PCE JOURNAL OF

ELECTRONICS AND TELECOMMUNICATION

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2018

FROM THE HEAD OF DEPARTMENT'S DESK

It has been an absolute pleasure seeing the final year students of the EXTC department work on their projects.The innovative ideas thought and implemented by them is quite impressive.Not only have they made sure their projects are efficient, they also made sure that it is cost-effective, a factor one needs to keep in mind while making a project with actual use.The paper submitted by them to the journal showcase their work to the rest of the college. By the means of the project, it has been made sure that thew work done by these students does not go unnoticed.The efforts taken by the journal committee to make sure the whole college sees the talent of our department is much appreciated and applauded. I wish the students good luck for their future and hope the continue taking such innovative approache in life.

With Best Wishes,

Dr Avinash Vaidya
Head of the Department
(Electronics and Telecommunication)

FROM THE TEACHER'S DESK

The annual journal of the EXTC department is a place where the projects formed by the student of the department are showcased in front of the whole college.The papers submitted by the students act as an excellent source of information that can be referred by the other students.The hard work done by the Journal committee has been immense.The committee members not only designed the journal, but also lend a hand to the students writing the papers.The punctuality with which the work has been done by them is really commendable.The technical papers submitted this year showcase how innovative the thinking of the students has become and indicates towards a promising future. I wish good luck to the committee and look forward to more wonderful issues of this journal.

prof.**Jayshree Bhosle**
faculty
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Project Work is a learning experience which aims to provide students with the opportunity to synthesize knowledge from various areas of learning, and critically and creatively apply it to real life situations. This year's projects have all been very much fascinating and at the same time productive in their own way. We came across various networking projects, energy management based projects which is the need of present day scenario and many more such amazing works. All of which were cost effective as well as creatively executed,showing the capability of the students to think outside the box.The members of journal committee have worked immensely well in showcasing the potential of our department students. The journal team was swift enough to get things done before the deadlines and made sure that the papers submitted did not have a shred of error.I appreciate the cooperative spirit and the attention to detail that enabled us to streamline the entire process to achieve success and meet our goals.

prof.**Suchitra Patil**
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Smart Traffic Control Based On Video Images

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Abstract*— Traffic lights play a fundamental role in everyone's day-to-day life by ensuring smooth transportation. By controlling the traffic signals efficiently, one can reduce the effect of traffic congestion. As the number of vehicles are increasing, there is a need to control the traffic light signals more dynamically. Many researchers have published their work to overcome the problem of traffic congestion but still there is a scope of improvement. There are many available techniques, the one which is being implemented here is based on image processing. Image segmentation is used for isolating the objects from images. From available image segmentation approaches discontinuity-based edge detection technique is used. The Canny edge detector processes the video images captured by digital camera thereby determining the vehicle count. Canny Edge Detection is the most efficient edge detection technique from the other techniques which are available.

This processed image can be used to give the number of count of vehicles.

***Index Terms*— Canny Edge detection, Image Segmentation, Processed image, Traffic Congestion, Traffic lights.**

I. Introduction

Modern lifestyle of people is very expensive it earns its living by saving its time and using it more productively but the majority of our productive time is being wasted because of traffic jams. The traffic congestion occurs due to various causes like number of increasing vehicles with lesser road width, buildings build irrationally and the inexperienced traffic police. This problem can be overcome by implementing some solutions like developing the infrastructure, by reducing the number of signals and by some new technical solutions for controlling our traffic system.

An intelligent traffic control system is important to ensure a faithful transportation. Initially, for implementing any solution to traffic problem it is required to acquire the traffic data. Traffic data is acquired by using a digital camera. The video images are converted into frames and then processed using image processing techniques. This technique is more promising among all the other techniques such as using sensors, RFID and RADAR based and many more because it is easy for maintenance and is more intelligent.

In this technique, image segmentation is used. The number of vehicles is detected using segmentation. The images are initially converted into grayscale then various morphological operations such as dilation are implemented on it [1]. Along with noise the obstacles which are undesired objects are removed from the original image. At the last stage the vehicles are detected in the form of an outlined border on the original image. This technique is beneficial for future use for controlling our traffic system. If this system taken under consideration can act as a boon to our ever-increasing technological world.

I. Methodology

II. Sub-Section

I. IMAGE SEGMENTATION

Image segmentation is an image processing technique which is performed for the easier analysis of an image. It is typically used for locating objects and boundaries of an image. It distinguishes between pixels based on their attributes. Image segmentation helps in identification of meaningful objects in an image.

Segmentation is broadly classified into two regions-based on discontinuities and based on similarities.

In discontinuities, the partition of an image is based on abrupt changes in intensity while in similarities image is partitioned based on the regions according to the pre-defined functions.

Image segmentation based on discontinuities is further classified into-point detection, line detection and edge detection whereas image segmentation based on similarities is classified as region growing, region splitting, region merging and split and merge [1].

Out of the above-mentioned techniques, we are using edge detection which is based on discontinuities. Edge can be defined as a set of pixels which is connected to form boundary between two disjoint regions.

In image processing morphological operations play an important role in the extraction of image components that helps in the understanding of the size and shape of the image. Dilation adds pixels to the boundaries of an object in an image while erosion removes the pixels on object boundaries [1]. Region filling is used to fill the hollow images.

II. CANNY EDGE DETECTION

Canny Edge Detection was developed by John F Canny. It follows an algorithm of multiple stages for the edge detection of an image [2]. The Multistage algorithm includes the following steps-

A) Noise Reduction:

For reducing the noise, a Gaussian filter is being used. It is a linear filter which is used for smoothing the images. The effect of Gaussian smoothing is performed to blur images thereby reducing the noise effects.

B) Intensity Gradient:

Image gradient helps in identifying directional changes in the intensity of an image. The direction of gradient is always perpendicular to the edges.

C) Non-Maximum Suppression:

After the completion of the previous two steps, a full scan of the image is done for identifying unwanted pixels which may not constitute any edge.

If such pixels are identified then they are removed. [1]

D) Hysteresis Thresholding:

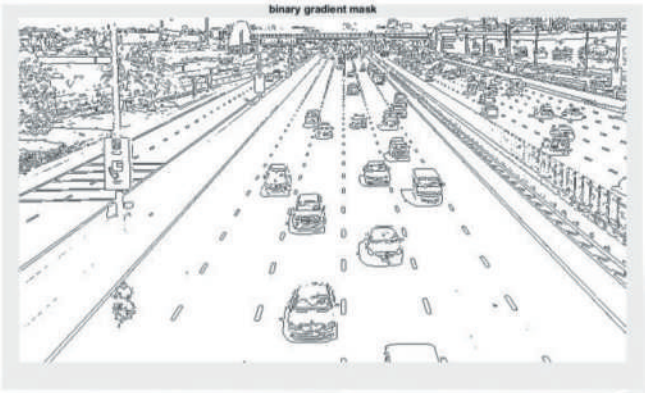
This stage decides between the edges that are real and that are not. In hysteresis thresholding, weak edges are also detected. Two values of a threshold are taken, one is minimum value and other is the maximum value.

III. EXPERIMENTATION

Identification and Detection of objects using Canny Edge Detection.

In the first stage, an appropriate image is been taken. The further processing of an image is carried out through image enhancement techniques. For any image to be processed through edge detection, the original image needs to be converted into Gray scale image as shown in Fig(i). Then the binary Gradient Mask is being calculated by which the image is converted into a binary image as shown in Fig(ii). After that the binary image is dilated as shown in Fig(iii). After that the holes are filled in Fig(iv) and then the borders are cleared and we get the segmented image as shown in Fig(v) and Fig(vi) respectively. Then the final output is obtained in the form of the outlined image as shown in Fig(vii). From the results obtained are as shown it has been observed clearly that Canny Edge Detection gives best possible output results as compared to other operators such as Sobel, Prewitt and Roberts. Except for one or two vehicles all the other vehicles are successfully detected using Canny Edge Detection.

Fig(i): Gray Image

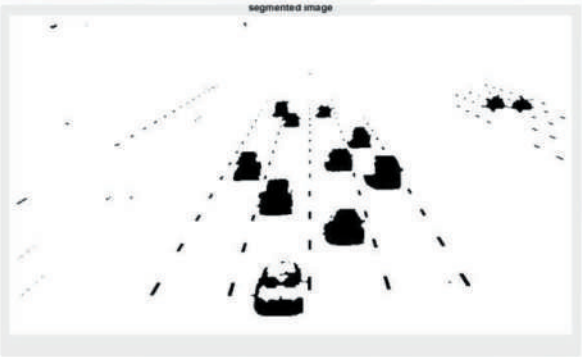


Fig(ii): Binary Gradient Mask

Fig(iii): Dilated Gradient Mask

Fig(iv): Binary Image with Filled Holes

Fig(v): Cleared Border Image



Fig(vi): Segmented Image

Fig(vii): Outlined Original Image

IV. Results and Discussion

This proposed work aims at the basic stage of a smart traffic control system. This stage helps in detecting the number of vehicles. The detection of vehicles using Canny edge detection gave more accurate results than other edge detection techniques. The objects which are being detected are then identified as vehicles and highlighted using an outline. Various image enhancement techniques are being used along with morphological operations.

V. Conclusions

Traffic congestion is getting increased in day-to-day life and is creating many problems. This paper, has laid emphasis on mainly detecting the vehicles. For this image processing techniques such as Canny edge detection is being used along with image enhancement techniques.

Future Work:

In the further part, implementation will be based on the hardware. The simulation results obtained from the software will be used as an input to the hardware section. PIC or any other Micro-controller will be used as the major hardware equipment. So, based on the simulation results obtained which is by achieving the count of the vehicles detected, the density of the traffic will be calculated and simultaneously switching of traffic lights will take place.

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PERSONALIZED SMART MIRROR WITH VOICE CONTROLLED HOME AUTOMATION USING RASPBERRY PI 3

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ABSTRACT

This paper presents a design of interactive voice controlled Smart Mirror.The mirror is converted into personalized digital device equipped with peripherals such as Raspberry PI-3, Google Assistant, and LED Monitor that is covered with two way mirror that provides the most basic common amenities such as weather, latest news and local time. With the help of speech processing techniques we can also control the equipments or devices of the home such as light, fan, blub . The Smart Mirror interacts with help of verbal commands to people. It responds to user's questions.

Keywords—Raspberry Pi-3 , Google Assistant , Smart Mirror

1. INTRODUCTION

The Internet has transformed our lives. Mobile phones are now smart phones and this introduced the concept of Internet of Things (IOT). Our research is to design a device called as "Smart Mirror". This project is been developed within the time where every day we get to see birth of new technology.

The motive of this project is to help humans with time management which has become an important aspect of life. So smart mirror is an effective step. As we know that sole purpose of a mirror is for personal grooming/admiring oneself, or used as a decoration piece So we are going to design a prototype which combines both the traditional mirror and time spent on smartphones together by embedding various electronic features to the mirror. Heads will be up, hands will be set free.

The paper is organized in the following way: Section II has the related work. The proposed work is in Section III and Section IV discusses the problem definition . Section V algorithm. Section VI concludes paper with future work. Section VII gives the references.

2. RELATED WORK

Multi Display in Black Mirror [1] by Toshiba is a prototype. It is a combination of the functions of tablet together and the reflecting surface of mirror. Taking into account two different home environments it provides different configuration: washroom and kitchen. Consider the washroom whose prototype provides Information that is useful at the start of the day like the weather forecast and fitness information from personal devices whereas in kitchen, while preparing recipes it allows the user to interact through gestures for appliance control as it has a camera..

"Smart Mirror: A Reflective Interface to Maximize Productivity"[2] Piyush Maheshwari ,Maninder Jeet Kaur, Sarthak Anand designed a prototype which describes a voice controlled wall mount mirror capable of displaying multimedia contents and also facial recognition. It uses OpenCV (Open Source Computer Vision Library) as an open source computer vision and machine learning software library.

"DESIGN AND DEVELOPMENT OF A SMART MIRROR USING RASPBERRY PI"[3]
An interactive multimedia futuristic mirror has been designed by Vaibhav, Khanna,Yash Vardhan, Dhruv Nair, Preeti Panu that used artificial intelligence for home environment and also for commercial use in factories. The smart mirror is able to display weather, latest news and time.

"IMPLEMENTATION OF MAGIC MIRROR USING RASPBERRY PI 3"[4] by SuryanshChandel, AshayMandwarya, S.Ushasukhanya designed and implemented a voice controlled wall mirror, called "Magic Mirror". It is a device that can function both as a mirror and an interactive display displaying multimedia content as time, date, weather and news simultaneously.

3.PROPOSED WORK

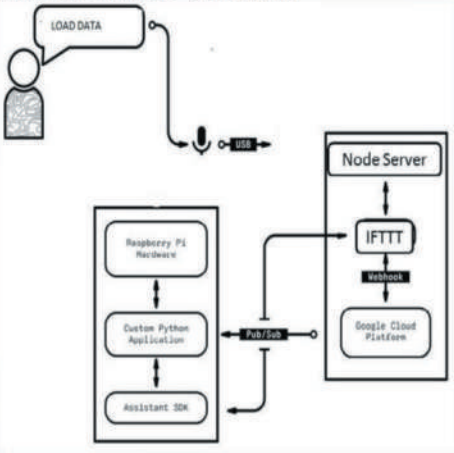


Fig.1-Block diagram.

