PCE
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# PRINCIPAL'S DESK

The need for ongoing exploration and innovation is critical in today's engineering world and it demands the highest level of creativity. So it has become essential for today's generation to find ways to embrace new experimental learning processes to succeed and move towards more concrete goals. As Principal, I stand with the thought of providing students the right platform for opportunities in an environment that fosters academic and co-curricular learning.

I am happy that the faculty members and students of electronics and telecommunication department with their teamwork succeeded in bringing out such an innovative journal which portrays various technological advances in the field of electronics and telecommunication.The encouragement and support provided by head of the department and professors has provided a framework for students to showcase their talent. It gives great pleasure to see the creative expression of students who had contributed to this journal. I am extremely delighted with this journal and I wish the department staff and students success in their future endeavors

With Besh Wishes

Dr. Sandeep Joshi
Principal.

# HOD'S DESK

Creating facilities for learning is the culture of Pillai College of Engineering.It is an occasion of great pride for the department of Electronics and Telecommunication to bring out this issue of the department journal. I am immensely pleased by the content that gives us insight in the fields of interest of our department. This journal portrays the creative potential and originality of our students and faculty in ample measure.

I am indebted to Dr. K.M.Vasudevan Pillai and Dr.Sandeep Joshi for their inspiration and their guidance. I am also thankfull to all students and faculty of Electeronics and Telecommunications Department for their efforts to make this journal a success. I am sure the journal will inspire the students and faculty to learn and research in their respective fields of interest.

With Best Wishes

Dr. Avinash Vaidya
HOD EXTC

# FOREWORD

*CCTV camera network design*
*Implementation of a CCTV monitoring system that would continuously capture the video packets and display them on monitors.*

*RF based Underwater wireless communication system.*
*Use of RF as a medium of communication between transmitter and receiver. RF will be unhindered in water by factors such as acoustic and optical, and they are also cost efficient.*

*Electronic Eye*
*Electronic eye is a device which is used for monitoring the surrounding area using wireless technology. The electronic eye caputures the image as soon as PIR senses the movement and an alarm is coonected to the control unit of Electronic Eye.*

*Monopole Patch antenna for UWB applications with single band rejection.*
*A monopole patch antenna which employs a notch or we can say a vertical coupling strip that could flexibly control the frequency rejection band for Ultra-Wideband operations.*

*Smart Farm: Automation in Farming Using Robot.*
*Implementation of automation in farming using a robot which will be equipped with a soil moisture detector, camera, IR sensor and water spraying Module. The components will be enabled with Internet of things.*

*Wildlife Observation Robot.*
*To provide the wildlife community a means of observation on the wildlife without human interference by the means of a robot, which ensures that there is no harm to the human life.*

*IOT based Heart Attack Detection and Heart Rate Monitoring.*
*A model which will detect the pulse, monitor it and send it for processing, all by the means of IOT. It also has a fail safe measure incase the pulse exceeds than normal value.*

*Alternators in Automobiles.*
*A mechanism which will vary the current as required by varying the strength of the magnetic field of a spinning electromagnet.*

*High gain wideband antenna for WiMax and satellite applications.*
*A Fabry-Perot Cavity(FPC) with rectangular array of square parasitic patch on a $FR_4$ substrate. The antenna structure consists of a microstrip antenna using Partially Reflecting surface(PRS) layers.*

*Life Saving suitcase*
*A suitcase which will be able to produce ECG and EEG signals, instead of using two different machines. This is obtained by changing the position of the sensors and is also useful for monitoring the abnormal behavior of a patient.*

# CONTENT

# CCTV Camera System Network Design

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***Abstract*— As the world is progressing, there can also be many chances of practice of many theft activities so as the technology is progressing the technology for security purposes is also in boon progress out of which CCTV is one of the important device in modern world. Using Cisco Packet Tracer this project is intended to simulate a multi-floor CCTV system and then implement it for real life applications. The designed system will be able to monitor a multi-floor building 24/7. The IP cameras capture recordings and transmit it to their respective monitor. The main aim of this project is to provide 24/7 security to any respective area in least cost from our respective topology.**

***Index-IP camera, DHCP, Router, DNS Sever, Switch***

## I. INTRODUCTION

To implement a CCTV monitoring system that would continuously capture the video packets and display them on the monitors is the main objective of this project. Generally this topology is designed on the basis of Metro Area Network or Campus Area Network as per the requirement of customer. Previously at earlier motion sensors, times burglar alarm, noise detection were used for security purposes but were not sufficient for larger industries.

Due to which CCTV camera came into existence and it is a boon to all the solutions of the security procedures of many organizations. It provides real-time monitoring of the environment, recorded archive for investigative purposes. Access to any video through any network location within a certain period of time can be achieved by using CCTV camera. Nowadays wireless network like mobile phones can easily access to CCTV camera. As every business needs change this system can be expanded to new locations

## II. BLOCK DIAGRAM

The block diagram of video surveillance CCTV camera is given as follows:

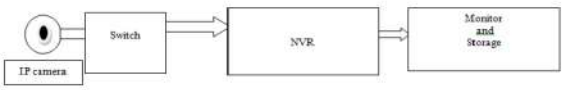


Figure no 1. Block Diagram of CCTV camera topology

**IP CAMERA**: It is basically a digital video camera which is generally used in applications such as security or surveillance purposes this camera can exchange data via computer network and the Internet.

**SWITCH**: It is generally a table of which stores the MAC address by creating a MAC table of different PCs. Since it uses less bandwidth to pass the data it basically used for connection between any two network devices.

**NVR (Network Video Recorder)**: It is basically video management software which is used for recording and video management. In other words it can be said that it is database which can be used to store recordings and essential information about the camera in the server database.

**Monitor and Storage**: This storage system is basically a server storage system which stores every information about topology such as IP address of PC, IP address of camera, DNS server which help it to get information about any device in topology and to check whether the device is in operation by pinging it with respect to its name stored in the server.

## III. SIMULATION DIAGRAM

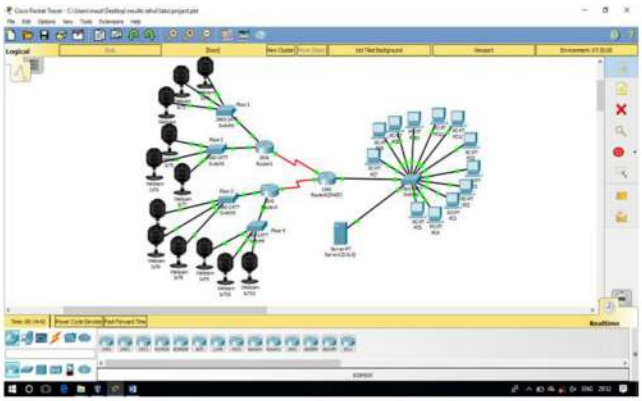

Fig no 2: Simulation diagram of CCTV camera topology

As we can see in the above topology ,the leftmost part of it consists of set of cameras where three cameras are connected to a switch. The first switch belongs to first floor and all computers connected in the rightmost part of the topology can control the first three cameras of first floor and this is applicable to all the other cameras too, in other words it can be said that no other floor the user can access the camera from any computer to any floor without any problem.

In the centermost part of the topology consists of three routers act as a backbone of the topology. All the three routers are connected to each other with the help of particular routing protocols called EIGRP. The centermost router which is connected by a serial wire is a DHCP router. By providing a pool of IP's to this DHCP (Dynamic Host Configure Protocol) router can make easy to provide IP to any camera by itself. On the rightmost part of the topology consists of DNS (Domain Name Server) this server is the heart of the topology because it makes easier to the user by just typing the name of the camera and it gives direct access

to the user without any problem and if the user wants to install any new camera or want to make any changes in IP of camera the user can directly make changes in DNS Server.

## IV. EIGRP PROTOCOL

EIGRP i.e. Enhanced Interior Gateway Routing Protocol here is used as a routing protocol which supports FLSM, VLSM, contiguous and non-contiguous networks .It uses MD-5 authentication and Diffusion update algorithm (DUAL) as its SPF also its AD value is 90. The multicast address is given as 224.0.0.10. EIGRP is the fastest routing protocol as it elects the next best path while electing the best path. Neighbourship rule is followed by two routers communicating using EIGRP is-

1. A.S. number must match.
2. K value must match.

The main aim of using EIGRP is the routing protocol of our topology because it is open standard and can be useful in all types of routers.

## V. DHCP & DNS SERVER

To assign IP address to host, we use Dynamic Host Configure Protocol which can only be made possible in port 67 of the router. Dynamic Host Configuration Protocol (DHCP) acts as a client or server protocol which then provides an Internet Protocol (IP) host with its IP address and other related configuration information such as the subnet mask and default gateway.


Fig.3. DHCP Server Configuration

The Domain Name System i.e. DNS is used to bind IP address with name which is used to store the IP addresses of every device and can also be used as a savior when any of the device get crash as it contains the sufficient information about the device. The DNS can only be made possible in port 53. It makes it easier for the user to directly access or ping the camera by its name.

Fig.4. DNS Server

## VI. APPLICATIONS

- It is used in places like shops, buildings, schools, colleges, in traffic jams etc.
- It is widely used in confidential areas like military station, research centers, bank.
- Special CCTV cameras are used to measure the temperature of certain processes.

## VII. RESULT

The following image shows the physical connection between the PC and the camera

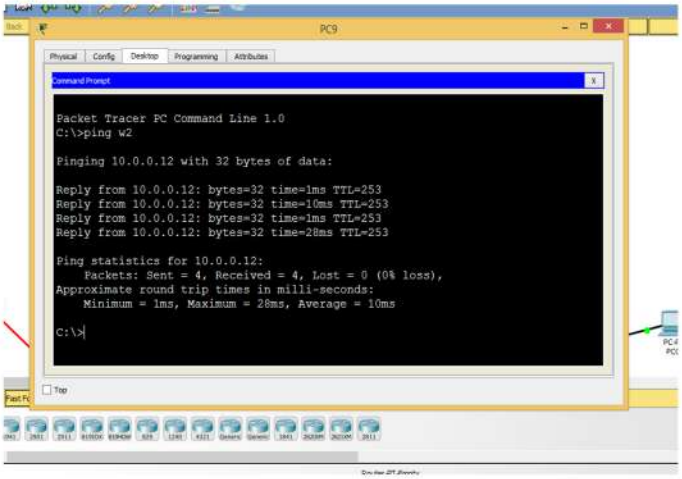


Fig.5. Ping testing between PC and CCTV Camera

## VIII. CONCLUSION

As it can be verified from the result figure that the ping between the PC and camera is successful without any loss of packets so it can be said that this topology can be made possible in hardware applications of CCTV camera.

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# RF Based Underwater Wireless Communication System

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**Abstract--- Till now there are many ways through which under water communication can take place, but either they are wired, complicated or expensive. In this paper, RF method is used for communication between transmitter and receiver. Where the Transmitter will be on-surface basically acting as an operating station and receiver will be an robot, providing the required information for transmitter. By using wireless camera, we will get the underwater pictures at receiver end on Mobile screen.**

*Keywords: RF (Radio Frequency), Wireless Camera, Motor, Atmel (89C51).*

## I. INTRODUCTION

In this paper RF will be use as medium of communication between Transmitter and Receiver. The reason for using RF is that Radio technology doesn't get affected in water due factors like Acoustic and Optical, and also, they are cheaper. They also can propagate in water easily. But there is problem with RF, that is high attenuation. RF operates in the range between 3 Hz to 300 GHz. In this paper a wireless underwater robot will be operated by using RF technology. This wireless robot will have wireless camera that will allow us to see the current underwater situation and this can also be used as a surveillance robot in field of underwater gas pipeline. The motor will move the robot in Forward, Reverse direction and also in Left and Right direction. The direction of robot will be given through RF remote. In this paper we will be using 89C51 Microcontroller which is a low power, high-performance CMOS 8-bit microcontroller with 4Kbytes of Flash programmable and erasable read only memory(PEROM)
.

## II. WORKING

In this paper RF will be used as a source of communication between transmitter and receiver. At the transmitter end the user will be able to see live underwater pictures by using wireless camera and also, we can use this robot as a surveillance robot for underwater pipe and gas detection. The robot can travel up to 2ft underwater and can move in Forward, Reverse and in Left, Right direction. The pictures that are being send through the camera at the receiver can be seen on our screen.

