"Forest Fire Detection System Using IOT"

Submitted in partial fulfilment of the requirement for the degree

In

Bachelor of engineering

(ELECTRICAL ENGINEERING)

Submitted by

Mrs. SHAIKH AFROZ RAFIQUE (17EE01)
Mrs. NALAWADE APURNA ANKUSH (18DEE19)
Mrs.PATIL DARSHANA DEVABA (18DEE20)
Mr.SHAIKH ANSAL AAMIR (15EE37)

Under the Guidance of
Prof.shraddha hule

Department of Electrical Engineering

Anjuman-I- Islam's Kalsekar Technical Campus New Panvel-410206

(Afflicated to University Of Mumbai)

2020-2021

Anjuman-I- Islam's Kalsekar Technical Campus
New Panvel-410206

CERTIFICATE

This is to Certify That Project synopsis Entitled "**Forest Fire Detection System Using IOT**" is a bonafide work "**Shaikh Afroz , Nalawade apurana ,Patil darshana and shaikh ansal** itted to the university of Mumbai in partial fulfilment of the requirement for the award of the degree of **"Postgraduate"** in **"ELECTRCAL ENGINEERING"**

Prof. Shraddha hule
(Project Guide)

prof.Mr.Rizwan farade
(Head Of Electrical Department)

Dr. Abdul Razzak
(Principal)

CERTIFICATE OF APPROVAL OF PROJECT WORK

This project work entitled “**Forest Fire Detection System Using IOT**" by

SHAIKH AFROZ RAFIQU
NALAWADE APURNA ANKUSH
PATIL DARSHANA DEVABA
SHAIKH ANSAL AMIR

Are approved for the degree of Bachelor Of Engineering **(Electrial Engineering)** Of University Of Mumbai, for the year 2020-21.

Examiner’s Signature

DATE-:

PLACE-:

DECLARATION

I declare that this written submission represents my ideas in my own words and where other ideas or words have been included. I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source submission I understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not being properly cited or from whom proper permission has not been taken when needed.

Name:

1. 17EE01 SHAIKH AFROZ RAFIQUE
2. 18DEE20 PATIL DARSHANA DEVABA
3. 18DEE19 NALAWADE APURNA ANKUSH
4. 15EE37 SHAIKH ANSAL AMIR

Date:-

Acknowledgement

It is indeed a matter of great pleasure and proud privilege to be able to present this project on **"Forest Fire Detection System Using IOT ".**

To work on the selected project is an milestone in the student life in the proper guideline of the project guide. We are highly indebted the project guide **Prof. Shraddha hule** for his invaluable guidance and appreciation for giving form and substance to this report. It is due to her enduring efforts, patience and enthusiasm, which has given a sense of direction and purposefulness to this project and ultimately made it a success.

We would also like to thank our head of department **Prof. Mr.Rizwan farade** for giving us this opportunity and guidance and encouragement. We would also like to express our deep regards and gratitude to our Principal **Dr. Abdul Razzak**

We would wish to thank the non - teaching staff and our friends who have helped us all the time in one way or the other. Really it is highly impossible to repay the debt of all the people who have directly or indirectly helped us for performing the project.

Abstract

In recent days, satellite-based surveillance gadget is used to notice wooded area hearth however this works when fireplace is unfold in the massive area. So these methods are no longer efficient. According to a survey, about 80% losses are accumulated in the woodland due to the late detection of fire. To overcome this two, we proposed a new method to predict and the fire at early stages . In our proposed method the hardware kit with temperature , soil moisture and humidity sensor is connected to the Mobile and it is deployed in many places in the forest area.

The Mobile is connected with the Internet . The details collected using sensor is upload with the fixed interval time. Then this data is uploaded to the cloud application. If the forest temperature is increased abnormally this will detect send notification to the forest authorities then the fire alarm will rung .It can also predict the fire that will be occur in future by using machine learning . This can be used in all kind of forest and considering the effectiveness of the sensors it be also used in industrial areas.

TABLE OF CONTENT

CHAPTER I

1.INTRODUCTION

The IOT industry is growing rapidly in the current scenario. Each and everyone now understood the significance of the Internet of Things . In this present time the IOT is used in all of the industries. It is now became a everyday necessity. By using these technologies we can simplify our lives and make great us of time. This will reduce the time ,the effort taken by human and reduce the errors.

In this project we used sensors to collect the temperature and humidity, soil moisturises. This sensors are connected the Arduino . By using this hardware the data is collected with the fixed interval time period. The collected data can be viewed in the hardware by using liquid crystal display and can be viewed in the cloud also. This hardware is connected to the mobile to send the information to the cloud without any interruption. The uninterrupted internet connection is given to the mobile using wireless sensor networks.

All the sensors will be connected to main interface to upload the data. According the area of the forest it is decided that how many sensors can be deployed in the forest . If the forest area is very large then the number of sensor deployment in the forest is high. If the area is low then the number of sensors is reduced. The sensor count will also vary by considering the density of the forest.

The collected data from the hardware is uploaded in the cloud server seamlessly. A threshold value is assigned , if the collected data is above this value then the alarm will get activated and e-mail is sent to the respective forest authorities. Our proposed system will also detect the fire even before the occurrence of the fire.

CHAPTER 2
2. LITERATURE SURVEY

1. Simultaneous Forest Fire Detection and Analysis with WSN:

In this paper the forest fire detection is done using the wireless sensors. These wireless sensors are quite costly when compared to wired sensors. The mechanism is much more complex in designing the wireless sensors. There are many technical difficulties while using the sensors. Especially using these kind of sensors in forest , making it more difficult. In this the sensor-nodes are deployed in the forest region. These sensor are interconnected. This uses a neural community technique. These deployed sensor-node will accumulate the measured information. Measured information will sent to the main node or interface. This main node is also known to be as a cluster head. These cluster heads will send the information to the supervisor or master node. These master node is like a computer. This will process the information collected form the sensors. The collected information is sent with particular interval time. This will reduce the traffic between the nodes. But in emergency situation like smoke or fire in the forest the information is sent quickly.

