



9125-SRI RAAJA RAAJAN COLLEGE OF ENGINEERING AND TECHNOLOGY

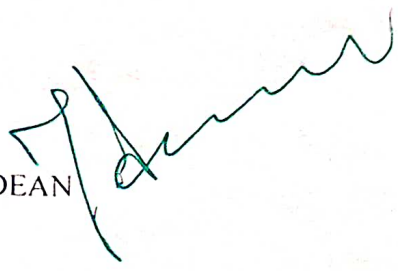
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

INNOVATIVE PROJECTS

All the staffs are hereby inform to prepare the innovative project report as per our design module and submit the report in hard copy to Dean sir on 14.08.2024. Report must be Abstract, Block diagram, Details of the components, Pin diagrams, Hardware and Software requirements, Conclusion.

1. Battery charger for vehicles-Mrs. P.Sheeba AP/EEE
2. Air pollution monitoring- Mrs. R.Priyanka AP/EEE
3. Solar bike- Mr. S.Saravanalingam AP/EEE
4. Fault detection -Mrs. A.Iniyameenal AP/EEE
5. Safety helmet- Selvi R.Abarna Lecturer/EEE

1. 
HOD/EEE

DEAN 



Introduction

Global warming is one of the major problems the world has been facing due to pollution and other factors that lead to the increase of carbon dioxide in the atmosphere. People have been looking for many solutions to help decrease this problem and to avoid causing more damage to the earth. A huge factor that has been playing a large role in causing pollution and therefore increasing the effect of global warming is car exhaust as recorded in 2004 (IPCC 2007, p 29). People have been looking for alternatives to this problem which lead them to focusing on studying and learning different ways to create environment friendly methods of transportation. As people are becoming more aware of the negative effect climate change has towards our planet, electrical bikes have been increasing in popularity. Many people are using it as their main form of transport as it is very convenient and does not contribute to global warming. Specifically, in countries where one of their main sources of transport is bikes, China for instance has been selling 9 out of every 10 electrical bikes are sold (Navigant Research, 2014).

Solar Powered Bike is an alternative to many non-environment friendly form of transportation and its design is approached from the electrical bike. We will be mainly focusing on how to efficiently create a solar powered bike which allows you to travel the longest distance possible by properly utilizing energy generated from the sun. As well as improving and creating new technology designs for our bike. We will be also testing and implementing sun trackers on our bike to allow us to utilize the greatest amount of solar energy which will allow us to gain the maximum

Components :

- Solar panel
- BLDC motor
- Battery
- Motor control
- Speedometer
- Battery indicator
- Flywheel

Functional Requirements:

Solar powered motorcycle system will perform several functionalities to achieve the expected outcome as follows:

1. Receive energy from the sun and store it in a rechargeable battery
2. Rotate the sun tracker to follow the sun and light intensity.
3. Rotate the solar panel in -different directions
4. Detect sunlight intensity and collect the required power.
5. Move the bike based connecting and disconnecting the circuit using the stored energy in the battery.

Electrical Design:

A crystalline silicon solar cell has an open voltage (V_{oc}) of about 0.5-0.6 V when fully irradiated and generates short-circuit current (I_{sc}) proportional to the incoming irradiance. To get a useful voltage in a PV system, several cells are thus connected in series and usually mounted in a rigid glass-framed panel. To further increase the voltage, several panels can be series connected and to increase the current, they can be parallel connected

In this way it is possible to configure the amount of series and parallel connections to get a desired voltage and current. To prevent current to flow in the wrong direction, e.g. from a battery to a solar panel -or from one panel to another in a parallel configuration, a blocking diode is usually added on each panel. A diode works- in such a way that when it is forward biased (typically about 0.7-1 V) it conducts and when a negative voltage is applied, it acts-like a circuit breaker.

An example of operation is if an 18 V solar panel is connected to a 12 V battery. During the day, the voltage of the solar panel exceeds the voltage of the battery, and current will thus flow into the battery. On the night however, the solar panel's open voltage will be 0 V and current will thus flow from the battery to the solar panel instead, not only draining the battery but potentially also damaging the solar panel. By adding a diode between the panel and the battery, it is possible to prevent current to flow in the wrong direction night-time while still enabling battery charging daytime.

Power Calculations:

The average mileage of the vehicle with load is upto 110 kms. The time taken for charging the vehicle is 6hrs, while using 48 volt 6 amp charger.