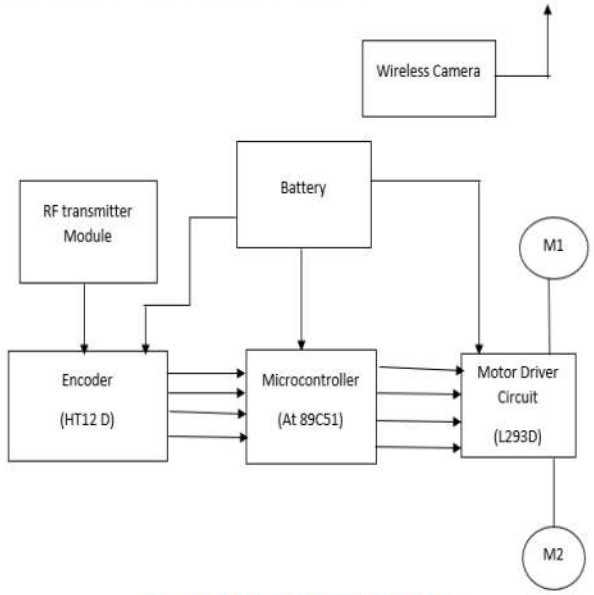


Figure 1 BLOCK DIAGRAM

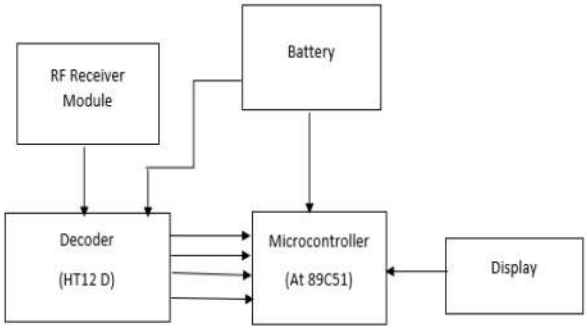


Figure 2 BLOCK DIAGRAM

## III. RF MODULE

### 1. *RF TRANSMITTER MODULE:*

The RF module operates at Radio Frequency. It operates on the frequencies between 30kHz to 300GHz. The **RF MODULE** comprises of RF Transmitter and RF Receiver. So, the RF Tx/Rx operates on the frequency of 434 MHz.

RF transmission is much more better than IR because IR operates in the line-of-sight mode.
RF transmitter range is approx. 100 meters. RF transmitter module is connected to the data encoder HT12E.

**Pin Description:**

| Pin No | Function | Name |
|---|---|---|
| 1 | Ground (0V) | Ground |
| 2 | Serial data input pin | Data |
| 3 | Supply voltage; 5V | Vcc |
| 4 | Antenna output pin | ANT |

**Table 1 RF Transmitter**

(1). **Ground (GND):**
It is a ground pin of transmitter.

(2). **Serial data input pin (DATA):**
It is an input pin. It is a compatible with CMOS to driven with CMOS input level.

(3). **Supply Voltage (VCC):**
It provides +5v supply to the transmitter. Operating Voltage for the transmitter. It degrades noise performance as there is noise in the power supply.

(4). **Antenna Output Pin (ANT):**
It is the output pin of the transmitter. It gives 50 ohms antenna output. The impedance of antenna affects the output power and harmonic emission.

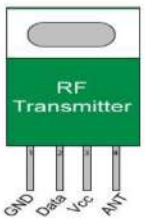


Figure 3 RF RECEIVER MODULE:

RF Receiver section is connected to the data decoder HT12D. The receiver receives serial data.

**Pin Description:**

| Pin No | Function | Name |
|---|---|---|
| 1 | Ground (0V) | Ground |
| 2 | Serial data output pin | Data |
| 3 | Linear output pin; not connected | NC |
| 4 | Supply voltage; 5V | Vcc |
| 5 | Supply voltage; 5V | Vcc |
| 6 | Ground (0V) | Ground |
| 7 | Ground (0V) | Ground |
| 8 | Antenna input pin | ANT |

**Table 2 RF Receiver**

The data is received by the RF receiver from the ANT pin, this data is now stored in this pin. There are Two data pins in RF receiver which are used for further use.

**GROUND PIN (GND):**
It is connected to the ground plane.

**SERIAL DATA OUTPUT PIN (DATA):**
It is a data output pin.

**ANTENNA INPUT PIN (ANT):**
It is the antenna input pin of the receiver to receive the antenna data.

**SUPPLY VOLTAGE PIN (VCC):**
It provides +5v supply to the receiver. It functions same as in RF transmitter.

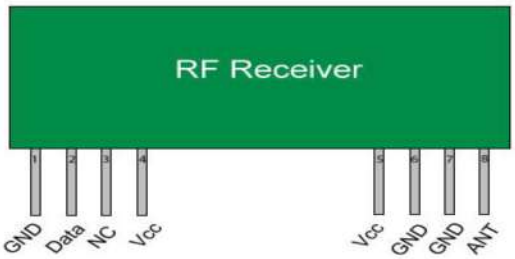


Figure 4 RECEIVER

## IV. RELATED WORK

When we went through previous paper done by various people. We came across two certain papers. That was wireless underwater metal detector robot. The project is based on ZigBee communication. The main application of this project was to detect metal & also measure two parameters of water, one is its $P_H$(Water Quality Sensor)& second is its Temperature. In this project the data is given to the ARM controller & according to the commands the robot will move in the desired direction. It is useful in scientific field, biology, offshore exploration, assisted navigation, etc.

## V. PROPOSED WORK

The proposed model basically includes the wireless communication in underwater based on RF technology. So, for this type of communication here we use one transmitter and one receiver. In this paper RF will be used as a source of communication between transmitter and receiver. At the transmitter end the user will be able to see live underwater pictures by using wireless camera and also, we can use this robot as a surveillance robot for underwater pipe and gas detection. The robot can travel up to 2ft underwater and can move in Forward, Reverse and in Left, Right direction. The pictures that are being send through the camera at the receiver can be seen on our screen.

## VI. APPLICATION

1. This paper can be used for surveillance application.
2. It can also be used to take underwater(marine) pictures of marine life.
3. This paper is used to detect turbulence in water which causes because of pollution in water due to oil pipes.

## VII. FUTURE SCOPE

1. This robot can be used as metal detection in underwater.
2. This robot can be used in rescue operations by reducing its size and by making it more advanced.

## VIII. CONCLUSION

Thus, we can conclude that the information is going to transferred from RF receiver to RF transmitter(RF technology).As there are many wireless technologies are available having different features, applications and limitations in the world. From above observation we conclude that it will be very useful if we use RF technology for wireless communication. According our observation RF technology is way better than any other technologies for long distance communication through wireless communication. These sources are easily available now days hence our proposed system become more cost effective and economical. Our proposed system will use oceanic research centers application for interfacing RF module & controller.

## IX. ACKNOWLEDGEMENT

It gives great pleasure to present this paper on "RF based Underwater Wireless Communication System". 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. S.K Srivastav for their valuable suggestions, support and timely guidance at every step during course of our project.

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# ELECTRONIC EYE

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*Abstract*—A **Electronic eye is a device which is used for monitoring the surrounding area using wireless technology. The main objective of this project is to design a security system based on passive Infrared sensor.Electronic eye describes the design and implementation of image capture using Arduino based security system for home and offices. It provides a very efficient and reliable security services at houses, offices and industries that supports the use of an sensor at home and send the signals to control unit of electronic eye with buzzer alarm for security purpose with image capture as soon as a movement is sensed by the PIR.**[1]

**Keywords-PIR, Arduino UNO, IP camera, Ethernet SHIELD, L293D**

## I. INTRODUCTION

The need of security system in our day to day life is essential due to increase in burglary.The security system with fast reponse to the threat is required.To overcome these problems we use a PIR sensor and Arduino.When the Electronic eye is ON, the PIR sensor will continuously monitor the room. If there is any intrusion the PIR senses the movement and send a notification to the user via the email.In addition to it we can also view the live video and also listen to the audio with the help of IP camera.

**ARDUINO UNO**:The Arduino Uno is a microcontroller based Atmega.It has 14 digital input/output pins,6 analog inputs.it requires a 16 Mhz cystal oiscillator and reset pin along with a clock.


**Figure 1.Arduino Uno**

**PASSIVE INFRARED SENSOR (PIR)**:PIR is an electronic device that measures IR light radiating from objects in its field of view.PIR detects any infrared radiations emitted form the sensor.The IR light is electromagnetic radiation with a wavelength between 0.7 and 300 micrometers.Human body temperature radiates IR of wavelength 10-12 micrometers.[2][3]

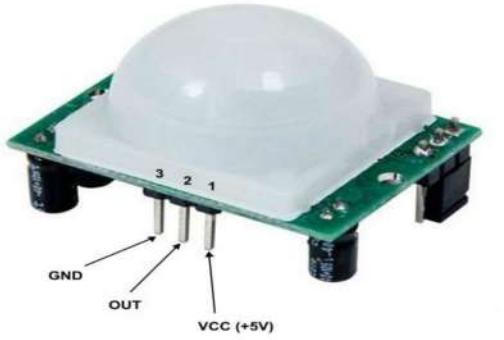


**Figure 2.Passive Infrared Sensor**

**ETHERNET SHIELD:**The Arduino Ethernet Shield allows an arduino board to connect to the internet using Ethernet library.To use the shield we mount the shield on top of Arduino board.Ethernet is used as an interface between Arduino and WIFI modem.Shield is used connect the computer or the network hub or the router by using standard ethernet cable[4].

**Figure 3.Ethernet Shield**

**LCD:**LCD used in our project is 2x16 Serial LCD which is interfaced with Arduino to read the output directly.

**PIN CONFIGURATION:**

| JP1/JP14 Pins 1 – 8 | Description | JP1/JP14 Pins 9 - 16 | Description |
|---|---|---|---|
| Pin1 | Ground | Pin9 | D2 (Not Used) |
| Pin2 | VCC (+5) | Pin10 | D3 (Not Used) |
| Pin3 | Contrast | Pin11 | D4 |
| Pin4 | Data/Command (R/S) | Pin12 | D5 |
| Pin5 | Read/Write (W) | Pin13 | D6 |
| Pin6 | Enable (E1) | Pin14 | D7 |
| Pin7 | D0 (Not Used) | Pin15 | VCC (LEDSV+) |
| Pin8 | D1 (Not Used) | Pin16 | Ground |

**Table 1. Pin Configuration**

**IP CAMERA:** Instead of using a traditional method to transmit video and audio over a video/audio cable. an IP camera will transmit the data over USB,Ethernet

Figure 4. IP Camera

IP camera is placed on top of two Dc motors which rotates the camera. One motor rotates camera up and down while the other rotates from left to right. since we use two motors we can make the camera rotate in 360°. The rotation of the motors is controlled by the Arduino which is programmed using Arduino IDE.

**L293D MOTOR DRIVER IC:**

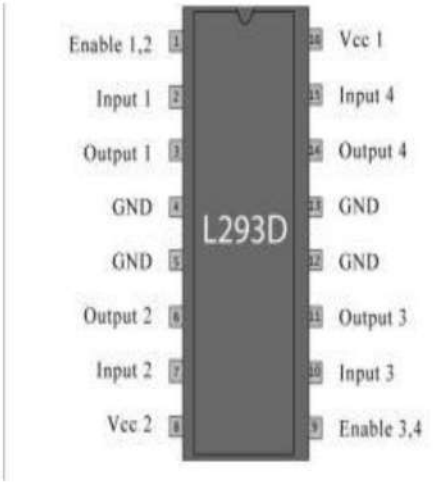


**Figure 5.L293D IC configuration**

This motor driver IC is used as an interface between DC motor and arduino board.These act as an curent amplifier. The input to these is a low current control signal and the output is a high current signal. This high current signal is used to drive the motor.[4]

**BLYNK**:We use Blynk hardware libraries to get your product online and connected to the cloud. Drag-n-drop widgets we need to visualize PIR sensor data, control DC motor push buttons, send mail Notifications.When the app is ready,icons and buttons are added. After the page is ready and the ports are configured in the Arduino,with the help of the push buttons in the Blynk Application the motors can be controlled according to us.[5]


**Figure 6. Designing of BLYNK app**

**360 EYES**:360Eyes is a free app, dedicated to the development of the panoramic camerasoftware, the software can be real-time viewing, receiving alarm information, remote control, playback, video and other useful functions.Similar to the BLYNK app[6].

**Figure 7. App view**

## II.WORKING:

The project intends to provide a more secure environment in homes,offices etc. The Arduino is programmed using Arduino IDE.The program includes the configuration of the Arduino board with PIR sensor, LCD, motors via L293D. When the setup is set, the LCD displays the project's title, guide and name of the college and the status of the circuit.on the top of Arduino an Ethernet is placed which is connected to the Wifi(300M MIMO Wireless-N Broadband Router). The PIR always senses the surroundings of about 120°. For manual control of the camera a IoT based app BLYNK where the push buttons are used to design and control the motion of the motors. The IP camera is mounted on top the motors. Another IoT based application called 360Eye is used for live streaming of the video, because of this feature a person can monitor the area under observation along with it the person is also able to communicate through the speaker present in the IP camera. The PIR sensor is triggered whenever it senses any infrared radiation within its range and sends a notification to the user via the mail(which is linked with the arduino). Also it displays it on the LCD and on the BLYNK the value of the PIR changes to '1'. The quality of the video is good.