2.Identifying of Forest Fires using Machine Learning:

There are many machine learning algorithms or methods can be used in forest fire detection . Basically machine learning algorithms are multi-purpose use. These algorithms can be applied in almost all the domains. Forest fire detection is also one of them. Support Vector Machine ,Random Forest Algorithm and K-Nearest Neighbour algorithm these algorithms and methods can be used to detect the forest fire. In this paper it checks which algorithm has generate the most accurate result within short time of period. Initially the dataset is dataset is collected from the forest fire authorities. The collected data cannot be used as given. It has lot of problems , like some of the rows will be empty, empty cells. In order to use the data the data should be pre processed . The pre processing is done with the help of anaconda and spyder software. Dataset is given to the all of these algorithms to test the accuracy, speed and response time. It will be tes2ted with different types of data. After analysing the test results KNearest Neighbour algorithm has the highest speed , accuracy and response time when compared to other algorithms. So it is suggested to use this algorithm in detecting forest fire.

3.Forest Fire Prediction and Alert System Using Wireless Sensor Network:

The method that has been used in this paper senses temperature from all over the wooded area and sends this statistics for processing. The path in which the fireplace spreads is determined and the fee of unfold is calculated to take faster action. The proposed device consists of standalone boxes, with every field consisting of more than a few sensors like humidity and temperature sensors. These bins are unfold round the whole wooded area location so that an entire insurance is obtained. When the temperature in a specific node receives accelerated over a constant threshold cost then the alert is despatched to the manage centre.The threshold fee is continually constant above the most temperature which is skilled in that precise location to keep away from any false alarm due to the extend in the atmospheric temperature. The goal of this paper is to decrease the harm and destruction brought on through the woodland hearth to the lifestyles property of human beings and additionally wild- animals. Apart from early detection of woodland fireplace we have additionally tried to predict the hearth in enhance with the assist of the statistics received from the sensors that are deployed in the forest

4.Forest Fire Detection System (FFDS):

This paper describes the effective characteristics of wireless sensor networks. It highlights the wireless sensor networks are the solution to detection and prediction of forest fire at early stages. In this the wireless nodes are deployed all over the forest . In order to protect the sensors they are moulded using fibre optic plastic. These mouldings are used for protecting the sensors from the animals and extreme weather conditions. These are very light and thin glass kind of plastics . So this will not affect the sensors effectiveness in taking temperature and humidity reading. Collected information is sent to the main interface and then it is sent to the cloud. Set of sensors are deployed in the forest. Each set contains of humidity sensor, temperature , moisture sensor , smoke sensor and GPS module. These sensor are used for collecting real world data and the Global Positioning System module is used for identifying the location of the sensor. In case of fire occurrence in particular place it is very easy to identify the location. Here Low Noise Amplifier is used for reducing the noise in the data. By using this data will be more clearer , so forest detection is very accurate in the method.

5.IOT established forest fire warning system:

In this paper the Node MCU act as a main interface. There are several alternatives for this Node MCU but it is effective than the other options. It is effective in both economical and performance. Main advantage in Node MCU is the ease of handling. Arduino is also used as part of the project for triggering the alarm. Arduino is best when it comes to handle raw hardware. It can be used on almost every accessories.

Temperature sensor, Humidity Sensor and Smoke sensor is used in this project. All these sensors are interfaced or connected with Node MCU in order to collected the real time data. Sensor connected with the Node MCU are very effective . It can even detect very small amount of smoke generated form burning the paper in the house. So the accuracy level when it is deployed in forest is high. Because of the high accuracy it can be also used in many places like homes, schools , shopping malls. When it detects fire or smoke then the buzzer connected with the Arduino is activated. The Node MCU is also connected with the Liquid Crystal Display to see the data collected from the sensors. An app is developed separately for this project to analyse the data even when we are away from the forest . This is the main advantage of this project. When the sensors interfaced with Node MCU detects fire or smoke it will send notification via the app. The application is supported both android and apple phones. This app works seamlessly without any lag or error. This app is tested in multiple scenarios. This requires uninterrupted network connection. If internet is not connected then it will cause problems.

6.Artificial Intelligence for Forest Fire Early Prevention:

Now a days the Artificial Intelligence has became a part of everyone's life. We use it for our day to day work without the conscious. This paper makes use of this technology to prevent the forest fire. All the existing forest fire systems are only detect when the fire or smoke has been occurred . This cause high damage to forest area the main aim of the project fails. To overcome this problem we can make use of this technology to predict the forest fire even before the occurrence by using the collected data. The algorithms are applied on the collected data to analyse the occurrence of the forest fire in future. Algorithms like Support Vector Machine and Random Forest Algorithms are used.

7.Data Mining Method to Speculate Forest Fire:

This Data Mining method is also the effective method to predict the forest fire occurrence. If the forest fire can be predicted early then it can be prevented. To prevent all the precaution step has been taken. We have enough time to take all these preventive measures. For this approach it needs huge amount of data. It needs at least ten years of data . Larger the data , accuracy of the result will be high. If data is not enough the result are not perfect. It needs the historical forest fire places, forest fire occurrence data and time, damage caused by the fire, fire burning time and the total area lost due to forest fire. And also need temperature and humidity data. The collected is cleaned and pre processed to do data mining. The pre processing of data is very essential, in this step empty data is filled and the noise in the is removed. Only pre processed data can produce the accurate results. Regression modelling is used on the data. Support Vector Machine algorithm is used for predict the fire occurrence.