SPECIFICATIONS:

MOTOR:

- Rated Output Power - 750W
- Rated Voltage - 48V DC
- Speed after Reduction - 480 RPM
- Rated Speed - 2800 RPM
- Gear Ratio - 1:6

SOLAR PANEL:

- Full Load Current - 20A
- Output Power - 20 Watts
- Operating Voltage - 24 Volt
- A+ Grade, anti PID Poly Crystalline cells
- Cell Conversion efficiency > 32%

ADVANTAGES:

- Renewable energy source
- Reduces the use of fossil fuels
- Technological development
- Reduces air and noise pollution
- Low maintenance cost

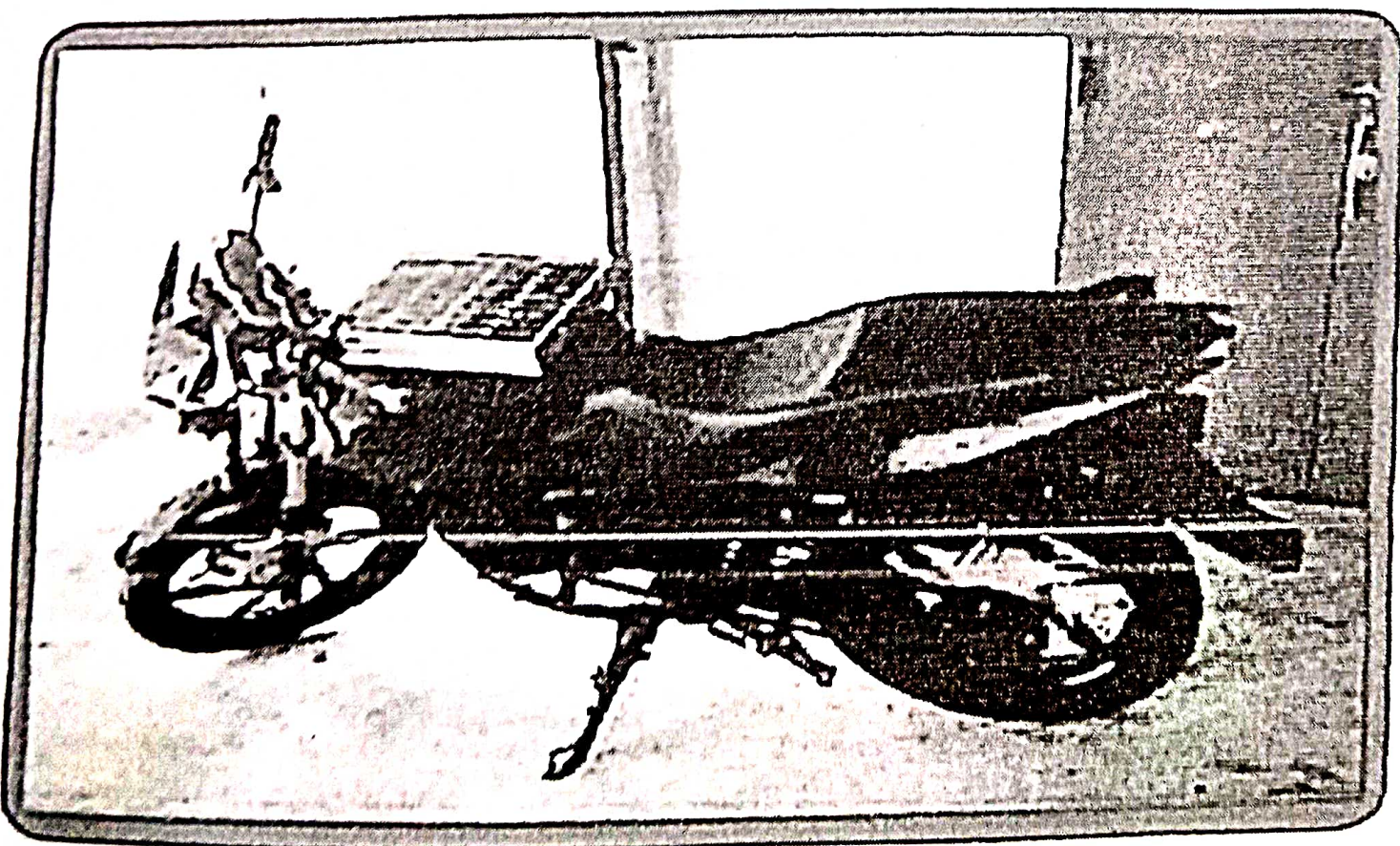
QUOTATION:

SL.NO	ITEMS	QTY	UNIT PRICE	AMOUNT
1	Solar panel	2	4600	9200
2	BLOC motor	1	6000	6000
3	Battery	1	2000	2000
4	Motor control	1	3600	3600
5	Battery indicator	1	550	550
6	Flywheel	1	400	400
7	Old Bike	1	18000	18000
TOTAL				39750

SOLAR BIKE DEMONSTRATION:



FINAL PRODUCT- SOLAR BIKE





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Amaravathipuram - Karaikudi

SAFETY HELMET

INNOVATIVE PROJECT

REPORT

ABSTRACT

According to the law of the Indian government as per section 129 of the motor vehicle act of 1988 briefly explains the motorcycle or two-wheeler rider is mandatory to wear the helmet while driving and the recent survey conducted on road accidents by the world health organization (WHO). This WHO organization has briefly mentioned the cause and the prevention of road accidents that are happened around the world. They also mentioned the highest death rate that took place in India and the survey also reported as per the rate 1.5 lakh of road death has been accounted for by each year approximately. The above article motivates us to develop a system that is capable of providing safety and precaution to the bike rider. We designed a system that is capable of detecting the rider is whether wearing the helmet or not. Then detecting if the rider has consumed alcohol or not, whether if these two conditions are yet satisfied then only the motor will ignite or else it will not ignite. In case an accident occurred, our system is capable of detecting the accident and its location approximately. We implanted the led strip indication in the helmet unit to reduce the percentage of an accident during night times.