## III.APPLICATION:

There are various applications where this project can be used in day to day life:

1.Malls and shops.

2.Home security.

3.Garage door opening circuit.

4.Banks.

5.Wildlife.

## IV.CONCLUSION:

In this paper, the study of different domain techniques is presented. Our project is mainly about home security. When no one is at home, and if the electronic eye is kept on, then by using PIR and IP camera we can keep an eye on surrounding area. If any intruder enters into our range or surrounding areas then the PIR senses the motion and send the notification to the user via Internet.

## V.ACKNOWLEGMENT:

We remain immensely obliged to our project guide Prof.Anup Vanage, for his valuable guidance.

We express our sincere gratitude to Dr.Avinash Vaidya, HOD,Electronics & Telecommunication Department without whom it would not have been possible to successfully accomplish our project.

Furthermore, we are indebted to the Principal Dr. Sandeep Murlidhar Joshi whose constant encouragement and motivation inspired us to do our best.

We would also like to thank our project co-ordinator Prof. Suman Wadkar.

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# Monopole Patch Antenna for UWB Applications with Single Band Rejection

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***Abstract*—A monopole patch antenna with single band rejection suitable for Ultra wideband applications is present here. Microstrip feeding technique has been used here. The proposed antenna would consist of a vertical coupling strip within a square slot patch, eventually occupying a small size. A good performance of frequency rejection could be achieved with a proper design of the strip, placed in center of the slot, for the UWB range defined from 3.15 to 10.6GHz. The antenna design is quite simple for the band notching property compared to other designs to reduce the frequency interference caused by other ISM standards defined bands. Apart from that, a good omni-directional radiation pattern and transmission responses for UWB operation can be obtained.**

***Keywords—Band-notched, Planar monopole antenna, Ultrawideband(UWB).***

## I. INTRODUCTION

Ultra wideband(UWB) wireless communication techniques (3.1–10.6 GHz) have attracted many researchers due to the advantages like small emission power, and high data rates at low cost design. To overcome the frequency interference caused due to the existing WiMAX (5.25–5.85 GHz) systems and WLAN (5.15–5.825 GHz), some Ultra wideband antenna designs having band-notching features have been presented in [1]–[8]. One simple way is by etching thin slots on the surface of antenna, such as L-shaped slot [8], U-shaped slot [1]–[3], and T-shaped slot [4]. By adding either a multiresonator load [7] or a split-ring resonator (SRR) [5], [6] in the antenna structure, the frequency bands that are not desired could be rejected and enhancement of the system performances could be observed as well. However, these designs would required a complex design/structure for generating as well as controlling of the stop band property, so the fabrication cost of the antenna may increase for practical applications.

We have thus proposed a monopole patch antenna which would be employing a notch or we can say, a vertical coupling strip that could be flexibly controlling the frequency rejection band for Ultra wideband system operation. We could obtain quite stable radiation performances unlike the conventional designs, as the major design parameters of the stop band are modified. This makes it possible for the proposed UWB band-notched antenna with a compact size of 15(L) mm×15(W) mm×1.6(H) mm which can be integral part within the portable devices without needing to retune the whole design structure. The design and details of the proposed antenna are described in Section II, followed by the fabricated antenna's construction and it's experimental study is mentioned in Section III. A number of design parameters with regard to the stop band feature are analyzed for the antenna, whose transmission characteristics including magnitude are further measured and discussed.

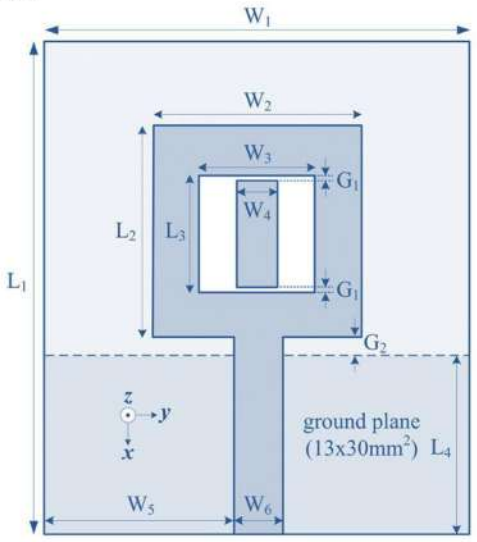


Fig. 1. Geometry of the proposed Antenna
($L_1$=35mm, $W_1$=30mm, $L_2$=15mm, $W_2$=15mm, $L_3$=8.3mm. $W_3$=8.3mm, $L_4$=13mm, $W_4$=3mm, $W_5$=13.3mm, $W_6$=3.4mm, $G_1$=0.2mm, $G_2$=1mm).

## II. ANTENNA DESIGN

Fig. 1. Portrays the actual geometry of the UWB square – slotted - antenna proposed here with design parameters as mentioned below the figure, fabricated on $FR_4$ substrate of depth 1.6mm, dielectric constant ($\varepsilon_r$ = 4.4) and a loss tangent tan$\delta$ = 0.02. The proposed antenna here is fed by a 50Ω matched strip line with a width of 3.4mm and is implemented using a coupling strip within a square slotted patch. Looking at the big picture, the overall dimension of the proposed antenna is 35mm($L_1$)×30mm($W_1$) and ground plane of dimension 13mm($L_2$)×30mm($W_2$).

The longest resonating length of the antenna was designed approximating around a quarter-guided-wavelength at 3.05 GHz, equal to $L_2$=$W_2$=15 mm, similar to the resonant monopole antenna. The space between the ground plane and the slot patch has been optimized to be about $G_2$=1mm, so that a tolerable impedance matching can be obtained across the operating band.

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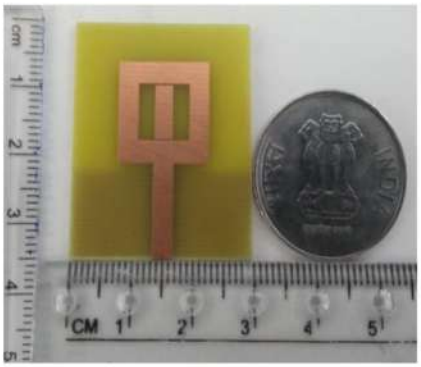


Fig. 2. Photograph of the Ultra wideband antenna proposed

The coupling strip placed at the centre of the slot patch as shown in Fig. 1, is used to generate the desired resonance corresponding to the stop band. In our design, the coupling strip is acting as a quarter-guided-wavelength resonator, and the center frequency $f_r$ can be empirically approximated as

$$f_r \approx \frac{c}{4\sqrt{\frac{\varepsilon_r+1}{2}} \cdot (L_3 - 2G_1)} \quad \ldots 1$$

Where $c$ is nothing but the velocity of light in free space and $\varepsilon_r$ is the dielectric constant. Since the centre frequency is expected about 5.6 GHz, the strip length of the antenna can be approximated as 8mm, suitable for those optimum design parameters as listed below:

$L_1$=35mm, $W_1$=30mm, $L_2$=15mm, $W_2$=15mm,$L_3$=8.3mm. $W_3$=8.3mm, $L_4$=13mm, $W_4$=3mm, $W_5$=13.3mm, $W_6$=3.4mm, $G_1$=0.2mm, $G_2$=1mm.

Besides, by the proper tuning of the width ($W_4$) or the gap ($G_1$), the stop band property of the antenna could be controlled flexibly, thus overcoming the effects caused due to the frequency shifting for practical applications. The High frequency electromagnetic wave simulation software package, HFSS, is utilized here to simulate and study the radiation performance and electrical features of the proposed antenna.

## III. Results and Discussions

The fabrication of the prototype of the proposed UWB antenna was done. Fig. 3 shows the simulated return losses against frequency of the antenna. The expectations of the antenna from the simulations were achieved and are good. We can observe that, the impedance bandwidth measured is with a return loss of 10 dB for the antenna i.e. ranging from 3.1 to 12GHz, with a rejection of the band of range 5.12–6.08 GHz, so the effects of frequency interference of WLAN and WiMAX could be avoided well.

With the help of the HFSS simulator again, we could further study the operating range for the stop band with different strip width ($W_4$) and gap ($G_1$). Results shown in Fig. 4(b) indicates that the stop band could be adjusted from 4.94 to 6.72 GHz, that corresponds to the strip width ranging from 1 to 4 mm, so the width of the notch in the design may be determined between 1–4 mm. Whereas on the other hand, different gaps ranging from 0.1-0.3 mm. Here, the antenna is capable of achieving a tuned stop band ranging from 4.86 to 6.28 GHz, as shown in Fig. 4(a).

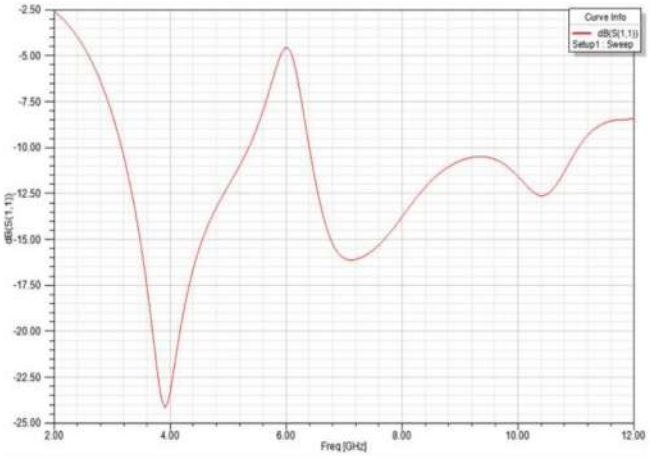


Fig. 3. Simulated return loss of the proposed antenna

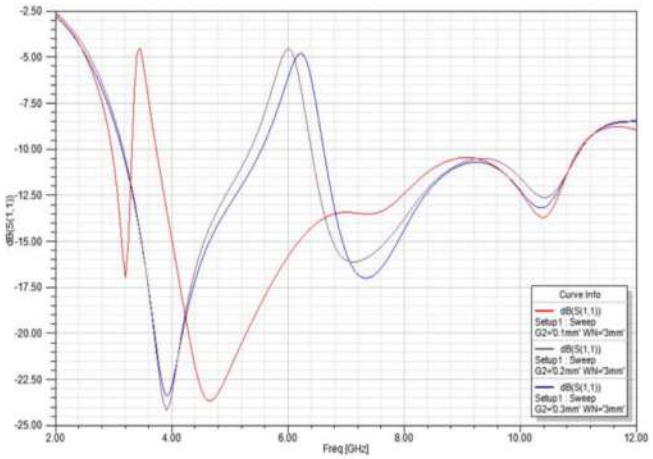


Fig. 4(a)

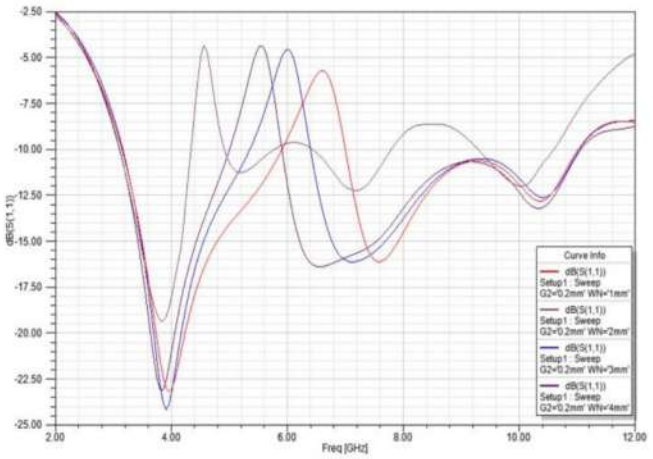


Fig. 4(b)

Fig. 4. Simulated return loss for different design parameters regarding the stop band property. (a) Notch Gap ($G_1$). (b) Notch Width ($W_4$).

We can further conclude that the antenna performance is less sensitive within the operating band as we can observe that the stop band would vary, so a maintained radiation performance of the antenna is achieved. This advantage of the antenna could cause a problem to the frequency shift caused by the antenna integrated within the portable devices addressing the internal antenna as well.

## IV. Conclusion

A compact single band rejected monopole patch antenna suited for UWB operation is presented and studied in this letter. Comparing the prior designs, we can conclude that the stop band property of the proposed antenna could flexibly adjusted therefore achieving a better radiation performance. With such tunable stop band, issues of frequency interference could be addressed in a better way as well. Furthermore, properties such as excellent pulse handling capability, omnidirectional coverage and a stable transmission characteristics indicates that the antenna proposed is well suited to be integrated into Ultra wideband portable devices.