8.IOT Enabled Forest Fire Detection and Altering the Authorities:

Nowadays IOT (Internet of Things) units and sensors permit the monitoring of distinctive environmental variables, such as temperature, humidity, moisture etc. two Arduino platform primarily based IOT enabled furnace detector and monitoring machine is the answer to this problem. This paper proposed a furnace detector the usage of Arduino is connected with a temperature sensor, a smoke sensor. GSM is used to supply the last SMS to the consumer via the given range in the simulation program, Temperature sensor which is used to denote the temperature High and Low that will be displayed in the LCD Display, Flame sensor which is used to denote the flame tiers and if it is excessive the woodland fireplace will be detected in the LCD show and if it is low woodland hearth won't be detected. When the fire is detected the alarm will rung and in it will send the information to the cloud server. Then the alert message is sent.

9.Preventing and Observing of Forest Fire Detection using Data Analytics:

This project added the far off monitoring technique for stopping woodland furnace based totally on FFDA (Forest Fire Detection Algorithm) sensing the threshold price is recognized routinely intimate to the approved character to take motion and forestall the woodland fire. The entire designing of this IOT enabled wooded area fireplace detection and monitoring machine has been normally detection the use of FFDA algorithm. Using the FFDA algorithm it is convenient to discover the fireplace is going to occur based totally on the parameter value, take stop motion based totally on the fee the automated sends the generated message thru GSM to approved character to take forestall motion to end furnace in the fores

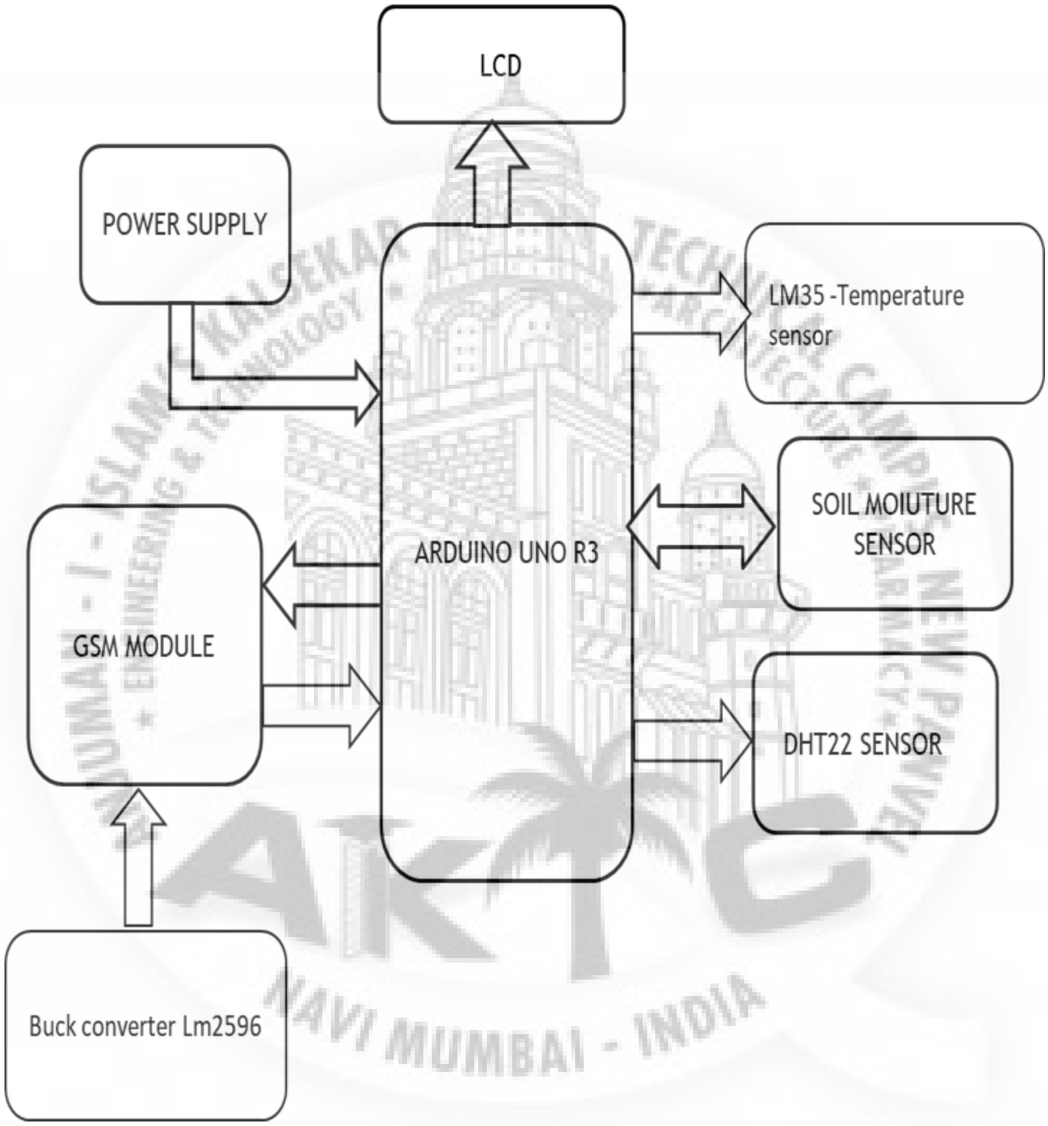
10.IOT Based Forest Fire Prevention Using Raspberry Pi:

In this project Raspberry is using instead of personal computer. This is like mini PC and very portable. The size is also very small , so the deployment of this hardware kit is became easy. It works seamlessly without any interruption like any other computers. Sensors are connected to the Arduino board to collect the data from the dense forest areas. PIR sensor , Smoke sensor and Temperature sensors are connected to this board. The PIR sensor is used for detecting the intruder. Camera is also installed with this to monitor the forest area. When an abnormal activity is detected in the sensor it will send the alert messages to the authorities. Alert message is also sent in case of smoke or fire has been detected.

