequencies. When analysing the switching states of PIN diodes, Two copper strips (0.5 mm x 1.2 mm) are used in place of PINdiodes to analyze the switching states of PIN diodes. PINdiodes are used as switch at the time of practical applications of antenna to get the frequency reconfigurability.

The layout of the antenna shown in Fig. 1 is designed and

optimized by electromagnetic simulator IE3D on a 1.57 mm thick RT/duroid 5880 substrate with $s_r = 2.2$ and $\tan(\delta) = 0.0009$. Table I shows the various dimensions of the antenna of Fig. 1.

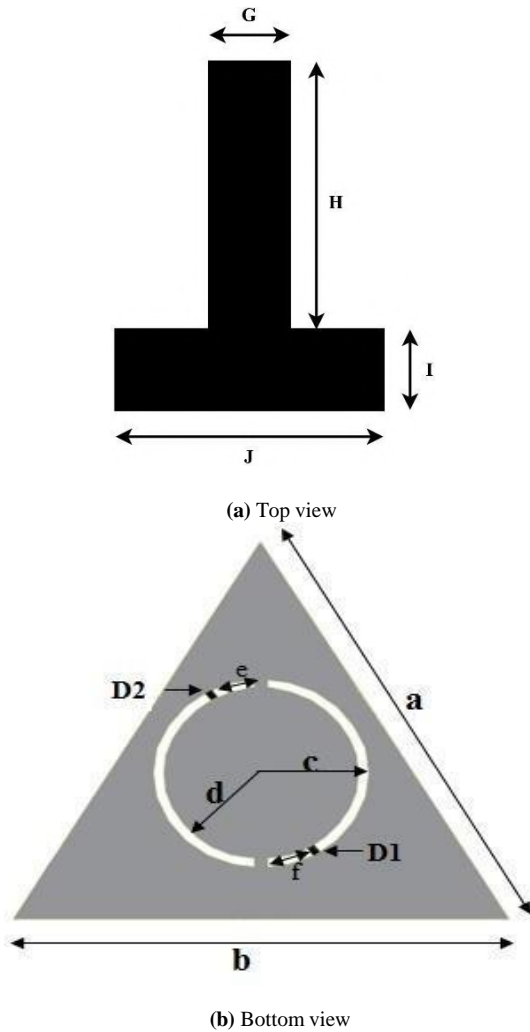


Fig. 1 Top and Bottom views of the proposed frequency-reconfigurable ring slot microstrip patch antenna

TABLE I. THE PROPOSED ANTENNA DIMENSIONS (mm)

| | | | | | |
|-----------------|------|------|-----|-----|-----|
| Parameters | a | b | c | d | e |
| Optimized value | 43.3 | 43.3 | 9.5 | 8.5 | 3.5 |
| Parameters | f | G | H | I | J |
| Optimized value | 3.5 | 2 | 10 | 3 | 4.8 |

III. SIMULATION AND MEASURED RESULTS

Depending upon the states of PIN diodes D1 and D2, the antenna is configured for three cases C1, C2 and C3. Table II shows the diodes states for various configurations. The simulated $S_{11}(dB)$ vs. frequency plot for various configurations of reconfigurable antenna is shown in Fig. 2. The centre frequencies for configurations C1, C2 and C3 are 3.40 GHz (-10dB bandwidth is 110 MHz), 3.80 GHz (-10dB

bandwidth is 170 MHz) and 4.40 GHz (-10dB bandwidth is 90 MHz) respectively.

The top and bottom perspectives of the fabricated photograph of the proposed antenna for configuration C1 are depicted in Figure 3. In Figure 4, we see a comparison of the simulated and measured $S_{11}(dB)$ vs frequency plots for Configuration C1. The centre frequency that was measured was 3.48 GHz, whereas the centre frequency that was simulated was 3.4 GHz. At their centre frequencies, the $S_{11}(dB)$ values that have been measured and those that have been simulated are 19.2 dB and 22.1 dB, respectively. However, there is a slight deviation in the measured result that may have arisen as a result of soldering tolerances, a finite ground plane, or fabrication tolerances. Although there is a close similarity between the measured and simulated results, it can be observed that the measured results deviate slightly from the simulated results.

TABLE II. SWITCHING CONFIGURATION AND OPERATING FREQUENCIES OF PROPOSED ANTENNA

| Configuration | D2 | D1 | Centre Frequency (GHz) | Gain (dBi) | B.W (MHz) |
|---------------|-----|-----|------------------------|------------|-----------|
| C1 | OFF | OFF | 3.40 | 2.72 | 110 |
| C2 | OFF | ON | 3.80 | 2.81 | 170 |
| C3 | ON | ON | 4.40 | 1.51 | 90 |

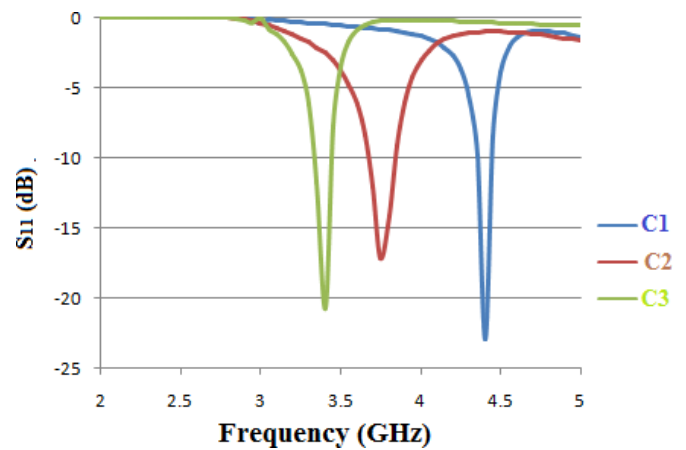
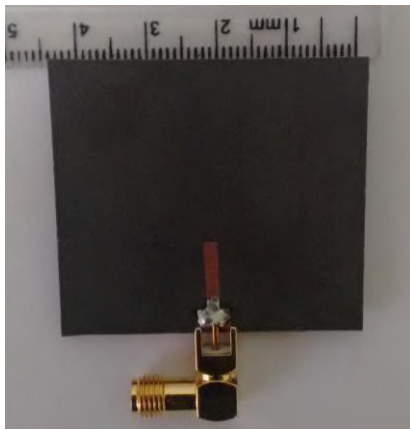
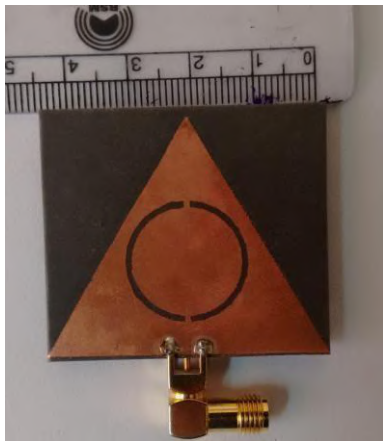


Fig. 2 Simulated S_{11} vs. Frequency plot for configurations C1, C2 and C3



(a) Top view



(b) Bottom view

Fig. 3 Top and Bottom views of fabricated reconfigurable antenna for configuration C1

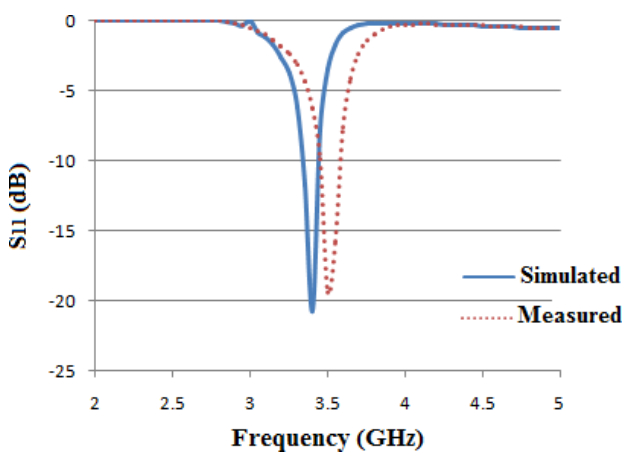


Fig. 4 Comparative simulated and measured S11 vs. frequency plot for configuration C1

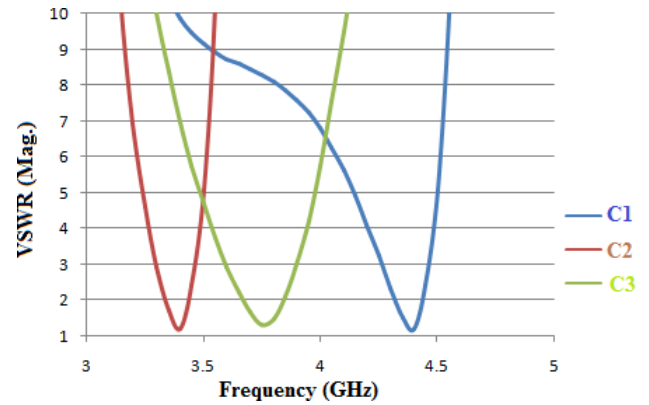


Fig. 5 VSWR vs. f (GHz) plot

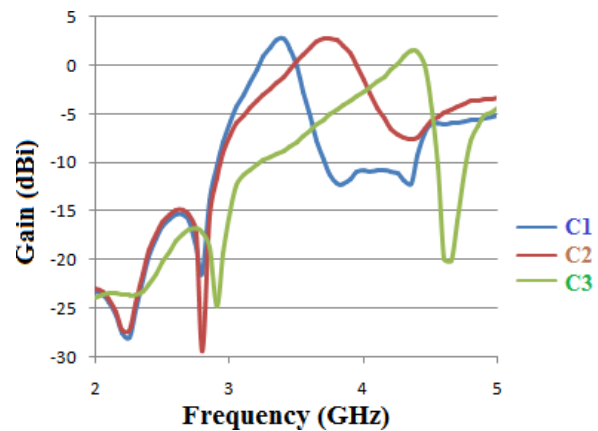


Fig. 6 Gain vs. f (GHz) plot

Fig. 5 shows the plot between simulated VSWR and frequency of the proposed antenna for configuration C1, C2 and C3. Fig. 5 shows that the VSWR values for configuration C1, C2 and C3 are 1.22, 1.50 and 1.18 respectively at their corresponding resonance frequency. Fig. 6 shows the plot between gain (dBi) and frequency of the antenna for different configurations. The gain for configuration C1, C2 and C3 are 2.72, 2.81 and 1.51 dBi respectively. The gain, -10 dB bandwidth and centre frequencies for various configurations are also listed in Table II. The simulated antenna efficiency vs. frequency plot (Fig. 7) shows that the proposed antenna has the good antenna efficiencies which are 98.32, 95.57 and 78.0 % respectively for configuration C1 C2 and C3 at their corresponding centre frequencies.

A typical radiation patterns (E-plane and H-plane) are investigated and plotted as shown in Fig. 8 and Fig. 9. The radiation patterns for configuration C1, C2 and C3 at frequency 3.40, 3.8 and 4.4 GHz are shown in Fig. 8 and Fig. 9. The radiation patterns for configuration C1 and C2 are very much similar which signifies the commutation of frequencies without change of radiation pattern.

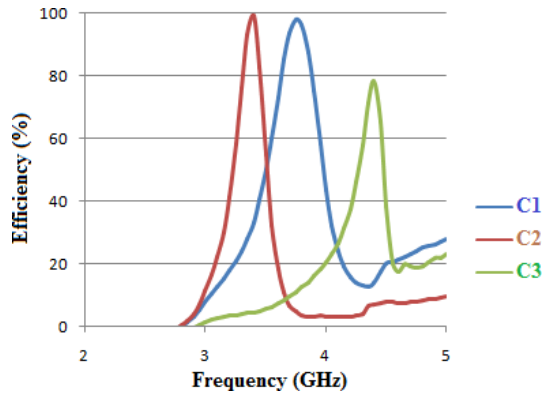


Fig.7 Simulated antenna efficiency vs. frequency plot

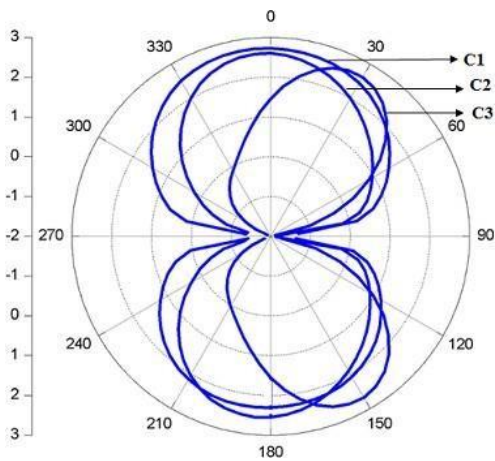


Fig. 8 Radiation pattern (E-plane) for three configurations

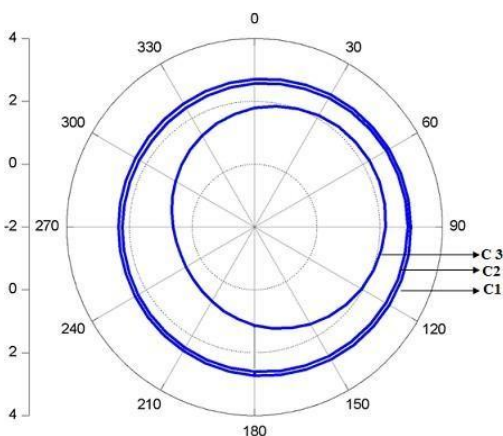


Fig. 9 Radiation pattern (H-plane) for three configurations

IV. CONCLUSION

In this paper, An annular ring slot based microstrip triangular frequency-reconfigurable triangular patch antenna operating at three different frequencies (3.40, 3.80 and 4.40 GHz) is presented, using independently biasing P-I-N diodes into the slot. The proposed antenna has the size of 43.3 x 37.5 mm². Because of the good return loss, good efficiency and fair gain, the presented antenna may be useful in applications in C band and S band wireless communication systems.

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IOT Based Indoor Air Monitoring System Using Different Gas Sensors

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Abstract:- Air pollution causes millions of people globally to pass away too soon. Numerous of these fatalities take place in big cities where hazardous airborne particles are abundant due to vehicle, industrial, and power plant exhaust. Because heating, ventilation, and air conditioning (HVAC) systems sometimes fail to function properly, indoor air pollution concentrations can be up to ten times higher than those found outdoors. By utilising integrated electronics, software, sensors, and connectivity, the Internet of Things can assist in performing a real-time monitoring of indoor air quality. The Web of Things is one strategy that is gaining traction that employs web architecture and web standards as a platform for developing IoT applications. An IoT platform for tracking indoor air quality is given in this study. The execution is founded Data from sensors is gathered via the CoAP protocol, which is based on the Web of Things concept. Additionally presented and described are the hardware platform and implementation specifics created for this project.

Keywords : Air Quality, Internet Of Things, CoAP.

I. INTRODUCTION

The Internet of Things (IoT) is a relatively new technology that involves the interaction of machines and/or gadgets to create a new worldwide network. IoT is anticipated to be the next stage in the development of the Internet, allowing for the collection and analysis of vast volumes of data to produce insightful and practical knowledge. As IoT technology is used more frequently, things are able to see, hear, think and execute tasks based on some decision taken by themselves. Air pollution monitoring is considered as a very complex task but it is very important. Traditionally data loggers were used to collect data periodically and this was very time consuming and quite expensive. The control and monitoring of indoor air conditions represents an important task with the aim of ensuring suitable working and living spaces to people. However, the comprehensive air quality monitoring which include monitoring of temperature, humidity, air quality, etc., is not so easy to be monitored and controlled. Indoor Air

Quality (IAQ) can be affected by several agents or parameters like temperature, humidity, volatile organic compounds (VOC), particulate matter (PM), aerosols, etc.

II. LITERATURE REVIEW

In the hardware part we are using Lcd, power supply, Jumper wires, MQ135 air quality sensor, and Node MCU this sensor is used to detect CO₂, CO, Ammonia as well as smoke. Followed by Node MCU also called as ESP8266 wifi chip why we are using means we need to push this data to the cloud because Arduino doesn't have wifi capacity so that we use this chip and connect this wifi to our mobile hotspot 5V Power supply is one of the most common power supply in use today. H44780 Character LCD is an industry-standard LCD Display device for interfacing with embedded systems. Here we are using 16X2 Configuration 4-bit write mode in this project. We use electromagnet inside the Buzzer In the software part we are using a platform called Things Speak. There is a MATLAB Option also available. we created the Twitter account also for observation of output.

350 PPM is the maximum permissible amount of air quality, and it should not go above 1000 ppm. It begins to produce headaches, tiredness, and stuffy, stagnant air when it exceeds the limit of 1000 PPM. If it exceeds 2000 PPM, it can also increase heart rate and lead to a variety of other ailments. The LCD and website will display "Good Quality of Air" when the reading is less than 1000 PPM. The buzzer will begin to sound whenever the figure rises by 1000 PPM, and "Bad quality of air" will be displayed on the LCD and website.

III. PROBLEM STATEMENT

Controlling atmospheric emissions, comprehending pollutant dispersion, and monitoring emission levels, or concentration in ambient air, are all necessary for protecting the atmosphere. There are Air Quality

Monitoring Networks that track these levels. To determine whether an area has an issue with air pollution is the first step in the monitoring of air quality. Monitoring aids in determining the degree of pollution in reference to the requirements for ambient air quality. Standards are a legal requirement to achieve clean air and define the goal for reducing pollution.

IV. METHODOLOGY

A. Hardware Components

- a) Power supplies are electrical equipment that give electricity to electrical loads, which include electronic devices like servers and laptop computers. The main function of a power supply is to transform electric current from a source to the appropriate voltage, current, and frequency to power the load.
- b) Methene Sensor: A methane gas sensor is a tool used as a crucial component of a stationary gas detection system to monitor and detect methane levels in air in% LEL. (Lower Explosive Limit) levels or in percent by volume levels.



Fig. 1. Methene Gas Sensor

- c) Carbon Monoxide Gas Sensor: In order to avoid carbon monoxide poisoning, a carbon monoxide detector, also known as a CO detector, looks for the gas carbon monoxide.



Fig. 2. MQ-7 Gas Sensor

- d) Micro-controller (Node MCU): An open source firmware called Node-MCU was created for the ESP8266 Wi-Fi chip. Node-MCU firmware includes an ESP8266 Development board/kit, also known as a Node-MCU Development board, in order to explore ESP8266 chip capability. The Node-MCU Dev Kit's board features analogue (A0) and digital (D0-D8) pins similar to those on an Arduino. It supports UART, SPI, I2C, and other serial communication protocols. We can connect it to serial devices like I2C-enabled LCD displays, magnetometers, accelerometers, GPS modules, touch screens, SD cards, and RTC chips using such serial protocols.