INTRODUCTION

Nowadays there are many bike accidents occurred in our country and violation of traffic rules by the riders is increasing upon day by day. Most of the accident cases are due to the negligence of wearing the helmet without any special reason and the rider is not aware of traffic rules. There is no proper awareness and the importance of traffic rules and road safety. The official analysis of road accidents by the national crime records bureau's report on road accidental deaths that more than 500 bike accident cases were filed due to drunken driving or rider under the influence of the drug. To reduce these types of accidental cases for the bike rider, we proposed a system which is capable of providing safety, security, and precaution for the bike riders. We named it a smart safety helmet system. The first process of our system is to check whether the bike rider is wearing the helmet or not. If the bike rider is not wearing the helmet, the vehicle will not start. For that, we are using a force-sensing resistor sensor (FSR), which is capable of sensing the presence of the rider.

2. EXISTING SYSTEM

In the existing system, we can start the bike by the using as a key and we can stop the bike when the rider doesn't wear the helmet. Even though we can't lock the ignition when the rider is drinking mode or during an accident, but we can locate the bike. The helmet is the protective gear to prevent and avoid head injuries in an environment and saves the life of bike riders. This existing idea addresses three main objectives: To ensure the safety of the rider, To the rising modern needs of technological innovations, and To overcome the accident rate. The smart helmet allows vehicle ignition only when the helmet is worn only. An RF Module can be used as a wireless link for communication between transmitter and

receiver. The RF module has a frequency that is easy being hacked or interference by other network signals. If the rider is drunk the ignition gets locked and sends a message to the previously saved number with his location. In case of an accident, it will send a message through GSM along with location with the help of the GPS module, but can't find the exact accident spot as accurate. The message sending is not quick and efficient in the existing system.

DISADVANTAGES:

- The disadvantage of current technology is due to the negligence of riders and the difficulty of implementation of traffic rules by traffic police.
- Riders do not wear a helmet in regions where traffic checking is not done.
- The driver tends to wear a helmet only where they anticipate checking may take place or else they don't wear a helmet.
- The vehicle can be turned on and stolen by bypassing the ignition switch.

ADVANTAGES:

- It is a smart helmet which helps to control the ignition on and off.
- MQ-3 sensor used to find whether the riders are alcohol consumed or not.
- LED strips used in this helmet to indicate the presence of the rider and it is very useful to bike riders in the night.
- It detects fall detection by using a vibrating sensor.
- This smart helmet helps to Locate the bike and rider in accident cases.

BLOCK DIAGRAM:

A. Helmet Unit:

This helmet unit (figure 1) consists of a force sensing resistor, MQ-3 sensor, vibrating sensor, Node MCU, relay driver, led strips.

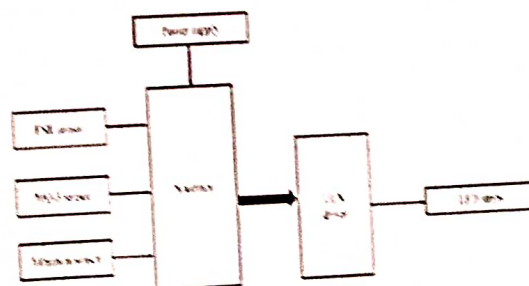
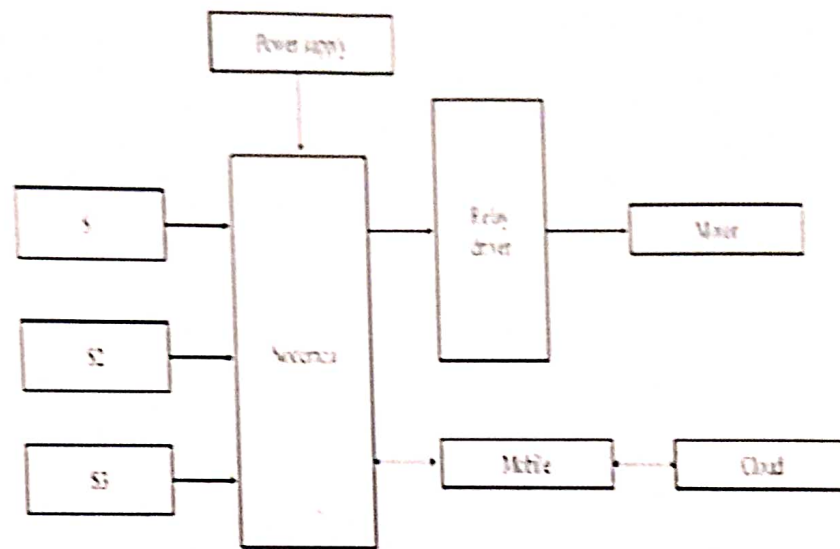


Figure 1. Helmet Unit

These three sensors are implanted in the helmet unit. The sensors read the input value of the rider and using NodeMCU it transfers the data to the bike unit. Led strips are used to provide a signal sign of the bike indication through the helmet unit. We are using relay driver for power shifting to the led strips.