In smart mirror, the LCD screen and raspberry pi are connected. And the screen is placed behind single sided mirror so the screen is off at that movement the screen appears as mirror and when we start the mirror it will show data on mirror. The controller will also connect with the voice input i.e google assistant. When we command to google assistant then according to command the data will fetch by controller from server and display on screen. In our project we are going to display the current time date and surrounding temperature and news.

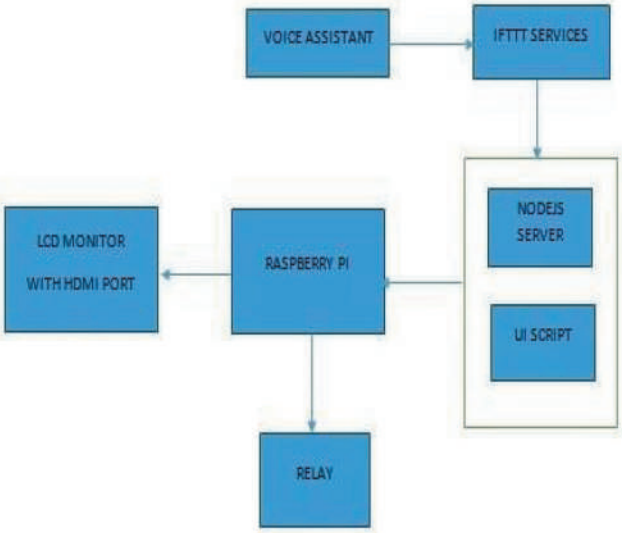


Fig.2- Block flow of proposed model.

4. PROBLEM DEFINITION

Besides counsel, people also pay utmost importance to their appearances and spend a massive amount of their time in front a mirror. A significant part of the day is spent in front of the mirror while other important things are taking place. Our lives are increasingly spent staring at phones, laptops and televisions. Cases of cataracts, headaches, eye strain and discomfort are extremely common. Digital eye strain or computer vision syndrome is also infamous. It's common symptoms are : dry or irritable eyes, blurred vision, eye fatigue, or head, neck and back pain after using a computer or Smartphone.

We need a compact device that allows the user to efficiently perform their daily activities by simple the voice control techniques that does not strain the eyes and also switches off or on the home automated appliances like light, fan, blub etc.

5.ALGORITHM

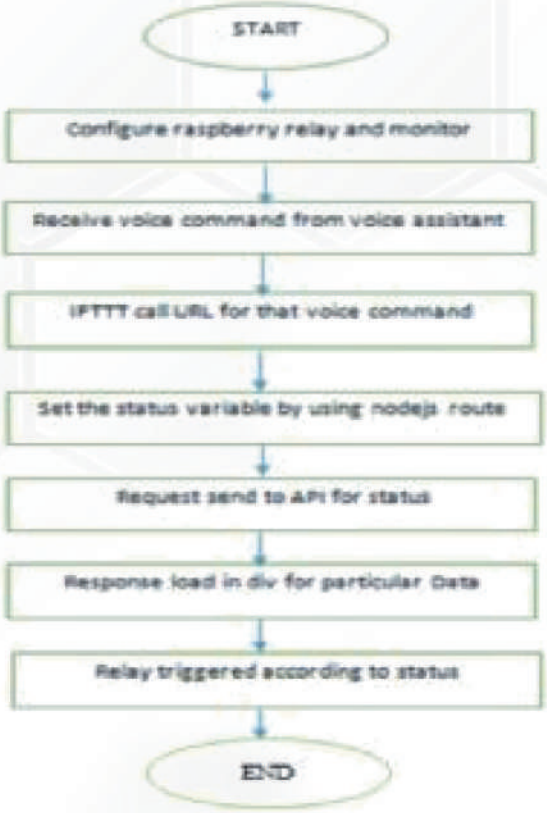


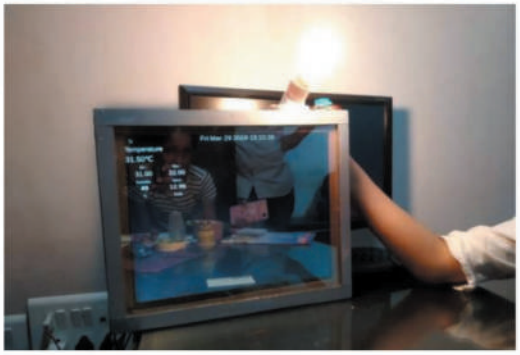
Fig.3-Algorithmic approach of model.

STEP 1: Start the power supply of raspberry and monitor.
STEP 2: Configure Monitor and relay with raspberry pi.
STEP 3: Load Bash script for auto run files. STEP 4: Load the Web service in Kiosk mode on start up.
STEP 5: Load The web service in KIOSK mode. STEP 6: The web service will load data on screen on request of voice assistant.
STEP 7: Voice command from the assistant generated it will invoke web service in backend for particular command using web hook by IFTTT.
STEP 8: That service will set the status variable for particular field like temperature, news;
STEP 9: The status will be read by JavaScript and call corresponding API for data.

STEP 10: Response receive from API will be loaded on front end div of web service.
STEP 11: Load Python script for relay operation in start-up.
STEP 12: Similarly for voice command python script will read the response.
STEP 13: The data received on python will be process to change state of relay.
STEP 14: Using the state of relay NC NO we can control
appliance.

6.RESULTS

We are successfully able to provide voice as input and obtain results on display as output .First the voice is given through Google Assistant as input which then pings a server that gives the output depending on type of command given by user. For example- If the voice command is given as 'Show me news' then it displays it on mirror and similarly if command 'Turn on light's is given then it send message to relay which turns on the bulb. Our smart mirror is able to function properly and execute the commands and reply appropriately. Thus we have successfully obtained the desired output. Images of obtained results are as follow-



7.CONCLUSION AND FUTURE SCOPE

The paper proposes a smart mirror system which allows users to utilize a object as an interactive interface to provide customizable services. The tracking of health is an added advantage in leading a healthier life. With the functionality of controlling the light settings it can be applied in various fields such as beauty palours and hotels. Further for security purposes face recognition technique and personalized voice recognition can be used .This makes sure that only authenticated users can access the information on the mirror.

We have designed a futuristic smart mirror that allows the user to interact with the internet. A flat LED display monitor act as mirror display cascaded by a 2-way mirror that displays all important information useful for the user. A picture-in-picture sub-display is provided by the mirror with voice control to facilitate the display of services such as maps, videos via YouTube. It will also help to control home services like switching off and on of lights, fan speed control, controlling temperature of AC etc.

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WIRELESS LIBRARY BOOK CATALOG SYSTEM

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Abstract— **Through this project we demonstrated the ideology of advanced wireless library system by using Arduino, RFID & TFT display and displayed the transmitter and receiver circuit of the same. When a particular person wants to issue a specific book, then the system will demand for the student id, student's current semester and the book index number of the issued book. As soon as the person sends the complete required details, the book is then issued and it is displayed on the LCD. The transmitter block will be at the issuing segment and the receiver will be at the operator end of the library. There is a display setup or LCD provided at the receiver side to display the content provided to the operator by the issuer. TFT Display is used to enter the data. This data consists of student ID of the specific student, semester of the student and the book ID which is being issued. When that student is issuing the book, the system asks for student id, student semester and index number of the book. These required details of the student is provided by the TFT Display. As soon as the student sends all the details, the system issues the book and display it on the LCD. That information is shown to issuer and the operator on LCD at the transmitter and receiver sections. Than the operator will grant the book that is issued of the chosen semester to that student.**

Keywords—TFT Display ,RFID, Arduino(Uno & Nano), LCD display

I. INTRODUCTION

II.

The project is mainly based on the design of complete automated books catalog system in the library by the help of TFT Display and RFID which controls and provides a general user-friendly environment to the user for registering the selected book easily using wireless medium. The catalog of library books is to be displayed by itself using the TFT display where one can select the book directly by using the same TFT. This TFT display provides faster access to all the types of digital media, without any text-bound interface interfering in the way. Faster input response will provide better service. With the help of a touch interface, we can effectively improve operator accuracy, reduce the training time and improve the overall operation of the system. A specifically, designed touch interface will help improve the accuracy of the operator. The owners who are familiar to the icon system appreciate the use of touch screens that will make this automation system user friendly.

This system consists of an Arduino microcontroller, which is to be interfaced with the help of input and output modules, the controller then acts as the connecting medium between the two. The controller is termed as the control unit. The input module is a TFT display, that takes that input from a user and gives it to the microcontroller. The output module used here is a RF module. The controller also initiates to display the catalog information of the book onto the LCD display. At the receiver end the selected books will get displayed on the LCD.

III. PROBLEM DEFINITION

In a standard library, a physical register is kept for entries of the students where we need to enter the details by writing it. This solves the problem related to addition time taken, long queues at the reception and also fake entries. To solve this problem we are using this system.

IV. SYSTEM DESCRIPTION

Transmitter section comprises of Arduino Uno, RFID Reader, TFT display and HT12E Encoder IC. A regulated power supply is to be given to Arduino Uno, which also drives the TFT display. When the RFID tag gets scanned by EM18 RFID reader then it displays the user information on TFT display, which is serially transmitted to Arduino. Arduino is working as a control unit, where it is controlling and maintaining the working of each component. This signal from Arduino will be passed on through HT12E Encoder. TFT display gets the main input. HT12E will convert the parallel inputs into serial output. It will encode the 12 bit parallel data into serial for transmission by an RF transmitter.

Receiver section is composed of Arduino Nano, HT12D decoder IC, LCD display and Buzzer. The data from the transmitter is then received at the RF receiver, and that data is given to Arduino Nano. Signal will be given to HT12D Decoder. The Decoder then receives the serial address and information from the corresponding decoder, which is then transmitted by a carrier which uses a RF transmission medium giving the output to the output pins once processing the data is done. The information received from TFT Display is then displayed on the LCD display and Buzzer will indicate if false entry is made.

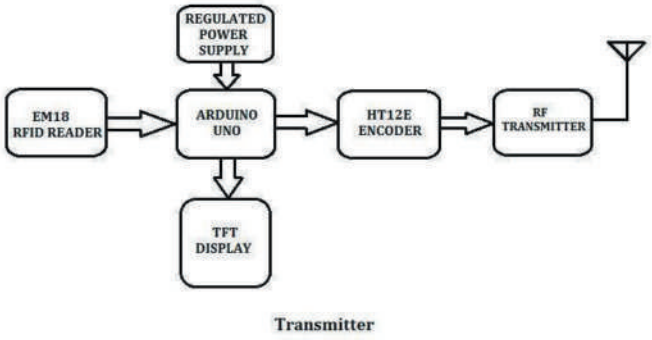

Fig. 1 Block diagram (Transmitter)

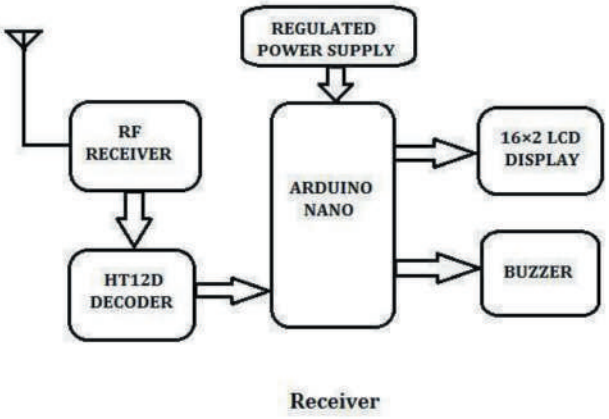

Fig. 2 Block diagram (Receiver)

IV. HARDWARE

4.1 Arduino Uno

Arduino Uno is amongst the most commonly used Arduino processor board. They have a wide option of shields (plug in boards adds functionality. This board makes the use of ATmega328 processor very easy as it provides smooth access to almost all the pins through the headers.

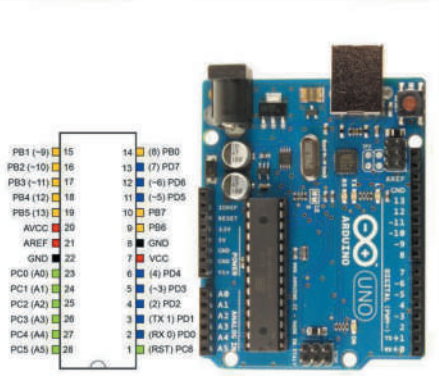

Fig 3.Arduino Uno

4.2 Arduino Nano

Arduino Nano is a small, compact, and breadboard-friendly board which is based on ATmega328P (Arduino Nano 3.x). It has almost the same functional properties as that of the Arduino Uno, but comes in an alternate package. The DC p power jack is absent in Arduino Uno, and it works by using Mini -B USB cable rather than a standard one.