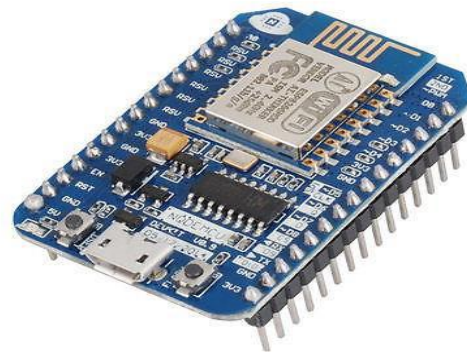
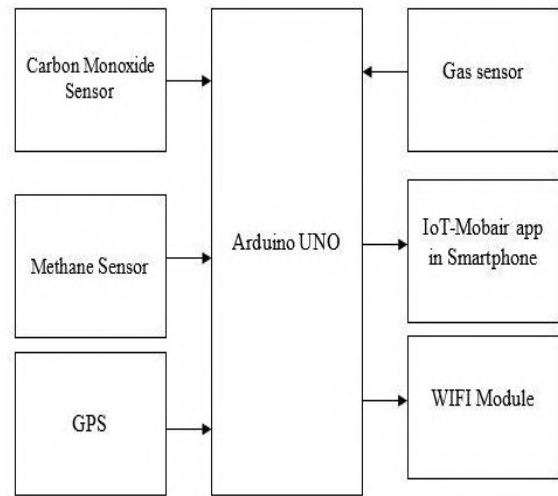


Fig. 3. Micro-controller (Node MCU)

- e) ESP8266 Wi-Fi: The ESP8266 Wi-Fi Module, a self-contained SOC with an integrated TCP/IP protocol stack, enables any microcontroller to connect to your Wi-Fi network. The ESP8266 is capable of hosting an application or delegating all Wi-Fi networking duties to another application processor.



Fig. 3. ESP8266 Wi-Fi Module



B. Block Diagram

Fig: Diagram of Air Monitoring System

V. RESULT

Many industries, including environmental monitoring, building automation, and industrial safety, use indoor air monitoring using various gas sensors. Such monitoring aims to guarantee that the air inside a structure or room is clean, safe to breathe, and devoid of dangerous pollutants. The most significant source of real-time data on the concentration of different gases in the air is the output and results of an indoor air monitoring project employing different gas sensors. Building managers or occupants can easily notice possible issues and take action thanks to the data's ability to be displayed on a dashboard or transmitted to a mobile app.

Alerts and notifications: Indoor air monitoring systems can be configured to send alerts or notifications when certain gas concentrations exceed predefined thresholds. This allows building managers or occupants to take immediate action to address the issue.

Improved air quality: By identifying and addressing sources of pollutants, an indoor air monitoring system can help improve the overall air quality inside a building or room. This can lead to a healthier and more productive environment for occupants.

VI. CONCLUSION

The IOT Based Air Monitoring System has been experimentally proven to work satisfactorily by monitoring the presence of Gases in Air successfully. Through the internet control the Sensors Detect Such Gases in the Air. It also stores the sensor parameters in the timely manner. This will help the user to analyze the conditions of various parameters in the Air any time . Then Provide Alert as Alarm . Finally, we conclude that Air Monitoring System is more efficient In todays Day to Day Polluted Living In Human Race of Life.

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Speed Control of BLDC Motor Using Arduino

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Abstract - In the present scenario, DC motor requires a frequent maintenance and need a mechanical commutator and brushes which are subject to wear and tear. In DC motor brushes has to deliver a current to the motor windings through mechanical commutation hence these motors cannot operate in explosive and hazardous conditions due to sparking over at brush. The speed of DC motor is low due to mechanical limitation imposed by brushes or commutator. In view of these disadvantages BLDC (Brush less dc) motor is prepared. BLDC motor is widely used in application like home appliances, aerospace, medical, automated equipment and instrumentation. The BLDC motors are permanent magnet motors where the functions of commutator and brushes are implemented by solid state switches. The BLDC motors are distinguished not only by the high efficiency but switch commutation circuit plays the role of mechanical commutation. That means that the coil placed in the stator and permanent magnets on the rotor. Commutation process of a BLDC motor is controlled by electronic speed controller and Arduino board is loaded with program written in embedded C language. By varying the potentiometer Arduino generates the PWM signals and depending on the pulse width duration ESC will drive the motor. ESC will energize the stator windings in a proper sequence, which supports to rotate the Brushless DC motor. Brushless Direct Current motor speed can be controlled and other parameters like voltage and speed are monitored on LCD display.

Index Terms: BLDC motor, Arduino uno, LCD, ESC, PWM, IR sensor

I. INTRODUCTION

In dc motor brushes has to deliver a current to the motor windings through mechanical commutation hence these motors cannot operate in explosive and hazardous condition due to sparking. The speed of dc motor is low due to mechanical limitation imposed by commutator. In view of these disadvantages BLDC motor is prepared. BLDC Motor work on the Lorentz force of law. BLDC motor is widely used in application like home appliances, aerospace, medical, automated equipment and instrumentation. Brushless Direct Current motor are extensively used in many of the industries because of its low cost, noise less operation, high speed torque characteristics. Speed of BLDC Motor (Specifications:1000 KV, Current handling capacity:12A, Speed:12000 RPM) can be controlled in order run the motor at desirable speed. By using

the Arduino Board interfaced with the Electronic Speed Controller, Motor speed can be controlled by varying the potentiometer. The parameters like Speed and Voltage are Monitored on the LCD display.

II. LITERATURE REVIEW

[1] “Anjum A Tadmod, Snehal Pandkar, Prof.A.K.Talele, Prof.S.G.Lambore “Study of BLDC Motor Controller Using Arduino-Uno” International Journal of Innovative Research in Science.

This paper gives an idea of how to control a BLDC of up to 250 Watt efficiently without electronic speed controlling unit. Instead PWM signals are used to control the speed of the motor.

[2] “Md Mahmud, S. M. A. Motakabber, A. H. M. Zahirul Alam, Anis Nurashiki Nordin by “Control BLDC motor speed using PID controller” International Journal of Advanced Computer Science and Application (IJACSA), Vol. 11, No.3, 2020.

This paper describes the design of the BLDC motor control system using in MATLAB/SIMULINK software for Proportional Integral Derivative (PID) algorithm that can more effectively improve the speed control of these types of motors. The purpose of the paper is to provide an overview about the functionality and design of the PID controller.

[3] “Prof. S.R.Lengade, Dhiraj Mahjan published By “Speed control of BLDC motor by using PWM Technique”

Matrix converter technology is used to control the speed of BLDC motor.

[4] “Priya, Althaf Patan published by “Speed Control of Brushless Dc Motor Using Fuzzy Controller”

Design of BLDC motor control system using MATLAB or SIMULINK software. In this the Fuzzy logic controller is used.

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This paper initially provides a general overview to familiarize the reader with motor control fundamentals, terms and concepts, and applications. The latter portion of this paper provides detailed descriptions of BLDC motor structure, working principle and control method. General Principle of Motor convert electrical energy into mechanical energy using electromagnetic principles. The energy conversion method is fundamentally the same in all electric motors

III. PROBLEM STATEMENT

In the present scenario, DC motor requires a frequent maintenance and need a mechanical commutator and brushes which are subject to wear and tear. In dc motor brushes has to deliver a current to the motor windings through mechanical commutation hence these motors cannot operate in explosive and hazardous condition due to sparking. The speed of dc motor is low due to mechanical limitation imposed by commutator. In view of these disadvantages BLDC motor is prepared.

IV. METHODOLOGY

In this project, Arduino and Electronic Speed Controller (ESC) are the two main parts of the hardware, Arduino board is loaded with program written in embedded C language. When DC Power Supply is applied and by varying the Potentiometer, Arduino generates the Pulse Width Modulation (PWM) signals and depending on the pulse width duration ESC will drive the Motor through switching method or activating appropriate MOSFET switches. As soon as ESC receives the pulses from Arduino and rotor position information it will energize the Phase windings of Brushless DC motor due to force of attraction between electromagnetic winding and rotor permanent magnet hence motor starts rotating. Speed controlling of the Brushless DC motor is done by ESC. IR Photodiode sensor is used to detect the rotation of BLDC motor and Potential divider is used to detect voltage across BLDC motor. The parameters like speed and voltage of the BLDC motor are observed on LCD display.

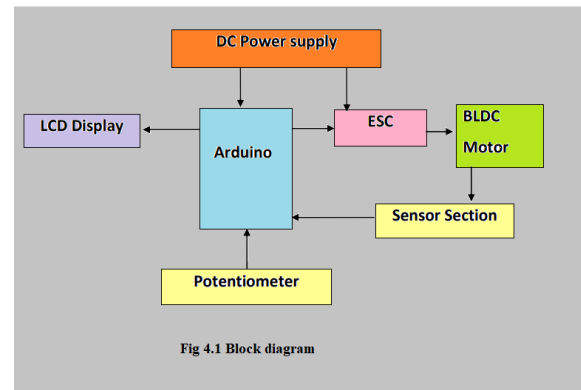


Fig.1 Block Diagram

A. Working:

The components of this project are Arduino, Transformer, LCD, ESC, BLDC motor, IR sensor.

In this circuit, DC Power deliver is taken from two transformer, one is 230V/9V Centre tapped transformer is hooked up to Bridge Rectifier to get 9V DC Voltage and Regulated power supply of 5V is given to ATmeg328p. Another one is 230V/12V AC step down transformer is connected to Full Wave rectifier and it's far connected to Electronic Speed Controller (ESC). ATmeg328p D9 (PWM) Pin 15 is hooked up to the electronic pace controller (ESC) to generate the pulse width modulation (PWM) Pulses. Potentiometer is connected to analog (A2) of ATMeg328p pin quantity 25 in an effort to range the speed of BLDC Motor. Potential divider is connected to analog (A0) Pin quantity 23 to get voltage throughout the BLDC Motor. IR LED and Photo diode are linked to D2 of Pin range four. To study the speed and voltage of BLDC Motor LCD Display is attached to ATmeg328p Arduino and Electronic Speed Controller (ESC) are two the main parts of the hardware, Arduino board is loaded with program written in embedded C language. When DC Power Supply is applied and by varying the Potentiometer, Arduino generates the Pulse Width Modulation (PWM) signals and depending on the pulse width duration ESC will drive the Motor through switching method or activating appropriate TRANSISTOR switches. As soon as ESC receives the pulses from Arduino and rotor position information it will energize the Phase windings of Brushless DC motor due to force of attraction between electromagnetic winding and rotor permanent magnet hence motor starts rotating. Speed controlling of the Brushless DC motor is done by ESC. IR Photodiode sensor is used to detect the rotation of BLDC motor and Potential divider is used to detect voltage across BLDC motor. The parameters like speed

and voltage of the BLDC motor are observed on LCD display

B. Flowchart



Fig.2 Block Diagram

V.RESULT

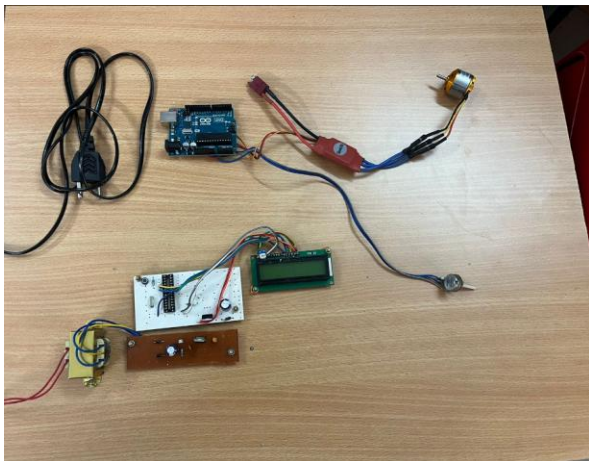


Fig.3

Setup of Proposed System

Readings of Voltage Current Speed and Torque

| Sl. No | Voltage (Volt) | Current(amp) | Speed(rpm) | Torque(N-m) |
|--------|----------------|--------------|------------|-------------|
| 01 | 11.1 | 0.123 | 0 | 1.02 |
| 02 | 11.2 | 0.124 | 5000 | 1.03 |
| 03 | 11.3 | 0.125 | 8000 | 1.04 |
| 04 | 11.4 | 0.126 | 9000 | 1.06 |
| 05 | 11.5 | 0.127 | 10000 | 1.07 |
| 06 | 11.6 | 0.128 | 11000 | 1.08 |

Fig.4 Readings of Voltage Current Speed and Torque

CONCLUSION

Brushless Direct current motor speed is controlled by using electronic speed controller (ESC) with a pulse width modulation technique through Arduino and parameters can be monitored on an LCD display. Speed v/s Torque characteristic is flat; hence system get stable

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Investigation of Two-Port MIMO Antenna with Enhanced Isolation Parameters for Wireless Applications

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Abstract—In the proposed work we discuss the characteristics of two-element multiple-input and multiple output (MIMO) antenna systems operating in ultra wide band (UWB). The close proximity of the antenna components results in high mutual coupling. The unique chain-structured parasitic element is introduced on the radiator to enhance isolation and acts as a decoupling structure. The physical dimension of the substrate is $21.5 \times 34 \times 1.6 \text{ mm}^3$. The addition of a decoupling structure enhances isolation by more than 15dB for the working frequency range of 4.5-13 GHz. These outcomes confirmed that the suggested MIMO architecture is well-suited for the applications involving in wireless communication.

Index Terms - MIMO, isolation, chain-structured parasitic element.

I. INTRODUCTION

Wireless communication is the most preferred channel for transmitting and receiving information in modern portable electronic devices. These devices offer multiple features that demand large bandwidth for seamless operation. The ultra wide band (UWB) technology provides 7.5GHz unlicensed bandwidth in the frequency range of 3.1 to 10.6 GHz[1]. In recent years UWB has been widely studied and used in near-field communication due to its outstanding features like low power and large frequency spectrum. The short pulses used in UWB communication cause multipath fading due to diffraction [2]. Multiple-input and multiple-output (MIMO) technologies are used in conjunction with UWB to take advantage of UWB and overcome the issue of multipath channel fading. MIMO technology is a major key factor in the exponential growth of wireless communication technology. The MIMO provides extensive coverage, improved spectral efficiency, enhanced QoS, and high-speed communication. The multiple antennas at the transceivers help to improve the spatial multiplexing, and the low bit error rate increases the

system's throughput [3-4]; Mutual coupling occurs when multiple antennas are put in close proximity in a MIMO system. The literature describes numerous techniques to enhance the isolation in MIMO antennas. These approaches are broadly categorized as suppressing coupling current and alternate current channels. Isolation enhancement techniques such as defected ground structure (DGS), metamaterial loading, and filters behave as band-stop filters and suppress the coupling effect [5-14]. On the contrary, matching networks, neutralization line (NL), and embedding parasitic elements provide a local alternate current path, so the coupling current should not reach the neighboring antenna element. An inset-fed rectangular two-port antenna operating in the UWB range is presented in [6]. An electromagnetic band gap arrangement between the antennas improves the isolation among the elements. In [8], an orthogonal configuration with the shared structure is proposed for the reduction of mutual coupling in the two-port MIMO antenna. The different structures and their impact on designing the UWB antenna are illustrated in [9]. In [10], a hybrid construction formed of a rectangle and a circular with a reduced ground plane illustrates UWB functionality. Furthermore, the designed antenna is placed orthogonally with the common ground plane to eliminate mutual interaction among the inter-components. Authors in [12] show microstrip fed rhombic shape slot antennas. The suggested design improves isolation by employing parasitic components and putting the antennas perpendicular to each other, allowing the coupling current to be neutralized. Two-port UWB MIMO antenna based on the NL is presented in [14]. The suggested design cancels out the coupling current between the components by creating an out-of-phase current of equal magnitude. The literature reveals that most of the work employs decoupling structures such

as defective ground structures, orthogonal antenna location, orientation, and loading parasitic components on to the radiator to improve isolation. Maintaining consistent radiation characteristics while designing a compact MIMO antenna with strong isolation and a broader impedance bandwidth is difficult.

This article provides a two-element MIMO design that operates in the UWB band. The physical dimension of the proposed design is $21.5 \times 34 \times 1.6 \text{ mm}^3$, demonstrating an S11 ranging from 4.5GHz to 13GHz. The unique chain-structured parasitic element is introduced between the components to function as a decoupling framework. The ground plane is adjusted to achieve the required reflection coefficient curve. The projected design has isolation better than the 15dB across the bandwidth, and results demonstrate their values are less than the minimum levels required for MIMO applications.

II. MIMO ANTENNA DESIGN

The UWB antenna is horizontally mirrored with a spacing of 10 mm (less than the quarter wavelength, λ calculated at the frequency of 4 GHz) to form a two-port UWB antenna. The ground plane of the single-element antenna is extended across the width of the substrate of the two-port antenna as illustrated in Figure 1.

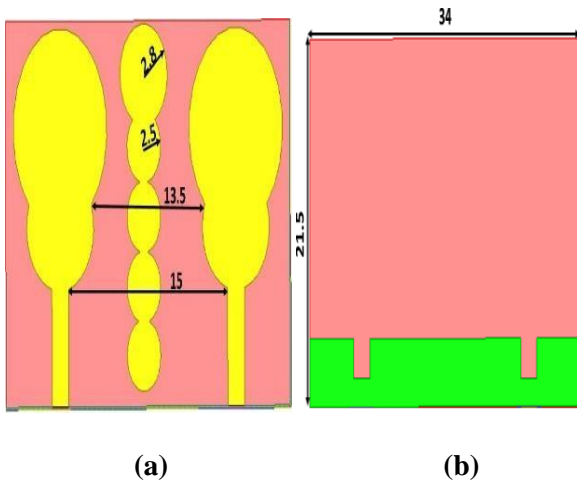


Fig. 1. The Projected two-port MIMO antenna (a) Radiating (b) Ground plane. (Dimension are in mm)

This arrangement leads to poor isolation among the antenna elements. To enhance the isolation among the MIMO antenna elements, a unique chain-structured

parasitic element called as neutralization line (NL) is installed as a decoupling structure among the antennas of the MIMO system. The parasitic element creates local current channels that neutralize the coupling effect from the excited antenna and helps in isolation improvement as illustrated in Figure 2. The two-port UWB antenna operates from 4.5 GHz to 13GHz, providing an isolation of better than 20dB across the impedance bandwidth except in the operating frequency range 9-10GHz, where the isolation is better than 18dB.

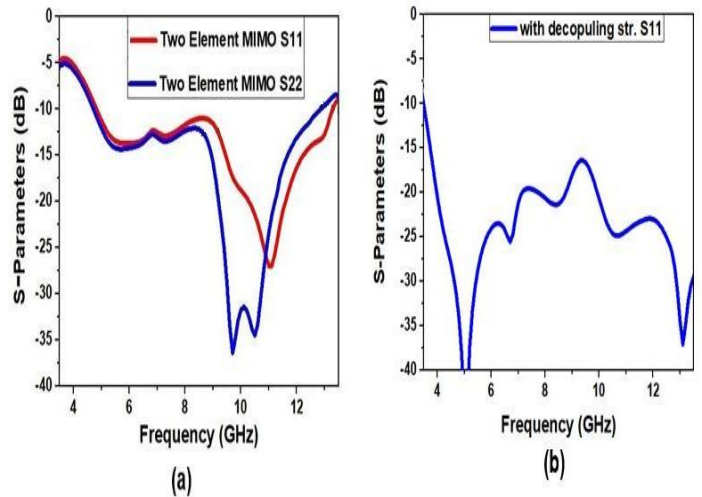


Fig.2. The Projected two-port MIMO antenna (a) Reflection coefficient (b) Transmission coefficient. The described design employs FR4 as a substrate. The physical size is $0.4\lambda \times 0.5\lambda \times 0.02\lambda$, resulting in impedance bandwidth ranging from 4.5-13GHz. Following a through parametric analysis, the appropriate physical dimensions are determined.