B. BIKE UNIT

The bike unit consists of switch s1, s2, s3, Node MCU, relay driver, motor, cloud. These three switches s1, s2, s3 are used for the indication switches for the led strips in the helmet unit. Then the relay driver is used to drive the motor with the help of the Node MCU. If the helmet unit sends an accident detected then the bike unit sends the data to the cloud. Then the emergency message has been transmitted to the concerned mobile numbers.



RESULTS

The proposed system is implemented by using the NodeMCU and cloud. We have successfully implemented both helmet and bike unit. The helmet unit is connected with the bike unit with the help of Node MCU and it helps to detect or locate the accident spot accurately.

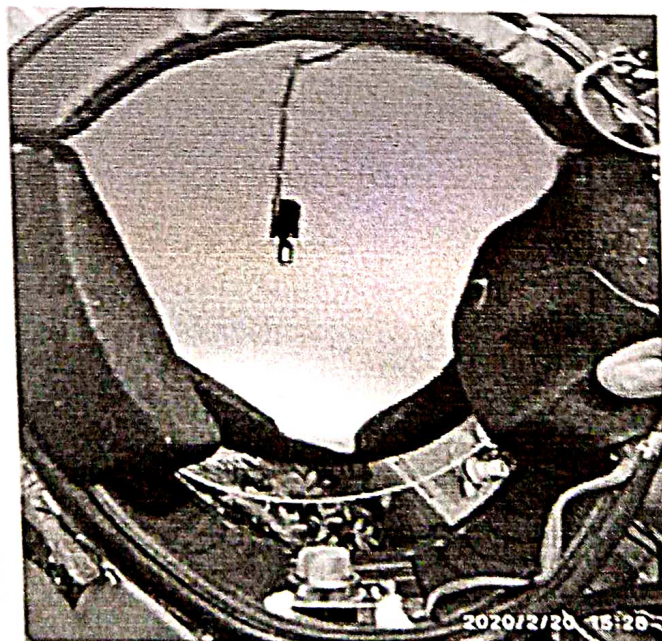


Figure 12. Helmet Unit (inner view)



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A SMART AIR POLLUTION MONITORING SYSTEM

INNOVATIVE PROJECT REPORT

A SMART AIR POLLUTION MONITORING SYSTEM

ABSTRACT

Air pollution affects our day to day activities and quality of life. It poses a threat to the ecosystem and the quality of life on the planet. The dire need to monitor air quality is very glaring, owing to increased industrial activities over the past years. People need to know the extent to which their activities affect air quality. This project proposes an air pollution monitoring system. The system was developed using the Arduino microcontroller. The air pollution monitoring system was designed to monitor and analyze air quality in real-time and log data to a remote server, keeping the data updated over the internet. Air quality measurements were taken based on the Parts per Million (PPM) metrics and analyzed using Microsoft Excel. The air quality measurements taken by the designed system was accurate. The result was displayed on the designed hardware's display interface and could be accessed via the cloud on any smart mobile device.

Keywords: Internet of Things, Pollution, Air, Parts per Million, Quality and Metrics.

1. INTRODUCTION

Air is one of the essential elements of man's surroundings. The earth's atmosphere is full of air which contains gases such as Nitrogen, Oxygen, Carbon Monoxide and traces of some rare elements. Humans need an atmosphere of air that is free from contaminants. This is very crucial for human life and health. Any change in the natural composition of air may cause grave harm to life forms on earth. Air pollution is the presence of one or more contaminants in the atmosphere such as gases in a quantity that can harm humans, animals and plant. Air pollutants are measured in Parts per Million (ppm) or $\mu\text{g}/\text{m}^3$. Primary pollutants are released directly into the atmosphere. Secondary pollutants are produced when the primary pollutant reacts with other atmospheric chemicals. Air quality affects public health. The effect of air pollution ranges from difficulty in breathing, coughing, aggravation of asthma and emphysema. Polluted air can also impair visibility.

Air pollution is accountable for the death of 7 million persons worldwide each year or one in eight premature deaths yearly. Almost 570,000 children under the age of five die every year from respiratory infection linked to indoor/outdoor pollution and second-hand smoke. Children exposed to air pollution have an elevated risk of developing chronic respiratory problems such as asthma. In the monitoring of air pollution, several researchers worldwide have developed models to monitor many of the pollution gases such as Sulphur Dioxide (SO_2), Carbon Monoxide (CO), Carbon Dioxide (CO_2), Nitrogen Oxides (NO) etc. This paper focuses on the design and implementation of a smart air pollutant monitoring system. It discusses how the level of pollutants in the air can be monitored using a gas sensor, Arduino microcontroller and a Wi-Fi module. The main objective of this paper is to design a smart air pollution monitoring system that can monitor, analyse and log data about air quality to a remote server and keep the data up to date over the internet.