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# Smart Farm: Automation In Farming Using Robot

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**Abstract--- With India being an agricultural country ,the need of automation in farming will always exist .The implementation of this system can be done through a robot equipped with soil moisture detector, camera, IR sensor and water spraying module. The components will be enabled with Internet Of Things to perform the task of autonomous farming ..With Internet Of Things I.e. through internet connectivity, the robot will be able to perform sowing, ploughing, spraying fertilizers and pesticides over a selected area in the farm.The robot will work on solar power. The robot can accept request from the user through mobile application and can prepare a schedule. This would be stored in a database and will perform all the operations without any user intervention. ESP can be used to get the data and control the bot continuously. A camera to carry out the surveillance connected to the remote could be an addition to the system.**

***Keywords- IOT,ESP.***

## I. INTRODUCTION

The main motive for developing Automation in farming is the need for improved food quality. On a global scale the need for more food is a serious issue. The worlds population is expected to reach 9.6 billion people by the year 2050. The world population today is 7.4 billion. [2] The increasing opportunities in other sectors is day-by-day reducing the man power availability in farming. With the help of robotics we can offer solutions in precision agriculture to processes related to seeding, harvesting, weed control, grove supervision, chemical applications, etc. to improve productivity and efficiency. In India there are 70% people dependent on agriculture. The main motive for developing Agricultural Automation is the decreasing labour force, a phenomenon common in the developed world. In the current generation most of the countries do not have sufficient skilled man power in agricultural sector and it affects the growth of developing countries. Automation in farming is the operation, guidance, and control of autonomous machines to carry out agricultural tasks. It motivates agricultural robotics. It is expected that, in the near future, autonomous vehicles will be at the heart of all precision agriculture applications. The robot will work on solar energy and will perform the task of ploughing, automatic seeding and spraying the pesticides. It consist of soil moisture detector which will give the content of moisture in soil and an IR sensor which will allow to take turn when it faces any obstacle in its path. Manual Control are also provided so that farmer can control the robot if he wishes to control it. Camera is provided for surveillance and the robot is controlled through a mobile application via Internet of Things. A battery is also provided as the efficiency of solar power is less.

## II. OPERATION MECHANISM

Soil moisture is attached to analog pin and obstacle sensors is attached to digital pin of arduino, soil moisture sensor will give moisture level of soil and obstacle sensor will detect obstacle, if obstacle get detected then robot auto change path. The motor connected through motor driver will operate in both auto and manual mode. By default the motors will be in auto mode and perform their respective functions or we can control their function through app in manual mode. 2 motors we are using for forward, backward , left and right operation. Relay we are using to spray pesticides. Communication between controller and app will be performed through wifi with intranet concept. One led will be turned on with solar panel supply. For Ploughing and seeding we also using DC motors.

## III. COMPONENT INTERFACES

The agricultural robot is designed to reduce the labour required for farming and to increase farming precision. The robot can perform the following tasks.

### *1. Use of IR sensor:*

The farm robot is designed for an enclosed farm surrounded by a wall. The robot will start from one corner of the field, it will travel along the length

of the field. When the robot reaches the end of the field the IR sensor detects the wall, it will travel some

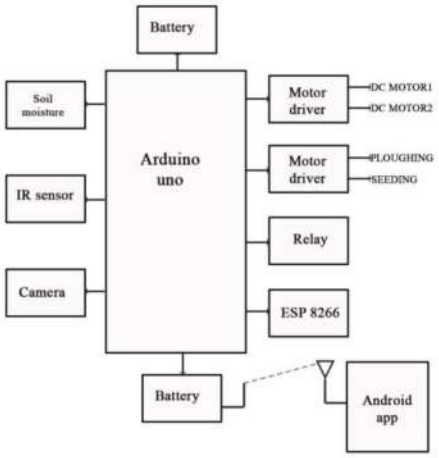


Fig. 1. Block Diagram

distance back so that it gets some space to turn and will take a right turn. It will travel a small distance for a few seconds as programmed and again takes a right turn. The robot will again travel along the length of the field to perform its task and it repeats this same procedure till the end of the field .

## 2. *Ploughing:*

For ploughing a motor is attached to the ploughing attachment. When it receives the ploughing instruction from the user, the motor rotates and the ploughing attachment moves in the downwards direction. The robot drags the attachment in the forward direction. When the ploughing is completed, the ploughing attachment is pulled in the upward direction.

## 3. *Seeding action:*

It has perforated pipe, imperforated pipe spring and a motor. The two pipes are joined using a glue gun. Seeds are fed through the imperforated pipe. Motor in Mounted at one end of the perforated pipe with spring attached to the axle of the motor. When it receives the command, motor rotates in clockwise direction. The seeds are pushed in the forward direction with the help of spring. As soon as a seed reaches the perforation, it falls on the ground. The seeds are sowed only after a certain distance in the field. Thus distance between every plant to be grown is same.

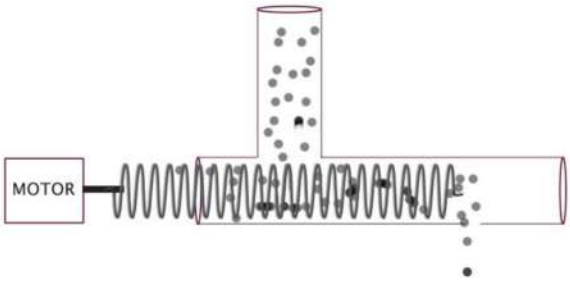


Fig. 2. Seeding Mechanism

## 4. *Soil moisture detection:*

The soil moisture is used to detect the moisture of the soil so that the watering action can take place if the moisture is low.

## 5. *Sprinkling of water and pesticides:*

Water and pesticides are stored in tank .The tank is filled with either water or pesticide as per requirement. A mini water pump (DC 3-6V) is placed inside the tank .One end of hoe pipe is connected to the pump whereas the other end is fed out of the tank and again enters the tank from the other hole. Holes are drilled in the hoe thus sprinkling action takes place.

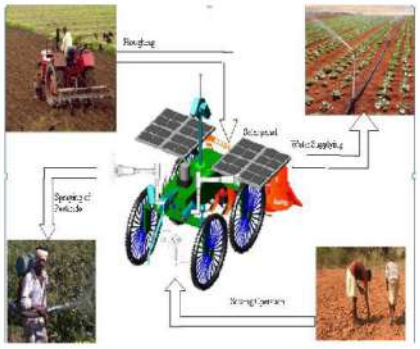

Fig. 3. Smart Robot

# IV. APPLICATION

Agricultural robot is highly useful in decreasing the unnecessary labour of farmers, since we are using soil moisture detector to detect the moisture content in soil and supplying adequate portion of water to that part, we are decreasing the wastage of resources and increasing the quality of produce grown in field. With the help of

wifi the farmer can comfortably sit in his house and operate the robot. Because of the android interface less skilled technicians can operate this bot.

## V. OUTCOME

The user will get the soil moisture on his mobile phone through the application. The robot will perform the ploughing, seeding, spraying when user gives the command from the mobile application. There are two modes of operation i.e. Auto Mode and Manual Mode. In Auto mode, the robot will perform ploughing, seeding and spraying automatically. In Manual mode the user needs to give the instruction for the above operations. LED is provided to signal that the robot is working.

## VI. FUTURE SCOPE

1. This robot can be made to function autonomously using AI(Artificial Intelligence).it can be left alone in the field and the the final product could obtained with minimum human interference.

2. This robot can be used for horticulture with reducing the size and making it work on battery without using solar energy.

3. Attaching a harvestor attachment to make the robot in use during the harvest season.

4. Incorporating automated drip irrigation in the robot in order to reduce water usage and increase the accuracy of the irrigation system.

## VII. CONCLUSION

Considering the decrease in the labour and with the increase in the population there is a need of automation in agriculture. This robot not only reduced the labour but increases the accuracy of seeding and ploughing. The farmers do not come in direct contact with poisonous pesticides due to spraying mechanism. It provides soil moisture which leads to reduction in the usage of water. There is a surveillance camera so that the farmer can have a view of his field .also reducing the cost of product by reducing the labour cost incurred.

## ACKNOWLEDGEMENT

It gives great pleasure to present this paper on "Smart Farm: Automation in Farming Using Robot". 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. Tusharika Banerjee Sinha and our co-guide Prof. Dipti Patil for their valuable suggestions, support and timely guidance at every step during course of our project.

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# Wildlife Observation Robot

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***Abstract*- At first, only undomesticated animal species were referred to as wildlife, but in the recent years, it has also come to include all other organisms that grow or live in an area that has not being introduced to humans. [1] Hence, a growing need to keep a constant observation over the widely spread wild society is highly required. The practice of noting the specification (i.e. life or death, health changes over time, threat to wildlife, etc.) is called as wildlife observation. Thus, the main objective of this project is to provide the observation of the wild community without human interaction to prevent any threat to human life and providing the live feed of action in the wild world.**

## I. INTRODUCTION

Robot, a machine, programmed by computer, designed to perform predetermined set of operations defined by humans, capable of carrying out a complex series of actions automatically. In this project, the combined effect of motors, sensors, camera, along with a processor is being brought together to observe the wildlife and give the live feed through camera to a distant viewer. The interaction between the robot and user is through a web application specially designed to control the robot. The wireless communication is carried out by a Wi-Fi module to increase the range of communication. It is accessible throughout the world using the IOT (Internet Of Things) platform. The major concept is to locate, observe and analyze the wild animals and accessing the robot from anywhere around the world. This project can be used as an alternative for humans. In wildlife photography, health diagnosis of wild animals, researches of wildlife in unsafe region, etc., where this robot can be easily disguised as a harmless animal and get in close proximity of dangerous animals. The robot is provided with a wireless interface to the PC to capture the live footage. This can ease the human effort and threat to human life that will occur by being in close proximity with wild animals.

## II. METHODOLOGY

The main advantage of this project is that the robot can be easily accessed from anywhere in the world. Using IOT technology, using a simple web application specially designed for this project. Where HTML and PHP software have been used to develop and operate the robot on user command.

### *A.* IOT platform for wildlife monitoring

A typical wildlife observation unit consists of a hardware unit operated on the software, along with some sensing units and communication components as shown in Figure 1. The main elements of the project are controller unit, motors and driver, and power supply. Here, using IOT platform the easy access of the robot to monitor, observe wildlife and track the wild animals is possible from anywhere. A network of physical devices which is embedded with electronics, software and sensors, that allows these devices to connect is called as Internet of things or IOT.[2][3][4] IOT is also called as IOE(Internet Of Everything) , and consists of all the web-enabled devices which help in collecting, sending and acting on data they acquire from their surrounding .environments by the use of communication hardware, processors and embedded sensors.[3][4]

### *B.* Hardware Implementation

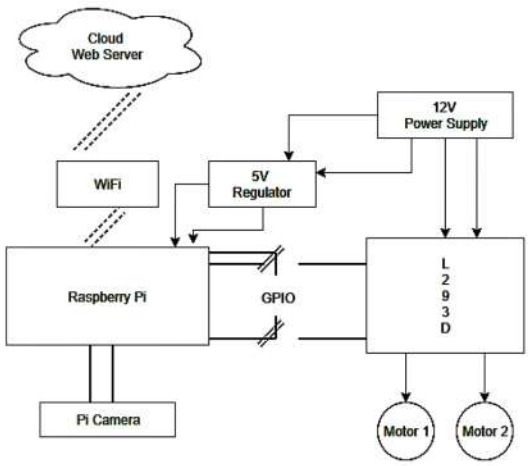


Fig.1. Block Diagram

In Figure 1. Raspberry PI is the main component of the project which carries out the operations of the robot. Here the robot is moved using DC motors which are driven by L293D which is a linear voltage regulator. The function of the regulator is to compare output voltage with a precise reference voltage and adjusts the pass device to maintain constant voltage.[5] The motors are connected in H-Bridge connection form to operate motors in both direction. The Wi-Fi device is used as a wireless interface between operator PC and PI. A Web Application is designed to control the entire robot applications operated on cloud server. The supporting camera is used to provide the live feed. The PI camera is directly interfaced to the Raspberry PI using the PI zero cable strip. Here, two different power sources are used, a 5V constant power source(Vcc1) applied to Raspberry PI with the help of power bank and a 9V battery(Vcc2) to the dc motor driver IC L293D. Here, to check the operating state of robot the internally connected two LEDs are checked (i.e., 5V-Vcc1-Green and 9V-Vcc1-Red) this indicated is robot is ready.