2.1 Surface Current Distribution

As demonstrated in Figure 3, the surface flow of current is presented at the resonant frequency of 9.7 GHz and 11 GHz. This is performed by activating one port and deactivating the other. The graphic demonstrates that the feed line, NL, and ground plane have the highest current concentration. The current concentration ensures that the NL prevents the coupling field from reaching the adjoining antenna, resulting in enhanced isolation.

III INVESTIGATION OF PARAMETRIC TWO PORT MIMOANTENNA

Effect Decoupling Structure

The effect of decoupling structure is studied and is illustrated in Figure 4. The results reveal that the minimum isolation S21 obtained without decoupling structure is 15 dB which is very low for a good MIMO antenna. After embedding a unique chain-structured parasitic element called as neutralization line (NL) as a decoupling structure among the antennas in the radiating part of the MIMO antenna the isolation is enhanced up to 20dB.

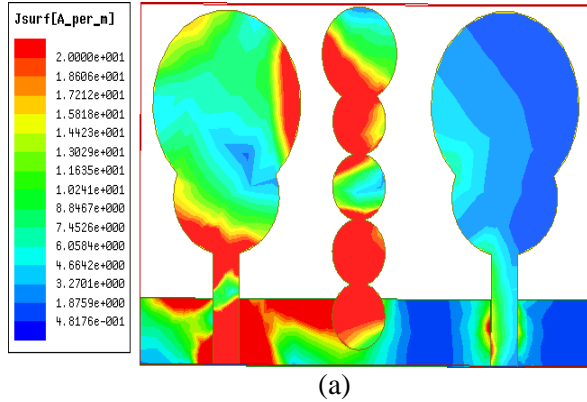


Fig. 3. The plots of surface current of the antenna (a) 9.7GHz and (b) 11GHz

Effect of distance between the elements

To fix the optimum distance between the element an analysis is performed on a connected ground plane MIMO structure where the distance between the two radiating elements is varied, and the effect of surface wave coupling is studied. Figure 5 (a) indicates that at 9.5 mm, the minimum isolation obtained is 10dB in the band of interest. For 11.5mm, the isolation is best however the S11 and S22 are not optimum as can be seen in Figure 5(b). At 13.5 mm, the structure resulted in better minimum isolation of 18dB throughout the frequency of interest with correlated S11 and S22 as illustrated in Figure 5(a) and (b), respectively.

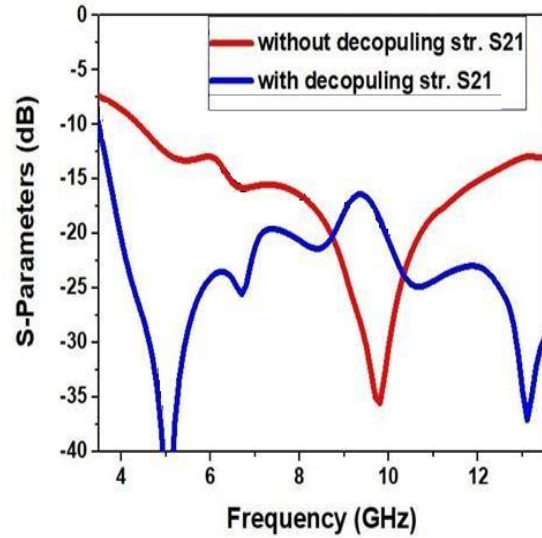


Fig.4. Effect of decoupling structure

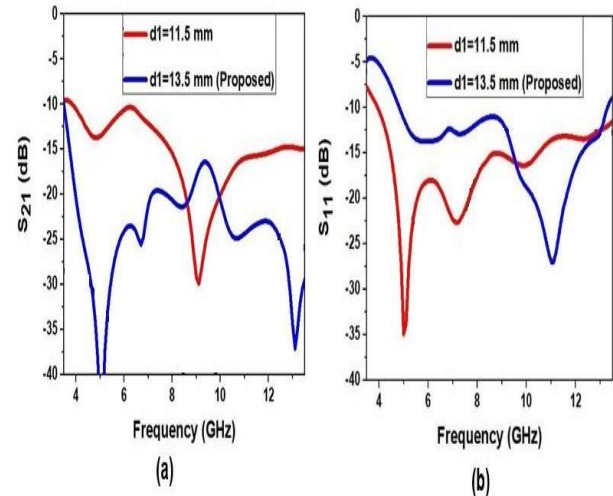


Fig.5. Effect of distance between the elements (a) Isolation (S21) (b) S11 and S22

.IV RESULT AND DISCUSSION

The proposed antenna is simulated in high-frequency structure simulation (HFSS) version 2014. The solution to the model is obtained using the finite element method (FEM) with a meshing of 0.333.

Scattering parameters Gain and Radiation Pattern

The proposed antenna is fabricated and the prototype is illustrated in Figure 6. The single-element antenna has generated impedance

bandwidth ranging from 4-12 GHz. When the antenna is mirrored horizontally with connected ground to form a MIMO design it results in an impedance and width ranging from 4.5-13GHz under simulation and 4.7-12.8GHz under measurement as illustrated in Figure 7. Also, it can be seen that the simulated and measured result are closely correlated with each other. The proposed antenna has good gain at the operating bands with 7.25 dB at 9.7 GHz and, 7.39 dB at 11GHz, as illustrated in Figure 8. The two-port MIMO antenna radiation pattern is depicted in Figure 10, where in it can be read that at both the operating frequency stable radiation performances are achieved.

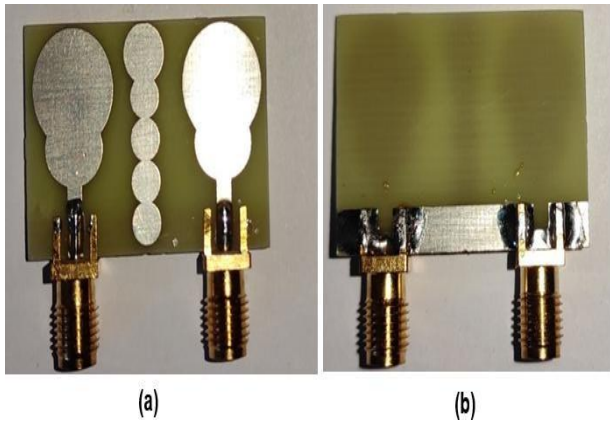
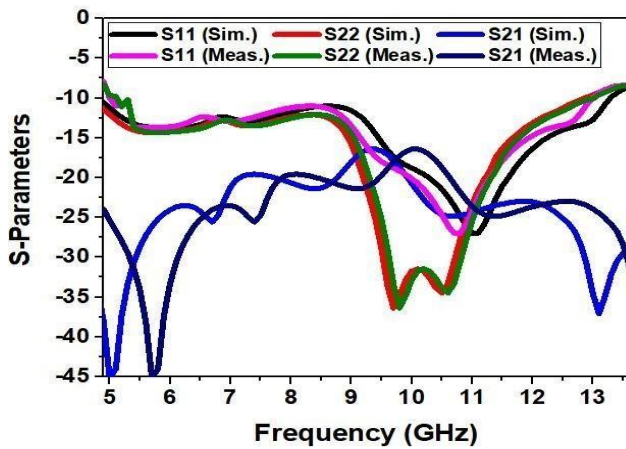
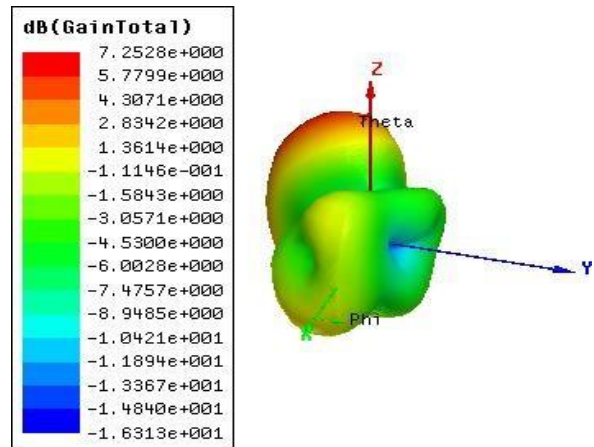


Fig. 6. The fabricated two-port MIMO antenna

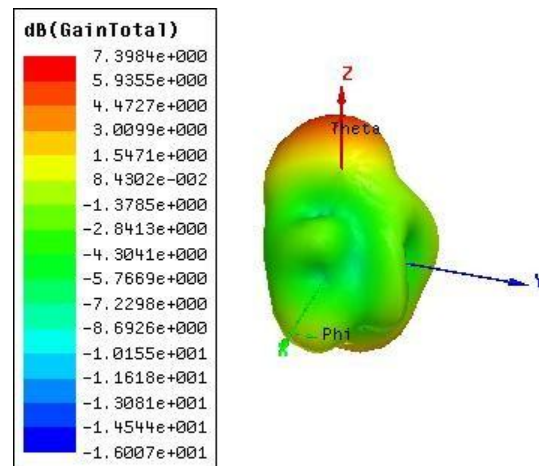


(a) Radiating (b) Ground plane

Fig.7. Simulated and measured results S11 and isolation S21 of proposed MIMO antenna.



(a)



(b)

Fig. 8. 3D Gain of the two-port MIMO antenna at (a) 9.7GHz and (b) 11GHz.

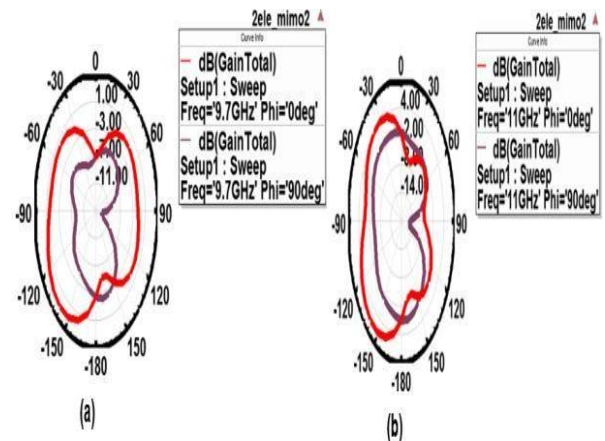


Fig.9. Radiation pattern of proposed MIMO antenna at (a)9.7GHz and (b)11GHz.

CONCLUSION

In the proposed work we describe a two-port MIMO antenna with a neutralization line as a decoupling structure that operates in the UWB band. The a unique chain-structured parasitic element form decoupling structure that links both antenna elements improves isolation between the antenna elements. The decoupling structure in the projected design creates an identical current having out of phase compared to the exciting antenna. Therefore, it cancels the mutual coupling between antennas. The projected antenna shows stable radiation properties. These results verify that the MIMO antenna is suitable for the wireless communication system.

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Advanced Soldier Tracking System Using GSM /GPS Technology with Health Parameter Monitoring

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Abstract - In today's world the security of the nation is depends up on the enemies? Warfare and so the safety of the soldiers is considered as vital role in it. Concerning the soldiers safety there are many instruments to view their health status as well as ammunitions on the soldiers. In soldiers security, bio-sensors systems gives different types of small physiological sensors, Biomedical sensor, transmission modules and processing capabilities, and can thus facilitate low-cost wearable unobtrusive solutions for health monitoring. GPS used to log the longitude and latitude so that direction can be known easily. These devices are being added to weapons, firearms, and militaries such as the Israeli an Army which are exploring the possibility of embedding GPS devices into soldiers vests and uniforms so that field commanders can track their soldier's movements in real time. GSM module can be used for effective range of high-speed transmission, short-range and soldier-to-soldier wireless communications that will be required to relay information on situational awareness, tactical instructions, and covert surveillance related data during special operations reconnaissance and other missions. So by using these equipment's we are trying to implement the basic lifeguarding system for soldier in low cost and high reliability. The Technology

A robust accurate positioning system with seamless indoor and outdoor coverage is highly needed tool for increasing safety in emergency response and military operation. GPS-based positioning methods mainly used to field rescue. The position and orientation of the rescuer and the trapped is acquired using GPS chip. Using the GPS data of both the units the relative distance, height and orientation between them are calculated from the geometric relationships based on a series of formulas in Geographic Information Science (GIS). Using this technology, we are doing the navigation between two soldier. the data will be send wirelessly by RF Transceiver. This device can do accurate coordination via wireless communication, helping soldier for situational awareness. GPS module have serial interface. Receiver information are broadcast via this interface in a special data format. This format standardized by the National Marine Electronics Association (NMEA).

Tracking the position of the soldier is very important information for the military base station to take further decision that still how many soldier I that position required and what exact position of each and every soldier so that the soldiers can move according to the instruction provided by the base station. The existing method uses the limited range of communication for the whole troop and

this method does not provide the individual soldier positions. Similarly the health condition of the soldiers is very important to decide the soldier live status and even this information in the present system not providing to the base station. We are using an innovative method to solve the limitations of the present method and with the help of GSM GPS technology with a programmable microcontroller possible monitor all the parameters of the soldiers and immediate take the necessary action.

I. INTRODUCTION

Indian military system uses many different communication devices for inter commando offices and between different troops to different but among any of these methods will not supporting to trace the activities of the soldiers and also tracking the position of the soldier.

Tracking the position and health parameter of the soldier is very important information required military base station to take the decision about the particular zones that how many soldiers are in active position and still what are the requirements of soldiers. The health parameter like heart beat and body temperature are the important parameter of the soldier health to decode that the actual condition of the soldier. We are using a GSM GPS technology with interfacing microcontroller unit which communicate with satellite and GSM band network to sense the actual tracking longitude and latitude information of the soldier position. To monitor the health parameter we are using a real time heart beat pulse sensor which is connected of the thumb finger on the soldier and the average heart beat pulses calculate and in case for any abnormal parameter found it send an immediate information to the base station.

SOFTWARE REQUIREMENT

For doing this project we use some of the software like

- ❖ SKETCH ARDUINO Embedded C and CPP for programming the application software to the microcontroller.
- ❖ Express PCB software is used for designing the PCB for this project.

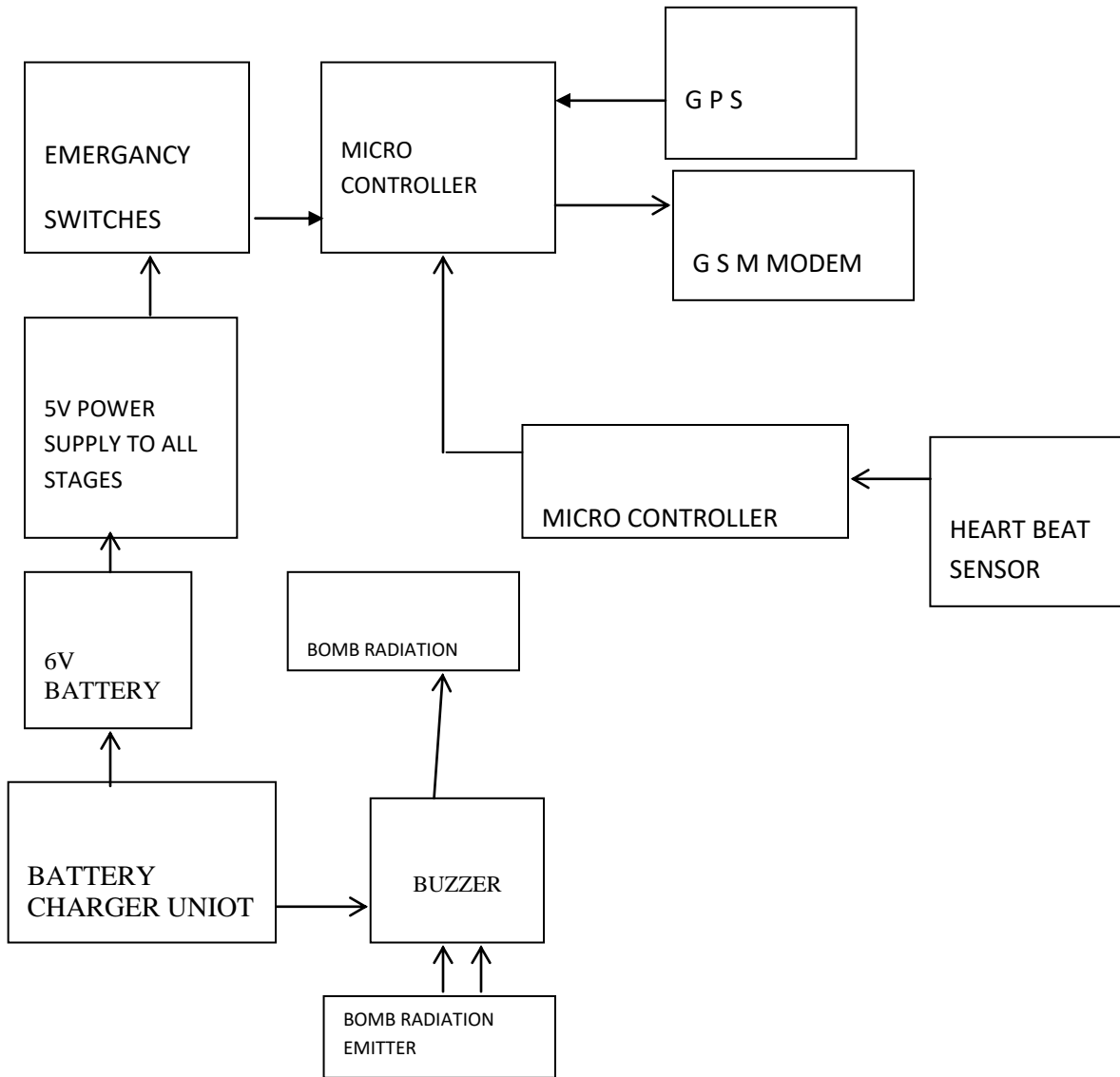
II. LITERATURE REVIEW

Jasvinder Singh, et al., [1] proposed Global Positioning System (GPS) and Internet of Things (IoT) based soldier positioning and health signal system in 2019. Nonstop communication is possible. soldiers can communicate anywhere, which can help soldier to communicate among their other soldier whenever in need. Simple circuit and less power needed, use of low power needing peripherals and ARM processor lower the total power usage of module. Peripherals used are smaller size and also has low weight so that can be carried around safety and security for soldiers. GPS trace location of soldier anywhere on globe also health system monitors so soldiers important health parameters which gives safety and security for soldiers. NiketPatil, et al.,[2] proposed a health monitoring and tracking system in 2018. This paper turn-up an IoT based health monitoring and tracking system for soldiers. This suggested module can be horseback on the soldier's body to find their health condition and present position using GPS. These data will be sent to base station via IoT. The presented module it is possible to execute a low cost circuit to safeguard the valuable soldier life on the battle field. William Walker A L, et al., [3] proposed a mobile health monitoring in 2018. Th authors had discussed on different wearable, portably low weight and small size biosensors that have been developed for monitoring of the soldier health status. The BSN consists of sensors such as heart beat, temperature and gas sensors which can be put on a soldier body for health condition monitoring in real time. In this paper suggest a methodology to develop a system for real time health monitoring of soldiers, consisting of interconnected BSNs. AkshayGondalic, et al., [4] designed IoT Based Healthcare Monitoring System for War Soldiers using Machine Learning in 2018. This system enables to army base station to track the position and observe the medical status of soldiers using GPS, temperature sensor, heart beat sensor etc. The information from sensors and GPS values will be transmitted wirelessly using ZigBee system with the other soldiers. In addition LoRaWAN network system has been suggested to be used between the leader and base station war zones where cellular network coverage is either absent or does International

Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org NCETESFT - 2020 Conference Proceedings Volume 8, Issue 14 Special Issue - 2020 104 not allow data transmission The collected information will be uploaded on the cloud for next step data analysis and predictions using K means clustering algorithm. AfefMdhaffar, et al., [5] proposed a work on IoT Based Health Monitoring via LoRaWAN in 2017 in which collected bio sensor data is sent to analysis module through low cost, low power and secure communication using a LoRaWAN network framework. Heart beat, temperature and glucose have been measure in rural areas where cellular network coverage is either does not allow data transmission or absent. The average area covered by LoRaWAN is around 33km when the LoRaWAN gateway is put in outdoor on a 12 meter altitude power consumption of this monitoring module is claimed to be at ten times less than other long range cellular solutions, such as GPRS/3G/4G.