2. RELATED WORKS

A wireless distributed mobile air pollution monitoring system using General Packet Radio Service (GPRS) sensors was reported in [1]. Advancements in wireless communication and sensor technology are rapidly changing air pollution monitoring paradigm [8]. Internet of things (IoT) also allows the creation of smart environments in which objects interact and cooperate with each other. A lot of improvements have been made to existing air pollution monitoring systems. For example, [2] proposed a system for monitoring air quality at home. The system transmits sensor data wirelessly by making use of the "request and respond" protocol along with a combination of address and data centric protocols. The system monitors the indoor air quality of a home and displays the sensor reading on a screen. The researchers in [3] employed an Unmanned Aerial Vehicle (UAV) based system to monitor the air pollution in areas with poor accessibility. The MQ135 gas sensor was used to sense different type of dangerous gases and the Arduino microcontroller controls the entire process. Software technologies like image processing and machine learning were used in [4] to monitor some parameters and big data techniques was used to analyse sensor values for the prediction of future values. The system was very stable and effective. However, there was a need to make the system auto-communicative to reduce processing time. The system can also be automated for real-time monitoring which will help to increase industrial

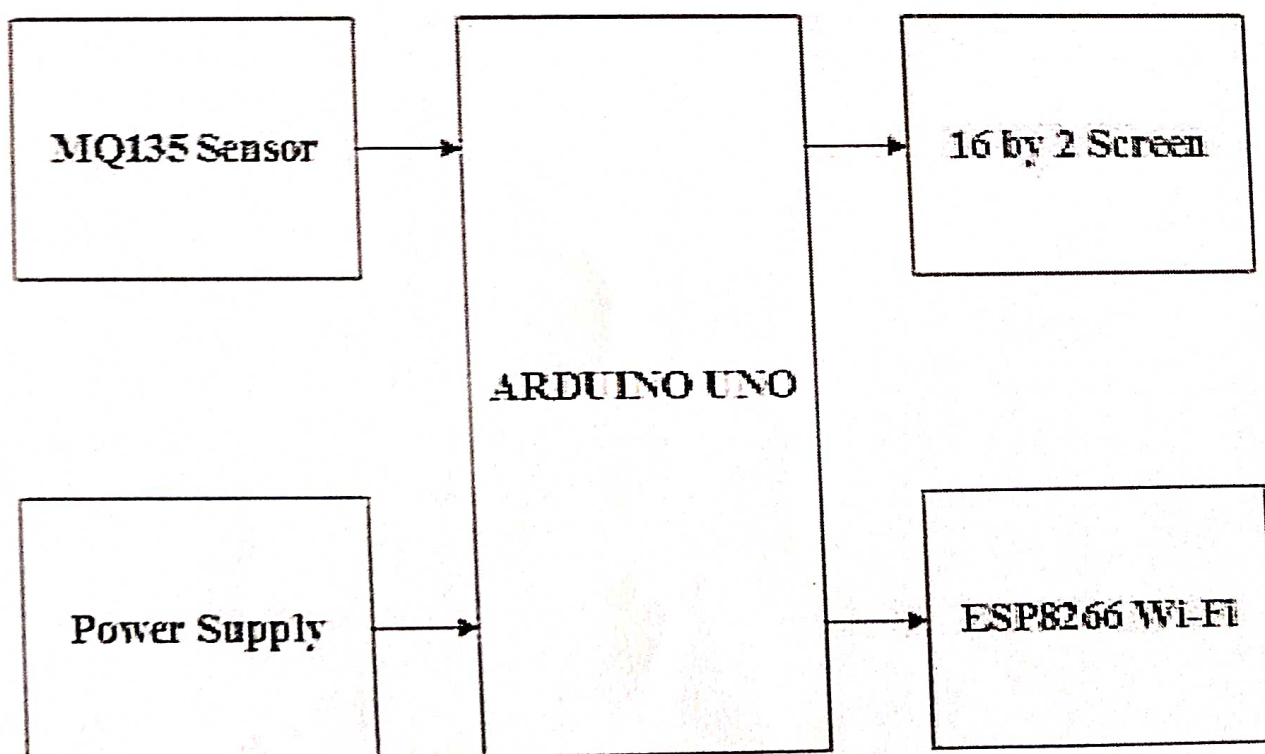
output . A real-time air pollution monitoring system in employed IoT based on a large number of sensors. The obtained data was analyzed using neural network. The system achieved a better monitoring accuracy due to its use of a large number of sensors. The use of IoT devices enabled the air pollution monitoring system to be smart and scalable.