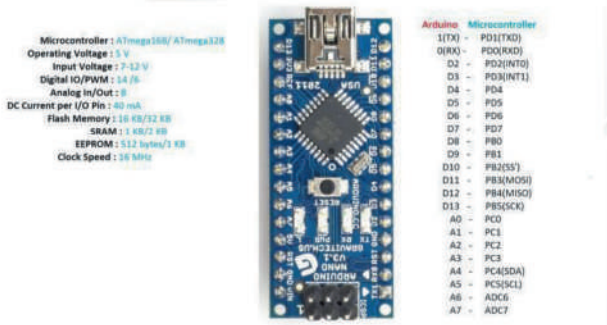

Fig 4.Arduino Nano

4.3 RFID Reader

Fig 5.RFID Reader

The EM-18 RFID Reader module operates at a frequency of 125 kHz which is an economical solution for any RFID based application. The Reader module has an on-chip antenna and is powered with the help of a 5V power supply. After powering the module, connect the transmitter pin of the module onto the receiver pin of the microcontroller. display the RFID card within the capturing distance and the card number is shown as the output. Alternatively, the module can also be configured for a weigand output.

4.4 TFT Display

Fig 6.TFT Display

A thin-film-transistor liquid-crystal display (TFT LCD) is an alternative of a liquid-crystal display (LCD) which uses thin-film-transistor (TFT) technology that improves the image quality including addressability and contrast. A TFT LCD is an active matrix LCD, which in contrast to a simple matrix LCD or direct-driven LCDs with some few segments. TFT LCDs can be used in appliances such as TV, computer monitors, mobile phones, handheld devices, video games , personal digital assistants, navigation systems, projectors and car instrument clusters.

4.5 HT12E Encoder & HT12D Decoder

Fig 7. Encoder & Decoder

The HT12E Encoder ICs is a series of CMOS LSIs used for Remote Control system applications. They can encode 12 bits of data that consists of 8 address bits and 4 data bits. Each individual address and data input can be externally programmed using switches.

The HT12D Decoder ICs is a segment of CMOS LSIs for Remote Control system applications. For efficient operation, a pair of encoder/decoder with the similar number of address and data formatting is to be selected (HT12E is paired with HT12D). The Decoder will receive the serial address and data, which is transmitted through carrier using an RF transmission medium which gives the output to the output pins after managing the data.

4.5 RF Transmitter & Receiver

This wireless data is very convenient to use as it is the lowest cost RF link. We can use these components which can transmit temperature, position data and also current program register values wirelessly at the receiver end. These modules can have a limit of 500 Ft. range in open space. The transmitter will operate at a range from 2-12V.

This receiver type is suitable for data rates of 4800bps which works with transmitter of frequency 434MHz to 315MHz. Many 434MHz or 315MHz receivers can interface to one 434MHz transmitter or 315 MHz transmitter. The receiver will operate at 5V.

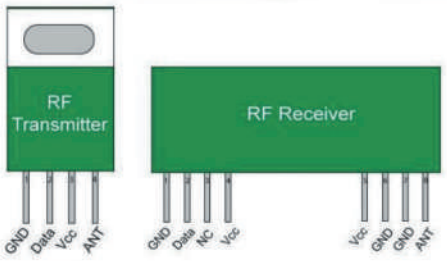

Fig 8. RF transmitter & Receiver

V. RESULTS & CONCLUSION

Library catalog system was designed and created for a receipt and issuance of books in the library including the student's detail. The books which are received in the library are entered in the register form and the new student is then added to the student entry form. If the student wants to have a specific book, it is issued on the basis of availability to that student. The issuance and due date of returning the book is also to be entered. The student is required to pay a fine if any considering the no. of days to the delayed deposit of that book in the library. It will be used in library for the students. By utilizing the work, students can easily register for the book instantaneously. The library catalog gets displayed automatically onto the TFT display by which the book will be selected using TFT. It gives immediate access to each and every type of digital media which in turn reduces the crowd in library.

RFID in the library will speed up the borrowing of book, monitoring, searching processes of books which frees the staff to do different user-service work. To get the most efficent performance, RFID readers and tags used should be of effective quality. The enhanced utilization of this technology will depend upon the data which is written in the tag.

ACKNOWLEDGEMENT

So, we would like to take this opportunity to express our profound gratitude and deep regards to the Principal Dr. Sandeep Joshi and also Prof. Avinash Vaidya, Head of Department for all the support and giving us this chance to work on this topic even if it is part of the course. While working on this project, we found great opportunity to express our sincere regards, deep sense of gratitude and thanks to our project guide, Prof. Sonali kathare for his valuable suggestion, support and timely guidance at every step during course of our project.

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Zigbee Based Room Temperature Controller

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ABSTRACT

Due to inventions, research and advancement in technology day by day is introducing new and intelligent systems, which are reducing human efforts for controlling certain parameters. Here we are introducing a Data acquisition system for factories, industries and for environmental monitoring boards, which will measure certain parameters like Temperature, Humidity, the level of gases present in the atmosphere and transmit these parameters to the control room wirelessly. The Design has been aimed for data acquisition of multiple parameters such as Arduino as software and hardware, LCD Display, relays, and temperature sensors modules. Temperature sensors are used to read data for simulation and to achieve better enhancement for the overall process (e.g. crop growth in the greenhouse). Arduino Uno board provides 6 analog inputs which are used to read analog values. Digital I/O is control by a relay and the result will display on LCD Board. We are monitoring and controlling the temperature in our project. These factors have a major effect on the quality of plants. For e.g. Greenhouse environments monitoring and control to keep parameters in the set limit, the system for this purpose had been provided and give an ability to control room wirelessly and it will also inform about activities in restricted areas.

I. INTRODUCTION

The research paper focuses on the development of a temperature scanning monitoring and controlling the system . physical parameters are associated with the industrial process. It requires different modules to be deployed in a system to perform a data acquisition process over multiple parameters. However, the prototype developed in this research work deals with an embedded system comprising the less chip-count and consequently reduce overall power utilization. The analog multiplexer routes electrical signals produced by process unit sensors. This signal voltage was transformed into their digital equivalents, by means of a12-bit serial Analogue to Digital Converter (ADC). Research work deals with standardized real-time hardware and monitoring system using Arduino and ZigBee. When outside temperature changes, it may affect the room temperature in such case we need a technique to control room temperature irrespective change in outside temperature. Our project Zigbee based Room temperature controller overcomes this problem. In this project, two boards are used which are control unit and plant unit communicating bidirectionally with each other. Control unit used to set the desired temperature and it also displays the temperature. Plant unit contains 2 loads with a temperature sensor. It uses a bulb to detect heater and fan to detect cooler by alternately turning ON/OFF the bulb and the fan. Once the system is turned ON, the control board displays the set temperature limit on the LCD screen.

II.METHODOLY

i. Hardware Description:

There are two unites in this project as follows :

a. Plant Unit

b. Control Unit

a. Plant Unit:

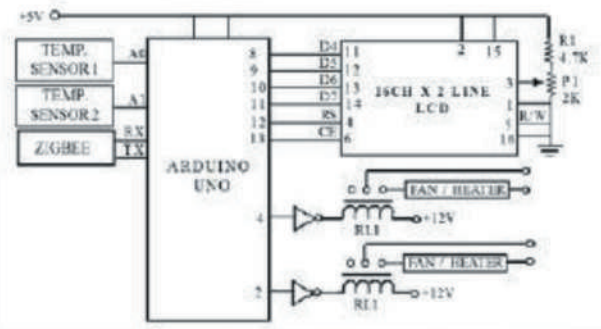

Fig.1 Block Diagram of Plant Unit

b. Control unit:

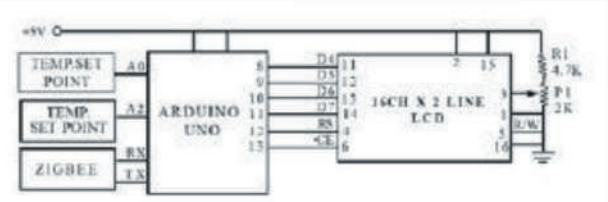

Fig.2 Block Digram of Control Unit

ii. Software Description:

Flow Chart of Transmitter & Receiver :

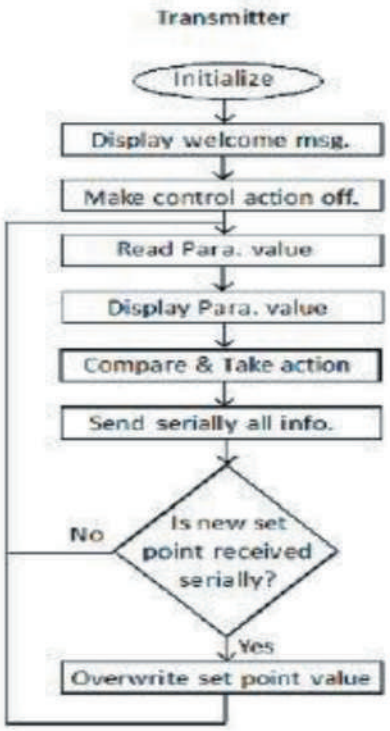

Fig.3 Transmitter Flow Chart

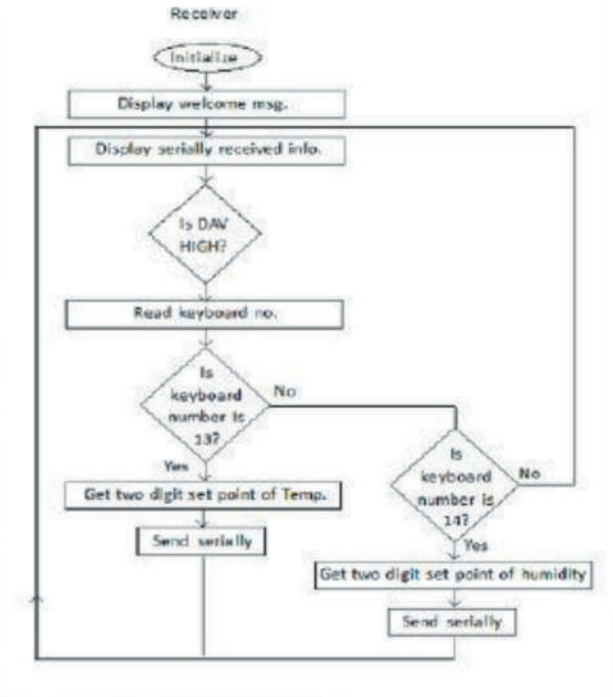

Fig.4 Receiver Flow Chart

III. RESULT AND CONCLUSION

The primary motto of this paper is to build a portable device which will give early warning in the restricted area and will measure physical parameters like Temperature, Humidity and will display it. Zigbee wireless protocol based systems have many advantages, especially when restricted areas are to be kept intrusion free. These systems are very useful for farmers as they are getting all data about the environment on a wearable device which is easily operable by them. Since the device is using Personal Area Network(PAN) for communication, so there are very few chances of a breakdown in communication. We can reduce the delay by using more efficient algorithms at the control node. Employing embedded technology, based on Arduino, the Wireless Sensor Nodes are designed and implemented. The results show that the temperature and gas sensor data given by the sensor node is accurate. The data received from sound and metal sensors are also found to be accurate. The Zigbee operate at 2.4GHz ISM band really help for secure data transmission

IV. FUTURE SCOPE

In the future part, for the more advanced feature, we can do camera interfacing using the internet. We can make system Battery operated which will make system portable and further Solar cell can be used for battery charging.

V. ACKNOWLEDGMENT

We would like to express our gratitude to our Principal Dr. Sandeep Joshi who was constantly encouraging and motivating us to put our best. We would like to give special thank our H.O.D of Electronics and Telecommunications Department Dr. Avinash Vaidya. We would also like to thank our guide Dr. S.K. Srivastava whose motivation inspired us to complete our report and helped us in our project throughout the semester. We would like to express our appreciation to all those who helped us to complete our project.

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IOT BASED STREET LIGHT FOR SMART CITY

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I.ABSTRACT

This project aims for designing and executing an advanced development in embedded systems for energy saving of street lights. Currently we have a manual system where the street lights will be switched ON in the evening before the sunsets and they are switched OFF in the next day morning after there is sufficient light at outside. But the actual timing for these lights to be switched ON is when there is absolute darkness. With this, the power will wasted up to some extent. This project gives solution for electrical power wastage . Also the manual operation of the lighting system is completely eliminated. The proposed system provide a solution for energy saving. This is achieved by sensing and approaching a vehicle using an IR transmitter and IR Receiver couple. Upon sensing the movement the sensor transmit the data to the which furthermore the Light to switch ON Similarly as soon as the vehicle or an obstacle goes away the Light gets switched OFF as the sensor sense any object at the same time the status(ON/OFF) of the street light can be accessed from anywhere and anytime through internet. This project is implemented with smart embedded system which controls the street lights based on detection of vehicles or any other obstacles on the street .Whenever the obstacle is detected on the street within the specified time the light will get automatically ON/OFF according to the obstacle detection and the same information can be accessed through internet. The real time information of the street light (ON/OFF Status) can be accessed from anytime, anywhere through the internet.