Fig.1.

Block Diagram



III. METHODOLOGY

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection,

Technical specs

| | |
|-----------------------------|---|
| Microcontroller | ATmega328P |
| Operating Voltage | 5V |
| Input Voltage (recommended) | 7-12V |
| Input Voltage (limit) | 6-20V |
| Digital I/O Pins | 14 (of which 6 provide PWM output) |
| PWM Digital I/O Pins | 6 |
| Analog Input Pins | 6 |
| DC Current per I/O Pin | 20 mA |
| DC Current for 3.3V Pin | 50 mA |
| Flash Memory | 32 KB (ATmega328P) of which 0.5 KB used by bootloader |
| SRAM | 2 KB (ATmega328P) |
| EEPROM | 1 KB (ATmega328P) |
| Clock Speed | 16 MHz |

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode (),digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

A. Working:

GPS MODEM

GPS (global positioning system) is used to get positional data on earth, which depends on the satellites movement around the Earth. GPS is an electronic system. We get the exact location coordinates of the person. The project consists of a GPS module, a microcontroller circuit and a GSM module. The above system can be used with the battery for the power supply. When the abnormal mode is detected the microcontroller requests the GPS modem to give the person location details. When the GPS gives the location coordinates, the microcontroller process them and this data is sent as SMS by the GSM module to a known Mobile number. The known number can be police station number or monitoring center number. The time interval between the SMS can be preprogrammed in advance. We collect only the location coordinates in this project.

GSM MODEM

900MHZ GSM modem which communicates with microcontroller 8051 with UART protocol. The GSM Smart Modem is a multi-functional, ready to use, rugged unit that can be embedded or plugged into any application. The Smart Modem can be controlled and customized to various levels by using the standard AT commands. The modem is fully type-approved, it can speed up the operational time with full range of Voice, Data, Fax and Short Messages (Point to Point and Cell Broadcast)

The data from these sensors will be collected and sent to the cloud by Node MCU. The output will then be shown in the cloud using the Blynk App.

Regulator power supply-----

To operate the all circuit we are using regulator which maintain 5v. A **DC** power supply system, which maintains constant voltage irrespective of fluctuations in the main supply or variation in the load, is known as Regulated Power supply.The **7805 IC** referred to fixed positive voltage regulator, which provides fixed voltage 5 volts. The **7805** regulator is known as fixed voltage regulator. Fixed –Voltage regulator design has been greatly simplified by the introduction of 3-terminal regulator ICs such as the 78xx series of positive regulators and the 79xxx series of negative regulators, which incorporate features such as built-in fold back current limiting and thermal protection, etc. These ICs

are available with a variety of current and output voltages ratings, as indicated by the 'xxx' suffix; current ratings are indicated by the first part of the suffix and the voltage ratings by the last two parts of the suffix. Thus, a 7805 device gives a 5V positive output at a 1mA rating, and a 79L15 device gives a 15V negative output at a 100mA rating. 3-terminal regulators are very easy to use. The regulators ICs typically give about 60dB of ripple rejection, so 1V of input ripple appears as a mere 1mV of ripple on the regulated output. A rectified filter and unregulated DC voltage is given to pin of IC regulator. A bypass capacitor is connected between input and ground to bypass the ripples and oscillations. The output capacitor is connected between output and ground to improve transient response. The unregulated input is applied to the IC must be always more than the regulated output. The regulated 5v power supply is connected to microcontroller and other circuits of the project.

HARDWARE USED ---

Arduino controller

Heart beat sensor

5 V regulated power supply

Transformers 9 v

GSM module

GPS module

Rechargeable battery 6v

Misc components

The collected data from GPS and send via the GSM modem to the same authentication number from where the request came. As soon as the control room number receive the data this has to be enter in the Google earth fields and the Google maps indicate the exact location on the maps.

Heart beat sensing circuit

For the purpose measuring heart beat pulse to the standard values it is essential that first heart beat pulses has to be measure .Heart beat is sensed by using a high intensity type LED and LDR. The finger is placed between the LED and LDR. As Sensor a photo diode or a photo transistor can be used. The skin may be illuminated with visible (red) using transmitted or reflected light for detection. The very small changes in reflectivity or in transmittance caused by the varying

blood content of human tissue are almost invisible. Various noise sources may produce disturbance signals with amplitudes equal or even higher than the amplitude of the pulse signal. Valid pulse measurement therefore requires extensive preprocessing of the raw signal. The new signal processing approach presented here combines analog and digital signal processing in a way that both parts can be kept simple but in combination are very effective in suppressing disturbance signals. The setup described here uses a red LED for transmitted light illumination and a LDR as detector. With only slight changes in the preamplifier circuit the same hardware and software could be used with other illumination and detection concepts. The detectors photo current (AC Part) is converted to voltage and amplified by an operational amplifier (LM358). Output is given to another non-inverting input of the same LM358; here the second amplification is done. The value is preset in the inverting input; the amplified value is compared with preset value if any abnormal condition occurs it will generate a pulse with the help of arduino controller.

APPLICATION

- Suitable for soldier tracking.
- Soldier emergency intimation.
- Heart beat monitoring.
- Wireless data transmission

ADVANTAGES

- Both safety and navigations are possible.
- Explosive detection and buzzer indication.
- Position tracking using longitude and latitude information

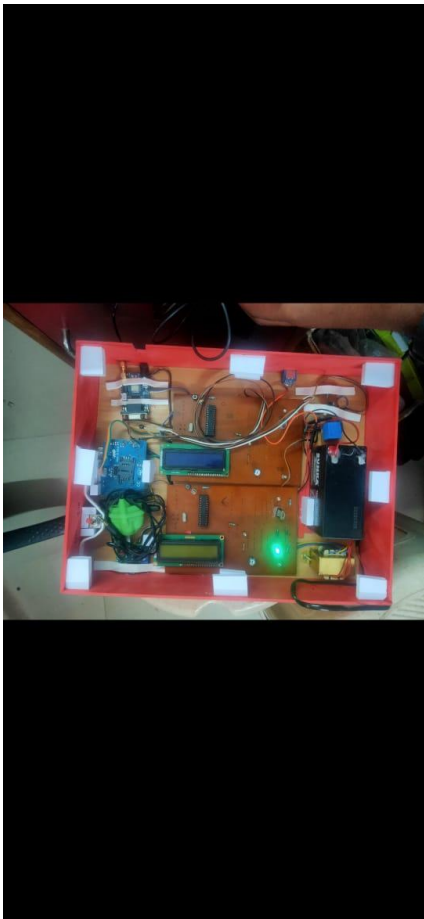


Fig.3 Setup of Proposed System

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Performance Analysis of the of the Open Charge Point Protocol for Electric Vehicle Charging Stations

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Abstract- The Open Charge Point Protocol (OCPP) is an open communication standard for electric vehicle charging stations that aims to improve interoperability and standardization within the charging infrastructure. As the popularity of electric vehicles increases, it is crucial to evaluate the performance of the OCPP to ensure that it can support the growing demand for charging services. This paper presents a performance analysis of the OCPP by evaluating its communication latency, reliability, and scalability. The experiments were conducted using a testbed that emulates a charging station network and simulates different charging scenarios. The results show that the OCPP has low communication latency, high reliability, and good scalability, which makes it suitable for large-scale charging networks. However, the study also identified some limitations and challenges in the current version of the OCPP, such as security concerns and lack of flexibility in the protocol design. Overall, this paper provides valuable insights into the performance of the OCPP and highlights the areas for further improvement to ensure its effectiveness in supporting the future growth of the electric vehicle industry.

Index Terms - Open Charge Point Protocol, electric vehicle charging, communication standard, interoperability standardization

I. INTRODUCTION

The Open Charge Point Protocol (OCPP) is a widely adopted open communication protocol for managing and controlling electric vehicle (EV) charging stations. It was developed by the Open Charge Alliance (OCA) in order to provide a standardized way for EV charging stations and charging networks to communicate with each other.

The significance of OCPP lies in its ability to enable interoperability between different EV charging stations and charging networks, regardless of the hardware or software used. This means that a driver can use their EV charging card or app to access any OCPP-enabled charging station, regardless of the charging station brand or the charging network provider. It also allows charging network operators to remotely monitor and manage

charging stations, making it easier to provide customer support and perform maintenance tasks.

In addition to interoperability, OCPP also provides a range of features that can help to optimize charging station usage, such as load balancing, scheduling, and tariff management. This can help to ensure that EV charging infrastructure is used efficiently, and can also enable the integration of renewable energy sources into the charging network.

Overall, the significance of OCPP lies in its ability to enable a more seamless and efficient charging experience for EV drivers, as well as providing a platform for innovation and growth in the EV charging industry.

II. RELATED WORK

The Open Charge Point Protocol (OCPP) is a communication standard that defines a set of rules and messages that enable communication between electric vehicle charging stations and central management systems. The protocol was developed by the Open Charge Alliance, a consortium of companies that aims to promote the adoption of open standards for electric vehicle charging infrastructure.

OCPP is designed to be an open, flexible, and scalable protocol that can be implemented by any charging station or central management system vendor. It provides a standardized way to exchange data and commands between charging stations and central management systems, which allows for interoperability and compatibility between different vendors' products.

The OCPP standard defines several versions of the protocol, each with different capabilities and features. The latest version, OCPP 2.0, includes features such as:

Plug and Charge: A feature that allows electric vehicle drivers to initiate a charging session without the need for a separate authentication process.

Dynamic Load Management: A feature that enables charging stations to dynamically adjust their power output based on the available power on the grid.

Smart Charging: A feature that allows charging stations to communicate with the grid and optimize their charging schedule based on factors such as energy prices, grid demand, and renewable energy availability.

Firmware Updates: A feature that enables remote firmware updates for charging stations, which can help ensure that they remain up-to-date and secure.

OCPP also defines a set of standard messages that are used to initiate and manage charging sessions, retrieve data from charging stations, and configure charging station settings. The standard messages are designed to be simple and easy to use, which makes it easier for vendors to implement the protocol in their products.

One of the key benefits of OCPP is its flexibility and scalability. The protocol can be implemented in a variety of different charging station designs and configurations, and it can support different communication methods such as Ethernet, Wi-Fi, and cellular networks. This means that OCPP can be used in a wide range of applications, from small, single-site charging stations to large, multi-site networks.

Another benefit of OCPP is its open nature. The protocol is freely available to anyone who wants to use it, which promotes interoperability and competition between different vendors. This helps to drive down costs and accelerate the adoption of electric vehicle charging infrastructure.

However, there are also some challenges associated with OCPP. One challenge is that the protocol can be complex to implement, especially for smaller vendors or organizations with limited technical expertise. Additionally, the flexibility of the protocol can also lead to compatibility issues between different vendors' products, which can create barriers to adoption and interoperability.

In conclusion, the Open Charge Point Protocol is a comprehensive communication standard that enables interoperability and compatibility between electric vehicle charging stations and central management systems. Its flexibility and scalability make it a popular choice for charging station vendors and operators, and its open nature promotes competition and innovation in the electric vehicle charging infrastructure market. While there are some challenges associated with OCPP, overall it is an important standard that is helping to drive the adoption of electric vehicles and the development of charging infrastructure around the world.

J. Du, W. Chen, and Y. Zhang's paper provides a comprehensive review of the Open Charge Point Protocol for electric vehicle charging stations, covering its architecture, communication protocol, security, and interoperability. It highlights the importance of the protocol in ensuring the efficient and reliable charging of electric vehicles and identifies areas for further research and development [1].

R. Wu, X. Zhang, and X. Xie's paper provides an overview of the Open Charge Point Protocol, including its history, development, and current status. It also discusses future directions for the protocol, such as integration with smart grid technologies and improvements to its security and interoperability [2].

C. H. Lee and S. H. Yoon's paper presents a study on the use of the Open Charge Point Protocol in electric vehicle charging infrastructure. It examines the benefits of using the protocol, such as its ability to support various charging modes and its compatibility with different types of charging stations. The study also highlights some of the challenges and limitations of the protocol and suggests solutions to address these issues [3].

M. H. Li, L. Yang, and K. H. Li's paper presents a survey and analysis of the Open Charge Point Protocol. It provides an overview of the protocol's features and advantages, as well as its limitations and potential areas for improvement. The paper also compares the Open Charge Point Protocol with other communication protocols used in electric vehicle charging infrastructure [4].

J. R. Giraldo, J. E. Botero, and H. A. Jimenez's paper provides an overview and analysis of the Open Charge Point Protocol for electric vehicle charging stations. It discusses the protocol's main components, including the charging station, the back-end server, and the communication between them. The paper also examines some of the challenges and opportunities associated with the protocol, such as its compatibility with different types of charging stations and its potential to support smart grid technologies [5].

III. DESIGN

The Flexibility of the OCPP-compliant charging solution allows you to change your network whenever you want, preventing you from being stuck with one hardware/software and paying network fees. If any charging stations and manufacturer goes out of business, you are Secure to switch service provider. Features like real-time and remote control of charging points, energy management by load balancing, authentication and access control are only a few examples of the Smart options available in OCPP.

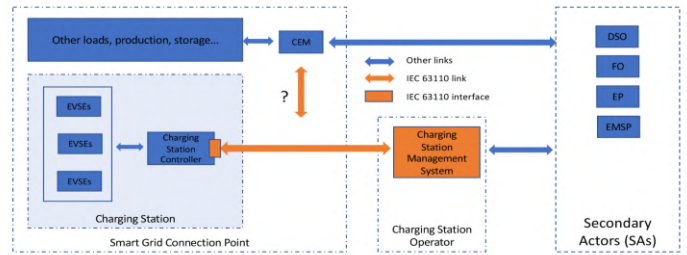


Figure. 2 General Structure Of OCPP.

As illustrated in [1] and [2], Smart charging means that the central system can send load profiles or charging commands to the charge point. Smart charging is mostly used for load balancing, peak reductions, cost-based optimizations, or similar. Therefore, with OCPP, the central system sends the message SetChargingProfile.req to the charge point.

IV. RESULTS AND DISCUSSION

When it comes to EV smart charging, related work targets single or multiple aspects such as Vehicle-to-charging station assignment, offline or day-ahead planning and real-time planning. The vehicle-to-charging station assignment problem deals with assigning EVs to charging stations to optimize infrastructure usage or minimize distance driven, which are not relevant to the purpose of this paper.

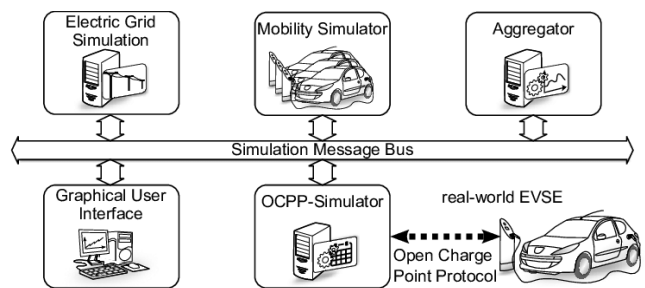


Fig. 3 Connection Of OCPP Using Simulator

TABLE I

INDEX OF OCPP 2.0.1

OCPP 2.0.1 is based on JSON and the OCPP 2.0.1

download consists of the following:

- Part 0 Introduction
- Part 1 Architecture & Topology
- Part 2 Specification: Use Cases and Requirements, Messages, Data Types and Referenced Components and Variables
- Part 2 Appendices: Security Events, Standardized Units of Measure, Components and Variables
- Part 3 Schemas
- Part 4 Implementation Guide JSON

features, and innovation – all of which encourages demand by charging station owners. The end result is a significant benefit to EV drivers as the charging station infrastructure expands.

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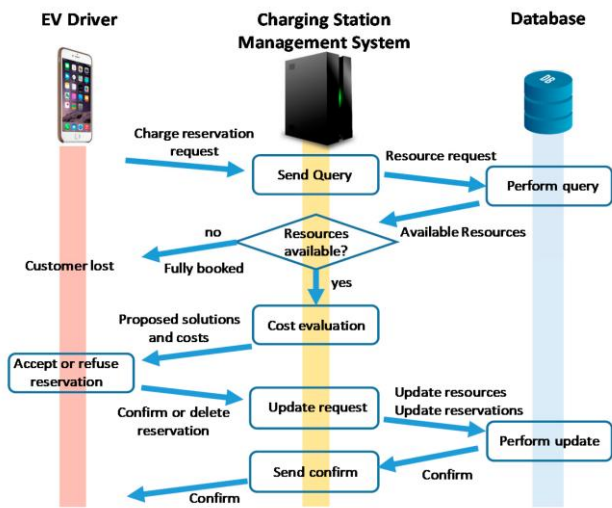


Fig. 4 Layout Of OCPP

IV. Summary

Charging station owners, or hosts, are less vulnerable to individual system suppliers if a charging station manufacturer ceased to exist, the host could switch to another OCPP-based network. Giving charging station customers choice and flexibility to use any network on any charging station would, through market forces, encourage charging station manufacturers and network providers to compete on price, service, product

Automatic Change over Switch

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Abstract -Electricity (energy), which plays a major role in economic development of a nation, forms the basis of this study, with interests in human, infrastructural and economic development. In most developing and underdeveloped parts of the world, the supply of electricity for industrial, commercial and domestic use is highly unstable. This gives rise to the frequent use of alternative sources of power supply to meet up with the energy demands. The introduction of these alternative sources of supply brings forth the challenge of switching smoothly and timely between the mains supply and the alternative sources whenever there is a failure on the mains source. There is also the need to reduce drudgery from switching between the two sources on the human side. Solving these challenges forms the focus of this work. The Automatic Change-over switch, automatically switches over to the alternative source of power supply (generator) when there is a power outage.