### C. Web Application

Initially, the robot is at stand by i.e., no moment but in active state. The web application page is designed using some basic software's for controlling the robot. Initially, SD card is formatted. Etcher software is used to burn Raspberry PI images to SD card. Raspberry PI is a Linux based system whose IP address is achieved using Angry IP scanner software One of the fastest IP address and port scanner is the Angry IP scanner software. The basic work of this software is to simply ping each IP address to check if it is active or not, and optionally also resolve its hostname, determine the MAC address, scan ports, etc. Further, PuTTY software is used which is a terminal emulation program. It is used to manage or configure a device from PC. It supports SSH, Telnet and Serial ports, so that we can connect directly through serial cable or may take remote session. In this project we are using SSH protocol. A very commonly known cryptographic network protocol is the secure shell. It is used for operating network services securely over an unsecured network. It is widely used for remote login to computer systems by users.6] The video streaming is done using port forwarding method on VLC player software. A vast number of streaming protocols, file formats, video and audio compression techniques are supported by VLC. The streaming of media over computer networks is also possible. VLC is also able to transcode multimedia files. CSS (Cascading Style Sheets) forms presentation layer of web page. It allows to apply visual styling to HTML elements with colors, fonts, layouts, etc.

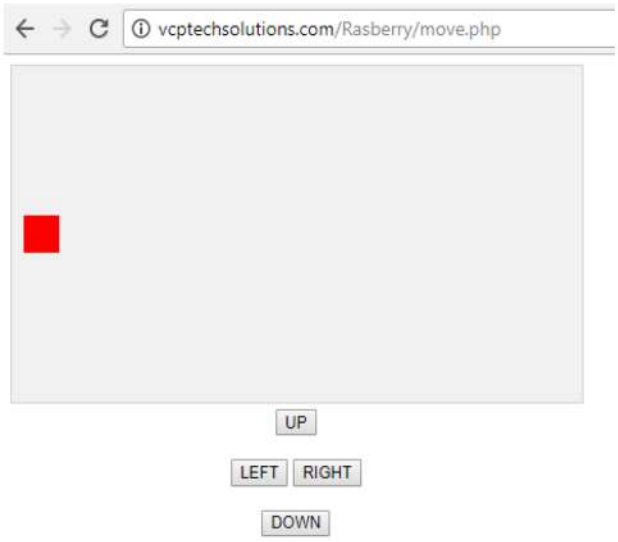


Fig.2. Web Application page

If you click a button the red square will start moving. The movement will stop when you stop pressing the button. We have added the on-touch-start event on the buttons, to make this example work for touch devices.

As shown in the Figure 2., the virtual buttons i.e., up, down, left, right are incorporated with the L293D IC pins. The program is created such that when any pin is pressed the corresponding value will be continuously sent to buffer till the button is released. Similarly, when no key is pressed buffer is continuously updated with value zero for no moment.

### D. Working

The inputs are taken form user. The robot is initially at rest but in active state. The motors are connected in H-bridge connection to operate it in bidirectional way.

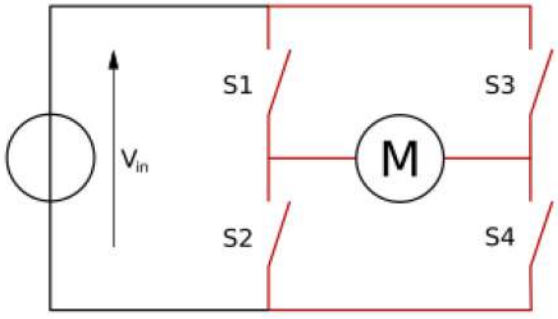


Fig.3. DC Motor in H-Bridge connection

The web application program is incorporated with motor pins such that when either of the virtual button (i.e., up, down, left, right) on web page is pressed the buffers in driver IC is uploaded with corresponding value until the button is released. Similarly, when no button is pressed the buffers are loaded with value zero continuously. For clockwise rotation the switches S1 and S4 are closed and for anti-clockwise vice-versa.

## III. CONCLUSION

This project can be further modified by using an ***infrared camera*** to verify the hot bodies present in the surrounding. Thus, modifying the project to a "***spying robot***" or "***defense thermal surveillance robot***". This project can act as an alternative for human in dangerous situations such as, exposure to high radiations, threat due to natural calamities, etc.

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# IoT Based Heart Attack Detection and Heart Rate Monitoring

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**Abstract- The present health systems and problems are of most importance to human beings. A number of models have been developed that are able to portray and monitor changes in health parameters. The model uses an on the alert buzzer and LCD display that used of monitoring the heart rate of the subject under study. This is low cost, very efficient and flexible heart attack detection and alert system designed using a GSM module sim900. The pulse rate sensors are used to detect heartbeat, measure them and then send the detected signal for further processing such as signaling the data over the internet or checking whether the data exceeds the limit. The PIC processor helps to display the heart rate on LCD which is then also given to alert system. If some large differences are observed between the referenced input and measured heart beats, then an alert will be provided by the model. This system is continuous, real time, safe and accurate in monitoring the heart rates. Analog sensors will be used to measure the heart rate. An analogue to digital converter will convert the sensed analogue data into corresponding digital data. This digital data is transmitted over an IoT. The control system accepts and processes the monitored signal.**

## I. INTRODUCTION

A lot of things have changed, in the new ages of communication and technology because of the rapid development of electronic and electrical devices, smart phones and tablets, which can be used to communicate directly or through wireless medium, which has become one of the most important part of our lives. The new generation technology of this modernized world is Internet of Things (IoT) which connects systems, actuators, devices, sensors, appliances, vehicles and other things. The things or objects could be mobile phones sensors the radio -frequency identification (RFID) tag, and much more. With the help of IoT, we connect anything television and a door sensor, a door bell system to a alert security system, access from any part of the world, and can at any time efficiently access any service and information about any object. The main objective of IoT is to extend the benefits of Internet without re mote control usage and dependence, easy data sharing services, constant connectivity and so on. Using an embedded system is always on and

collecting data, all the devices would be tied to local and global networks. IoT can be used to revolutionize the present medical industry to the next level. The GSM module is used to send alert over IoT. Also, is a buzzer provided to alert the nearby people about the project. [3]

## II. INTERNET OF THINGS

Internet of Things (IoT) technologies are changing the aim of trade world from wire-controlled products to wireless products by using internet-controlled services. The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Internet of Things (IoT) technologies has been with us for a while. During the last two decades, many researchers have made successful advances in smart products, communication protocols and systems, middleware and integration platforms, architectures, and applications. Scientific journals as well as management magazines profile cutting-edge IoT developments. However, less attention has been given to the IoT's economic impact. [5]


Figure 1: Internet of Things

## III. MEDICAL AND HEALTHCARE SYSTEMS

IoT devices also used in medicine for remote health monitoring and emergency notification systems. The health

monitored by sensors can also be equipped within living spaces to monitor the health and this is generally useful for senior citizens. The system we proposed is combination of remote health monitoring and emergency monitoring system using some wearable device like smart bands. We are developing a device that reduces fatalities by early detection of heart attack. In our proposed system we will be using smart bands or devices that are easily available in the market. [2]

## IV. Existing System

The transmitting end of the system uses an AVR microcontroller, ECG leads, Power supply, wireless transmitter module, LCD display and multimedia card (MMC). AVR microcontroller is an 8-bit RISC Atmel microcontroller. The heart's electrical activity is represented using ECG lead system. The electrodes are placed on the chest to measure the heart rate. The ECG lead system can be either uni-polar or bipolar. The uni-polar lead system uses single conductor lead with an electrode at the tip. The bipolar lead system uses two separate conductors. In this system, ZigBee is used as wireless transmitting module. The MMC is a solid state storage device. The ECG leads convert heart beat into pulses. Pulses at the rate of heart beat will be generated and are fed into the micro controller. The microcontroller continuously counts the pulses. If any irregularity in the pulse count is detected, the microcontroller transmits signals to the receiver section through wireless transmitter module. The wireless transmitter module acts as an encoder. [1]

## V. Proposed System

*A). Transmission end*

1. At the transmission end are our principal components:

- GSM
- PIC 16F877A
- Buzzer
- 16x2 LCD Display
- Heart Beat Sensor
- Power Supply
- Sweat Sensor

2. At first the power supply provides power to all the components at the transmitter
3. The LCD display turns on and starts connecting with the receiver through the GSM module.
4. If there is no range in the present place then it continues to reconnect to establish the connection
5. Once the connection is established the system is ready to take the input
6. The input is taken in the plug and play sensor which consists of heart pulse sensor
7. The readings are then given to the PIC controller. The controller checks whether the input which is in the terms of beats is within the permissible range i.e. 70-75bps
8. If the bps excesses the limit then it is checked whether the sweat sensor receives a sweat limit.
9. Sweat is basically a mixer of salt and water. Salt and water together make a great conducting media. The proportion of the salt decides the conductivity of the liquid.
10. The same concept is used for sweat sensor in which we place two conducting plates near to each other and measure the resistance between them.
11. When there is no conducting media between them they act as open circuit. But when they come in contact with sweat, current starts flowing through them proportional to the volume of sweat.
12. If both the condition is satisfied then a buzzer alarm starts to play.

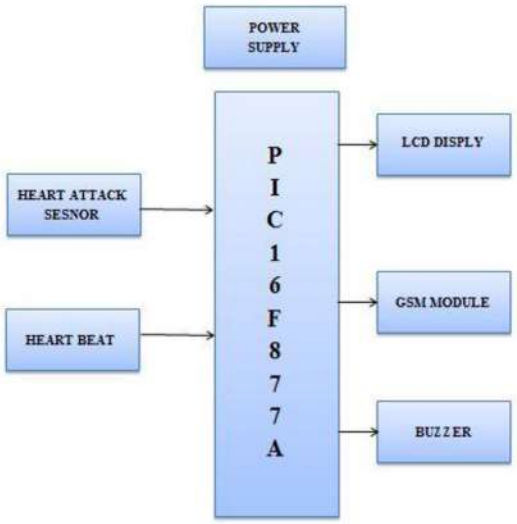


Figure 2 : Transmission End

*B). Receiving End*

1. After the buzzer alarm is send a message alert is send to a website clearly monitoring the beats.
2. Otherwise only the new beat per minute is updated is updated in the website.

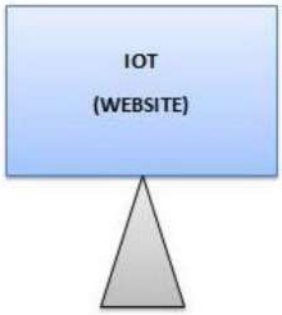


Figure 3: Receiving End Software Webpage

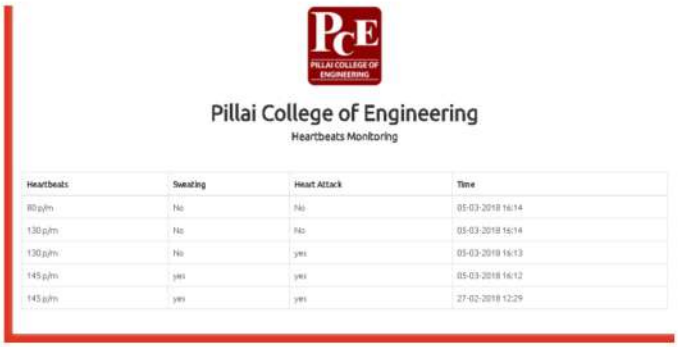


Table 1 : Heart and Sweat rate display using IoT

## VI. CONCLUSION

In Heart Attack Detection system with the help of IoT heart attack can be detected and life can be saved. The existing model and the proposed models showed how small differences in the hardware can overcome big disadvantages such as a complex system. The system is made wireless with the help of IoT.

This system helps people who are more prone to suffer from heart attack and other heart abnormalities. The usage of sensors such as heart rate sensor and sweat sensor gives us more accurate detection of heart attack. Doctors will be notified about the heart attack with the help of alert systems.

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# Alternators in Automobiles

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*Abstract*— **Until 1960s, DC dynamo generator were used in automobiles, but it becomes difficult for dynamo when high voltage bulbs and other peripherals gets introduced in vehicle. So to overcome this problem a new device called "Alternator" came into existence. This was due to the more electrical power consumptions in vehicles. Initially alternators were used in military purposes during WWII [1]. In this paper author discuss about the importance of alternator and its process of recharging the battery at any rpm due to the availability of cheap silicon diode rectifiers and why alternators are better alternative for dyanamo.**

**Keywords- Commutators, dyanamo, alternator**

## I. INTRODUCTION

In 1960 Chrysler Corporation was the first automobile company to introduce alternators in vehicles which was then followed by Ford and General Motors. An alternator is a major component of vehicle charging system which generates electrical power for vehicle. The moment engine starts running, the battery gets charged and the additional electric power is supplied for the vehicle's electrical systems. An alternator is attached to the engine which is driven by a a serpentine belt and it is a maintenance-free unit [1]. When alternator fails the vehicle can work for short period of time on battery power, but will die as soon as the battery charge is depleted.