II.KEYWORDS

Raspberry pi,RFID Reader, IR Sensor, LDR, Wi-Fi module

III.INTRODUCTION

The street lighting is one of the largest energy expenses for a city. An intelligent street lighting system can cut municipal street lighting costs as much as 50% - 70%. An intelligent street lighting system is a system that adjusts light output based on usage and occupancy, i.e.,automating classification of pedestrian versuscyclist, versus automotive.An intelligent street light management proposes the installation of the wireless based system to remotely track and

IV. METHODOLOGY

A. HARDWARE

1. RASPBERRY Pi

A raspberry pi is a credit card sized computers originally designed for Education.raspberrypipromotes python as the main programming language. It is open source device. It is a multithread device. Its libraries are easilyavailable.

2. IR SENSOR

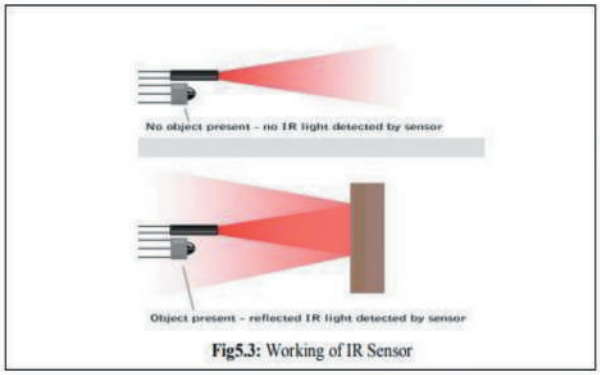


Fig5.3: Working of IR Sensor

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation is the region having wavelengths longer than visible light wavelengths, shorter than microwaves. The infrared region is approximately demarcated from 0.75 to 1000µm. IR (infrared) sensors detect infrared light. The IR light is transformed into an electric current and this is detected by a voltage or amperage detector.

Control the actual energy consumption of the street lights and take Appropriate energy consumption reduction measures through po wer conditioning and control. The street light controller should be installed on the pole lights which consist of along with various Sensor and wireless module. The street light controller installed on the street light pole will control LED street lighting depending on traffic flow, communicate data between each street light.

3. LDR

Light dependent resistors, LDRs or photo resistors are often used In circuits where it is necessary to detect the presence or the level of light..They can be described by a variety of names from light dependent resistor,LDR, photoresistor or even photocell, photocell or photoconductor. Although other devices photodiodes or phototransistor can also be used, LDRs or photoresistors are a particularly convenient electronics component to use. They provide large change in resistance for changes in light level. In view of their low cost, ease of manufacture, and ease of use LDRs have been used in a variety of different applications. At one time LDRs were used in photographic light meters, and even now they are still used in a variety of applications where it is necessary to detect light levels.

3. RFID READER

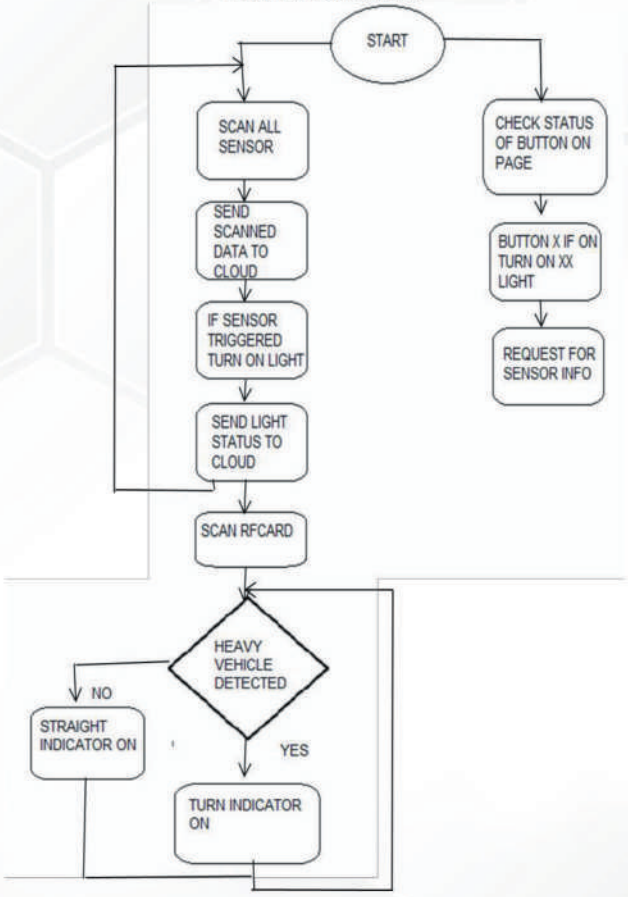
A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader.RFID is a technology similar in theory to bar codes. However, the RFID tag does not have to be scanned directly, nor does t require line-of-sight to a reader. The RFID tag it must be within the range of an RFID reader, which ranges from 3 to 300 feet, in order to be read. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items.

B.SOFTWARE

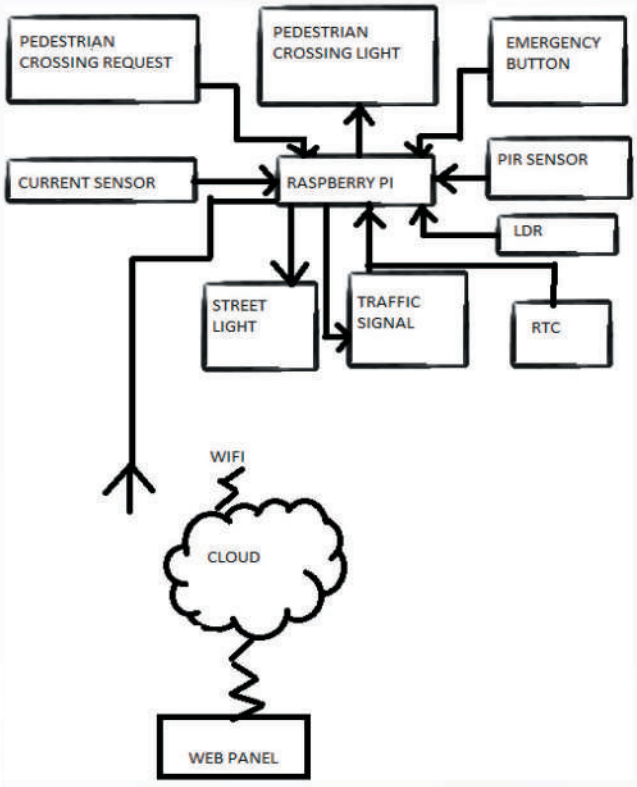
4. PYTHON

Python is an interpreted, high-level, general-purpose programming Language. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, Notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales.

A.ALGORITHM



B.BLOCK DIAGRAM



VI .CONCLUSION AND FUTURE SCOPE

This project "Iota Based Smart Intelligent Lighting System for Smart City" is a cost effective, practical, eco-friendly and the Safest way to save energy and this system the light status information can be accessed from anytime and anywhere. It clearly tackles the two problems that world is facing today, saving of energy and also disposal of incandescent lamps, very efficiently. Initial cost and maintenance can be the draw backs of this project.The system solves the energy efficiency problem of conventional solar-powered street lamp system, ensure the traffic safety.It will also help in making our city a Smart City To provide wireless access for handling it. Need some Server which can be used to monitor whole city's street lights. Low-cost Internet technology can be used for remote access.

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SMART WASTE MANAGEMENT SYSTEM USING E-SPEAK

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Abstract:

The biggest problem in today's fastest growing world is the waste management. In this paper, we have presented a smart solution for the waste management not only by informing the authorities about the level of waste but have also made an attempt to segregate waste by using the technique of Text to Speech Engine (TTS) e-Speak which will help the citizens in recognising the dustbins for wet waste and dry waste. The TTS Engine functions as a person approaches the dustbins. The level of waste in both dustbins is detected and simulated on a web application. Internet of Things (IOT) has been used majorly for this smart waste management which will help in the connectivity and management of data on the server. We have proposed a prototype to be useful for efficient waste management and can help in making environment clean and also contribute as a step towards the
"SWACHH BHARAT ABHIYAN".

Keywords: *Smart City, e-Speak, Waste Management.*

I. INTRODUCTION

The future city brings in the concept of information and communication technology (ICT), and various physical devices connected to the network (the Internet of things or IoT) to optimize the efficiency of city operations and services that connect to citizens. The solid waste policy in India specifies the duties and responsibilities for hygienic waste management for cities and citizens of India. Since there is no segregation of dry waste and wet waste, the landfills contain many dangerous materials including plastics and chemicals. As per Rule 4 of the Municipal Solid Wastes (Management and Handling) Rules, 2000 "every municipal authority is responsible for infrastructure for segregation and processing of municipal solid waste (MSW), commonly known as garbage".

In this paper, we discuss a smart mechanism for improving and enhancing the management of waste in cities. The proposed system consists of IOT based system with sensors to measure the volume of waste in waste bin. The same volume will be displayed on the web page and mobile application by which we can keep track of waste. The major problem in waste management is to segregate the waste. The proposed idea of using e-Speak (TTS) and IR sensor to acknowledge the people who come close to bin about dry waste bin and wet waste bin could be effective at base level for segregation of waste. By proper segregation we can generate revenue from waste. The rest of the paper is organised in the following sections. Methodology is covered in section 2. Section 3 discusses the Conclusion. References are given in section 4.

II. METHODOLOGY

A. Raspberry Pi:

Following sensors are interfaced with Raspberry Pi:

Ultrasonic Sensor:

Ultrasonic sensor HC-SR04 is used for measuring the level of waste in the dustbin. Usually the range of ultrasonic sensor is 2cm - 400cm or 1-13 feet. Ultrasonic sensor includes ultrasonic transmitters, receiver and control circuit. The basic working of the sensor is as follows:

This sensor uses sonar to determine the distance to an object.

- The transmitter sends a signal that is a high-frequency sound.

- When the signal hits an object, it is reflected back and the transmitter receives it.

The distance formula is given by,

Distance = (high level time × velocity of sound (340M/S) /2

IR Sensor:

- IR sensor will be used for determining when the person is in front of the dustbin and as soon as it detects, it then sends the signal to the controller which then sends the signal to the TTS engine to speak a message as an output. An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. These types of sensors measure only infrared radiation. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that is emitted by the IR LED. The infrared portion consists of three regions namely: near infrared region, mid infrared region and far infrared region.
- The range of near infrared region is 700 nm to 1400 nm. Example: IR sensors, fibre optic.
- The range of mid infrared region is 1400 nm to 3000 nm. Example: Heat sensing.
- The range of far infrared region is 3000 nm to 1 mm. Example: Thermal imaging.
- The basic concept of an Infrared Sensor is to transmit an infrared signal. This infrared signal bounces from the surface of an object and is reflected. This reflected signal is received at the infrared receiver.
- There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing.

B. Web-based System Implementation:

The data collected by the sensors is then sent to the web server. This data includes:

- Level of waste in dry waste dustbin
- Level of waste in wet waste dustbin
- Location of dustbin

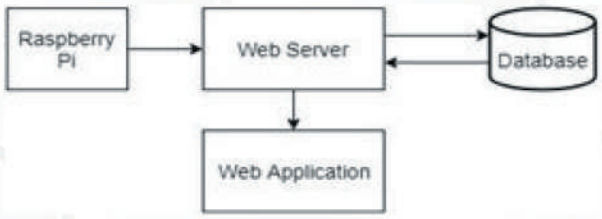

Fig: B-1 Web based System

The data is stored in a database on the server. This database is then used to add data about dustbin, update data about the levels of waste in dustbin, retrieve data to inform the concerned authorities. For this purpose, a web application and a mobile application is developed. The levels of waste at every instant is simulated on the web application by representing the percentage of waste generated on the dustbin simulation. With the help of this web-based system, the authorities can easily keep track of waste generated and can collect the waste as and when the dustbins are full. Similarly, the amount of waste generated and collected can also be tracked using a mobile application. A GSM module is used for sending data to the mobile application.

***C. GSM Module*:**

A GSM module is used to communicate. In this case, it is used to notify the authorized person about the waste collection. Communication takes place via text message wherein the bin ID and location address is mentioned. Thus, person can collect waste from informed address. This module can be used in a two-way format that is; it is used as a complaint number for people. If cleaning of waste bin is not properly done then people can raise the complaint on these number to municipal office.

D. Global Positioning System (GPS):

The Global Positioning System (GPS) is a U.S. space-based global direction-finding satellite system. It provides consistent positioning and navigation to all the global users on a continuous time basis be it day or night, summer or winter and anywhere near or on the surface of the earth. The system has an unhindered view of four or more GPS satellites. GPS satellites relay signals from space that GPS receivers make use of three-dimensional location (latitude, longitude, and altitude) plus accurate time.

III. CONCLUSIONS

Smart waste management System is used to check the garbage levels, to check whether the dustbins are full or not, using ultrasonic sensor. When more amount of waste level is detected, the system will inform to the concerned authority through GSM/GPS.

In this system, the status of dustbin can be accessed by the respective user or authorities from anywhere by using android app. We have used Raspberry Pi here to give the constant internet connection to the system to update the data in database and android app will give the details of bin. The proper use of both dustbins for segregation of waste is ensured by using TTS Engine e-Speak and then the percentage of waste generated is displayed on a web application.