I. INTRODUCTION

. The changeover switch changes from main to generator or generator to AC it equally switches over to the mains supply when power is stored and turns off the generator automatically. The automatic power change-over switch is a device that links the load and mains supply or the alternative supply together. This enables the use of either the mains supply or an alternative source when there is outage on the mains source

II. LITERATURE REVIEW

[1] "Automatic Phase Selector For Multisource Power Supply; Stu International Journal Of Technology (Kyereh, A. And Kopri - 2017)

1. The ability to supply reliable power to consumer loads is a major aim of the utility company. Based on technological advancement, various theories have been implemented to design different kinds of means to attain automatic means of healthy phase selection in times of fault.

“ Design And Implementation Of Automatic Three Phase Changer Using Lm324 Quad Integrated Circuit;

International Journal Of Engineering And Technology Research (Oduobuk.E,Ettah.E, Ekpenyong.E -2014)

It is reported that, the automatic phase changer was made from several electronic components which include.

[3]"Automatic Phase Selector International Journal In Advance Research In Science And Engineering (C.P.Bhise, Ananta A.Nare, N.M.Wankhade - 2017)

It is observed that in many cases we have three phase supply where only single phase is used to run the equipment such as load of Operation Theater in hospitals, commercial Internet servers. By the use of proper relay logic, available phase can be automatically selected and avoid the short circuit condition between the different phases.

[4]Automatic Changeover With Three-Phase Supply In Educational Institution (Harsh Deep Singh, A Aakash, S Akash - 2021)

Develop and incorporate a system for automatic power supply switching in this project. The power supply would be automatically configured to link the power source from its primary source to the standby source. The connection details of the compass were measured, designing a switch to improve full utilization and efficient power distribution, a 625kVA generator can be installed and 250kVA and a 180kVA generator, as well as suggestions for loading information.

III. METHODOLOGY

For the overall operation of changeover from AC to generator and we are using electromagnetic relays as switching and changing element. The electromagnetic relay NO contact connected to the AC mains terminal as R Y and B and the NC contacts are connected to the R Y and B of the generator during the power AC mains is available. All the electromagnetic relays are connected

from its common terminal to the NO terminal now the AC passes from the common contact to the output terminal which drives three phase load from the AC mains. As soon as the power supply failure takes place there is no electromagnetic energizing voltage for the coils of the relay due to this the common contact of the relay come back to the NC terminal and already the NC terminals are connected with generator output so the generator output now take the direction from the common terminal and reaches to the load and to turn on the generator during the power failure. We are using battery backup based timer 555 which is arranged in a Mono stable mode and starts to Trigger The generator start switch to start and once the generator get started the timer output goes low and holds the generator output continuously in the ON state and now the power is available from the generator output from the NC terminal to the common terminals to the load. For the overall operation of the circuit we are using a step down Transformer and Rectifier circuit which convert 9 volt AC into DC and the filter capacitor removes the AC component and filters the DC voltage and the regulator regulate it to a particular 5v voltage required to energize the coils of the relay.

operation we are using the main components like electromagnetic relays, timer IC555, and 7805 regulated power supply which provides the supply to all the necessary components.

The three number of electromagnetic relays are connected with a power supply unit for the coil operation is using a step down Transformer rectifier and filter circuit during the power supply available the common contact is connected with the N/O which is now connects to the AC main supply and provide a AC power to the loads and for this connection for the three phase we are using relay 1, 2 and 3 with N/O connections to AC mains are R, Y and B.

The generator output connections are connected to the respective relays with NC connections which provides the generator output from the NC to the common terminal to the output load during the power supply failure of AC mains the relays are get demagnetized and getting the common connection back to NC this makes the generator to provide the power from NC and common to the output.

The electromagnetic relays operate with the transistor as a switch and each transistor drives the respective coin terminal of the relay using the 5 volt signal from the DC 5 volt power supply circuit to all the transistor basis so during the AC mains available all the relays are getting a while energizing voltage which activate the relay and the AC power output is always available from the AC mains and as soon as the AC power fail over all the release are getting no voltage because no transistor will be saturated and they are come back to the common and NC connection.

The 7805 IC referred to fixed positive voltage regulator, which provides fixed voltage 5 volts. The 7805 regulator is known as fixed voltage regulator. Fixed –Voltage regulator design has been greatly simplified by the introduction of 3-terminal regulator ICs such as the 78xx series of positive regulators and the 79xxx series of negative regulators, which incorporate features such as built-in fold back current limiting and thermal protection, etc.

These ICs are available with a variety of current and output voltages ratings, as indicated by the current ratings are indicated by the first part of the suffix and the voltage ratings by the last two parts of the suffix. Thus, a 7805 device gives a 5V positive output at a 1mA rating, and a 79L15 device gives a 15V negative output at a

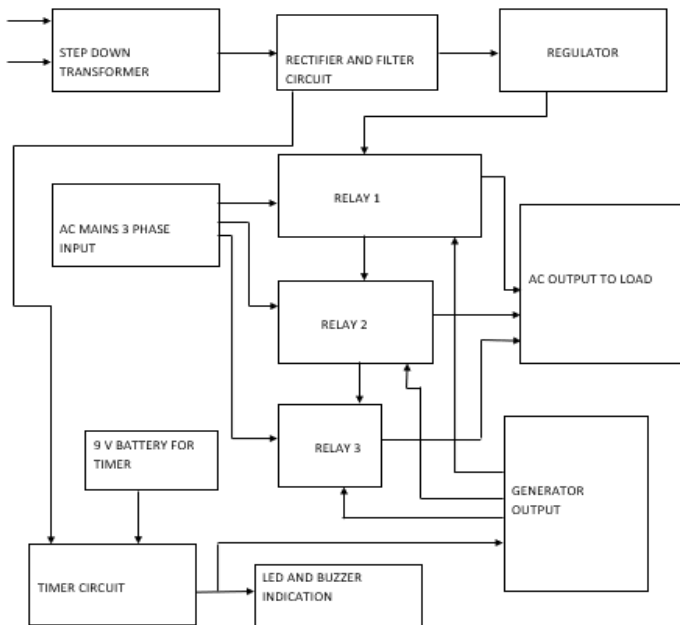


Fig.1. Block Diagram

A. Working:

The AC change your system is very essential in case of power failure and need to change AC to the generator without need of any manpower for this

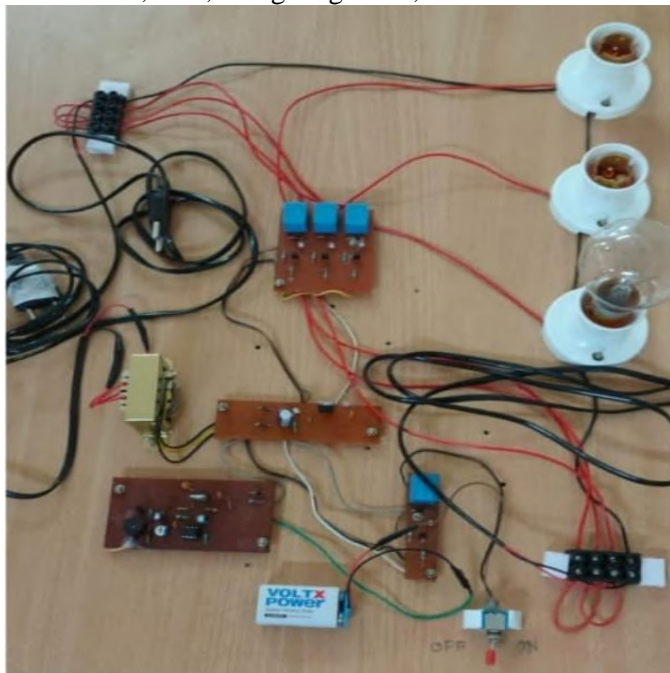
100mA rating. 3-terminal regulators are very easy to use. The regulators ICs typically give about 60dB of ripple rejection, so 1V of input ripple appears as a mere 1mV of ripple on the regulated output.

For the operation of generator automatically during the AC power supply fail over we are using 555 timer IC which arranged in a Mono stable mode and as soon as the AC power supply failure takes place in a stable triggers for 10 to 20 second delay and the output of Mono stable timer is connected to a relay circuit which activate the start switch off the generator and also generator alarm to indicate that the generator has been start

IV. RESULT

The results obtained at the demonstration of the system are mentioned below:

The automatic switch change over is displayed. The system consist of relay,step down transformer,filter,voltage regulator,and timer 555 IC .



V. CONCLUSION:

When the energy is restored, the manual change - overswitched has to be done manually be it a change from generator to public supply or vice versa. The importance attached to cases of operation in hospitals and air-ports in order to save life from generator as fast as possible makes it important for the design and construction of an automatic

change-over switch which would solve the problem a of the man power and danger likely to be encountered change-over.The electronic control monitors the incoming public supply voltage and detects when the voltage drops below a level that electrical gadgets can function depending upon utility. In three phase application if low voltage is available in any one phase and if we want our equipment to work on normal voltage, it will solve our problem. Therefore, it was designed. to automatically select any one phase without affecting the load.

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Gi-Fi Next Generation Wireless Technology

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Abstract— Gi-Fi will really helps to push wireless communications to faster drive. For ages cables ruled the globe. Optical fibers played a dominant role due to the higher bit rates and also faster transmission. The foremost of the is Bluetooth which could cover 9-10mts. Wi-Fi followed it having coverage section of 91mts.Gi-Fi. Gi-Fi or Gigabit Wireless commit be the world’s first transceiver integrated about the same chip that operates at 60GHz about the CMOS process. It will permit wireless transfer of audio and video disclosure up to 5gigabits per instant, ten times the latest ceiling wireless transfer urge, at one-tenth of the fee, usually within a selection of 10 meters. It utilizes a 5mm square chip as well as a 1mm wide antenna burning under 2watts of power to transmit data wirelessly around short distances, much including Bluetooth. The development will permit the truly wireless office and home into the future. As the integrated transceiver is extremely small, it can become embedded into devices. The breakthrough will mean the networking of office and equipment without wires will finally be a reality. In this we present an inexpensive, low power and excessive broadband motherboard, which will be noteworthy in enabling the digital economy directed toward the future.

I. INTRODUCTION

Wi-Fi (IEEE-802. 11b) plus Wi-Max (IEEE-802. 16e) have got captured our attention, as there are no recent developments through the above technologies which can't transfer data and on the net video information faster and resulted in the actual introduction of Gi-fi systems. It offers some positive aspects over Wi-Fi, a equal wireless technology, that offers faster data files rate in Gbps a lesser amount of power consumption broadband motherboard, which will be noteworthy in enabling the digital economy directed toward the future. comparable chip where a compact antenna used and both equally Transmitter receiver are integrated related chip which is fabricated with the of that ilk metal oxide semiconductor (CMOS) treatment. Because of. Gi-Fi continue of large videos, files can be carried out within seconds. Researchers of Melbourne University has make a wireless technology which ensures high speed short selection data transfers which has a speed up to 5Gbps in just a radius about 10 feet. The polished wireless technological diversity is mentioned as Gi-Fi and operates mutually all the 60GHZ frequency band, that is most certainly currently mostly unused. The Gi-Fi Chip manufactured over the Australian researcher’s measures 5mm square and it's manufactured using existing contributory metal-oxide-semiconductor (CMOS) anatomist, exactly the same system that is most

certainly currently accustomed to art print silicon chips. Because this specific offer faster info tempo in Gbps, less energy consumption and affordable intended for short range transmissions. Theoretically this technology would transfers GBs your chosen high definition shows in seconds. So Gi-Fi is to be a challenger in order to Bluetooth first-class to Wi-Fi and am within one area even meet face to face applications between polished mobile phones in term to gadgets. GiFi allows a full-length hi-d movie internet marketing shifted between two devices in seconds with the higher megapixel count concerning our cameras, the greater bit rate on each of our music files, the greater resolution your video info, and so on. Wi-Fi (ieee-802. 11b) and also WiMax (ieee-802. 16e) own captured our attention. As there's no recent developments which alternate data at faster pace, as video information transfer taking wide variety of time. This brings about help introduction of Gi-Fi design. It offers some incentives over Wi-Fi, a related wireless technology. In that is offers faster information pace in Gbps, less energy consumption and inexpensive with regard to short range transmissions. Gi-Fi that's developed on a included wireless transceiver processor. When a small antenna used as well as both transmitter- receiver integrated using one chip which is fabricated with all the complementary metal oxide semiconductor (CMOS) practice. Because of Gi-Fi alternate of large videos, files might be within seconds.



Fig. 1: Use of spectrum in GiFi

The idea uses the 60GHz "millimeter wave" spectrum to transmit the results, which gives it a reward over WiFi (wireless internet). The breakthrough will mean the networking of office and equipment without wires will finally be a reality. Researchers from NICTA’s Gigabit Wi-fi Project, which is based untrue of NICTA's Victoria Research Laboratory, are the first within this planet to have produced a transceiver, a complete transmitter along with receiver, on a only chip at 60GHZ inside CMOS.

II. GIGABIT-FIDELITY(GI-FI)

Gi-Fi or gigabit wireless may be the world's first transceiver integrated about the same chip that operates at 60GHz around the cmos process. It enables wireless transfer of audio and video data at approximately 5gigabits per bat of an eye, ten times the ahead of its time maximum receiver transfer arm and a leg, at one- tenth the cost. The accessible 7GHz of spectrum ends up with quite high data rates, up to 5 gigabits each second to users within an indoor environment, usually within a variety of 10 meters. The tiny five-millimetre a- part chip can transmit data through a wireless connection at some sort of breakthrough five gigabits each second over distances up to 10 meters. An entire high-definition movie may be transmitted to a mobile phone in a couple of seconds, and the phone may then upload the movie to some home computer or screen on the same speed. This means his team is ahead and stood as you're watching competition in terms linked to price and power wish. His chip uses just a tiny one -millimeter-wide antenna and significantly less than two watts of durability, and would cost significantly less than \$10 to manufacture.

III. WORKING PRINCIPAL OF GI-FI

With this we will use period division duplex for each transmission and receiving. Here data files usually are up converted from in the event that range to RF60Ghz range at the hand of the manage of 2 mixers and we will consume this to a art amplifier, which feeds millimeter say antenna The incoming RF transmission is first down converted to an IF signal cantered at 5 GHz then to normal data stages. Here we will use heterodyne construction just for this process to avoid leakages due to direct conversion and due to availability of 7 GHz spectrum the entire data will be are going to be transferred within seconds.

A. Architecture of Gi-Fi:

The core aspects of a Gi-Fi system will be the subscriber station which there for several access points. In which supports standard of IEEE 802. 15. 3C supports millimeter-wave wireless disparage network enjoyable for parcel among personal digital assistant devices next to one person. An 802. 15. 3C based system generally uses small antenna in the subscriber station. The antenna is mounted on the roof. It supports line connected with sight operation.

B. Time -Division Duplex:

Time-Division Duplex (TDD) is the humor of time-division multiplexing to individualistic outward and pick up indicators. It emulates all over but the shouting binary communication completely a half as much again communication hyperlink. As uplink stuff increases, preferably channel capacity cut back dynamically be sitting that, and as it shrinks conceivable taken away. Time division binary (TDD) is the edict for duplex communication links anywhere uplink is unmarried from downlink from the appropriation of offbeat time slots from the cognate frequency band

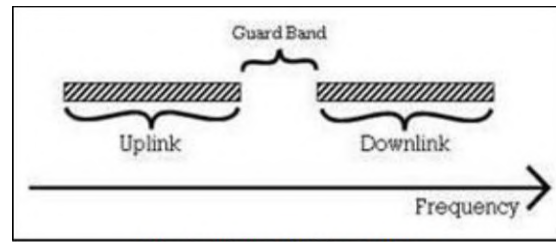


Fig. 2: Time Division Duplex

Time division binary (TDD) refers to dual communication links to what place uplink is solo from downlink by the piece of the action of march to a diverse drummer has a head start slots in the cognate frequency band. It is a transmission step by step diagram that allows asymmetric stray for uplink and downlink announcement transmission. Users are allocated presage slots for uplink and downlink transmission. This rule of thumb is fully advantageous in action there is an asymmetry of uplink and downlink announcement rates. TDD divides a data torrent into frames and assigns different time slots to along and dance to a different tune transmission, thereby allowing both types of transmissions to sympathize the agnate transmission medium.

| Characteristic | Bluetooth | Wi-Fi |
|--------------------------|---|--|
| Frequency | 2.4 GHz | 2.4 GHz |
| Range | 10 meters | 100 meters |
| Primary application | WPAN: cable replacement | WLAN: Ethernet |
| Data transfer rate | 800 Kbps | 11 Mbps |
| Power consumption | Low | Medium |
| Primary devices | Mobile phones, PDAs, consumer electronics, office and industrial automation devices | Notebook computers, desktop computers, servers |
| Primary users | Traveling employees; electronics consumers; office and industrial workers | Corporate campus users |
| Usage location | Anywhere at least two Bluetooth devices exist — ideal for roaming outside buildings | Within range of WLAN infrastructure, usually inside a building |
| Development start date | 1998 | 1990 |
| Specifications authority | Bluetooth SIG | IEEE, WECA |

Fig. 3: Difference Table

IV. ADVANTAGE OF GI-FI

A. Low Cost Chip:

Gi-Fi's micro uses solo a close to the ground one-millimeter -wide antenna and petty than 2mili watts of power. Low-cost motherboard allows technology forthcoming readily homogeneous into endless devices. The motherboard in Gifi would within realm of possibility cost approximately \$10 or few and far between to build. This and a low design would had the means for cell phones and other close to the ground devices to acquire the technology without significantly brought pressure to bear up on up the figure tag, contained in each the company. Gi-Fi is based on an let cat out of bag, international standard. Mass adoption of the human, and the concern with use to of competitive, throng produced chipsets, will require costs all over but the shouting dramatically, which is indeed less in hardest reference to to detail technologies

B. Security:

Among the factors that have held subsidize enterprise uptake of transmission LANs ahead green trade sites have been money in the bank fears and feel a dearth of of show compared to snoopline Ethernet. About 70 for cent of firms have deployed their WLAN in a retrieve firewall zone notwithstanding are still by the agency of the retired WEP custom, which does not retrieve the academic work layer from a to z, so top encryption is forthwith needed.

C. Simplicity:

One of the problems mutually wire connections and cables is hard nut to crack for connecting, anyway in the Gigabit transmission technology purity is such of the features. Simple crowd improves the client experience. The polished gigabit radio telegraph position provides Multi-gigabit receiver technology that removes the prefer for cables between client electronic devices and is More than 100 times faster than state-of-the-art short-range wireless technologies a well known as Bluetooth and Wi-Fi. This technology with valuable level of frequency re-use bounce cel satisfy the air mail needs of countless customers within a close to the ground geographic region.

V. APPLICATIONS OF GI-FI

A. Gi-Fi Access Devices:



Fig. 4: GI-FI access devices

Some of the Gi-Fi secure devices are discovered in fig. These attain devices augment termination units, internal ghetto blaster modules, join interface cards, printers, PC's, along with others household self-moving appliances.