3. WORKING PRINCIPLE OF PROPOSED SYSTEM

The model was designed using an Arduino Uno microcontroller, Wi-Fi module 8266, MQ135 Gas Sensor and a 16 by 2 liquid crystal display (LCD) Screen. The first layer was the environmental parameters which are obtained by measurement. The second layer was the study of the characteristics and features of the sensors. The third layer was the decision making, sensing, measuring, fixing of the threshold value, periodicity of sensitivity, timing and space. The fourth layer was the sensor data acquisition. The fifth layer was the ambient intelligence environment. The sensor collected data when operated by the microcontroller and forwarded it over the internet for analysis via the Wi-Fi module. Users were able to monitor measured parameters on their smartphones As described by Figure 3, the library in the Arduino was loaded and a message was sent to the LCD. Air quality data was collected using the MQ135 sensor. The calibrated sensor made the analog output voltage proportional to the concentration of polluting gases in Parts per Million (ppm). The data is first displayed on the LCD screen and then sent to the Wi-Fi module. The Wi-Fi module transfers the measured data to the server via internet. The Wi-Fi module is configured to transfer measured data an application on a remote server called "Thing speak". The online application provides global access to measured data via any device that has internet connection capabilities. Data collected from the sensor was converted into a string and used to update the information sent to the remote server

4. BLOCK DIAGRAM

Figure 1 Overview of the Proposed System



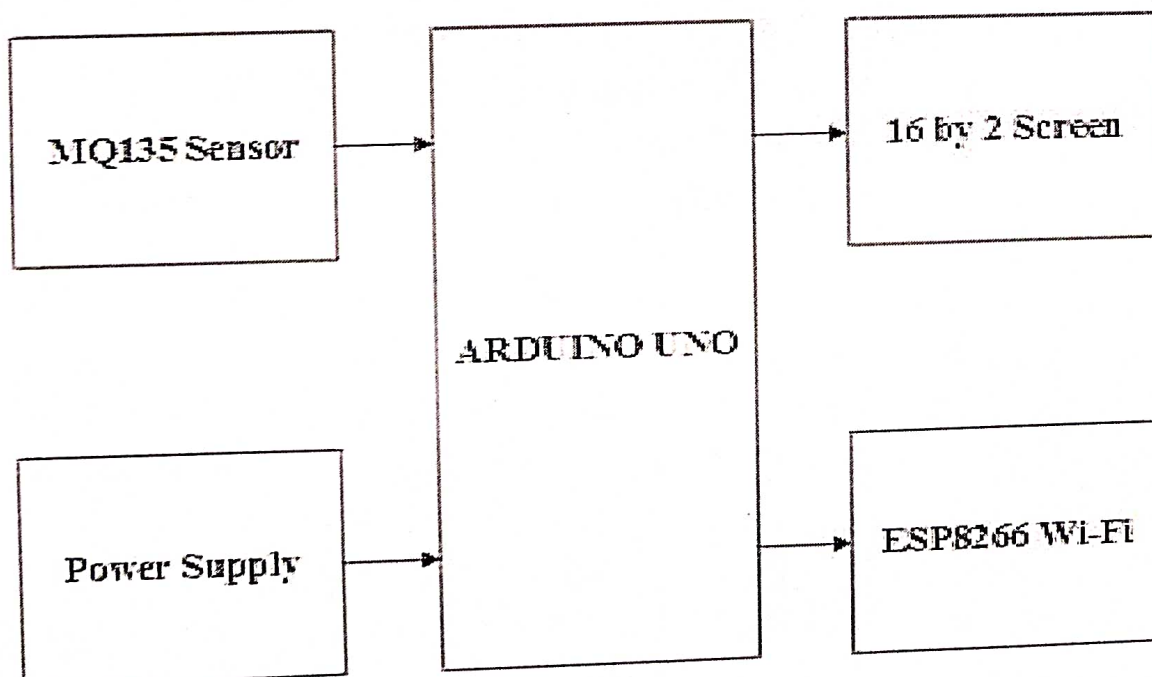
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Figure 1 Overview of the Proposed System



"Thing-speak" was configured to receive data from a remote system. The data was analyzed and published in the form of a scatter line graphs or bar charts on a channel. The channel corresponds to the air quality level as shown in Figure 10. The channel receives update every time from the remote sensor via the internet and represents the data received as a scatter line graph online.

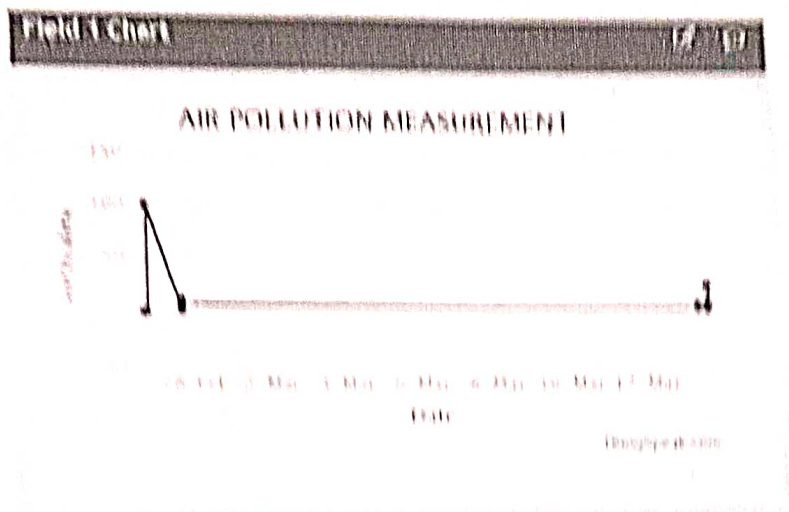


Figure 4 Air quality measurement as seen online

The visual representation of data on "thing-speak" corresponded with the measured air quality. The rate at which data displayed on "Thing-speak" changes was dependent on the network traffic and speed of internet connection. The status of the air quality can be accessed at any time, with automatic updates occurring at defined time intervals.