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IOT based Theft detection, Connection and Disconnection of Energy Meter

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ABSTRACT

This paper represents a design to check power usage and consumption, at household and commercial level and to provide live status of its customer to that particular electricity board or distributer. The main purpose is to make our conventional system smarter and provide comfort and convenience to both, customer and electricity distributer. Entire design of our project is based on Wi-Fi module and a controller unit in our energy meter. Our project also deals with any kind of tampering of electricity at consumer end and if detected then our system is capable of automatically cutting the power supply of that respective customer. Thus usage of multiple hotspots and Wi-Fi module makes a complete IOT ecosystem where energy meter will respond directly to main monitoring control unit.

Keywords— Wi-Fi ESP8266 Module, Current Sensor ACS 712, Arduino Nano ATmega328 microcontroller, LCD Display.

1. INTRODUCTION

The current system of energy reading uses monthly billing criteria and hard copy of the bill is sent to consumers address. This traditional process is lengthy and time consuming as it involves manual checking of meter readings, the photo of which needs to be attached to the bill. The Electricity Board also has to manage the travelling allowance of their workers. All these extra charges can be eliminated by the use of our project.

A energy meter is a compact embedded system which measures how much electricity is consumed by the customer. Since all systems are not accurate, this equipment also has some faults of it own, like limited application areas, especially in restricted positions.

In the current situation, our world is having power and electricity problems. In this present network, the consumers are increasing rapidly so the electricity requirement is increasing day by day. This increases the losses of electricity and power, so to overcome all this basic problem a centralized live reading system should be present to minimize the power losses happening due to gradually increasing consumers. Even in urban areas where digital energy meter systems are well established the meters are easy to tamper with, by creating a separate node before the meter an individual can have illegal access to electricity. And such theft of electricity is very difficult to track down for any electricity board.

Using our concept we can remotely access a particular customer's energy meter and monitor it by using IOT function. Since, IOT is used so security is also maintained in our concept. The current energy meter does not have intelligence to communicate directly with electricity board, that is this system is not fully transparent.

The main purpose of using IOT is to create a system smart enough to analyze the energy meter billing and monitor the entire system. This whole system is based on IOT (Internet of Things) which helps the consumer in power management by giving exact data of power consumed by him/her in a given course if time. In our concept the Wi-Fi section communicates with arduino controller and gives the necessary acknowledgement for our concept to work and display all the vital information such theft detection, power readings from power grid as well to the consumer.

2. RELATED WORK

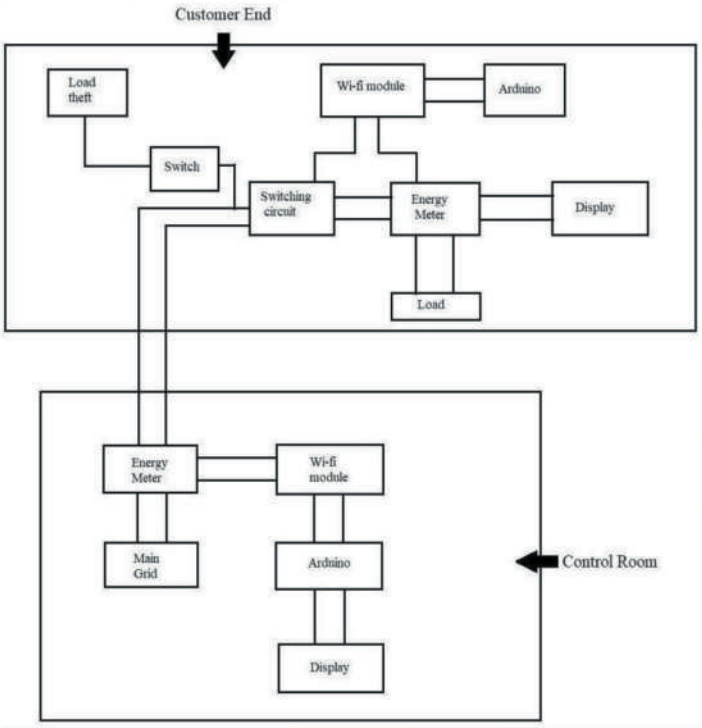

Fig.no.1-Block diagram

Control Room End:

In the control room end there is a main grid (power plant) which generates the electricity. The power having two major components current and voltage. In the voltage is constant which is 230v.So we measure current by using current sensor which is present in energy meter. It gives current data to controller and display power which is consumed by the costumer and theft detection warning is also displayed in the control room. This makes the system the system more efficient and because of the ESP8266 NodeMCU the whole system becomes wireless.

Customer meter end:

Consumers have the same setup which includes controller, energy meter and display as is used in the control room. But in this display we will also show billing cycle (5min=1 month). If customer is doing any malpractice regarding the electricity theft so theft detection warning is displayed in the control room, so the controller automatically sends information to disconnect power of the customer by communicating through Wi-Fi module by using IoT. So controller of the customer end will turn 'Off' the relay switch and disconnect the power supply of the customer. Because of the concept of IoT used, the designed system is efficient enough to work without any human intervention. Thus making this designed system full-fledged home automation system.

Calculation of Power:

1) Equation for power:-

POWER (P) = V x I = R x I^2 = V^2/R.

Here Power is in watts, voltage in volts and current (I) in amperes(DC).

2) If voltage is AC, then power factor will be:-

PF = cos φ, where φ = power factor angle between V and I.

Electric energy (E) = P x t , measured in watt-hour, or also in kWh.

1J = 1W x s.

Communication used in ESP8266 NodeMCU:

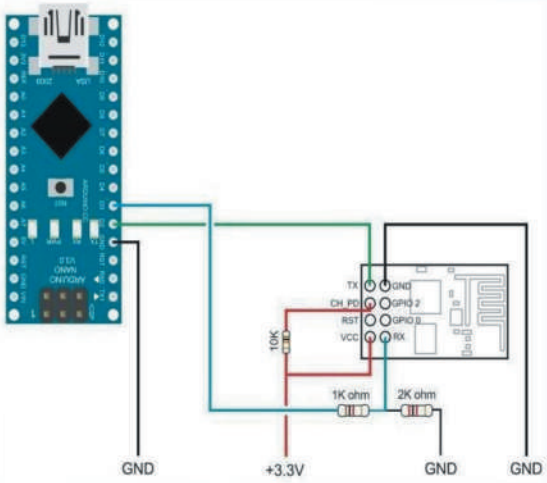

Fig.no.2-ESP8266 Node MCU interfaced with Arduino

It uses Wi-Fi Direct (P2P), soft-AP type of communication mechanism. It uses TCP/IP protocol and UDP to make sure all packets are received in order if packets are corrupted they are re-sent. It supports all type of various Wi-Fi standards which are IEEE based 802.11 b/g/n .It uses OTA feature to burn programs through wireless medium instead of using a dedicated USB port. Since, TCP/IP protocol is used this chip can easily communicate with internet making it a perfect companion for IOT.

3. PROBLEM DEFINITION

In today's generation we have seen energy meter calculates all the power consumption we do at our home, and it's very easy to tamper and show less readings in meter by attaching magnet and other false means because of which electricity theft have become too common especially in semi urban and rural areas. Even in urban areas where digital energy meter has been established we can easily tamper those meter and create a separate node before the meter to access electricity for our own purpose illegally. And such theft of electricity is very difficult to track down for any electricity board. Even the employees of that particular electricity board who come to check and take photo of our energy meter readings or to disconnect the electricity of that consumer can be bribed easily. So to remove the human labor at this basic low level stage, to eradicate corruption and to make ecofriendly and paper free energy bill by using email will help electricity board to communicate better and in transparent way with their customers using this above concept.

4. ALGORITHM

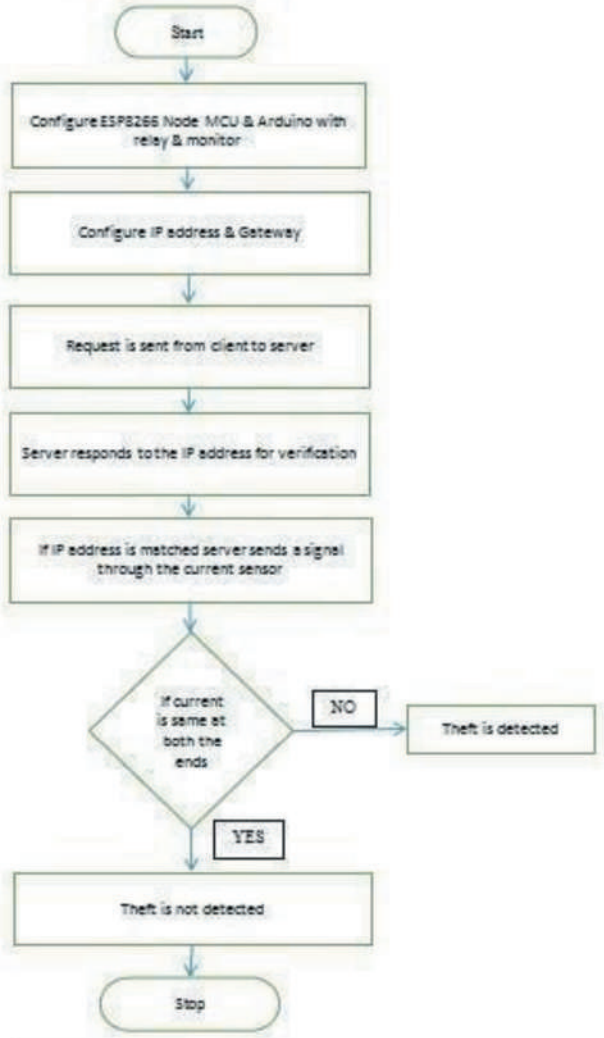

Fig.no.3-Flowchart

STEP 1: Start the power supply of ESP8266 Node MCU & monitor.

STEP 2: Configure ESP8266 Node MCU & Arduino with relay & monitor.

STEP 3: Configure IP address & Gateway.

STEP 4: Client sends a request to the server.

STEP 5: Then the server responds to the client after verification of IP address.

STEP 6: If the IP address is matched the server sends a signal through the current sensor.

STEP 7: If the current measured is same then no theft is detected.

STEP 8: If the measured current is not similar then theft is detected.

5. CONCLUSION AND FUTURE SCOPE

In previous systems, human labour was required to read the energy readings manually and supply the hardcopy of bill. So, the designed system has become wireless through IOT concept, live power consumption readings of the energy meter is sent to the control room and it can also detect any power theft by consumer if he is tapping before energy meter and illegally using electricity. This concept in future can also be expanded to multiple users connected to different hotspots using Wi-Fi configuration in which hotspot's IP is configured and connected to main server which electricity board will use to monitor all its consumers connected through various nodes.

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MICROCONTROLLER BASED HIGHWAY NAVIGATION SYSTEM USING LI-FI TECHNOLOGY

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Abstract—"Light is everywhere, so why not data!". This paper presents microcontroller based highway navigation system using Li-Fi. Light Fidelity also known as Li-Fi is a technology which is based on the principle of transmission of data using light. Data transmission in Li-Fi takes place through variations in currents within the LED bulb. In this project, the programmable data is transmitted from the LED bulbs installed in the street lamps to the receiver. The project is divided into two sections - transmitter and receiver. In transmitter, there are three street lamps which are used to transmit desired message (location) to the receiver. The receiver contains a bluetooth controlled bot which will receive and display the message. In comparison with Wi-Fi, Li-Fi has a number of advantages such as greater speed, more secured, large range, etc. As an emerging technology, this project tries to implement the application of Li-Fi in communication sector.

Keywords :

Li-Fi, LED, Wi-Fi.

I. INTRODUCTION

a. Overview

Due to increase in number of users and development of various technology, Radio frequency wireless communication is under constant pressure to increase its area of acceptance. An alternative method called Li-Fi is the new generation wireless communication. This type of communication takes place through LED i.e. Light Emitting Diode. The LED's are used for transmission of signal through different patterns.

These patterns are in form of 1's and 0's controlled by a controller which can be any microcontroller, thus making it easy to implement. Incoherent lights which are emitted by LED's can be detected by using a strong and a fast detector by the method of intensity modulation or direct detection.

Visible light communication (VLC) has emerged as a point–to–point data communication technique. This mode of Visible Light Communication provides a major solution to the problem of limited RF spectrum as the light provides a wide spectrum with abundant bandwidth which is unlicensed and free to the users. Not only this, Li-Fi also provides multiuser communication, multiuser access points is involved which forms a wireless network of very small optical attocells with seamless handovers.

b) Characteristics of Li-Fi:

Li-fi, as a major substitute of Wi-Fi radio waves with congestion and wireless dead zone, have its own characteristics which are at par with other industrial technologies like RFID, iBEACONS, etc.

Security: as light cannot penetrate walls, it makes them a very secure way of communication. This nature also eliminate the interference between neighbouring cells.

High speed: The speed of around 1Gbps has been recorded by using a single phosphor-coated white LED. The achieveable speed for Li-Fi when the whole spectrum is utilized is up to 100 Gbps.

Low cost: This method of communication is cheaper than other communication technologies.

Low energy consumption: As the indoor lights are switched ON most of the time, the practical energy consumption is zero for this technology. Energy efficient intensity modulation (IM) techniques allow data communication even if the lights are visually off.

Non-hazardous: As this method only uses the light spectrum, it is safe to use .Unlike other methodologies which uses radio waves spectrum which adversely affect the physical heath of the person.