CHAPTER 3

METHODOLOGY

3.1 BLOCK DIAGRAM



3.2 HARDWARE REQUIRMENTS

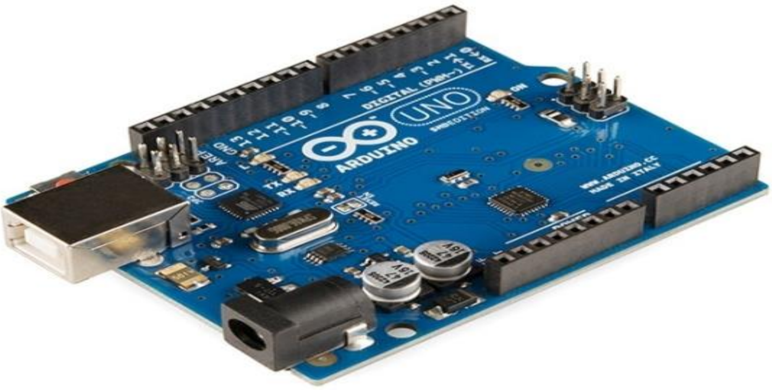
i. ARDUNIO:

- The Ardunio UNO is a microcontroller board based on ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs),6 analog inputs.
- A 16MHz ceramic resonator, USB connection a power jack, an ICSP header and a reset button.
- It consist everything needed to support connect it to a computer with a USB cable or power it with a AC to DC adapter or battery to get started. Arduino is a single-board microcontroller, intended to make building interactive objects or environments more accessible.[1] The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Current models feature a USB interface, 6 analog input pins, as well as 14 digital I/O pins that accommodate various extension boards.Introduced in 2005, the Arduino's designers sought to provide an inexpensive and easy way for hobbyists, students, and professionals to create devices that interact with their environment using sensors and actuators. Common examples for beginner hobbyists include simple robots, thermostats and motion detectors. It comes with a simple integrated development environment (IDE) that runs on regular personal computers and allows users to write programs for Arduino using C or C++.
- The current prices of Arduino boards run around €20, or $27 and those of related "clones" as low as $9. Arduino boards can be purchased pre-assembled or as do-it-yourself kits. Hardware design information is available for those who would like to assemble an Arduino by hand. It was estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced,[2] and in 2013 that 700,000 official boards were in users' hands.

- **HARDWARE**

- An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I^2C serial bus—so many shields can be stacked and used in parallel. Official Arduinos have used the megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. A handful of other processors have been used by Arduino compatibles. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (orceramic resonator in some variants), although some designs such as the Lily Pad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer.

- At a conceptual level, when using the Arduino software stack, all boards are programmed over an RS-232 serial connection, but the way this is implemented varies by hardware version. Serial Arduino boards contain a level shifter circuit to convert between RS-232-level and TTL-level signals. Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232. Some variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. (When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used.)
- The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.10-inch (2.5 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards.
- There are many Arduino-compatible and Arduino-derived boards. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education to simplify the construction of buggies and small robots. Others are electrically equivalent but change the form factor—sometimes retaining compatibility with shields, sometimes not. Some variants use completely different processors, with varying levels of compatibility.



- **SOFTWARE**

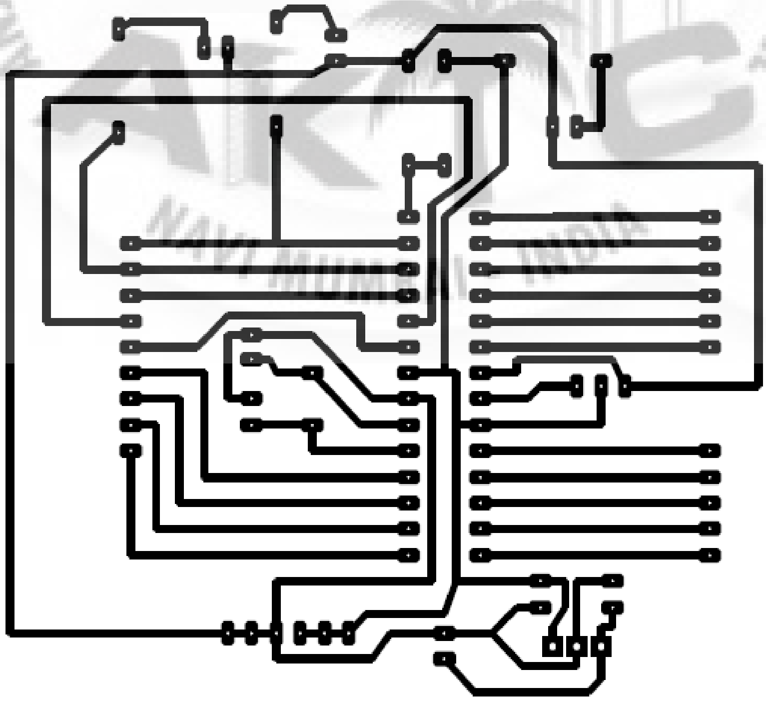
- The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and derives from the IDE for theProcessing programming language and the Wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a sketch.

- Arduino programs are written in C or C++. The Arduino IDE comes with a software library called "Wiring" from the original Wiring project, which makes many common input/output operations much easier. Users only need define two functions to make a runnablecyclic executive program:

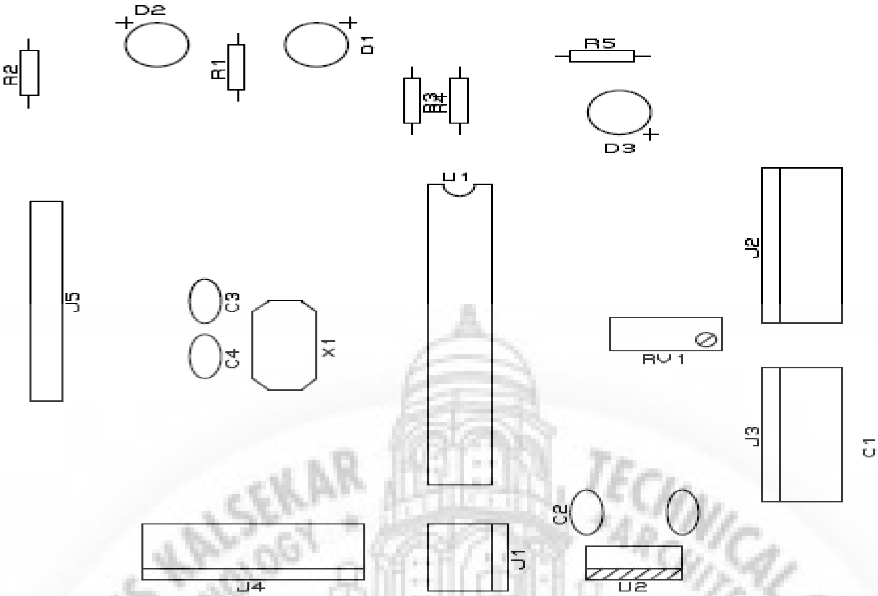
▪ setup(): a function run once at the start of a program that can initialize settings

▪ loop(): a function called repeatedly until the board powers off.

ii. ARDUINO COPPER



iii. ARDUINO SILKLAYER



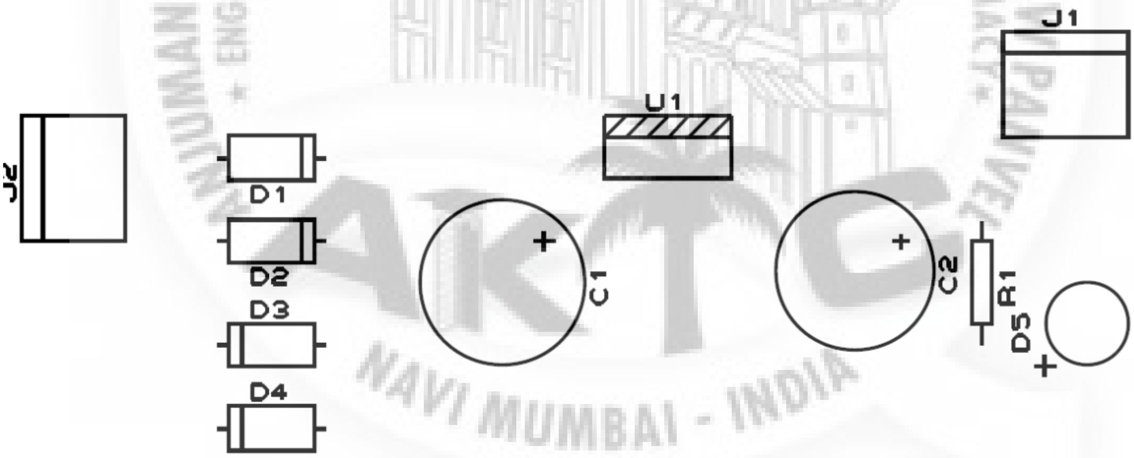
iv. LCD DISPLAY:

- LCD is used in a project to visualize the output of the application. LCD can also used in a project to check the output of different modules interfaced with the microcontroller. LCD plays a major role in a system to see the output and to debug the system module wise in case of system failure in order to rectify the problem.
- In the mid 1920s, Russian Oleg Vladimirovich Losev independently created the first LED, although his research was ignored at that time.
- In 1955, Rubin Braunstein of the Radio Corporation of America reported on infrared emission from gallium arsenide (GaAs) and other semiconductor alloys.
- Experimenters at Texas Instruments, Bob Biard and Gary Pittman, found in 1961 that gallium arsenide gave off infrared radiation when electric current was applied. Biard & Pittman received the patent for the infrared light-emitting diode.
- In 1+962, Nick Holonyak Jr., of the General Electric Company and later with the University of Illinois at Urbana-Champaign, developed the first practical visiblespectrum LED. He is seen as the "father of the light-emitting diode".
- In 1972, M. George Craford, Holonyak's former graduate student, invented the first yellow LED and 10x brighter red and red-orange LEDs.
- Shuji Nakamura of Nichia Corporation of Japan demonstrated the first highbrightness blue LED based on InGaN. The 2006 Millennium Technology Prize was awarded to Nakamura for his invention.

v. POWER SUPPLY

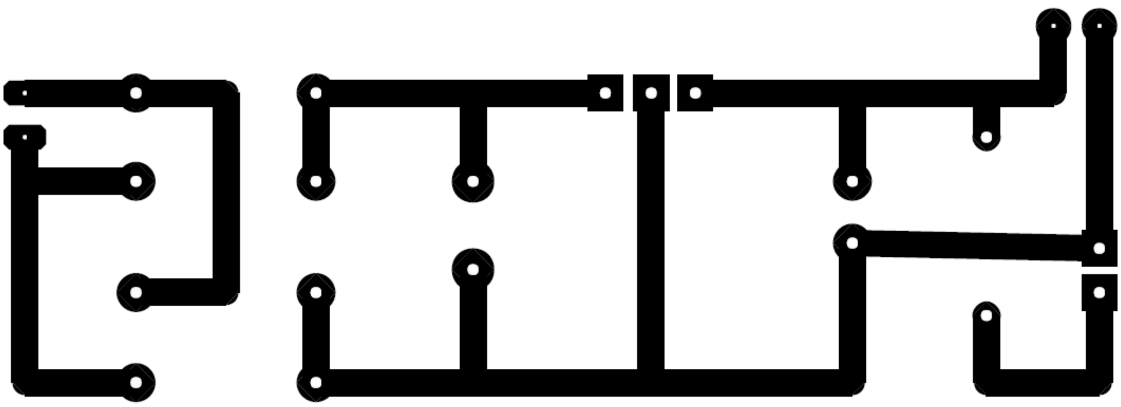
- The input to the circuit is applied from the regulated power supply [6]. The AC input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating DC voltage. So in order to get a pure DC voltage, the output voltage from the rectifier is fed to a filter to remove any AC components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant DC voltage.