An alternator is the preferred option in an automotive role as the current can be varied as required, by varying the strength of the magnetic field of the spinning electromagnet. A generator is dependent on it's rotational speed and will always output the same current at a given rpm[4]. Thus alternator is required to charge the battery by using the help of mechanical operation of engine into electrical energy for charging the battery.

## II. WORKING AN DIAGRAM

The block diagram of alternator is given below:

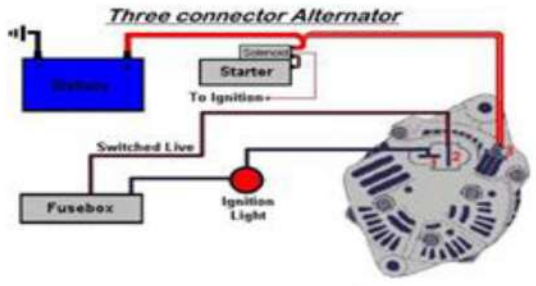


Fig 1.a Block Diagram of Alternator

Alternators are workhouse of power generation industry. It is called as synchronous generator. In alternator electricity is produced by electromagnetic induction. The induced magnetic field should rotate either in the direction of coil or coil should rotate in the direction of magnetic field. Salient pole rotor and amateur coil are the main components in alternator, in alternator rotor rotates which produces rotating magnetic flux and amateur remains stationary and the magnetic flux induces electricity in amateur coil. This AC electricity produced then converted into DC by the commutator and brushes. Nowadays modern trucks Lundell alternators are used. It is a wound-field three-phase synchronous generator containing an internal three-phase diode rectifier and voltage regulator.

### Compact alternator

Fig 1.b Compact Alternator

Compact alternators are also designed in modern vehicles which are similar to designs of previous alternators layout the only difference is that it contains a better cooling system than the previous ones The casing has distinctive radial vent slots at each end which is enclosed with fans. The stator windings contains a dense central band where iron core and copper windings are tightly packed which creates closer core spacing which improves the magnetic efficiency. The noise produced by the enclosed fans is less generally at high machine speed. Hydrogen cooling system played an important and efficient role in modern alternators.

## III. ALTERNATOR VS GENERATOR

Alternator and Generator both have same function of producing electricity by mechanical energy but they differ by following factors

- In generator the armature spins which limits the rpm of generator and it can without damaging itself. Meanwhile in alternator the armature remains stationary and the magnetic field around it rotates which solves the problem of high rpm.
- Alternator is lighter compared to generator and alternator also have the ability to charge the battery at idle or low rpm.
- Alternators are easy to repair as compared to generator. An modern alternator can run up to eighty to one hundred thousand miles with little maintenance.

## IV. TYPES OF ALTERNATOR

- One wire alternator

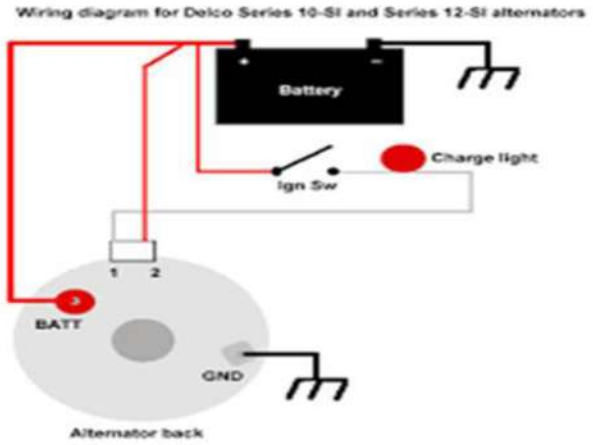


Fig 1.c One Wire Alternator

Alternators that have one positive wire connected to the alternator has the ground connected to its case. These alternators are provided with separate ground terminals to battery and alternators. As shown in the figure one terminal of alternator and battery are connected to each other with help of jumper wire [2].

Two wire alternator

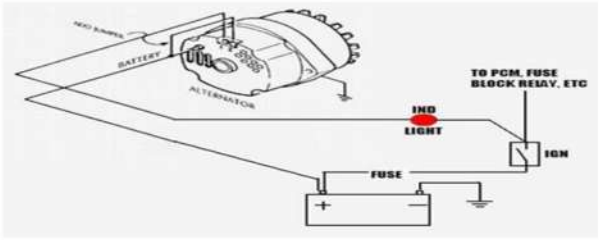


Fig 2.a Two Wire Alternator

Alternators that have two wires connected to them are self excite. The two wires connected to the alternators are the positive and negative cables. Similarly like a one wire alternator one terminal of alternator and battery are connected to each other with help of jumper wire [2].

- Three wire alternator

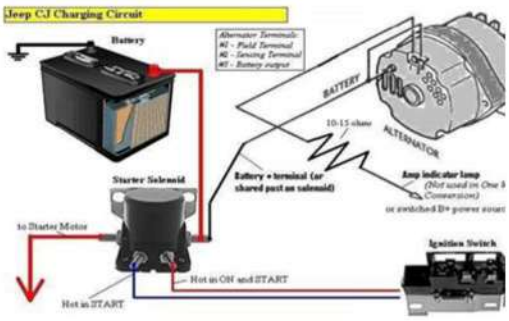


Fig 2.b Three Wire Alternator

Alternators that have three wires connected to them could be ignition excite or self excite with remote voltage sense or lamp.

## V. ADVANTAGE OF ALTERNATOR OVER DYNAMO

The function of alternators and dynamo is similar that is they both are used to produce direct current to recharge the battery. There are several advantages of alternator over dynamo they are lighter, cheaper and more rugged. The brushes in an alternator carry only excitation current, a small fraction of the current carried by the brushes of a DC generator, which carry the generator's entire output. A set of rectifiers is required to convert AC to DC. Alternators can operate at different RPM, and this variation in RPM does not contains any problem as alternating current gets rectified by direct current through rectifiers.

On other hand as the number of components are increasing in automotives the current required for sensors, dashboard etc are also more so in dynamo as load gets added it can give handle a limited number of components an if number of components exceeds it may leads to overheating or burning of dynamo takes place but it is not similar in alternator as it is dependent on the generation of rpm and to avoid overheating it is provided with the casing that has a distinctive radial vent slots at each end with a fan. Nowadays modern alternators consists of hydrogen cooling.

## VI. APPLICATIONS

1. Used in diesel engine train to provide electricity for traction motors [3].
2. Used in yacht as marine alternators to conserve power and are designed as explosion proof.
3. It is used in radio alternator as a high frequency alternator of the variable reluctance type commercially to radio transmission in the low frequency radio bands.

## VII. FUTURE SCOPE

As there is a growth in population there has been increase in demands for the installation of new electronic devices in vehicles essential for the development of automotives. Future technologies may include use of alternator in electric cars or invention of new technologies in form of regenerative braking which can be useful for the conservation of energy and needful for the greener future.

## VIII. CONCLUSION

Alternator is one of the most important components in car if alternator fails this would lead discharge of battery which causes dim lights and weak electronics. Alternator is

efficient for charging the battery at any RPM. Thus by further development and its more usage in future it can be very beneficial for conservation of energy and countries economy.

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# High Gain Wideband Antenna for WiMAX and Satellite Applications

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***Abstract*— This report proposes a low cost, high gain and wideband Fabry-Perot Cavity (FPC) with rectangular array of square parasitic patch on a FR4 substrate. The patches are at the bottom of FR4 substrate of dielectric constant 4.4 and released in air at 0.55 $\lambda_0$ height. The antenna structure consist of microstrip antenna using Partially Reflecting Surface(PRS) layers fabricated on a low cost substrate i.e air($\varepsilon_r = 1$) at 2mm.Constant high-gain and broad-band performance is obtained by resonating antenna array patches at different frequencies in 5.725–6.4GHz band, which covers 5.725–5.875GHz ISM band and 5.9–6.4GHz up-link C-band for satellite communication. The structure provides more than 10dBi gain, less than -20dB cross polarization, more than 80 per cent antenna efficiency. The measured VSWR is less than 2 over the frequency band of interest. The proposed antenna is an attractive solution for several wireless communication systems. To meet the miniaturization requirement, compact antennas are required. The design is analysed by IE3D software which shows the simulated result of the proposed antenna.**

***Index Terms*— High gain wideband antenna, FR4 substrate, ISM band, C band, Fabry-Perot Cavity.**

## I. INTRODUCTION

Micro strip Antenna (MSA) is a low gain, narrow bandwidth and low efficiency antenna. Improving MSA gain, bandwidth has been a great attraction in antenna designing. High gain wideband antennas are realized by line fed antenna arrays, but a single-feed antenna system is always desirable. Reflect array avoids the feed-line network but suffers from low efficiency [1–2]. Therefore FPC techniques are used in gain enhancement. Gain of FPC antenna depends on the reflection coefficient of Partially Reflecting Surface (PRS) and radiation characteristic of feed antenna. The gain of PRS antenna depends on the feed element and the reflection coefficient of PRS. It has been shown that, larger systems can have more directivity but they suffer from low efficiency [3]. To achieve high gain antenna, Parasitic Patches (PPs) are arranged below the superstrate. MSA in the form of arrays are used in satellite imaging systems. GSM (Global System for Mobile), Bluetooth, GPS (Global Positioning System) etc.

In this paper, easy to design, low cross-polarized, constant high-gain broad-band antenna structures comprising Feed Patch Array (FPA) superstrate layer are experimentally investigated. Details of antenna structure design, geometry, and simulation and measurement results are described in following sections. [5]

## II. ANTENNA GEOMETRY AND DESIGN THEORY

The antenna structure is shown in Figure1.MSA consisting of ground plane and a metallic Feed Patch (FP) of 0.5 mm thickness placed at a height h = 2 mm from the ground plane is designed. The PPs are fabricated at the bottom side of 1.59 mm thick FR4 superstrate and placed at height hs =0.55 $\lambda_0$ from the rectangular ground. Air is used as a dielectric medium between ground plane, FP, and superstrate. FP is fed through a 50 Ω coaxial probe at point 5 on patch. Superstrate layer is placed at $0.55\lambda_0$, where $\lambda_0$ is the free space wavelength at central frequency 6.0 GHz. The loss tangent of FR4 is 0.002 and the dielectric constant is given as 4.4.

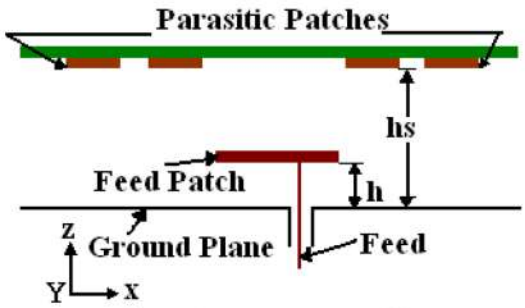


Fig.1. Antenna structure [3]

Gain ,bandwidth and the Radiation pattern of such structure varies with the size of PPs and the spacing between them. It also varies with the height between FR4 superstrate and ground plane. If reflection coefficient of the PRS is $\rho e^{j\varphi}$ and *f(α)* is the normalized field pattern of FP, then normalized electric field E and power S at an angle α to the normal is derived in [3-6] as,

$$|E| = \sqrt{\frac{1-\rho^2}{1+\rho^2-2\rho\cos\phi}} f(\alpha) \quad \text{And } s = \frac{1-\rho^2}{1+\rho^2-2\rho\cos\phi} f^2(\alpha) \tag{1}$$

Where, $\phi$is the phase difference between waves emanating from PRS. Resonant distance $L_r$ between ground plane and PRS is given by [3-6].

$$L_r = \left(\frac{\varphi_0}{360} - 0.5\right)\frac{\lambda}{2} + N\frac{\lambda}{2} \tag{2}$$

Where, $\varphi_0$is phase angle of reflection coefficient of the PRS in degree and N=0, 1, 2, 3 etc.