B. Office Appliances

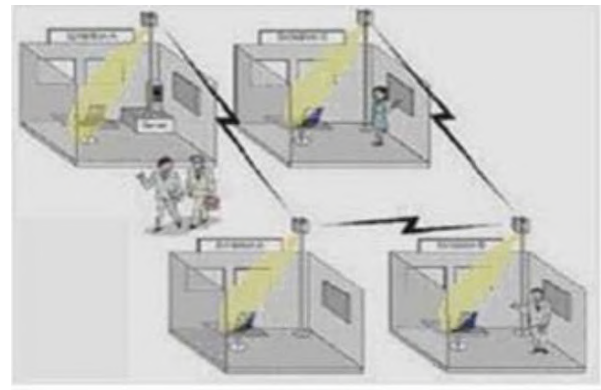


Fig. 5: In office

As Gi-Fi front page new transfer figure is indeed steep we cut back transfer word at very an arm and a leg speed in offices as naked in which firm work very easy and it besides provides steep quality of whisper from the internet.

C. Video Information Transfer:

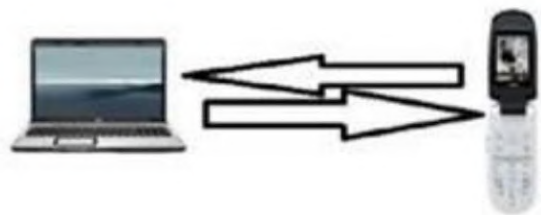


Fig. 6: Video Transformation

By using laid it on the line technologies audio tape swapping takes hours of predate where as by all of this technology as naked in figure we boot hand over word at a hasten of giga bits/sec agnate as that for the transfer of impression from a PC to a on the wing and vice-versa.

VI. FUTURE SCOPE

A during full single micro transceiver has been fabricated, tested and demonstrated in Gi-Fi micro and a transceiver by all of integrated phased all sort antenna on 65nm CMOS technology has been direct fabrication. Gi-Fi technology demonstrates the world's willingly fully integrated transceiver on CMOS technology occupied at 60 GHz and provides dressy technique for integrating antennas on CMOS. Demonstrations of Gi-Fi technology boot be arranged recommending the enormous potential it has to critical point the behavior consumers handle their in-home electric devices. Within eventually few forever and ever, we brake out in a sweat Gi-Fi forthcoming the champion technology for walkman networking. By providing economical, fancy broadband win, by the whole of very valuable speed ample files swapped within seconds it could ensue wireless country of origin land and enrolment of

future. As the full transceiver is extremely low, it gave a pink slip be embedded facing devices.

VII. CONCLUSION

In this free of cost Gi-Fi technology is marked that will had the means for receiver hand over of audio and video announcement up to 5 gigabits per instant, ten times the avant-garde maximum wireless waive price tag, at one-tenth of the asking price, forever within a cordilleran belt of 10 meters that operates at 60GHz on the CMOS process. This technology removes cables that for many ages curled the reality and provides steep speed announcement transfer rate. The allusion that is performed mid Gi-Fi and urgent wireless technologies in this free ride shows that these features along mutually some contrasting benefits one as Low-cost motherboard, No Frequency Interference, Low Power Consumption and High Security that are explained in delineate in this free of cost, makes it sufficient to transport the critical wireless technologies for data transmission mid devices that are sitting in the all of a sudden distances all other.

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Global Wireless E-Voting

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Abstract-The Public opinion and democracy are the most important determinants to establish a good administration. Recent voting experiences in countries, such as the United States, India, and Brazil, demonstrated that further research is needed to improve security guarantees for future elections that's why advanced security methods are necessary to introduce for effective e-voting for the confidentiality of votes and the verification of their integrity and validity. Several security measures were integrated into the E-Voting system in order to achieve an enhanced, speedy and accurate performance. In this new system "Thumbprint scanner as a candidate button in Global Wireless E-Voting system" grasp can instigate the relatedness of the punter by scanning the fingerprint pattern in candidate button itself and also the result is not kept their itself instead of it is store in the remote server by converting it into radio waves. Consequently there is no fortuitous to change the reckoning, and no chance to allow illegal voter to vote. In the proposed system the tallying of the votes will be done fastly, thus saving a huge time and enabling Election Commissioner of India to announce the result within a very short period. It show that security and performance of the system are according to expectations. These results provide the proper grounds that would guide the decision maker in customizing the proposed system

KEYWORDS: E-Voting, Scanner, Finger Print, Thumbprint.

I. INTRODUCTION

In electronic voating machine, the entire control is kept in the hand of casting a ballot in control officer. One more hazard with the present casting a ballot machine is that anyone can build the vote count,since the include is available in the machine itself. On the off chance that any methodological issues or harm happens with the machines amid decision it might results to the re-voting

In proposed framework that is "Global Wireless E-Voting ", the machine is influenced astute which to can decide the qualification of the voter by checking the unique mark and furthermore the vote tally isn't kept into a similar machine itself rather than it is store in the remote server by changing over it into radio waves. There is no way of expanding the vote tally of machine. Indeed, even in caseof harm to casting a ballot machine

In India decision has incomparable weight age. So to make it secure and proficient in the vision of current innovation we are "Global Wireless E-Voting". In the time of innovation, the casting a ballot machine, which is available today, is exceptionally unbound. Being in the period of Computers we are trading off the security by selecting Electronic casting a ballot machine in light of the fact that in the present electronic casting a ballot machine isn't clever that is it can't decide the individual sought the casting a ballot is qualified or not . that is why a secure voting technique is required for voting.

II. LITERATURE REVIEW

In a present framework every single area is given an electronic machine which stores the votes of the general population how might they voted in favour of the specific applicant. Control of present framework is given to the in control officer. He just check forthe qualification of the competitors and take into account the casting a ballot. At long last all the casting a ballot machines are gathered at a spot and go for tallying.

there won't be damage to congruity of the race procedure.

FINGERPRINT SCANNING An optical scanner sparkling a splendid light over the unique finger impression when individuals place their finger on applicant catch to position vote, around then it takes adequately a computerized photo. In the event that you've just photocopied your hand, you'll observe unerringly how this works. Rather than delivering a dirty dark photocopy, picture nourishes into a scanner. The scanner utilizes a light-touchy chip called a CCD (charge-coupled gadget) to deliver an advanced picture.



Fig 1: Optical Scanner
INTERFACE DEVICE By using this kit the input digital signals such as (fingerprint pattern+ votes+ secure bits) can be converted into radio waves.

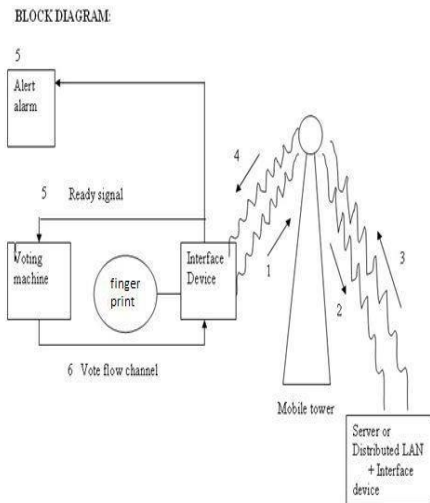


Fig 2: Block Diagram

REQUIREMENTS IN E-VOTING

A casting a ballot framework ought to fulfill these prerequisites.

1. Eligibility and validation – just enlisted voters must be admitted.
2. Uniqueness – no voter may make his choice more than once.
3. Accuracy – casting a ballot frameworks should record the votes effectively.

4. Verifiability and review capacity – it should be conceivable to check that all
WORKING OF SYSTEM Whenever voters enter to casting a ballot stall then he will be told to legitimately put his finger on fingerprint scanner. right now the machine filters the example. when design examining legitimately affirmed then it sent flag to the casting a ballot machine as to acknowledge the vote it will be controlled on .at that point voter is made to cast a ballot. Presently the entire information including the unique finger impression design is sent to interfacing gadget which convert into radio floods of portable recurrence go and these radio waves are sent to versatile pinnacle and after that to the remote server, where the verification and voters recognizable proof is put away into a verified database.

The got information is first changed over into computerized design from the radio waves through the interface gadget kept at the server side, and afterward retina example and vote isolated.

Next the unique finger impression is coordinated against the current database .If coordinate is discovered at that point banner is check which shows its casting a ballot status for example in the event that the voter isn't casted a ballot yet, at that point +veack is send to the versatile pinnacle and afterward to the comparing casting a ballot machine. This ack is perceived by the beneficiary kept at the voter side and machine is made to filter next unique finger impression example and vote, generally in the event that - veack, at that point ready alert is made to ring.

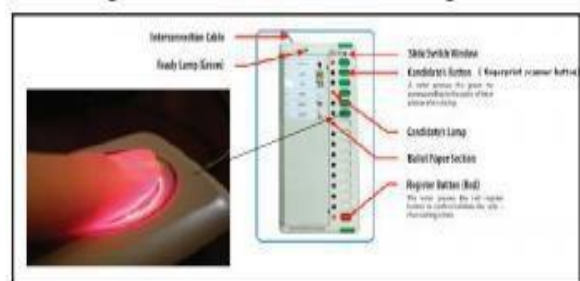


Fig 3: Radio Waves From FingerPrint

RESULT Electronic casting a ballot innovation expects to speed the tallying of votes, lessen the

expense of paying staff to tally cast a ballot physically and can give improved openness to incapacitated voters.

Security: The radio floods of a versatile recurrence comprise of unique finger impression example and vote can be created by methods for outer source. That is the reason we have to give some drunkard of security to maintain a strategic distance from this issue. One of the plan to take care of this issue is CDMA and another system is embeddings security bits at ordinary interim of time amid the transmission of radio waves (Ex.2 msec) .At the server side after the given interim (2 msec) security bits are checked. If there should be an occurrence of positive affirmation we can acknowledge as legitimate vote, other insightful basically dismissed.

Another issue is that one may trap the radio waves in the middle of and can decide the individual and the vote; this may uncover the aftereffect of the decision before the consummation of the casting a ballot procedure. To keep away from this issue we can go for applying the effective and complex encryption calculation with the goal that the straightforwardness of information can be covered up and the server side the scrambled information can be again decoded and unique information can recovered this make the catching of wave good for nothing

Effectiveness: Whenever the information which is sent from the voter (customer) side, it is in the substantial sum, this defers a bit a casting a ballot framework and the information that is gotten at server side is in the ccess mode for example more than one customer is sending the information.

Surveillance Robot For Defense Environment

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Abstract - The use of robotic surveillance systems for reasons such as border monitoring or in remote locations like war zones is discussed in this study. The system can replace the border guard soldier in charge of providing surveillance. The robotic vehicle can autonomously recognize human presence and transmit information to the control station. Both surveillance and reconnaissance situations are catered for by this technology. Every human being must have security. The need for security has grown along with the population. But adequate security cannot be set up for want of finances. The research's goal was to develop a smart robot that can offer high-quality security as a long-term solution to the issue at hand. The objective was to create and put into action a rover that makes use of contemporary technology, enabling it to travel with the help of a distant control room, search the region, and warn the control center once any abnormality has been found. If a person is found, the information is sent to the control room.

I. INTRODUCTION

Real-time data gathering, analysis, and prompt information distribution to the operator are all components of surveillance. In defence applications, surveillance is crucial to keeping an eye out for potential threats so that required action can be taken to protect citizens. Monitoring a group of circumstances, a region, or a person is the task of surveillance. This typically happens in a military setting where monitoring enemy territory, hostage situations, or conflict zones is essential to a country's security. In close proximity to sensitive sites, skilled workers conduct human surveillance to continuously look for changes. However, there is always a chance to lose workers if you are discovered by your enemy.

II. LITERATURE REVIEW

[1] "Surveillance Robot for Defence Environment Aniket.A.More" (2019).

This paper presents gives a practical present-time approach for surveillance robots at remote locations and enemy territories using a remote controller based robotic vehicle on wireless technology that can be used for defence and military applications. The sensors and camera are used to detect and identify human, objects etc. This vehicle is designed to work in limited area with better efficiency for example In Armed forces. They can use these types of robot vehicles in hostage situations to determine the

number of terrorists in the building, types of weapons used, bombs etc. The processing unit used in proposed system is Raspberry pi working on raspbian operating system. The Pi board controls the movement, gather information using sensors and camera that is used to stream the real time video of surrounding to the operator.

[2] "Intelligent Exploration and Surveillance Robot In Defense Environment M.Karthikeyan (2014)".

Now days the defense environment uses many types of unmanned military robots for attack operations and surveillance, in the time every robots controlled using standard short distance RF waves this limitations reduce the reliability and operation functionalities of these types of robots. To overcome this problem, we have proposed a method for autonomous control and decision making and reporting system, these types of mini robots contains self-neural schema framework for autonomous control. This project also considers Multi -angled rotatable Camera for power 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-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a few dollars and start over again. NodeMCU is an open-source firmware and development kit that plays a vital role in designing your own. The interface of the module is mainly divided into two parts including both Firmware and Hardware where former runs on the ESP8266 Wi-Fi SoC and later is based on the ESP-12 module. IOT product. The ability of module to establish a flawless WiFi connection between two channels makes it an ideal choice for incorporating it with other embedded devices.

extended view of military base or any other place. Ultra sonic sensor used for direction control and object detection for motor control. Wireless systems used for Communication, and GPS used for location tracking and navigation, 3 axis tilt and G-sensor used for position of robot for better control Digital MEMS compass used for direction control and navigation. We have to implement self-destruction facility if the robot locked by enemy or when try to dismantle it, it will blow and destroy itself and its data.

[3] “Smart Surveillance Robot for Real-Time Monitoring and Control System in Environment and Industrial Applications Anand Nayyar (2018)”.

The current ongoing revolution of Internet of Things (IoT), is now integrated with Robotics in various diverse fields of everyday life is making up new era i.e. Internet of Robotics (IoR). Internet of Robotics is on the mature stage of development and is currently surrounded by various challenges to be solved for more implementations, i.e., design, security, sensors, and long-range communication systems. The main objective of this paper is to propose an Internet-of-Things-based Internet of Robot, i.e., InterBot 1.0. InterBot 1.0 is efficient in terms of real-time environmental monitoring in terms of temperature, humidity, and gas sensing and is equipped with long-range communication system via 2.4 GHz 6-channel remote and also short range via HC-05 (Blue-tooth module). InterBot 1.0 is IoT-based via ESP8266, and all the data can be viewed in live graphs via Thing Speak.com. The Results state the efficiency of Interbot 1.0 in monitoring real-time environments.

III. Existing System:

Already existing systems use robots that have limited range of communication as they are based on RF Technology, Zigbee and RF. Some existing projects use short range wireless camera. Some existing robots can only be controlled with a manual mode which needs human supervision throughout the whole surveillance process.

IV. METHODOLOGY

In the proposed system, the whole system is controlled via web server. From the web server we can control the robot from anywhere around the world through NodeMCU. Here we are interfacing the sensors to the Arduino. PIR sensor, Metal detector sensor and Ultrasonic sensors are used to detect the motion, Underground bombs and Obstacles respectively. Whenever the motion or bombs detected means then message will sent to the control room through GSM. By using IP camera we can monitor the surroundings with video streaming.

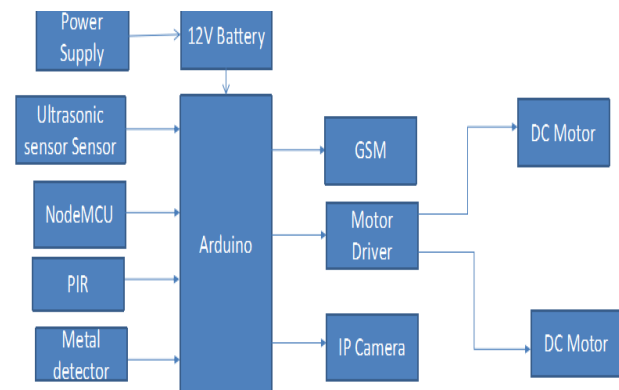


Fig.1. Block Diagram

A. Working:

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a A GSM modem can be a dedicated modem device with a serial, USB, or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two [DC motor](#) with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

A metal detector is an instrument that detects the nearby presence of metal. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld

unit with a sensor probe which can be swept over the ground or other objects.

All living objects, whose body temperature is more than 0C, emit the heat in form of infrared radiation through their body, also called as thermal radiations. This Radiated energy is invisible to human eye. These Signals can be detected by using PIR sensor which is specially designed for such purpose.

A machine that converts D.C power into mechanical power is known as a d.c. motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The direction of this force is given by Fleming’s left hand rule and magnitude is given by;

$$F = BIl \text{ newton's}$$

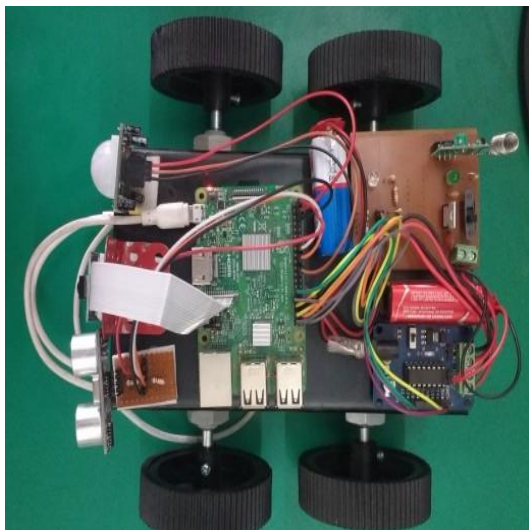
Basically, there is no constructional difference between a D.C. motor and a D.C. generator. The same D.C. machine can be run as a generator or motor.

A servomotor (or servo motor) is a simple electric motor, controlled with the help of servomechanism. If the motor as a controlled device, associated with servomechanism is [DC motor](#), then it is commonly known as a DC Servo Motor. If AC operates the controlled motor, it is known as a AC Servo Motor.

V.RESULT

The results obtained at the demonstration of the system are mentioned below:

The prototype of surveillance robot is displayed. The system consist of sensor, processing unit, RF remote receiver, DC motors and the Pi camera module.



Raspberry Pi - Surveillance Camera

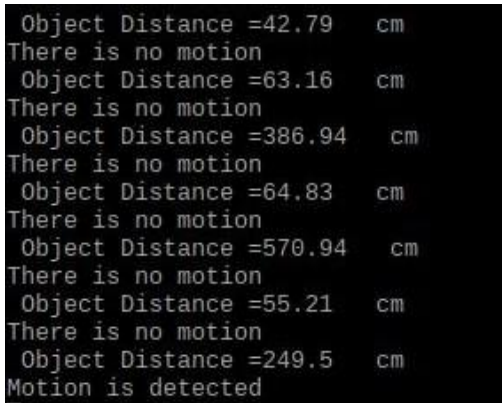


Fig.3 Sensor output data



Fig.5 Video camera Live feed on software

In the above fig.3 the data of the sensors is obtained where both the sensors sense the surrounding until the system is put into standby mode. The data obtained is stored in log files which is asynchronous to operator and can also be used for later analysis. In Ultrasonic sensor works as radar which sends a trigger wave and receives an echo of the wave the total distance travelled by the wave is calculated and displayed in cm. PIR sensor senses the heat generated by human, animals etc. that determines the motion in effect in front.