  Power supply is the first and the most important part of our project. For our project we require +5V regulated power supply with maximum current rating



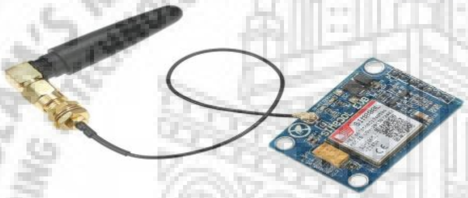
500Ma.

- Following basic building blocks are required to generate regulated power supply.



vi. GSM Module :-

It operates over subscription to a user mobile with a sim card. It helps to transfer the soil status when dry and motor gets ON to the user mobile. The AT command +CMGF (command name in text: Message Format) is used to select the operating mode of the GSM/GPRS modem or mobile phone. It takes one parameter. The value of the parameter can either be 0 or 1. The values 0 and 1 refer to SMS PDU mode and SMS text mode respectively. SMS PDU mode is the default mode if it is implemented on the mobile device. To change the operating mode of a GSM/GPRS modem or mobile phone, perform a set operation with the + CMGF AT command. If the operating mode specified is not supported by the GSM/GPRS modem or mobile phone, the final result code "ERROR" will be returned. To find out the operating mode currently used by a GSM/GPRS modem or mobile phone, perform a read operation with the + CMGF AT command. The response above indicates the GSM/GPRS modem or mobile phone is using SMS PDU mode.



- **Sensors :-**

A sensor can be defined as any instrument that measures some type of physical or chemical characteristic and converts that measurement into a signal that can be read by an observer or automated data collection system. All sensors have measurement errors and it is important to understand the different limitations that affect measurements.

vii. Soil Moisture Sensor :

It is used to measure the content of water in the soil. This detects the wet/dry condition of the soil according to the need of crops. The sensor has two probes which are used to pass current through soil while inserted the probes in the soil. When the soil is wet it has less resistance hence passes more current whereas in dry condition the soil has high resistance and passes less current through the soil. The detection of soil status is done with knowing the resistance valve. Here we use frequency domain sensor which has oscillating circuit, it measures water content by measuring the soil's dielectric constant. When the soil's water content decreases rapidly dielectric also decreases it indicate the water content of soil. Thus the analyzed signal would be in analog signal that has to be converted into digital signal using LM393 driver and the sensor would operates at 5v power supply.

a)Introduction

Soil moisture sensor measure the water content in soil. Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, but they are also able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages. Besides agriculture, there are many other disciplines using soil moisture sensors. Golf courses are now using sensors to increase the efficiencies of their irrigation systems to prevent over watering and leaching of fertilizers and other chemicals offsite. The module uses LM393 comparator to compare the soil moisture level with the preset threshold. When the soil moisture deficit module outputs a high level, and vice versa.

b)Features

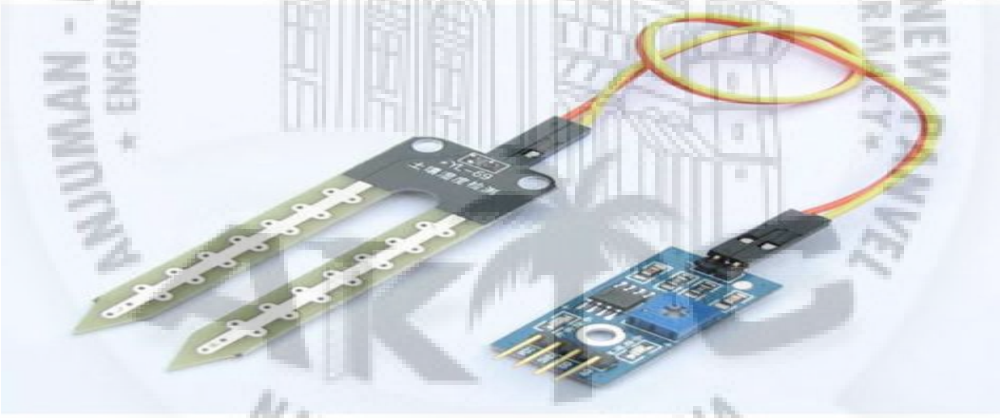
- 2 state binary output
- Adjustable sensitivity

c) Specifications

- Input operating voltage: 3.3 to 5V

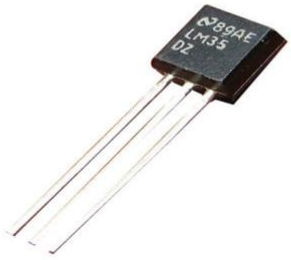
d)Hardware Connection

The sensor have 3-Pin male header. The pins are as follows VCC (external 3.3V-5V) GND (external GND) and DO-board digital output interface (0 and 1). The pin explanation for each pin is shown below.



viii. Temperature Sensor :

LM35 is used as temperature sensor which is integrated circuit rated to operate over -50 degree to +155 degree Celsius. The temperature and humidity reading value are sent to user through IoT so that user is able to know the field conditions from anywhere. Temperature sensor is a device which is used to measure the hotness or coldness of an atmosphere. Here we use LM35 which is an integrated circuit sensor used to measure temperature with an electrical output proportional to the temperature around the atmosphere. Operating voltage of this sensor is 5V. Measured analog signal would be converted into digital by using ADC converter.



ix. Humidity Sensor :

DHT11 is used to measure the water vapor in air which defines the humidity. If there is change in temperature there will be change in humidity also, this occurs before and after irrigation. Humidity sensor plays major role in greenhouse effect it measures the water content present in air which is measure the humidity of the area by using electronic hygrometer. Operating voltage of this sensor is 5V and water content present in air will send to IOT device through ADC converter.

x. TRANSFORMER

- Transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. A varying current in one coil of the transformer produces a varying magnetic field, which in turn induces a voltage in a second coil.
- Power can be transferred between the two coils through the magnetic field, without a
- metallic connection between the two circuits

xi. VOLTAGE SENSOR :