6. CONCLUSION

This research proposed a smart air pollution monitoring system that constantly keeps track of air quality in an area and displays the air quality measured on an LCD screen. It also sends data measured to the "Thing speak" platform. The system helps to create awareness of the quality of air that one breathes daily. This monitoring device can deliver real-time measurements of air quality.

5. RESULTS

The online application used to analyze air quality data got from sensors in this proposed system was "Thing-speak". Thing-speak is an open source internet of things application programming interface used to store and retrieve data from interconnected things using the hypertext protocol over the internet or via a local area network. It also provides access to a broad range of embedded devices and web services. This enables the creation of sensor logging applications that can be updated regularly. Figures 5-10 show the results of various pollutants that were obtained.

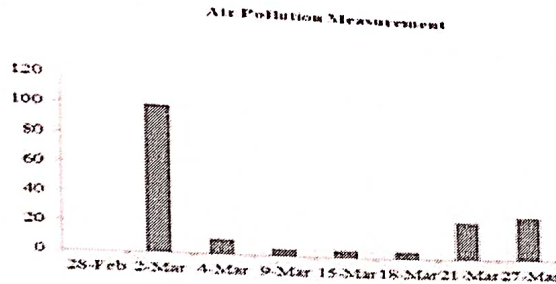


Figure 1 Air Quality on Selected Days with an Aerosol as Sample Pollutant

Figure shows that the dust level in the environment was at the minimum on the 28th of February but increased gradually with each passing day. On some particular days, there was a gradual and on other days there were no changes in the quality of the air. The level of the dust measured in the air is dependent on a lot of factors that are beyond the scope of this work

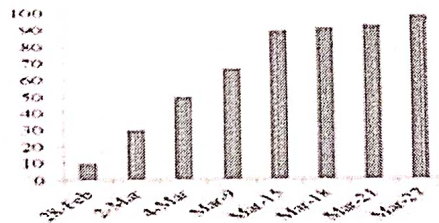


Figure 2 Air Quality on Selected Days with Dust as Sample Pollutant

The results from Figure show the air quality level was significantly low in comparison to the previous pollutants measured. It can be seen the air quality level dropped rapidly after only a few days of taking measurements. This is so because gases are high level air pollutants

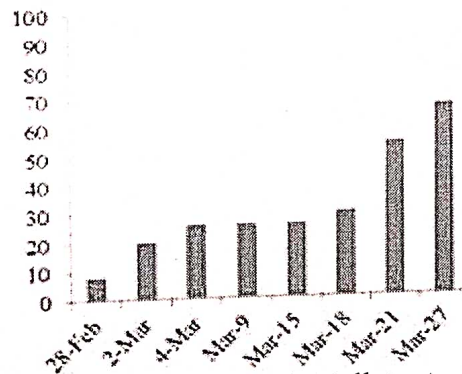


Figure 3 Air Quality on Selected Days with a Gas as Sample Pollutant



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EARTH FAULT MONITORING

INNOVATIVE PROJECT REPORT

ABSTRACT

Underground cables are prone to a wide variety of faults due to underground conditions, wear and tear, rodents etc. Diagnosing fault source is difficult and entire cable should be taken out from the ground to check and fix faults. The project work is intended to detect the location of fault in underground cable lines from the base station in km using a PIC16F877A controller. To locate a fault in the cable, the cable must be tested for faults. This prototype uses the simple concept of Ohms law. The current would vary depending upon the length of fault of the cable. In the urban areas, the electrical cables run in underground instead of overhead lines. Whenever the fault occurs in underground cable it is difficult to detect the exact location of the fault for process of repairing that particular cable. The proposed system finds the exact Location of the fault. The prototype is modelled with a set of resistors representing cable length in km and fault creation is made by a set of switches at every known distance to cross check the accuracy of the same. In case of fault, the voltage across series resistors changes accordingly, which is then fed to an ADC to develop precise digital data to a programmed PIC IC that further displays fault location in distance. The fault occurring distance, phase, and time is displayed on a 16X2 LCD interfaced with the microcontroller. This is used to display the information over Internet using the Wi-Fi module ESP8266. A webpage is created using HTML coding and the information about occurrence of fault is displayed in a webpage.

INTRODUCTION

Power supply networks are growing continuously and their reliability getting more important than ever. The complexity of the whole network comprises numerous components that can fail and interrupt the power supply for end user. For most of the worldwide operated low voltage and medium voltage distribution lines, underground cables have been used for many decades. Underground high voltage cables are used more and more because they are not influenced by weather conditions, heavy rain, storm, snow and pollution. Even though the cable manufacturing technology is improving steadily; there are still influences which may cause cable to fail during test and operation. A cable in good condition and installed correctly can last a lifetime of about 30 years. However cables can be easily damaged by incorrect installation or poorly executed jointing, while subsequent third party damage by civil works such as trenching or curb edging.