Mobility restrained: as the communication takes place with the help LED's, it creates a hindrance in its mobility sector. The maximum range of a Li-Fi network is 10m as the transmission performing LED's are fixed.

II. METHODOLOGY

A. Hardware

i) PIC microcontrollers

PIC (Programmable Interface Controllers) are electronic circuits that carry out a vast range of tasks through programming. It can be programmed to be timers or to control a production line . They are found in most electronic devices such as alarm systems, computer control systems, phones, in fact almost all electronic devices. Many types of PIC microcontrollers exist, although the best are probably found in the GENIE range of programmable microcontrollers. Circuit Wizard software helps in programming and simulation.

ii) UART:

A UART (Universal Asynchronous Receiver/Transmitter) is a microchip with programming that controls a computer's interface to its attached serial devices. Specifically, it provides the computer with the RS-232C Data Terminal Equipment (DTE) interface so that it can "talk" to and exchange data with modems and other serial devices. As part of this interface, the UART also:

o The bytes received are a single serial bit stream which is used for outbound transmission and are converted from the parallel circuits.

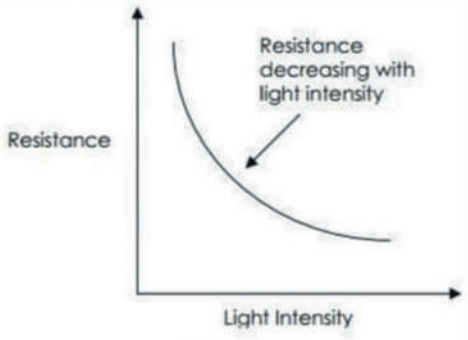
o The serial bit stream are converted into bytes that are handled by computer in case of outbound transmission.

o Adds a parity bit (if it's been selected) on outbound transmissions and checks the parity of the incoming bytes (if selected) and discards the parity bit.

iii) LDR (Light Dependent Resistor):

An LDR is a component with a variable resistance that changes according to the light intensity that falls upon it. This allows them to be used in light sensing circuits. The most common type of LDR has a resistance that falls with an increase in the light intensity falling upon the device (as shown in the image above). The resistance of an LDR may typically have the following resistances:

Daylight= 5000Ω and Dark= 20000000Ω



The above graph shows the relationship of the resistance of the device with respect to the light intensity. The resistance of the device decreases when the intensity of the light increases.

iv) Bluetooth Module (HC05):

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module which is designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate).It has 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm.

B. Software

v) Embedded C

It is a set of language extensions by the C Standards Committee for the C programming. It is used to address commonality issues that exist between C extensions for different embedded systems.

vi) Flash Magic

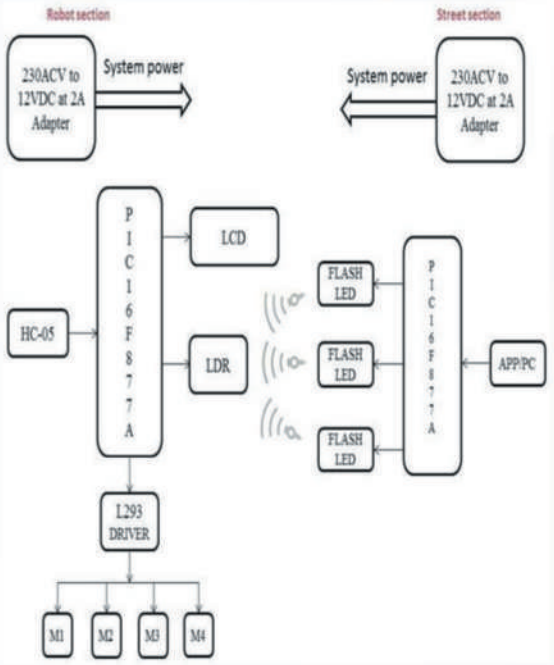
Burner program in computer read hex file, convert to binary data and send to microcontroller in a format required by microcontroller. Flash Magic is a PC tool for programming flash-based microcontrollers from NXP using a serial or Ethernet protocol while in the target hardware.

vii) Atmel IDE 6.0

Atmel Studio 6 is the integrated developed environment (IDE) which is used for developing and debugging embedded applications. It is based on Atmel AVR and ARM Cortex M microcontrollers (MCUs) in C/C++ and assembly code.

III. CIRCUIT DIAGRAM AND EXPLANATION

Circuit diagram:



The project is divided into two parts namely:

- Robot section or Receiver module
- Street section or Transmitter module

1) Robot Section:

The receiver module consisting of a 40-pin PIC 16F877A and LDR act as output. The LDR detects the pattern of the flash LED's and forwards it to the PIC Controller. It then processes the received signal and shows the programmed output on the LCD. This whole circuit is mounted on the Bluetooth controlled car-bot, with an L293D Motor driver IC which controls 4 X 30RPM 12V DC motors which monitors the movement for the bot. This module is powered by an 12V-2A DC power supply.

2) Street Section:

Here, the transmitter consisting of a 14-pin PIC 16F877A, LED's and UART module act as input. The information programmed into the PIC Controller is transmitted through the flash LED's in the pattern of 1's and 0's. This information can be edited using the UART module by the user. This signal transmitted act as an input to LDR connected on the bot. This module too is powered by an 12V- 2A DC power supply.

IV. CONCLUSION

The use of light fidelity technology is not just an indoor application but also can be applied to outdoor application as well. The use of LI-Fi in case of navigation can be helpful to the drivers or the users as well. Not just for four-wheelers, this technology is useful for the two-wheelers as well. This technology is applied not in comparison but as a helper in navigation and location. While in bad climatic conditions where the signals from the antenna for the GPS doesn't give accurate location, this technology can be used for knowing the location just by passing from under the street lamp. This technology can improvise the traffic control system by sending the traffic updates.

In this project, we use 3 LED street lamp for location and message display purpose. The messages that are being displayed on the LCD can be edited using UART. The messages like a quick turn ahead, or update about any work in progress related to road construction or its repairing. The major advantage of the Li-Fi would be in the night time, where we cannot see the road signs are misguided in the judgments for the path ahead.

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Real Time Air Quality Monitoring System

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Abstract*—The level of pollution is increasing with times by lot of factors like- increase in population, increasing vehicle use, industrialization and urbanization. It has resulted in harmful effects on humans by directly affecting health of population. Air pollution is a common phenomenon everywhere. Majorly in the urban areas, air pollution is a real-life problem. Due to air pollution, lot of people are getting sick. Also, increased number of diesel and petrol vehicles and industrial areas at the outskirts of the urban cities are the main causes of air pollution. The problem is seriously escalating in the urban cities. Also, the climate change are now evident. All around the world, the government are taking every possible measure. This project will monitor air quality using gas sensors(MQ135 &MQ7) and will trigger an alarm when the air quality goes beyond certain level i.e when there will be higher amount of harmful gases present in the air like CO2, CO, NH3, Smoke. The air quality will be displayed on the LCD. By using Wi-Fi module the data will be transmitted and can be accessed using an application by different users.

***Index Terms*—Air pollution, Air quality , Atmosphere , Industries, Microcontrollers, Urban areas**

I. INTRODUCTION

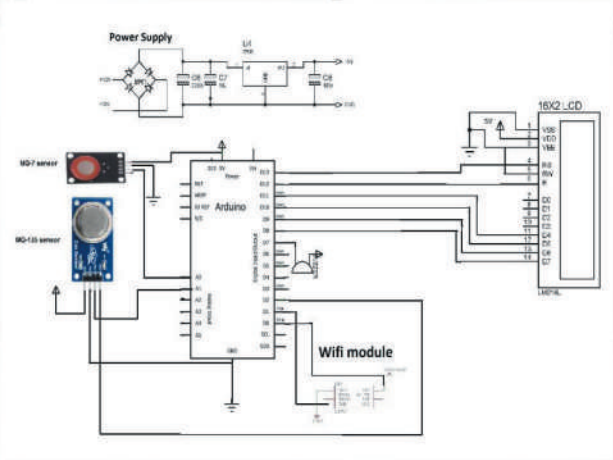
Air pollution in many parts of the world, appear as a result of explosive industrial growth. Road transport is one of the major contributors of air pollution. Due to which climate changes and has domestic and global consequences.Air is one of the essential elements of human's surroundings. The earth's atmosphere is full of air which contains gases such as Nitrogen, Oxygen, Carbon Monoxide and traces of some rare elements. Human beings need an atmosphere of air that is free from impurities. This is very crucial for human life and health. Any change in the natural composition of air can cause grave harm to life forms on earth. Air pollution is the presence of one or more contaminants in the atmosphere such as gases in a quantity that can harm humans, animals and plant [1].

Air pollutants are measured in Parts per Million (ppm) or ug/m3 [2]. Primary pollutants are released directly into the atmosphere whereas, secondary pollutants are produced when the primary pollutant reacts with other chemicals present in the air[3]. The effect of air pollution ranges from problems in breathing, coughing and asthma [4]. Polluted air can cause damage to visibility. Air pollution is responsible for the death of 7 million persons worldwide each year or one in eight premature deaths yearly [5]. Almost 570,000 children under the age of five die every year from respiratory infection due to indoor/outdoor pollution and smoke [6]. Children exposed to air pollution have a rising risk of developing chronic respiratory problems such as asthma. Several researchers worldwide have developed models to monitor many of the pollution gases such as Sulphur Dioxide (SO2), Carbon Monoxide (CO), Carbon Dioxide (CO2), Nitrogen Oxides (NO) etc.

This project focuses on the design and implementation of a air pollutant monitoring system. It discusses how the level of pollutants in the air can be monitored using a gas sensor(MQ135&MQ7), Arduino microcontroller and a Wi-Fi module. The main objective of this project is to design a air pollution monitoring system that can monitor, analyse and log data about air quality to a remote server and keep the data up to date over the internet which can be accessed by user via an application.

II. METHODOLOGY

A) CIRCUIT DIAGRAM



B) ARDUINO UNO

Following are interfaced with Arduino Uno--

MQ-135 sensors:

The MQ-135 gas sensor senses the gases like ammonia nitrogen, oxygen, alcohols, aromatic compounds, sulfide and smoke. MQ-135 gas sensor are used to detect the smoke, CO2and NH3.The MQ-135 sensor consists of tin dioxide (SnO2), a perspective layer inside Aluminium Oxide micro tubes (measuring electrodes) and a heating element inside a tubular casing. The end face of the sensor is enclosed by a stainless steel net and the back side holds the connection terminals.Analog pins are used to measure the gas in PPM.Analog pin is TTL driven and works on 5V and also can be used with most common microcontroller. We will read the analog values (0-5V) using a microcontroller, this value will be directly proportional to the concentration of the gas to which the sensor detects. We will get the values according to the sensor react to different concentration of gas.
The value sensed by the sensors is given to the arduino controller,The communication between the controller and android application is done by using WiFi module(ESP8266P).The sensor data from the controller is send on the android application through WiFi.

MQ-7 sensors:

This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the air. The MQ-7 can detect CO-gas concentrations anywhere from 20 to 2000ppm.Sensitive material of MQ-7 gas sensor is SnO2, which has lower conductivity in clean air. It make detection by method of cycle high and low temperature, and detect CO when low temperature (heated by 1.5V). The sensor's conductivity is more higher along with the gas concentration rising. When high temperature (heated by 5.0V), it cleans the other gases adsorbed under low temperature. MQ-7 gas sensor has high sensitivity to Carbon Monoxide

The value sensed by both the sensors is given to the arduino controller,if any gas is detected by the sensor then the controller will send the signal to the buzzer to get turn on for the alert indication.

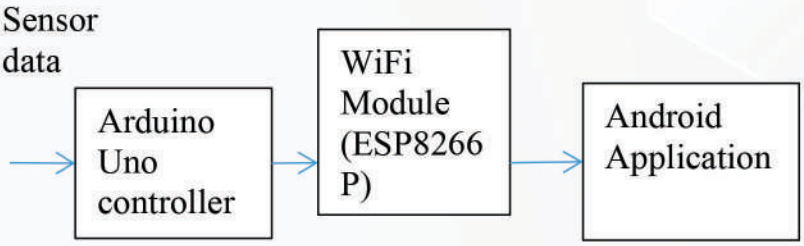
Buzzer

Depending on the area the threshold value is set for the total concentration of gases.If the value of PPM(Parts per million) exceeds the threshold value then the buzzer will beep and the alert will be send ,so that some precaution could be taken by the users.

Web Based System Implementation:

The data collected by the sensors is then sent to the controller on to the android application through wifi module which will display the gas status.this data includes:

- Concentration of gas like CO2,Smoke,NH3 etc by MQ135.
- Concentration of gas like CO by MQ7.
- Status of quality of air in surrounding .



Wi-Fi MODULE

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application networking functions from another application. Each ESP8266 module comes pre-programmed with an AT command.

The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF

allowing it to work under all operating conditions, and requires no external RF part.

Android Application

For day to day life application ,the data send by the sensors(MQ135 and MQ7) i.e concentration of gases like CO2,CO,NH3 and Smoke in the form of PPM and the status of air quality like if the concentration of harmful gases is very high then it will indicate it is harmful.This data can be seen by user through Android Application.