- Total voltage, voltages of individual cells, minimum and maximum cell voltage or voltage of periodic taps.
- This module is based on resistance points pressure principle, and it can make the input voltage of red terminal reduce 5 times of original voltage.The max Arduino analog input voltage is 5 V, so the input voltage of this module should be not more than 5 V x 5 = 25 V (if for 3.3 V system, the input voltage should be not more than 3.3 V x 5 = 16.5 V).Because the Arduino AVR chip have 10 bit AD, so this module simulation resolution is 0.00489 V (5 V / 1023), and the input voltage of this module should be more than 0.00489 V x 5 = 0.02445 V.

xii. Buzzer:

- A **buzzer** or **beeper** is an audio signalling device,which may be mechanical, electromechanical,
- or piezoelectric.
- Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as
- a mouse click or keystroke.

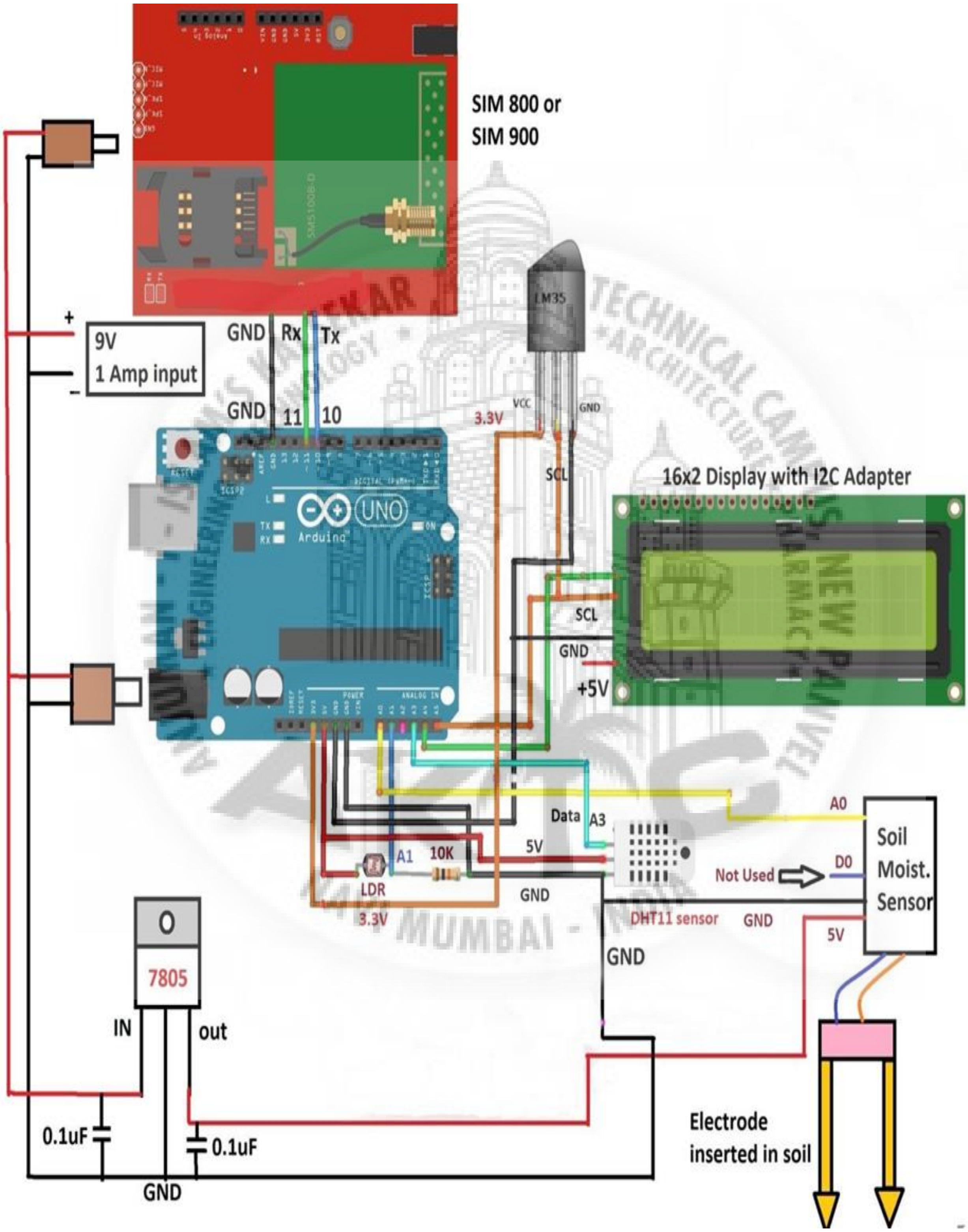
- Early devices were based on an electromechanical system identical to an electric bell without the metal
- gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to
- buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer"
- comes from the rasping noise that electromechanical buzzers made.
- **small Buzzer**
- Ideal for alarms and warning indication. Mounts easily with loud audible sound.