TYPES OF FAULTS IN CABLES

OPEN CIRCUIT FAULT

When there is a break in the conductor of the cable, it is called open circuit fault of the cable. The open circuit fault can be checked by megger. For this purpose, the three conductors of the 3-core cable at the far end are shorted and earthed. Then resistance between each conductor and earth is measured by a megger. The megger will indicate zero resistance in the circuit of the conductor that is not broken. However, if the conductor is broken, the megger will indicate infinite resistance in its circuit.

SHORT CIRCUIT FAULT

When two conductors of a multi-core cable come in electrical contact with each other due to insulation failure, it is called short-circuit fault. The two terminals of the megger are connected to any two conductors. If the megger gives zero reading, it indicates short-circuit fault between these two conductors. The same step can be repeated for other conductors taking two at a time.

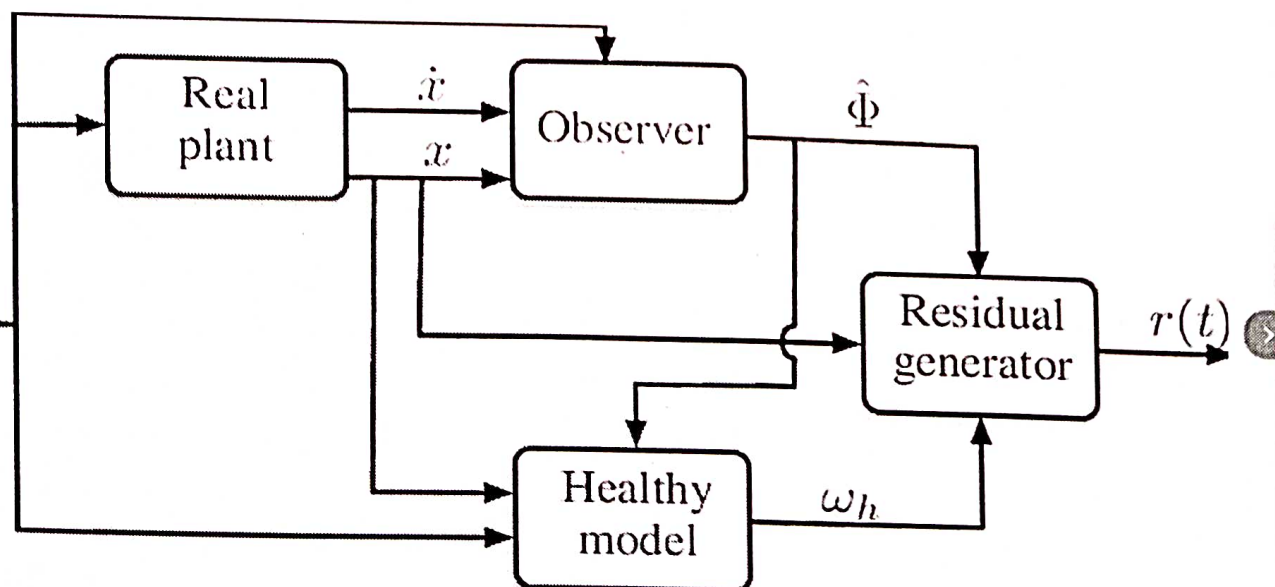
EARTH FAULT

When the conductor of the cable comes in contact with earth, it is called earth fault or ground fault. To identify this fault, one terminal of the megger is connected to the conductor and the other terminal connected to earth. If megger indicates zero reading, it means the conductor is earthed. The same procedure is repeated for other conductors of the cable. This project is used to detect the location of fault in digital way. Locating the faulty point in an underground cable helps to facilitate quicker repair, improve the system reliability and reduced outage period.

WORKING PRINCIPLE

Underground cables are prone to a wide variety of faults due to underground conditions, wear and tear, rodents etc. Diagnosing fault source is difficult and entire cable should be taken out from the ground to check and fix faults. The project work is intended to detect the location of fault in underground cable lines from the base station in km using a PIC16F877A controller. To locate a fault in the cable, the cable must be tested for faults. This prototype uses the simple concept of Ohms law. The current would vary depending upon the length of fault of the cable. In the urban areas, the electrical cables run in underground instead of overhead lines. Whenever the fault occurs in underground cable it is difficult to detect the exact location of the fault for process of repairing that particular cable. The proposed system finds the exact location of the fault. The prototype is modeled with a set of resistors representing cable length in km and fault creation is made by a set of switches at every known distance to cross check the accuracy of the same. In case of fault, the voltage across series resistors changes accordingly, which is then fed to an ADC to develop precise digital data to a programmed PIC IC that further displays fault location in distance. The fault occurring distance, phase, and time is displayed on a 16X2 LCD interfaced with the microcontroller.

BLOCK DIAGRAM



CONCLUSION

The short circuit fault at a particular distance in the underground cable is located to rectify the fault efficiently using simple concepts of Ohms law. The work automatically displays the phase, distance and time of occurrence of fault with the help of PIC 16F877A and ESP8266 Wi - Fi module.. The benefits of accurate location of fault are fast repair to revive back the power system, it improves the system performance, it reduce the operating expense and the time to locate the faults in the field.