III. CONCLUSION

We have developed an Arduino based Real time air quality monitoring system which is a very effective air pollution monitoring system. Based on the performance we can say that it is easy to use, and functionality is comparable to the expensive existing air pollution detectors. It is a microcontroller based portable system. It is efficient and user-friendly air quality detection system.

IV. FUTURE SCOPE

Along with gas and sensor, a number of other sensors can be used such as humidity sensor , smoke sensors , vibration sensors , etc for monitoring the environmental conditions . An additional feature like an alert SMS options can be used . In this an SMS to any concerned authority can be send through android application in case of emergency situations .

V. ACKNOWLEDGEMENT

We would like to express our gratitude to our Principal Dr.Sandeep Joshi who constantly encouraged and motivated us for giving our best. We would like to thank our H.O.D of Electronics and Telecommunications Department Dr.Avinash Vaidya. We would also like to thank our guide Prof. Monica Bhagwat and Prof. Aboli Khedkar inspired us to complete our report and helped us in our project throughout the semester. We would like to express our appreciation to all those who helped us to complete our project.

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Mathematical modelling of RF wave propagation in VHF/UHF bands

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***Abstract*— In wireless communication, the transmission of RF waves between transmitter and receiver includes various purposes like exchange of audio and video signals, resources which are sent digitally. During the transmission process the RF waves doesn't reaches the receiver for a purpose to send the signals efficiently. The problem concerned here is loss in quality of signal due to interference caused by obstacles. The problem can be overcome by development of new path, a path loss model is necessary as the precision of existing models is highly affected. The project is done on both simulation and practical approaches. The frequency range used is 2.45GHZ. Project is initiated based on functioning of present mathematical model for the calculation of propagation such that it will help us develop a new model while suggesting some changes in the current model as well. The calculation of path loss values will be generalized by a formula generated purely in MATLAB. The losses analysis is observed by parameters and VSWR.**

***Keywords*—Obstacles, mathematical modelling, pathloss signal, losses, RF waves.**

1. INTRODUCTION

Communication had played a major impact over our lives for a very long time. The evolution of technology from the old ways of sending hand written letters to the analogue telephonic conversation to the current digital communication, the communication systems has been changed significantly and has been improved and is still upgrading with new improvements to provide a quality communication seamlessly. Nowadays, a person can communicate using a video call or by sharing of large number of information from one place to another with less amount of time anywhere on Earth. The success achieved in the field of mobile communication is remarkable, from 1G where one can only use it for call purpose to the 2G where internet was introduced to the mobile where either calling or the internet can be done at a time to 3G with the accessibility of attending calls with the simultaneous use of internet can be done to the current 4G with high speed internet and improved quality of calling is now possible. A little over 3 years ago, LTE or what we are aware of as 4G connectivity was introduced to become ultimate path of revolution in the smartphone world and improve data transmission speed, so we are not unfamiliar to this concept anymore. In comparison to the previous foundations built over years, new technologies and vast series of possibilities has widen the growth in wireless communication. Also, in the near future, the development of 5G is going on for better communication. Most of these signals works on the VHF/UHF bands for the longer transmission of the signals.

With the increase in population, the user demand has also increased exponentially. With such a high demand, certain aspects play an important role for the seamless services of network to satisfy the needs. Such aspects include transmission power from the antenna, the losses from the transmitter antenna, the path from which the signals are going and other environmental factors. To provide such seamless network, many problems arises such as distortion, the mixing of noise with the important signals, ISI and the most important the path loss which takes place between the transmitter and receiver antenna. To avoid such problems, prediction of signals is done. The focus is primarily on the propagation path losses and to derive a mathematical formula to avoid such losses.

- A Radio Wave Propagation model, is a mathematical formulation for the characterization of radio wave propagation as a function of frequency,
- Distance and other conditions
- These models can be classified as empirical & deterministic

A. DETERMINISTIC MODEL

Deterministic or theoretical approach is based on the principles of physics and provides an accurate data about channel behavior necessary for hypermedia transmission. There is requirement of exact data about the terrain, leading to a huge database of environmental characteristics. The consideration of huge amount of terrain data makes these models highly accurate even when applied to different environment.

B. EMPIRICAL MODEL

Empirical model are approved and are often more used in for both research and industrial communities following to their speed of performance and their limited dependency on inclusive knowledge of terrain. Accurate prediction of path losses is a critical element to be considered when it comes to network planning and optimization in mobile communication. However the existence of multiple propagation models means that there is no propagation model that gives the precise and accurate results of path loss for every conditions other than in which they are designed.

1.1 PATHLOSS

Path loss is the attenuation of signal radiated from transmitter due to distance travelled and characteristics of propagation channel. The wireless communications and signal propagation are often used terms. Factors that may be responsible for path loss are free-space loss, refraction, diffraction, reflection, aperture-medium coupling loss, and absorption. Path loss is also influenced by terrain contours, environment, propagation medium (dry or moist air), the distance between the transmitter and the receiver and the height and location of antennas.

1.2 CAUSES OF PATHLOSS

Path loss essentially reduces the power density of the signal, during process of transmission. Pathloss mainly causes due to following reasons:

1) ***Free space loss:*** The free space loss occurs due the signal travels from the space, signal attenuation takes place, in the absence of any other effect diminishing in the signal as it spreads. For e.g. when radio signal has to cover wide area, the energy will reduce as the area increases.

2) ***Diffraction:*** Diffraction occurs when the object appears in the path, the signal gets diffracted from the object losses occurs. Radio signals tends to diffract better around sharp edges.

3) ***Multipath:*** In a real terrestrial environment, signals which is being reflected would ultimately reach the receiver following a number of different paths. Addition and subtraction of signal takes place depending of the phases of received signal. If the receiver is moved the scenario will change and the overall received signal will be found vary with position. Mobile receivers (e.g. cellular telecommunications phones) will be subject to this effect which is known as Rayleigh fading.

- ***Absorption losses:*** Absorption losses occur when the radio signal passes into a medium which is partially being transparent to radio signals. When radio signals travels to buildings, dense materials, attenuation takes place.
- ***Terrain:*** The signal travelling on specific terrain will have significant effect on the signal. The signal which travel from over hills would act as an obs0truction on the path will considerably attenuate the signal, often making reception impossible. Additionally at low frequencies the composition of the earth will have a considerable effect.

I. EXISTING INDOOR PROPAGATION MODELS

Researchers began with the suggestion of an intuitive empirical model, which is a mathematical expression of the path loss dependent on distance and some other empirical parameters. They conducted measurements and used the results to find the parameters of their models. Then, comparing the measured results and the results offered by their models, they presented how closely their model represents the real environment.[3]

A. FREE SPACE MODEL

The free space path loss model is not directly related with the indoor propagation. As it is required to compute the path loss at a close-in reference distance as desired by the models. The free space model defines a measurement of path loss as a function of T-R separation when the receiver and transmitter are under the LOS range in a free space environment[11]. The model is defined by equation given below, which depicts the path loss as a positive quantity in[3]:

$$(P_r / P_t) = D_r D_t (\lambda / 4\pi d)^2$$

B. LOG DISTANCE PATH LOSS

The log-distance path loss model assumes the path loss variations takes place exponentially with distance. The path loss in dB is given by equation.[4]

$$PL_{d_0 \to d}(dB) = PL(d_0) + 10n \log_{10}\left(\frac{d}{d_0}\right) + \chi \qquad d_f \le d_0 \le d$$

PL (d0) = Path Loss in dB at a distance d0
PL (d>d0) = Path Loss in dB at an arbitrary distance
d n = Path Loss exponent.
χ = A zero-mean Gaussian distributed random variable (in dB) with standard deviation – σ[5]

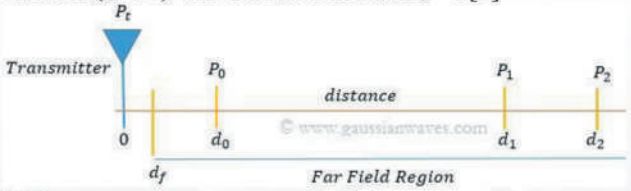


Fig1
Path loss of a signal inside a building or densely populated areas over distance. Extension to Friis Free space model

C. OKHUMARA MODEL:

Okumura used extensive measurements of base station to mobile station signal attenuation throughout Tokyo to develop a set of curves giving median attenuation relative to free space of signal propagation in irregular terrain.

Most common model for signal prediction in large urban macro-cells.

Parameters: -
Distance :1-100km
Base station antenna height:30-100m
Frequency:150-1500MHz
The empirical path loss formula: **-11**
L=
Where,
L = the median path loss. Unit: Decibel (dB)
= The free space loss. Unit: decibel (dB)
= Median attenuation. Unit: decibel (dB) =
Mobile station antenna height gain factor. =
Base station antenna height gain factor.
= Correction factor gain (such as type of environment, water surfaces, isolated obstacles etc.)

II. SYSTEM REQUIREMENT

SMA CONNECTOR: **SMA** (*Sub Miniature version A*) connectors are semi-precision coaxial RF connectors developed in the 1960s as a minimal connector interface for coaxial cable with a screw-type coupling mechanism.[6]

PLANAR MONOPOLE ANTENNA**:** Microstrip antennas, consists of a very thin metallic strip (patch) placed a small fraction of a wavelength above a ground plane. The microstrip patch is designed so its pattern maximum is normal to the patch.

Where,
This is accomplished by properly choosing the mode of excitation beneath the patch. For rectangular patch, the length L of the element is usually λ0/3 < L < λ0/2. The strip (patch) and the ground plane are separated by a dielectric sheet (substrate)[5].

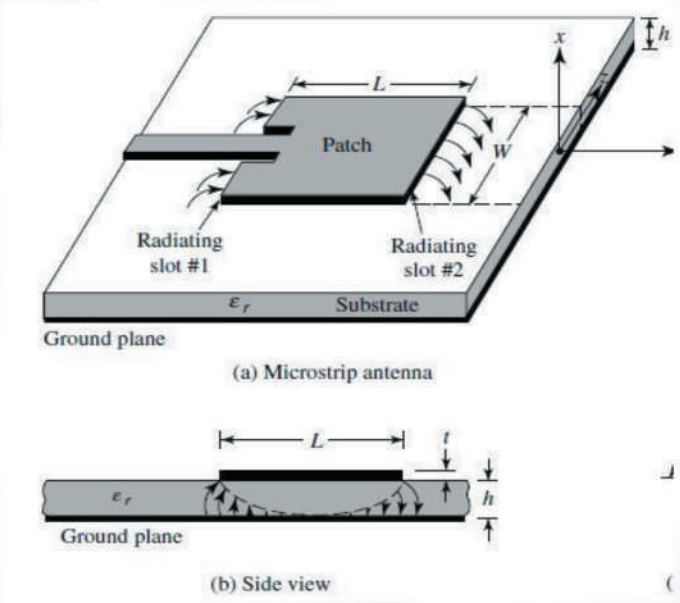


Fig2

Some of their principal advantages are given below:

1) Light weight and low fabrication cost.
2) Supports both, linear as well as circular polarization.
3) Can be easily integrated with microwave integrated circuits.
4) Capable of dual and triple frequency operations.
5) Mechanically robust when mounted on rigid surfaces.

Microstrip patch antennas suffer from more drawbacks as compared to conventional antennas. Some of their major disadvantages are given below:

1) Narrow bandwidth.
2) Low efficiency and Gain.
3) Extraneous radiation from feeds and junctions.
4) Low power handling capacity.
5) Surface wave excitation

SNA (SCALAR NETWORK ANALYSER): A Scalar Network Analyzer is a type of RF network analyser that is used to measure only the amplitude properties of a DUT (Device Under Test)[8]. Contrary to a Vector network Analyzer, it does not measure both amplitude and phase of the DUT. They can be used to measure parameters like VSWR and Return loss, which only requires the measurement of the magnitude of a signal at a particular frequency or frequency range. In this case, we do not need to measure the phase.

SOFTWARE USED; CST MICROWAVE STUDIO

CST MWS enables the fast and accurate analysis of high frequency(HF) devices such as antennas, filters, couplers, planar and multi-layer structures and SI and EMC effects .It quickly gives you an insight into the EM behaviour of your high frequency designs

III. METHODOLGY

A. ANTENNA DESIGN

We used CST Studio Suite 2018 for the purpose of designing and simulation of the antenna. The antenna is designed on a FR-4 substrate with the dimension length L=60mm, width W=50mm, height H=1.6mm and has a dielectric constant Єr=4.4. The copper patch which acts as an antenna has a thickness of 0.004mm. The port used has a dimension of 6mm X 1.608mm. Copper was used to make the patch. The microstrip feed line has a width w=6mm. The port is connected directly to the microstrip feed line.

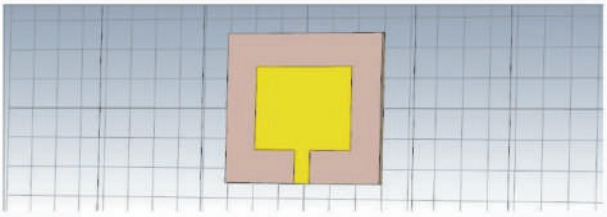


Fig3: Simulated antenna design

B.Design process:

The antenna was designed based on our recognition and readings of several research papers, where in the general parameters were suggested with respect to what results we needed to justify. The microstrip feed line width and height was calculated through I3D calculator.