(1) Calculation for patch dimensions:

a) Width of the patch

$$w = \frac{c}{2f_0\sqrt{\frac{\epsilon_r+1}{2}}} \tag{3}$$

b) Effective dielectric constant

$$\epsilon_{eff} = \frac{\epsilon_r+1}{2} + \frac{\epsilon_r-1}{2}\left[1+\frac{12h}{w}\right]^{-\frac{1}{2}} \tag{4}$$

c) Length of the patch

$$L_{eff} = \frac{c}{2f_0\sqrt{\epsilon_{eff}}} \quad (5)$$

d) Length extension

$$\Delta L = 0.412\frac{(\epsilon_{eff}+0.3)\left(\frac{w}{h}+0.264\right)}{(\epsilon_{eff}-0.258)\left(\frac{w}{h}+0.8\right)} \quad (6)$$

Hence the length of the patch is,

e) $L = L_{eff} - 2\Delta L$ (7)

(2) Calculation for ground dimensions:
The ground plane dimensions are 6 times greater than that of patch dimensions.

f) $L_g = 6h + L \qquad w_g = 6h + w$ (8)

## III. DESIGN AND ANALYSIS ON INFINITE GROUNDPLANE

| Antenna structure | Frequency band | Peak gain |
|---|---|---|
| MSA | 5.8-6.12GHz | 9.8 dB |
| Superstrate | 5.8-6.1GHz | 11.9 dB |
| 1 PP | 5.75-6.0GHz | 13 dB |
| 2 × 2 SPPA | 5.7-6.0GHz | 13 dB |
| 3 × 3 SPPA | 5.7-5.9GHz | 14.5 dB |

Table 1 Frequency and gain of designed antenna structures

A metal plated patch is designed of dimension 22.22mm ×25mm at height $h$ = 2mm on infinite ground plane to operate over 5.725–6.4GHz band, which provides gain of 9.8 dB.

Then, a FR4 superstrate is placed above it at height $hs$ = 0.55λ0 from ground plane. The Structure is optimized to compensate resulting capacitive impedance caused by superstrate and results increase in gain of 11.9 db. Then a single patch of dimension 11 × 11 is placed in the center at the bottom of the FR4 superstrate which provides gain up to 13dB and wideband Structure is optimized. Then, 2×2 SPPA is designed results into increase in gain and referred as Square Parasitic Patch Arrays( SPPA).Similar design procedure is followed for higher order SPPAs.To achieve high gain, 'hs' is optimized. As a result, impedance bandwidth is improved and VSWR less than 2 is obtained over 5.725–6.4 GHz. Then, 3×3 SPPA is designed in at the bottom of the superstrate layer. The optimized structure provides peak gain of 14.5 dB gain. Distance between PPs is also optimized to obtain desired gain bandwidth performance.

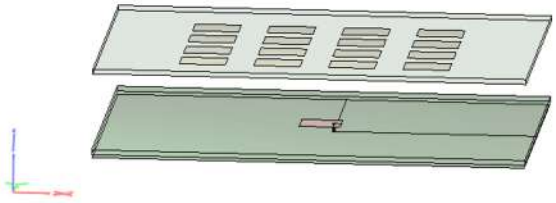

Fig.2. 3D model of antenna structure

## IV. DESIGN AND ANALYSIS ON INFINITE GROUNDPLANE

| Antenna structure | Frequency band | Peak gain |
|---|---|---|
| 4 × 4 SPPA | 5.75-6.4GHz | 16.5 dB |

Table 2 Frequency and gain of designed antenna

A 4×4 SPPA structure is designed at finite ground plane which resonates over 5.725–6.4GHz band, which provides peak gain of 16.5dB. Gain increases slightly with finite ground due to constructive interference between radiated and reflected waves at particular dimensions of finite ground. It can be observed from above fig.2 that, PPs are of same dimensions and located at a distance of 15mm. All PPs are designed to resonate at 5.725-6.4GHz. PPs contribute in gain improvement maintaining the desired bandwidth of feed patch array (FPA). The 4x4 SPPA is fabricated and the result is obtained. It provides bandwidth of 5.75-6.4GHz. The percentage bandwidth of the proposed antenna is greater than 10 %.

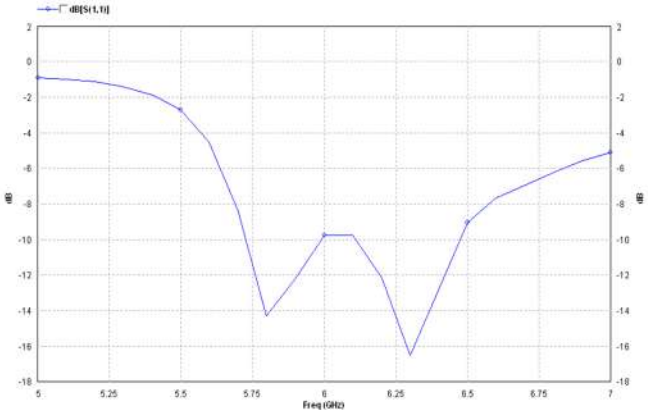

Fig.3. S-parameter

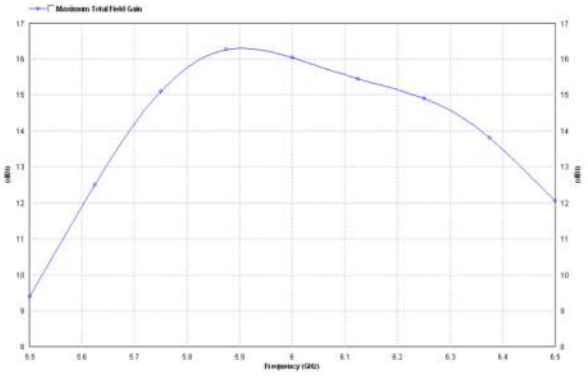

Fig.4. Gain vs. Frequency

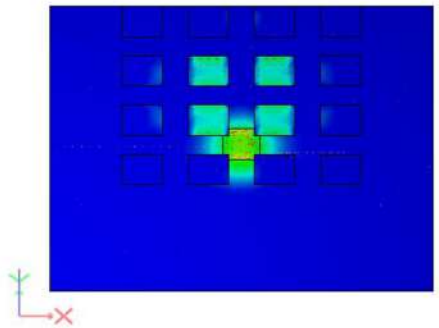

Fig.5(a). Current distribution at 5.8GHz

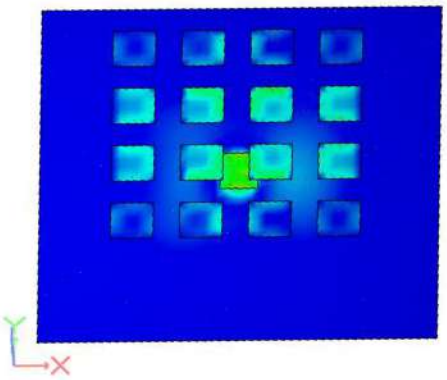

Fig.5(b). Current distribution at 5.8GHz

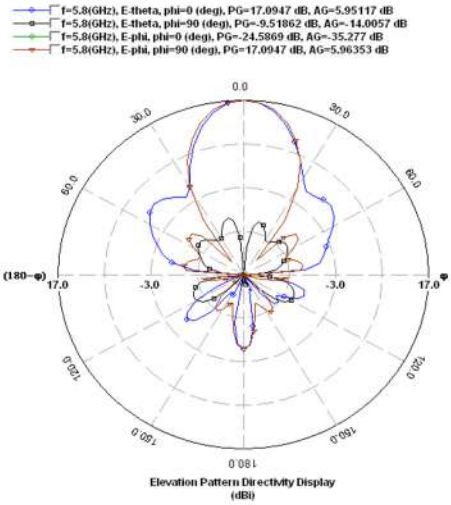


Fig.6(a). Radiation pattern at 5.8GHz

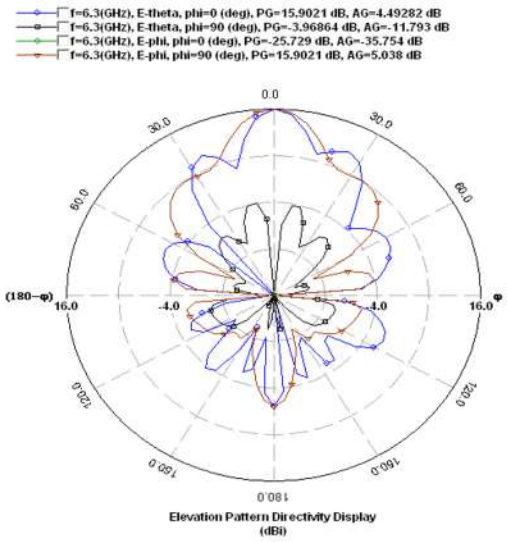


Fig.6(b). Radiation pattern at 6.3GHz

Figure 5(a) and 5(b) shows the vector current distribution in structure at 5.8GHz and 6.3GHz. The current induced in PPs is nearly in phase and its amplitude decreases as its distance from FP increases [5].The superstrate affects the phase and amplitude distribution of fields. It has focusing effect, which increases the effective aperture area, resulting in gain improvement. Radiation patterns on finite ground are shown in Figure.6 (a) and 6(b). Measured VSWR is less than 2 for all designed structures. Operating frequency is inversely proportional to the length of patch antenna. The length of patch is varied to achieve the required resonant frequency. Distance between patch and ground plane is inversely proportional to capacitance of the antenna. For high bandwidth antenna should be more capacitive as shown in figure.7.

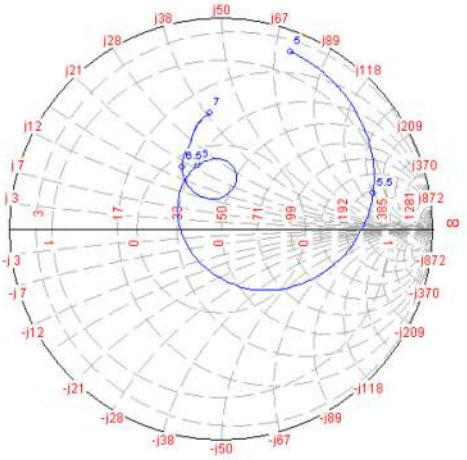

Fig.7. Smith chart

## IV. CONCLUSION

A low cost, high gain and wideband Fabry-Perot Cavity with rectangular array of square parasitic patch on an easily available FR4 substrate is proposed. Impedance and radiation pattern, current distribution, bandwidth characteristics are observed. The antenna structure provides gain of 16.5dB.Percentage bandwidth greater than 10% is obtained.The results obtained indicate that the proposed antenna is capable of generating efficient radiation pattern in the desired frequency band.

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# Life Saving Suitcase

## Real Time Measurement of ECG and EEG using LabVIEW

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*Abstract*— **We need to use different machines for generation of ECG as well as EEG signals. But here in this project we are going to make a device which can be able to produce both the signals from same sensors. ECG and EEG are used to measure heart rate and brain waves for procedures such as polysomnography or the hybrid brain computer interface (BCI). We can separate the waveforms by using appropriate methods. By changing the position of the sensors we can obtain an ECG or an EEG waveform. In a condition where both of them are useful to monitor the abnormal behavior of the patient, this project is useful.**

***Keywords-*** *ECG, EEG, combine ECG and EEG*

### I. INTRODUCTION

Electrocardiography is a process where the electrical activity of the heart is recorded over a period of time, using electrodes place on the skin. The tiny electrical changes in the skin is detected by these electrodes that arise from the heart muscle electro-physiologic pattern of re-polarizing and depolarizing during each heartbeat. It is a very commonly performed cardiology test. The overall goal of performing electrocardiography is to obtain information about the function and structure of the heart. A machine that is used to perform electrocardiography, and produces the electrocardiogram is called an electrocardiograph..

An electrophysiological monitoring method to record electrical activity of the brain is called Electroencephalography (EEG). With the electrodes placed along the scalp, it is thus non-invasive. Electrocorticography uses invasive electrodes. Voltage fluctuations are measured by EEG resulting from ionic current within the neurons of the brain. Epilepsy is diagnosed using EEG, which causes abnormalities in EEG readings. It is also used to diagnose depth of coma, encephalopathies, anesthesia, sleep disorders, and brain death. EEG used to be a first-line method of diagnosis for stroke, tumors and other focal brain disorders, but with the advent of high-resolution anatomical imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) and its use is decreased. Despite limited spatial resolution, EEG continues to be a valuable tool for diagnosis and research . It is one of the few mobile techniques available and offers millisecond-range temporal resolution which is not possible with MRI,

CT, or PET.

### II. PROPOSED SYSTEM

A standard EEG signal usually is measured with an ear reference. In some rare cases, the ECG components, which are regarded as artifacts to be removed, can be observed in the EEG signal, although the recording of EEG does not always acquire the ECG component. The reference electrode is tried to move used for the EEG recording from the ear to a non-cephalic location in order to more reliably obtain ECG components in EEG measurements; this reference electrode was described as a non-cephalic reference (NCR) electrode. The ECG components measured with the NCR electrode were sufficiently strong as compared to the components of EEG to allow for further processing. We found that EEG and ECG components could be obtained in a single measurement if an EEG-ECG combined signal from the NCR electrode is separated into two components by using an appropriate method and displayed the strongest one. Our current objective is to develop a signal processing algorithm that can separate the EEG and ECG signals to extract EEG components in the frequency domain and detect peaks of the R wave of the ECG for a heart rate analysis. Generally, the SAECG method is used to remove ECG artifacts from the EEG signal (however, in our study, the ECG component was not treated as an artifact to be eliminated). Nevertheless, the resultant signal contains some non-negligible residual ECG components, which have harmful effects in terms of EEG frequency analysis. In our research wavelet transformation was used to remove residual components attributed to the SAECG, and most frequency components of EEG were extracted from EEG-ECG combined signal measured with the NCR electrode.