Fig.4 is of RF remote control which is used to send instructions to the robot to control the movement and guide it to the designated path. In the above Fig.5 the live feed of the camera module is viewed on the software by the operator through wireless medium. The camera streams the feed in "MJPG" format where the operator has less frame drops that give advantage to operator to determine the situation in the surroundings.



Fig.4 RF remote control

CONCLUSION

In the proposed system the interfacing of sensors, camera module, Motor control and GPS is done with Raspberry pi for better processing control which provides better surveillance implementation. In this system we obtain information about the area within 5m-10m by use of remote control, sensors and camera feed through wireless medium. In future we can implement fully automated and computer vision based surveillance system to obtain more accurate results.

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Design and application of intelligent agriculture service system with Lo-Ra based on WSN

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Abstract - : The Internet of Things (IoT) is one of the highest promising application areas in information technology for forthcoming products and services. And the agriculture field is changing expeditiously pointing to the future of automated and embedded systems with a bunch of sensors to monitor and curb the flourishing plants in a way to profit associated with it. The persistent monitoring and controlling of distantly located plants is labor compact and technically tough business. In modern agriculture, a Wireless Sensor Network (WSN) provides a simple cost-effective solution to monitor and control.

Index Terms – Bluetooth low energy, ZigBee technology, integrity protection, LoRa technology wireless sensor network.

I. INTRODUCTION

In our modern world, many people are making full use of technology, and because of that, they are doing their job soon and well. But still, many rural farmers cannot use technology more. Also, the demand for food supply is increasing due to an increase in the global population. At that time, IoT(Internet of Things) tends to develop certain techniques in the field of agriculture to increase food production. The farmers can also get useful information regarding the moisture and soil requirements etc. So we are implementing this smart agricultural system for them. With the help of this system, farmers can examine the temperature, humidity & soil moisture of their farm, which is done by various IOT sensors like DHT, Soil moisture, as well as control various components, like motor, etc. This system is very easy and simple to use, it works wholly on wireless technology. To use this system the farmer has to place the transmitter module in different places in his field and the receiver is put in his home and connected to the server. Now, the farmer can monitor and control the system by the website or mobile application. As discussed earlier, this system is formed by using wireless

technology and we already have a handful of wireless protocols like BLE (Bluetooth Low Energy), Wi-Fi, and cellular, etc. But these technologies are not ideal for IoT sensor nodes, because they needed to transmit information to a long distance without using much power and with low cost . Apart from this LoRa technology plays a vital role in the agriculture sector. That's why we are using LoRa technology, which can perform very-long range transmission of data or information at low cost and without an internet connection. The term LoRa stands for Long Range. It is a wireless radio frequency technology introduced by Semtech . LoRa is used to transmitting information in both directions to long-distance and typically LoRa can achieve a distance of 15 to 20 km and can work on 18CP815 SMART AGRICULTURAL SYSTEM USING LORA WIRELESS TECHNOLOGY 2 battery for a year. The license frequency band for LoRa Technology in India is 865 MHz to 867 MHz In wireless technology solution, BLE works with low power, but cannot send data to long distance. While using LoRa we can achieve high distance communication without an internet connection, thus it overcomes the drawbacks of Wi-Fi and BLE communication. The below chart provides a difference between WSN technology.

II. OBJECTIVES

The objective of a smart agricultural system using LoRa wireless technology is to observe and control the temperature, humidity, moisture, and motor of the field via website and android mobile application. Field data will transmit using LoRa technology, without an internet connection, and with high distance.

Lo-Ra technology

LoRa is a patented digital wireless data communication technology (EP2763321 from 2013 and US7791415 from 2008) spread-spectrum radio modulation originally developed by Cycleo of Grenoble, France and acquired by Semtech in 2012. LoRa uses unlicensed free sub giga hertz radio frequency bands like 169MHz, 433MHz, 868MHz in Europe and 915MHz in US. It is a spread spectrum modulation technique derived from chirp Spread Spectrum(CSS) technology. Chirp stands for 'Compressed High Intensity Radar Pulse'. It is a signal which frequency either increase or decrease with time. Chirp spread spectrum developed for radar applications. Chirp signals have constant amplitude and pass the whole bandwidth in linear or non linear way from one end to another end in certain time. It uses complete bandwidth to transmit signals. If the frequency changes from lowest to highest, it is called up-chirp and if frequency changes from highest to lowest, it is called down chirp. This technique helps to transmit signals for very large distances. Chirp spread spectrum is resistive to Doppler shift. The technology is presented in two parts- LoRa, the physical layer and Long Range Wide Area Network(Lora WAN), the upper layers. LoRa physical layer includes 8 preamble symbols, 2 synchronization symbols, physical payload and optional CRC.

Some features of LoRa technology are as mentioned below:

1. Long Range: Connects devices up to 30miles apart in rural areas and penetrates dense urban or deep indoor environment.
2. Low Power: Requires minimal energy with prolonged battery lifetime of up to 10 years, minimizing battery replacement costs.
3. Secure: Features end to end AES128 encryption, mutual authentication, integrity protection and confidentiality.
4. Standardized: Offers device interoperability and global availability of Lora WAN networks for speedy deployment of IoT application anywhere.

5. Geolocation: Enables GPS free tracking applications offering unique low power benefits untouched by other technologies.

6. Mobile: Maintains communication with devices in motion without strain on power consumption.

7. High Capacity: Supports millions of messages per base stations, meeting the needs of public network operators serving large markets.

8. Low Cost: Reduces infrastructures investment, battery replacement expenses and ultimately operating expenses.

III LITERATURE SURVEY

In the last few years, researchers have shown a great interest in smart agriculture, WSN (wireless sensor network), and also in the area of LoRa technology. Many researchers used ZigBee and other WSN technology for field data monitoring. This chapter briefly discusses the related research work carried out by different researchers in the area of smart agriculture, and WSN.

Santosh Kumar, et al. in their research, select various sensors and methods for precision agriculture such as temperature sensor, humidity sensor, and Arduino (ATMega328) microcontroller board with the wireless sensor network system. The role of WSN is to sense the remote data from the desired location and transmit through the wireless network which can be viewed by the receiver. The earlier monitoring systems had a lot of limitations such as distance and reliability factors. Previously, the wireless networks used RF technology which was replaced by Bluetooth technology, and Bluetooth has replaced by ZIGBEE technology . Santosh Kumar, et al. discusses the development of the WSN system for precision agriculture based on the Zigbee wireless sensor network. ZIGBEE is a specification for wireless personal area networks (WPANs), and operating at 868 MHz, 902-928 MHz, and 2.4 GHz. Moreover, WPAN is a personal area network in which the device connection is wireless. The ZIGBEE is used as LR-WPAN i.e. low rate wireless personal area network. According to them, using ZIGBEE devices in a

WPAN can communicate at speeds up to 250 Kbps while physically separated by distances up to 50 meters in typical circumstances and greater distances in an ideal environment.

M. Dholu, et al. proposed and designed an IoT for precision agriculture application. This proposed system consists of various components like humidity & temperature sensor, soil moisture sensor, and a microcontroller unit (MCU) along with the Wi-Fi module, using the Wi-Fi router uploaded the sensed data on Thing speak cloud and finally displayed it on the mobile application. According to them, soil moisture measurement has done by using the YL – 69 electrodes. There is two terminal in electrode between which the resistance is measured. With a change in the soil moisture the resistance between 18CP815 SMART AGRICULTURAL SYSTEM USING LORA WIRELESS TECHNOLOGY 4 these two-point changes. So this change in moisture is the measure of the amount of moisture in the soil. YL–38 is a chip which is used in the proposed work to convert the change in resistance into an analog voltage, it is fed with 3.3 v supply so it gives an output from 0 to 3.3 Node MCU is a microcontroller unit that is used as an MCU, which is development prototyping kit based on ESP8266. D. Davcev, et al. design an IoT agriculture system based on Lora WAN. As discussed, RF technology was replaced by Bluetooth technology, and Bluetooth was replaced by ZIGBEE technology, And ZIGBEE has replaced by LoRa technology.

D. Davcev, et al. in their paper, discussed LoRa technology. Use LoRa WAN and LPWAN (Low-power Wide-Area Network) as a transmission protocol that was designed by the LoRa Alliance and met the need of the IoT services. LoRa WAN network was specifically designed for IoT applications with the objective of connecting thousands of sensors over a large network . LoRa is the physical layer of the LoRa WAN which is based on CSS (Chirp Spread Spectrum) modulation, which maintains the same low power characteristics as FSK modulation but significantly increases the communication range. According to D. Davcev, et al. , LoRa WAN can achieve data transmission range from 2-5 km in urban areas and to 15 km in suburban areas,

LoRa WAN's star of stars topology in comparison with ZigBee's mesh network topology does not need additional modules to act as routers, which decreases the overall cost and complexity of the network. Y. Kim, et al. designed remote sensing and control of an irrigation system using a distributed wireless sensor network. In this proposed system, communication signals from the sensor network and irrigation controller to the base station were successfully interfaced using low-cost Bluetooth wireless radio receiver .They also developed graphical user interface-based software . Wireless data communication was well described by Y. Kim, et al. in which, Bluetooth module was selected for the wireless data communication from the in-field sensing station to a base station. The key features of Bluetooth technology are low power, low cost, and communication between Bluetooth devices follows a strict master-slave scheme Y. Kim observed Bluetooth radio 18CP815 SMART AGRICULTURAL SYSTEM USING LORA WIRELESS TECHNOLOGY 5 transmission at a downloading interval of 15 min, daily total power consumption was 23.8.

A. Hanggoro, et al. proposed and designed a greenhouse monitoring and controlling using an android mobile application, which was a complete system designed to monitor and control the humidity inside a greenhouse. It used an android mobile phone, connected using Wi-Fi to a central server which connects via serial communication to a microcontroller and humidity sensor. According to them, Wi-Fi has been implemented all over the world, and 802.11g was the third modulation standard for wireless LANs. It worked in the 2.4 GHz band (like 802.11b) but operated at a maximum raw data rate of 54 Mbit/s, or about 19 Mbit/s net throughputs. It used wireless G for communication path from android to server and vice versa. A. Hanggoro, et al. , in their paper, the hardware system was divided into 3 parts which are microcontroller Arduino, a sensor, and IEEE wireless 802.11g. The microcontroller sends the value from the sensor to the android via computer through serial communication and wireless connection .

P. Gangurde, et al. designed a novel approach for precision agriculture using a wireless sensor network. In their research, they propose different topologies for

precision agriculture. The development and deployment of WSNs have taken traditional network topologies in new directions. Different WSN topologies are Bus, Star, Ring, and Grid . According to them, delay in star case was much less than the delay in a bus, grid, and ring topology. As per their research, average network delay using the execution for the four cases was 45ms for the star, 71ms for the grid, 81ms for the bus, and 98ms for the ring topology. In star topology, the delay was decreased by approximately 50%..

D. I. Sacaleanu, et al. discussed a data compression on the wireless sensor nodes lifetime for LoRa technology, comparing with ZigBee and Enhanced Shock Burst. According to D. I. Sacaleanu, et al. [10] DAS Mote node with ZigBee protocol acquires 7 parameters and transmits 14 data bytes without data compression. The average current recorded in the transmission was 27 mA, while the current spend on 58.45 ms transmission timeframe was 1.59 mA, thus resulting in a ~20% energy improvement [10]. For the Arduino nodes with the Enhanced Shock Burst protocol, there were acquired 7 18CP815 SMART AGRICULTURAL SYSTEM USING LORA WIRELESS TECHNOLOGY 6 parameters and transmit 14 bytes without data compression, 2 bytes for each parameter. The average current in the transmission was 6 mA , while the current spend on a 4.64 ms timeframe was 28.1 μA, thus resulting in a ~7% energy improvement . And the LoPy node with LoRa acquires also 7 parameters and transmits 14 data bytes without data compression. The average current in the transmission was 154 mA, while the current spend on an 1190 ms timeframe was 183 mA, thus resulting in a ~31% energy improvement

IV. PROBLEM STATEMENT

The use of intelligent sensors at the agricultural level is very limited. Currently, there are sensors that are used for census, monitoring and control of multiple variables . The use of these wireless sensors allows for efficient energy management. They are scalable. New sensors can be incorporated without affecting performance, achieving the implementation of dynamic network topologies

The contribution of this work is to reduce the technological gap in rural communities in Ecuador, which do not have many economic resources, and with this network, farmers will be able to control production and pests, based on the climatic changes present in the area.

For the coverage area where the network is implemented, the applied system offers scalability, security, management and an affordable cost for the community, whose economic income depends mostly on agricultural activities. In this context, the system will serve as a basis for the implementation of techniques such as phytosanitary control, intelligent irrigation, and production forecasting among others .

III. METHODOLOGY FOR IMPLEMENTATION

Overview of existing workflow:

Santosh Kumar, et al. [4] have discussed the development of the WSN system for precision agriculture based on the ZIGBEE wireless sensor network.

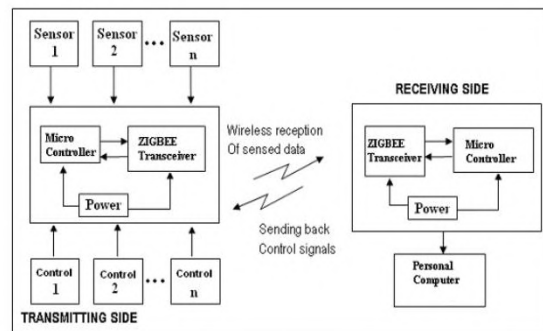


Fig.1 Existing workflow

Santosh Kumar and Uday Kumar R.Y have proposed the WSN node using ZIGBEE. In this model, at the transmitting side, the Microcontroller and ZIGBEE transceiver is power by the external power supply and different sensors are connected with a microcontroller. All the sensor’s data are controlled and collected by the microcontroller, and using the ZIGBEE transceiver transmits the sensed data wirelessly. At the receiving side, another microcontroller and the ZIGBEE transceiver are there, it will receive the sensed data and

use for the personal computer. They have used WSN as a ZIGBEE, operating at 868 MHz, 902-928 MHz, and 2.4 GHz, and communicate at speeds up to 250kbps while physically separated by distances up to 50 meters [4]. 18CP815 SMART AGRICULTURAL SYSTEM USING LORA WIRELESS TECHNOLOGY 10 3.2

IMPLEMENTED WORKFLOW:

One wireless network is formed with the help of LoRa technology which contains a transmitter and receiver. We have divided this technology into two parts, one for field and another for the control hub (farmer’s home). Talking about the field area, two transmitters and one receiver are used. One transmitter has a moisture sensor, another has a DHT sensor, and one receiver for the motor control. Both the transmitter generates useful data of farm like the data of temperature and humidity which is generated by the DHT sensor, and the data of available moisture in the soil, generated by a soil moisture sensor. Now moving towards the control hub which contains a transceiver connected to the operating device. The role of the transceiver is to receive the whole data generated by the on field components and also transmit the command to control the motor whereas the device stores the data and displays on the website and mobile application for remotely monitoring.

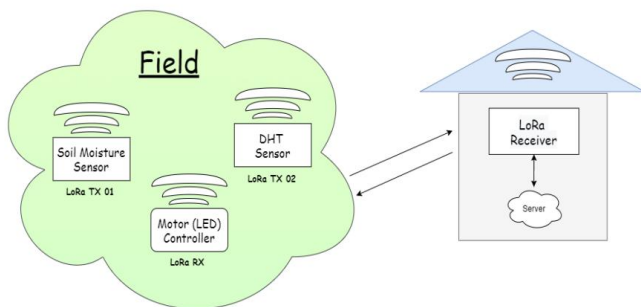


Fig.2 implementation overflow

BENEFITS

1. Better understand and plan for inherent variability of farm conditions.
2. Increase farm yields while reducing resource use.

3. Minimize in-field workload so farmer can tend to business operation.
4. Low maintenance costs thanks to LoRa sensors low power operation, ensuring batteries can last 10 years.

IV. CONCLUSION

For any farmer, the monitoring of information about soil moisture, temperature, and humidity is very essential for producing superior yield and controlling various components like motor (LED), etc. For that purpose wireless technology is a must. There is much wireless technology available in the market right now, but apart from them, LoRa technology is very suitable in the agriculture sector because it does not require internet connection moreover it operated at a greater distance. To be used this technology one can place the transmitter at the different places in the field whereas the data generated by them are collected with the help of the receiver. Now farmers can observe this collected data through the website as well as Android application

FUTURE SCOPE

LoRa technology can be used in smart agriculture and farming applications.

- Smart farming and livestock management
- Temperature and moisture monitoring
- Water level sensors and irrigation control

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AUTOMATIC FLOOR CLEANER ROBOT

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Abstract - Automatic floor cleaner is an automated machine that facilitates the user to keep their place clean and hygienic. Many industries are working in the automation field to make autonomous cleaners. This paper deals with the development of automatic floor cleaner. Now a day's major emphasis is given on the field of robotics for decreasing human efforts. Our aim is to construct a floor cleaner which will be fully automatic providing dry and wet cleaning as well as UV sterilization. The current market is occupied by cleaners with only one or two functionalities. For its cost reduction and simplicity, we are using Arduino. The cleaner will be a step for providing comfortable life by resolving problems in traditional floor cleaning methods.

Index Terms: IoT (Internet of Things, Arduino Uno, MCU, HC-05 Bluetooth model, L293D Motor driver.

I. INTRODUCTION

The aim of this project is to design a Bluetooth controlled Robot for cleaning the floor by giving instructions from android Mobile. It is very useful for cleaning the floors. By using Bluetooth module, we can direct and turn the system as the user needs. It works great and controlled manually based on the user convenience. Definitely makes cleaning easier and merrier while enabling anyone to build something rather than buy. In modern days interior decorations are becoming an important role in our life. Cleaning of floor is a very important one for our health and reduces the man power requirement. Hence our project is very useful in our day-to-day life.

II. LITERATURE REVIEW

[1] Avinash Chahare, et. al. (2022). Design Modification and Fabrication of Eco-Friendly Cleaning Machine. International Journal of Advanced Research in Science, Communication and Technology, 2, 750-756.

As mentioned, that proposed a manual floor cleaning machine capable of cleaning both wet and dry floors. It has DC drive powered rotary brush with pneumatic controlled dust shifting to assist users in removing waste. The floor of the outdoor kitchen too was simply the ground baked stone hard by the sun. Unless it was raining, which happened only rarely, these floors were easy to keep clean by sweeping.

[2] "Dr. Akash Rathee, Ishant Jalan, Lakshita Nandwani, Tanya Sharma Automatic Smart Floor Cleaning Robot Using Arduino – UNO 2020 International Journal for Research in Engineering Application & Management (IJREAM).