The length and breadth of the patch was calculated based on the justification for proper working and optimization in the 2.452 GHz range. The substrate was chosen as FR-4 because of its ease of availability and significant dielectric constant.

The ground layer is kept at the back of the substrate providing proper grounding to the patch.

B. Room Simulation :

The room consist of 20ft x 10ft x 10ft size. The room is made out of concrete wall with 8 inches of thickness. The ideal room condition simulation was taken to observe the path loss and the s-parameter and VSWR. Both the planar monopole antennas are fixed at a corner of the room. In ideal room condition with zero obstruction, the path loss is simulated. After that, different materials are placed as an obstruction between those 2 antennas to see the effect of path loss.

Fig: Simulated room design

IV. : IMPLEMENTATION PLAN

The implementation of this project is done in 3 phases. These phases include:

1) The software simulation of the antenna and the room.
2) The hardware setup inside the room without and with obstructions.

For the experimentation of this project, we have performed in a communication lab situated at the first floor of our sister college, Pillai HOC College at Rasayani, Mumbai. This was selected because communication lab was suitable room for our experiment which was matching ideally with our simulated room.

SOFTWARE SIMULATION:

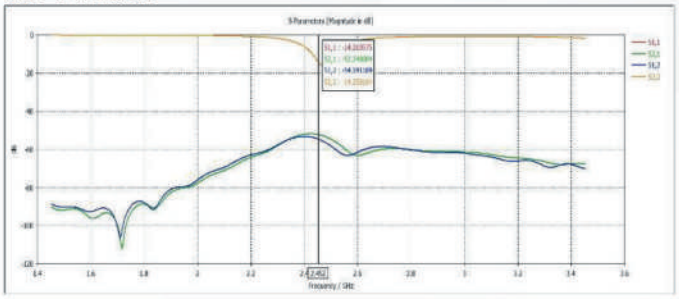
As we have discussed earlier, the software simulation of both the antenna and the room have been done. The antenna simulation has been designed[5]. Our antenna gives a very promising result. The room simulation has also done with all those obstacles.

HARDWARE SETUP:

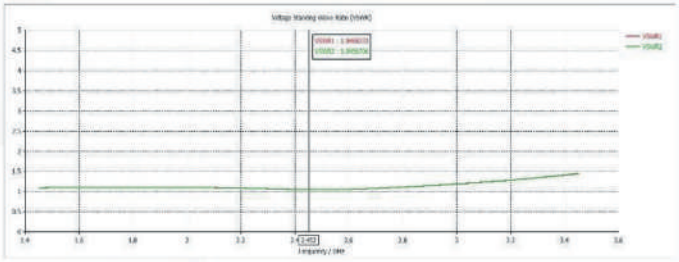
The hardware setup was done according to the requirement and the availability of those resources. Since there was only one SNA available with the length of the connector 1m each port, all the experiment was done in between 2m range. This setup gave us some of the promising results which have led us to the formation of the model

V. OBSERVATION AND RESULTS

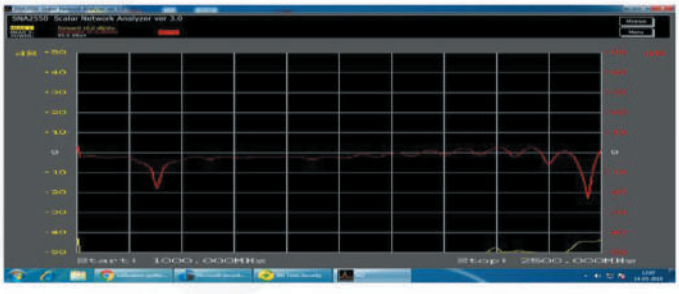
1.S-PARAMETER IN AN IDEAL ROOM IN CST SOFTWARE:



2. VSWR PARAMETER

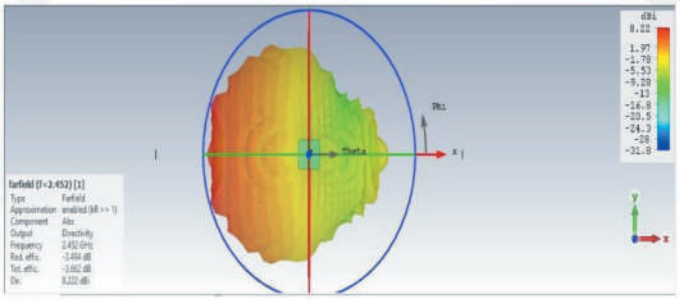


3. PRACTICAL RESULTS:

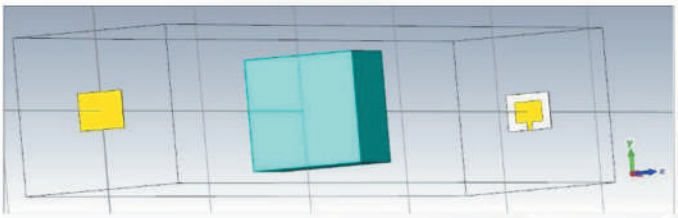


Path Loss in Ideal Room condition with loss of -22Db

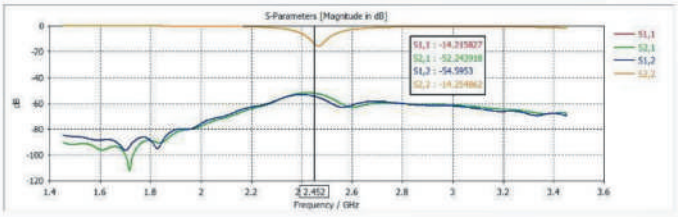
4. FAR FIELD:



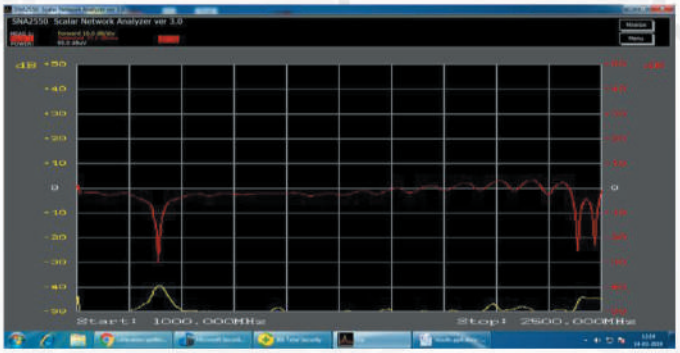
CONCRETE SIMULATION MODEL:



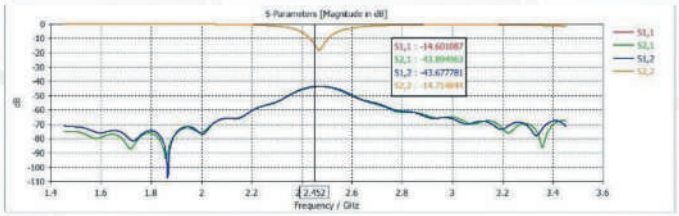
S-PARAMETER:



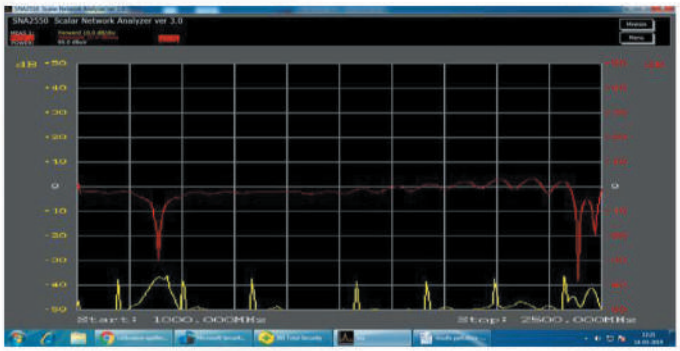
PRACTICAL RESULT:



Concrete material between transmitter and receiver with loss of -28dB

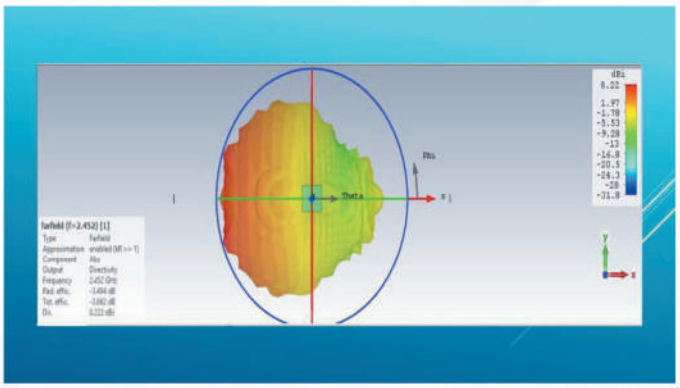


PRACTICAL RESULT:

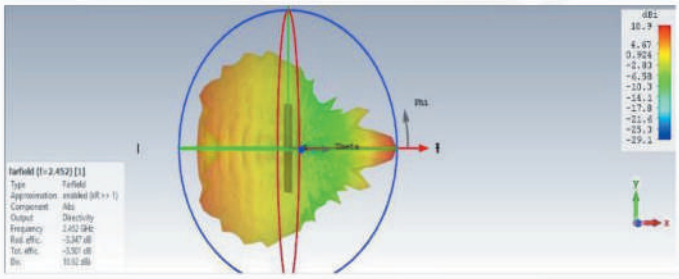


Aluminium material between transmitter and receiver with loss of -39.5Db

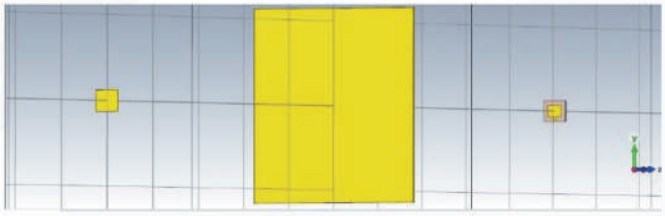
5. FAR FIELD:



FAR FIELD

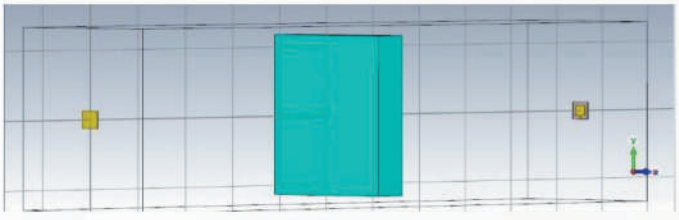


ALUMINIUM SIMULATION MODEL:

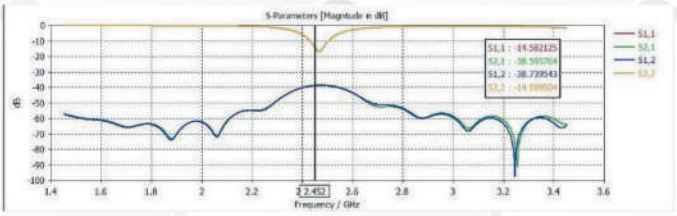


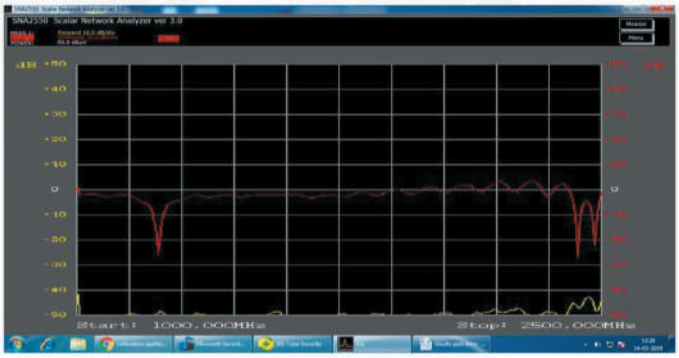
S-PARAMETER:

WOOD SIMULATION MODEL:



S-PARAMETER:





Wood material between transmitter and receiver with loss of -28dB

VII. CONCLUSION AND DISCUSSION

From this project, we have observed and deduced a lot of things. This include the information of different pass loss models, how RF signals get affected by the environment and how we can predict to give a better path for the transmission of signal. As the time goes by, the environment has changed a lot and will change even more. Because of this, the urge of deriving prediction model has come. This model, derived from previous model can predict path loss between transmitter and receiver inside a house more accurately. This can help us to avoid such path where the losses is more. The designing of simulated room and the adding the obstruction has significantly helped us for this model. Doing the practical experimentation, the results is similar to the simulated results which helped us to verify the model. We have also designed an antenna which is suitable for the transmission of signals. This antenna is designed by keeping a material as an obstruction to see the effects of RF waves. From this we have also derived a mathematical model which can predict the path loss.

ACKNOWLEDGMENT

We would like express our special thanks of gratitude to our project guide Amit Tikaria (BARC, SO(G)) & Prof. Suman Wadkar who gave us this golden opportunity to do this project on the topic of "Mathematical Modelling of RF Wave Propagation Models in VHF/UHF Bands" which also helped us to do a lot of research and came to know about many new things

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