The other two methods were realized in the opposite manner as the first method; regarding the ECG as the major signal and the EEG as a type of EMG-like noise, from the raw signal to obtain an estimated ECG, the EEG signal was removed first. In the combined EEG-ECG signal was decomposed by five scale levels and the wavelet shrinkage, a technique to eliminate noise from the ECG, was performed to separate EEG components from the combined EEG-ECG signal. Because the shrinkage function was ineffective for approximation level five, we proposed a processing method based on cosine window function. A combination of wavelet shrinkage and the cosine window function could separate the EEG and ECG components from the mixed signal, implying that denoising algorithms for the ECG signal can be applied to separaste EEG and ECG components. In the application of the cosine window function proposed in was improved. In approximation level five, the wavelet coefficient was

determined using a window function of a fixed size. However, given the fluctuations of ECG durations, a variable window size is preferable, and thus, a variable window operation was proposed. Although the shape of the separated ECG components was rough, this method was shown to separate EEG and ECG signals that included ectopic beats, which was a significant feature among the three methods because the SAECG-based method could not distinguish ectopic beats. and ECG components depended on the periodicity of the ECG component. These processes were not suitable when the separated EEG and ECG components had to be applied on a real-time basis, such as in the hybrid BCI, because the analysis of the EEG signal must be controlled by the periodicity of the ECG component. Therefore, a method that is not regulated by the periodicity of the ECG component would be more effective for a real-time EEG-based analysis.

## III. LITERATURE SURVEY

After going through some research papers for collecting information about our project, we have decide to form a device to measure ECG and EEG device such that it will be portable and cost effective.

ECG and EEG are used for monitoring the activities of heart and brain. ECG helps in monitoring cardiac activity which I turn helps us prevent some possible threats like cardiac arrest and any dysfunction. While EEG helps us to monitor our brain activities like information about its proper functioning and disorders if any, for example for a person in coma.

### *2.1 Willem Einthoven*

Before Einthoven's time it was known that heat beats produces electrical impulses but the instrument of that time could not accurately measure this phenomenon. Thus he invented a machine for monitoring the same and named it Electrocardiogram in 1903. This machine needed to be made compatible with body considering the insulation due to flesh. Thus galvanometer string was developed which allowed us to monitor heart effectively. Einthoven was again awarded Nobel Prize in 1924 for inventing first practical system for electrocardiography.

### *2.2 R.Prakash and B.Paulchamy, "Remote Monitoring Of ECG and Body Temperature Signals"*

The project represented a problem of Real Time processing of ECG signal from patients by mobile embedded monitoring stations. Two ECG measurement devices were used in real tests. A two ECG channel bipolar ECG CorBelt and a 12channels ECG device BlueECG. Due to a problem of processing a 12channels ECG from ECG device by Bluetooth to mobile stations, the problem of packet parsing was discussed and two possible solutions were focused on. Another important part in biomedical data processing is visualization. A WindowsPresentation Foundation solution was presented and tested. Mobile embedded monitoring stations are based on MicrosoftWindows Mobile operating system. The whole system is based on the architecture of DOTNET Framework, DOTNETCompact Framework, DOTNET Micro Framework and Microsoft SQL Server. The project was successfully tested in real.

### *2.3 Hans Berger*

In 1924, Berger made the first EEG recording of human brain activity and called it Electroencephalogram. Using the EEG he was also the first to describe the different waves or rhythms which were present in the normal and abnormal brain, such as the alpha wave rhythm (7.812–13.28 Hz), also known as "Berger's wave"; and its suppression (substitution by the faster beta waves) when the subject opens the eyes (the so-called alpha blockade). He also studied and described for the first time the nature of EEG alterations in brain diseases such as epilepsy.

### *2.4 Tsuyoshi Sekitani, Shusuke Yoshimoto, Teppei Araki and TakafumiUemura,"Invited paper: A Sheet-type wireless electrocephalogram (EEG) sensor system using flexible and stretchable electronics"*

A sheet-type wireless electroencephalogram (EEG) sensor system using flexible and stretchable electronics has been successfully developed on flexible substrates. c. The sensor is compactly designed for 3 cm × 9 cm × 6 mm with weight of 12 g. Results show that the proposed sheet-system demonstrates a promising performance in diagnosing brain-related diseases including the Alzheimer's disease using frequency domain analysis.

### *2.5 Barry R. Greene, Geraldine B. Boylan, Richard B. Reilly, Philip de Chazal, Sean Connolly, "Combination of EEG and ECG for improved automatic neonatal seizure detection"*

This paper introduced a nonlinear state space projection based technique to extract the EEG and ECG component from common signal (EEG signal). One of the three methods is used depending on its simplicity.

## IV. WORKING

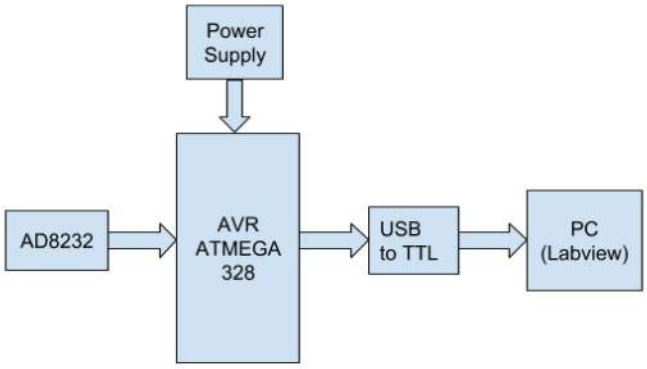


Fig 1

For power supply we are using adapter to input of power supply. Adapter convert AC signal into DC, its 12v DC. Power supply convert 12v dc into 9v DC.

The AD8232 is an integrated signal conditioning block for ECG, EEG other biopotential measurement applications. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement. The output signal of AD8232 goes to controller, and then the controller will send the calculated signal data to the PC to process in

Labview through USB to TTL

AVR ATMEGA 328 controller will perform operation on the signal obtained and hence will separate the unwanted signal and noise. The connection between controller and PC will be wired communication using USB to TTL serial cables. The obtained final output that is ECG and EEG waveforms will be observed on LabVIEW.

## V. CONCLUSION

The separate methods to calculate EEG &ECG are already present. Here in our project we are going to perform various operations on the common signal and then separate different waveforms. There are three methods to do this signal separation, out of which we are going to perform signal averaging and wavelet transform on the given signal as it is easy to perform and then display the signal on LabVIEW software.

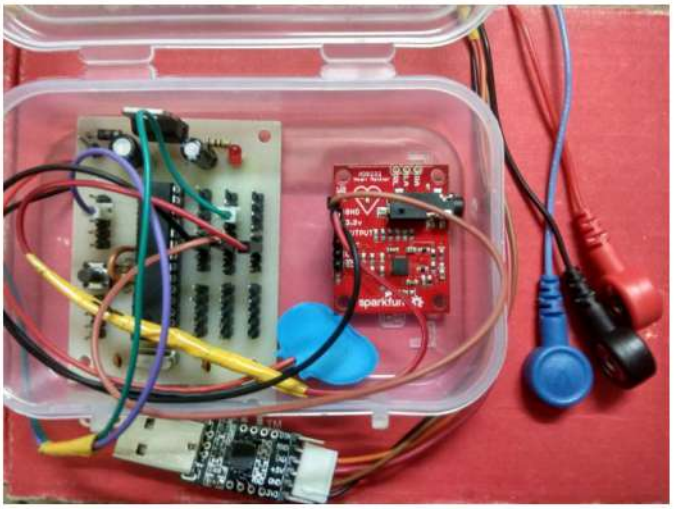

Fig 2

## VI. FUTURE SCOPE

We can save and separately transmit both the signals via emails to experienced doctors located at far distance; this is useful for people living in remote areas to take medical advices from any experienced doctor.

## VII. ACKNOWLEDGEMENT

It gives great pleasure to present this project report on " Life Saving Suitcase: Real Time Measurement of ECG & EEG Using LabVIEW". 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. Rubina Shaikh for her valuable suggestions, support and timely guidance at every step during course of our project. Our sincere thanks to Dr Avinash Vaidya, head of the department for his timely guidance and cooperation throughout the period. Also thanks to our principal Dr. R. I. K. Moorthy, for his support and providing us with all the facilities. Last but not the least, we owe to all those who directly and indirectly helped us for successful completion of our project.

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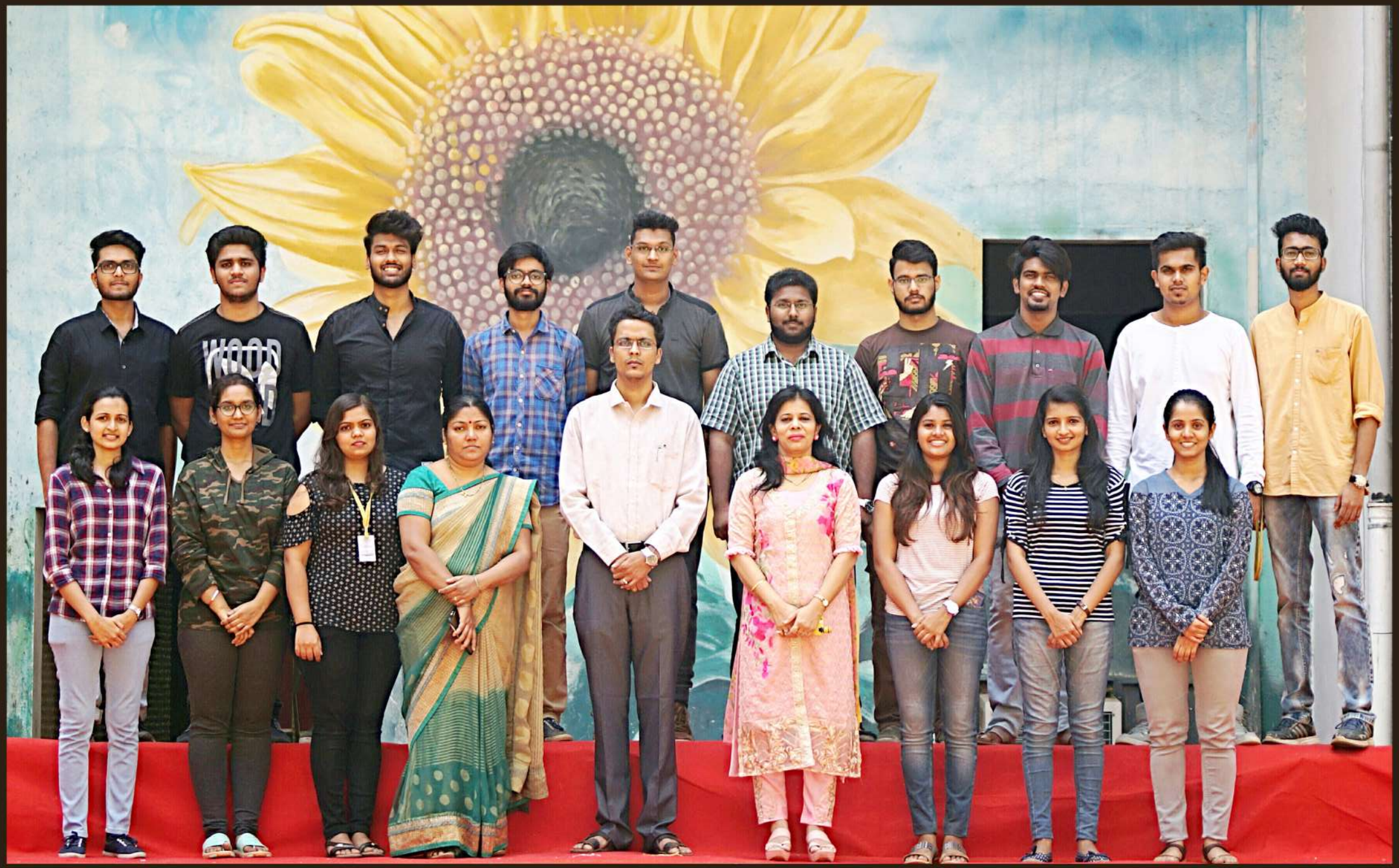

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