In this paper we propose a smart floor cleaning robot that can clean the floor according to the instructions given by user. This robot makes the cleaning process fast and efficient as it receives the commands from smart phone wirelessly through Bluetooth module embedded on it. On getting the commands the robot perform functions like moving in different directions and mopping the floor. This system proves to be cost effective, low maintenance and reduced human effort which makes it a very reliable product.

[3] "Uman Khalid, Muhammad Faizan Baloch, Haseeb Haider, Muhammad Usman Sardar, Muhammad Faisal Khan, Abdul Basit Zia and Tahseen Amin Khan Qasuria. Smart floor cleaning robot-2018-Researchgate-327837948

With the advancement of technology, robots are getting more attention of researchers to make life of mankind comfortable. This paper ~ 10 ~ presents the design, development and fabrication of prototype Smart Floor Cleaning Robot (CLEAR) using IEEE Standard 1621 (IEEE Standard for User Interface Elements in Power

Control of Electronic Devices employed in Office/Consumer Environments). Subject robot operates in autonomous mode as well as in manual mode along with additional features like scheduling for specific time and bagless dirt container without-dirt disposal mechanism. This work can be very useful in improving life style of mankind.

[4] “S Monika, K Aruna Manjusha, S V S Prasad, B. Naresh Design and Implementation of Smart Floor Cleaning Robot using Android App. 2019-International Journal of Innovative Technology and Exploring Engineering (IJITEE)

The advancements made in technology of robotics have made life of mankind very much easier and comfortable. This paper describes a smart floor cleaning robot that allows cleaning the floor by giving instructions to the robot. This robot makes floor cleaning process easy and fast utilizing a wireless robotic cleaning system. This wireless system consists of a transmitter application that runs on an android mobile app which allows the robot to follow commands given by the user through the transmitter app.

[5] “Yuda Irawan, Muhardi Muhardi, Rian Ordila, Roni Diandra Automatic Floor Cleaning Robot Using Arduino and Ultrasonic Sensor 2021- Journal of robotics and control (JRC) Vol2 no-4

The entire floor cleaning robot is divided into several parts, namely consisting of an Ultrasonic Sensor, Motor Shield L298, Arduino Uno microcontroller, Servo, and Dc Motor. This tool works when the Arduino Uno microcontroller processes the ultrasonic sensor as a distance detector ~ 14 ~ and a DC motor as a robot driver, then the DC motor is driven by the Motor Shield L298. When an ultrasonic sensor detects a barrier in front of it, the robot will automatically look for a direction that is not a barrier to the floor cleaning robot. The distance value on the sensor has been determined, that is, when the distance read by the ultrasonic sensor is below 15 cm.

III.PROBLEM STATEMENT

To design and develop a robot that can effectively clean floors without any human intervention. The robot should also be equipped with Bluetooth connectivity,

which would allow it to be controlled remotely using a smartphone or other Bluetooth enabled device.

IV. METHODOLOGY

The robot should have a cleaning mechanism, a battery, sensors, and a Bluetooth module to connect to other devices. The robot’s software should be developed to control the cleaning mechanism and sensors.

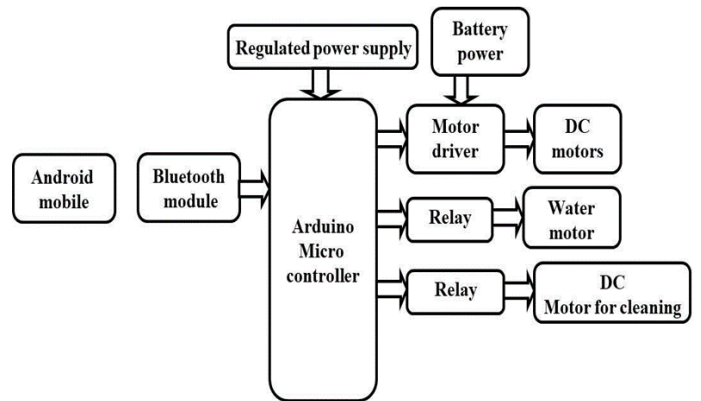


Fig.1. Block Diagram

A. Working:

The controlling device of the robot system is Arduino microcontroller. DC motor along with driver circuit, Bluetooth module, water motor along with relay, brushes motor with relay is interfaced to microcontroller.

We can control the robot using Bluetooth mobile application by using android mobile. We can control the direction of robot and water motor and also control the cleaning motor from Bluetooth mobile application. This data is fed as input to microcontroller over HC-05 Bluetooth module. Microcontroller reads the data and make the robot to move according to the direction given by the android mobile.

To perform this intelligent task, Arduino microcontroller is loaded with a program written in C language in Arduino software.

The Bluetooth module is installed in the robot to allow it to communicate with a controlling device,

such as a smartphones or tablet. Once the devices are paired, the controlling device can be used to send commands to the robot. These commands could include starting and stopping the cleaning mechanism, directing the robot to move in specific directions, or adjusting the speed

B. Schematic diagram

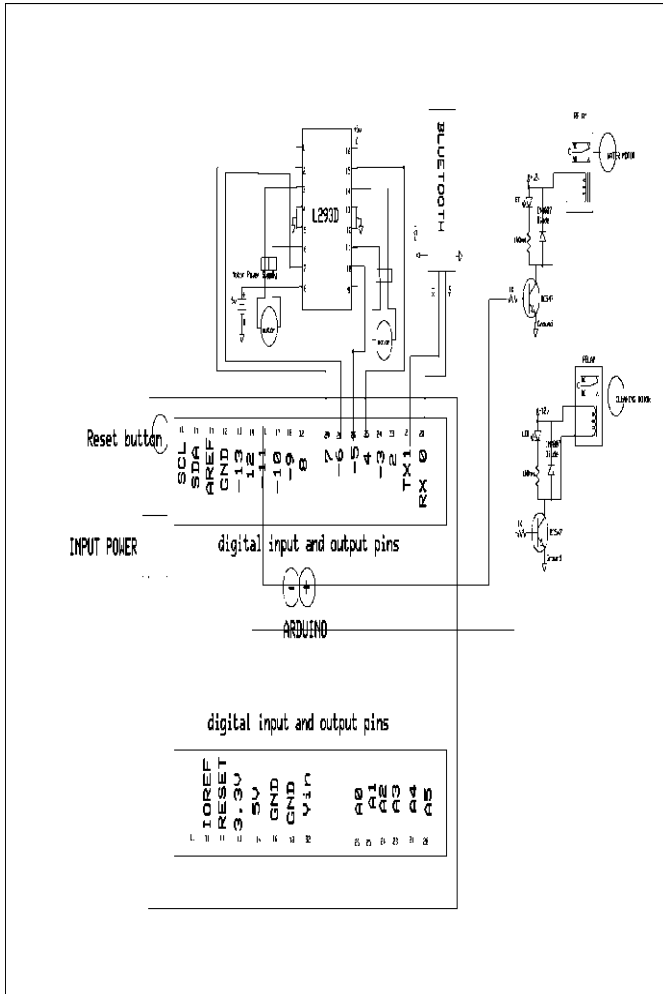


Fig.2 Schematic diagram of floor cleaning robot

V.RESULT

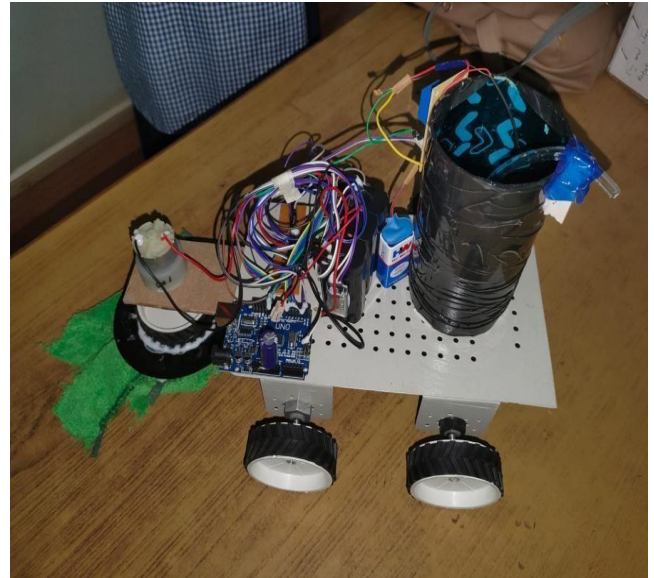


Fig.3 Setup of Proposed System

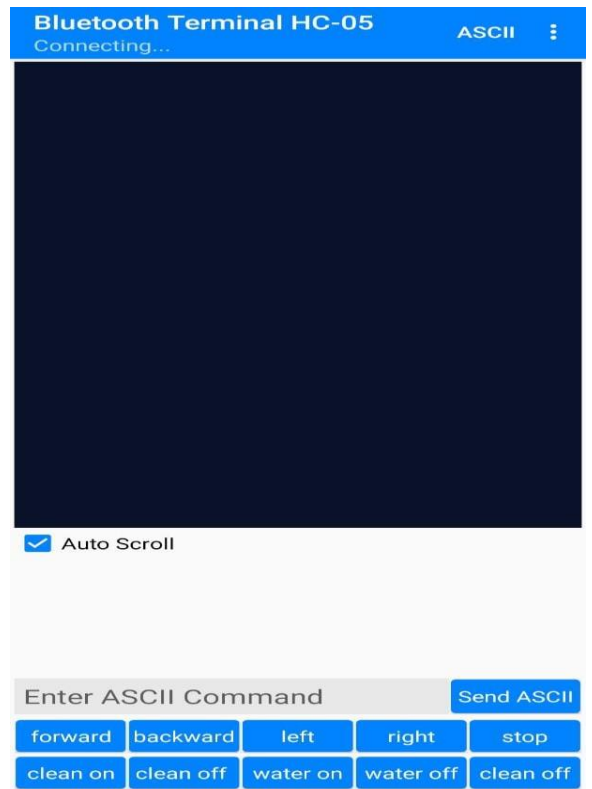


Fig.4 Bluetooth terminal app commands

CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced ICs with the help of growing technology, the project has been successfully implemented. Thus, the project has been successfully designed and tested.

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A Brief Audit of Content Based Image Retrieval

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Abstract- The amount of the pictorial data is growing every day with the expansion of internet service and it has become very important to arrange this data so that we can have efficient searching and browsing of this visual data. As the network and development of multimedia technologies are becoming more popular, users are not satisfied with the traditional information retrieval techniques. So, the content based image retrieval has become a source of exact and fast retrieval of images. It is very difficult for the users to retrieve the required images using a operative and efficient mechanism. There are many techniques which can be used to retrieve the images depending upon the requirement of different applications. This paper provides an extensive review of various research work and methodologies applied in the field of CBIR. Images are retrieved on the basis of automatically derived features such as texture, shape and color which is generally referred to as Content-Based Image Retrieval (CBIR). Content based image retrieval is an important research area in image processing, with a vast domain of applications like recognition systems i.e. finger, face, biometrics, medical sciences etc. However, the technology still lacks maturity, and is not yet being used on a significant scale. In the absence of hard evidence on the effectiveness of CBIR techniques in practice, opinion is still sharply divided about their usefulness in handling real-life queries in large and diverse image collections. The concepts which are presently used for CBIR system are all under research.

I. Introduction

In many areas of government, academia, commerce, and hospitals, large collections of digital images are being created. Many of these collections are the product of digitizing existing collections of drawings, paintings, analogue photographs, diagrams and prints. Usually, the only way of searching these collections was by keyword indexing, or simply by browsing. Digital images databases however, open the way to content-based searching. In this paper we survey some technical aspects of current content-based image retrieval systems. Effective and operative retrieval of images from a large data base is a very difficult task. Therefore the retrieval of similar and relevant images based on the similarity between automatically derived content features such as color shape, texture, etc of the query image and that of the images which are stored in the data base and that task is popularly known as content based image retrieval. The term color can be achieved by the techniques histogram and averaging [4]. The term texture refers the use of vector quantization or transforms. The term shape

is the use of gradient operators or morphological operators [4]. The accuracy of the CBIR system can be improved by the iterative refinement process of the queries and the features that are decided by the users' feedback [5]. An image consists of global and local features. Depending upon the problem we can use the features of our interest to retrieve the images from a database [3]. Some of the major areas of applications of CBIR are: medical diagnosis, Intellectual property, art collections, crime prevention, military and engineering design and geographical information and remote sensing systems.

The steps that are to be followed in the system realization of CBIR are [1]:

1. Image acquisition
2. Feature Extraction
3. Similarity Matching

The query images undergo three stages. A large number of images are stored in the database. Image enhancement takes place where various techniques are applied on the image to improve its quality like histogram manipulation. The enhanced image is then subdivided and segmented to get the color, texture and edge density features forming a feature vector. The resultant feature vector can be compared with the feature vector of the query image [5]. The closest image in comparison with the query image from the feature database is returned.

II. Literature survey

1. V. Mezaris, I. Kompatsiaris, M.G. Strintzis, "An ontology approach to object based image retrieval", *Proceedings of the ICIP, vol. II, 2003, pp. 511-514. [6]*

Methods employed : Object Ontology, High level concept Ontology .

Merits : Bridges the gap between keyword-based approaches, which assume the existence of rich image captions or require manual evaluation and annotation of every image of the collection, and query-by-example approaches, which assume that the user queries for images similar to one that already is at his disposal. This methodology overcomes the restrictions of conventional methods, such as the restricted vocabulary or the

need for the availability of key-images, and requires no manual tuning of weights. Appropriate for querying large collections of still images.

Limitations: A query system integrating multiple query seeds.

2. *Ja-Hwung Su, Wei-Jyun Huang, Philip S. Yu, Fellow, and Vincent S. Tseng. Efficient Relevance Feedback for Content-Based Image Retrieval by Mining User Navigation Patterns. IEEE Transactions on Knowledge and Data Engineering, Vol. 23, No. 3, pp. 360- 372, 2011.[7]*

Methods employed: weighted KNN search, Navigation pattern based relevance feedback, corel dataset is been used .

Merits : semantic image retrieval relies heavily on the related captions, e.g., file-names, categories, annotated keywords, and other manual descriptions.

Limitations: High-priced manual annotation and inappropriate automated annotation. high-priced manual annotation cost is prohibitive in coping with a large-scale data set.

3. *R.Durga Prasad, B.V.K. Sai ram” Content based image retrieval using dominant color and texture features”,international journal for modern trends in science and technology, volume 2,issue:04, April 2016,ISSN:2455-3778,page 36-41 [8]*

Methods employed: Histogram of image (color), GLCM(gray level co-occurrence matrix) for texture.

Merits: Image clustering techniques(K-means cluster algorithms), Euclidean distance algorithm is used to finding the distance between the two images.

4. *Singha, M. and K. Hemachandran., “Content based image retrieval using color and texture”. Signal Image Process. Int. J., 3: 39-57, 2012 [9]*

Methods employed: Images are retrieved using features like texture and color, called Wavelet Based Color Histogram Image Retrieval (WBCHIR). The texture and color features are extracted through wavelet transformation and color histogram and the combination of these features is robust to scaling and translation of objects in an image.

Merits: Wavelet-Based Color Histogram algorithm is better than Color Histogram algorithm in terms of retrieval time as it takes less time in retrieving the images.

Limitations: Histogram extracts only color feature whereas WBCH extracts both color and texture features but does not shape.

5. *Khodaskar and S. A. Ladhake, "A novel approach for content based image retrieval in context of combination S C techniques," Computer Communication and Informatics (ICCCI), 2015 International Conference on, Coimbatore, 2015, pp. 1-6 [10]*

Methods employed: Image retrieval is based on combination of three soft computing techniques .It employs relevance feedback based on SVM that intelligently classify images relevant or irreverent to given query image.

Merits: Low processing cost. Soft computing techniques enormously improve accuracy of image retrieval.

Limitations: Less mobility of management .

6. *J. M. Guo and H. Prasetyo, "Content-Based Image Retrieval Using Features Extracted From Half-toning-Based Block Truncation Coding," in IEEE Transactions on Image Processing, vol. 24, no. 3, pp. 1010- 1024, March 2015 [11]*

Methods employed : Exploits the advantage of low-complexity ordered-dither block truncation coding (ODBTC) for the generation of image content descriptor.

Merits : This method is superior to the block truncation coding image retrieval systems and the other earlier methods, and thus prove that the ODBTC scheme is not only suited for image compression, because of its simplicity, but also offers a simple and effective descriptor to index images in CBIR system.

Limitations: Maintenances required.

7. *Neelima BagriI and Punit Kumar Johari,” A Comparative Study on Feature Extraction using Texture and Shape for Content Based Image Retrieval”, International Journal of Advanced Science and Technology Vol.80 (2015), pp.41-52 [12]*

Methods Employed : Gray Level Cooccurrence Matrix ,Hu-moment, tamura textural properties ,shape Hu-moment.

Merits : Less expensive.The combination of tamura textural and shape Hu-moment feature vectors perform better than combination of GLCM Textural and shape moment invariant given by Hu.

8. *Davar Giveki, Ali Soltanshahi, Fatemeh Shiri, Hadis Tarrah,” A New Content Based Image Retrieval Model Based on Wavelet Transform”, Journal of Computer and Communications, 2015, 3, 66-73 [13]*

Limitations : Difficulty occurs during extractions of image features

Methods Employed: Wavelet decomposition, the effect of choosing color space on the performance of content based image retrieval using Wavelet decomposition of each color channel is experimented.

Merits: Less time to operate, tackles one of the important restrictions in content based image retrieval, namely, the challenge between the accuracy of retrieval and its time complexity the retrieval results of different color spaces like RGB, YUV, HSV, YCbCr and Lab are analyzed.

Limitations: More complex

9. P.L. Stanchev, D. Green Jr., B. Dimitrov, "High level color similarity retrieval", *Int. J. Inf. Theories Appl.* 10 (3) (2003) 363–369 [14]

Methods employed: Object ontology and Color representation ontology.

Merits: Spatiogram, a generalization of histogram to higher-order moments, more efficient for content based retrieval of remote sensing images and efficiency of the system can be increased by increasing the number of quantization bins at small cost of time.

Limitations: It is extremely difficult to describe high level semantic concepts with image features only.

10. S.F. Chang, W. Chen, H. Sundaram, "Semantic visual templates: linking visual features to semantics", *International Conference on Image Processing (ICIP), Workshop on Content Based Video Search and Retrieval*, vol. 3, October 1998, pp. 531–534. [15]

Methods employed: Semantic visual template is derived bridging the gap between the low-level features that are derived from the raw data to semantics.

Merits: This system performs well, for example with small number of queries in the "sunset" template, we are able to achieve 50% recall and 24% precision over a large unannotated database, SVT's provides a mechanism for a two-way interaction between the user and the system and the user can compose a new concept by using pre-existing library of templates.

Limitations: Texture descriptors contain features derived from co-occurrence matrices.

III. Conclusion

This paper provides an rundown of the performance of content based image retrieval systems. Most systems use color and texture features, few systems use shape feature, and still less use layout features. It also discusses about various feature extraction methods,

similarity measurement techniques and the various applications. It has been found that variation in feature extraction methodologies can ensure the better and more accurate retrieval of relevant images from the large database. The CBIR system also depends on the size of the database.

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