Features

- Compact Design
- Flying Leads Included
- Easy Mounting
- Loud Sound Output

CHAPTER 4

4.1 CIRCUIT DIAGRAM



4.2 WORKING

- It is quite obvious that any power system contains harmonics and many techniques have been implemented to measure them so far.
- Following are some methodologies that have been use for harmonics measurement. For the consistent and proficient working of any system a properly designed electrical system is necessary. And the system should
- in this project have discussed two harmonic detection methods. The methods are selective harmonic compensation and overall harmonic compensation . A inventive system is presented and which is made from a combination of the controller chip and virtual instrument methodology. It is designed for measurement of real-time harmonics . Frequency is a significant factor for harmonics measurement. The Project contains a review of several commonly used methods for power system harmonics measurement. And those methods are compared according to the feature of frequency recognition .This gives a new idea for harmonic detection adopting the algorithm n with combination of FFT with and wavelet transform for obtaining parameters of harmonic . Harmonic components and harmonic distortion can be calculated using distortion meter. This paper presents the harmonic distortion meter based on microcontroller and its software part carries out calculations using DFT. DFT is used to find amplitude in order to measure THD in power system . In this review paper an author has discussed harmonic detection methods in frequency domain as well as in time domain .
- Usage of non-linear loads in power system is leading sources of harmonics; and this has become much serious problem. One of the widely used algorithms for harmonic analysis is Fast Fourier Transform (FFT). In this project, a harmonic analyzer is implemented] using FFT on controller core processor (LPC2138). This system has the advantage of being available in at low cost . It is very well known that harmonics is a very basic property of power quality. So it has become necessary a thing to measure these harmonics.
- Instead of using traditional measurement device a new method to detect and measure
- Harmonic presented.
- This device consists of the analog to digital converter, FFT unit, LCD display unit, and
- network
- communication unit. This methodology adopts FPGA and DSP processor.

4.3 SYSTEM WORKING

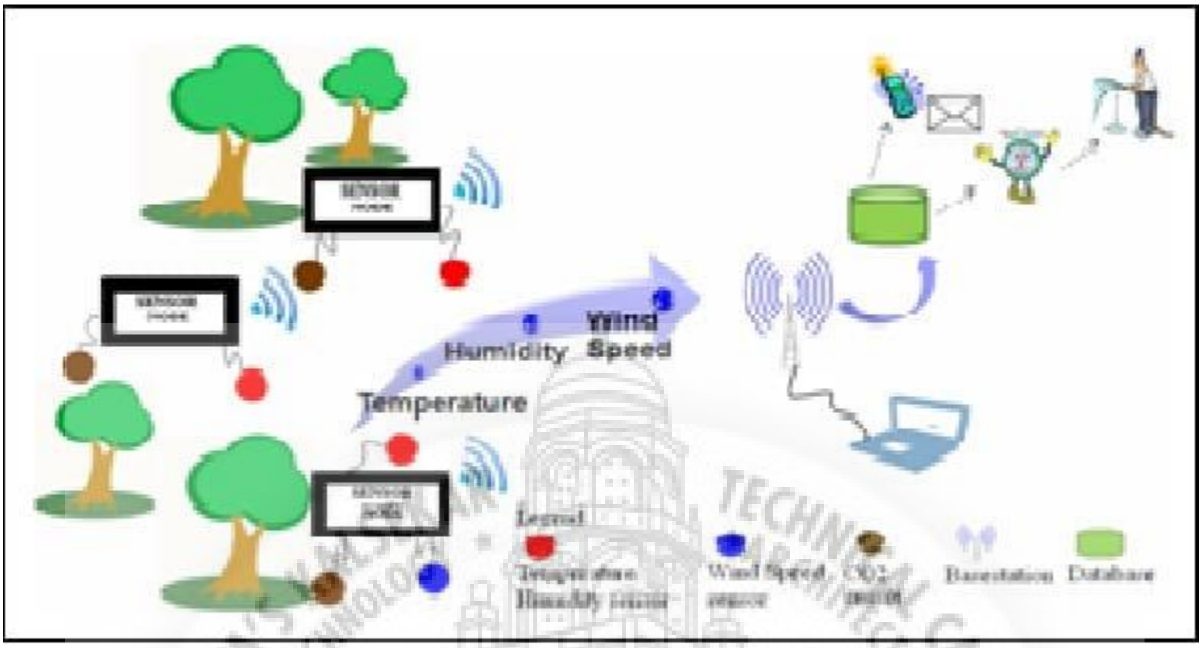


Figure 1. Basic Structure of Wireless Sensor Network

The forest fire detection system is the real-time device monitoring system. The connected sensor components and ports are initialized to display the start-up information on the 16 _ 2 LCD screen. The Arduino uno subsequently attempts to establish connection with the different components of the system. As soon as the connection is established, the WiFi module and moisture sensors will authenticate the established connection and start reading the moisture content level of the soil. The readings are displayed on the LCD screen through the user interface window of the Arduino serial monitor. In situation whereby the sensor readings are not obtained, i.e., there is no established connection, a retransmission is possible. The real-time water level (moisture sensor) module is accessed through the Internet at the interface to obtain the monitoring values from the sensors. The date and time when the data was sensed are recorded. The two sensors autonomously obtain the measurement of the indicated parameters, such as temperature, humidity, and moisture level. The recorded measurements are saved in the Internet server at thingspeak.com, along with the date and timestamp. After the recorded data are received, a descriptive chart is plotted to indicate the moisture level of the soil.

The implementation of the low-cost autonomous sensor interface, for a smart IoTbased forest fire detection system, establishes that the new system is operational and satisfies the operational requirement of the user for measurement and evaluation. The important parameters to be measured, by the smart system, have been defined and are well-established. The moisture sensors are buried in the ground at the required depth of 2 cm. Once the soil reaches the desired moisture level, the sensors send a signal to the Arduino. The implementation can be tested in the designated location. These tests include, arranging the constructed system prototype at a strategic location in forest, such that the environmental parameters would be monitored by the sensors. The processed sensor data are transmitted to the web server through the website, where users can view the monitoring and control data. The components are interconnected via a smart interface, the immersed moisture sensor, buried in the soil, monitors the moisture level and communicates the level and communicates the information to the Arduino. Thereafter, the monitored and control information is transmitted to the LCD screen, and uploaded to the web server, through the WiFi module.The Smart irrigation system consists of two units - Sensor units and a controller with communication unit.

The Sensor unit includes sensors like soil moisture sensor, temperature and humidity sensor, moisture sensor sense the field and measures the analog signals by calculating the electrical resistance in this resistance value decides the soil whether it is wet or dry. I this resistance value is low then the soil is wet and if this resistance value is high then the soil is dry. The electrical n resistance from the sensor can be a continuous analog signal. These signals from the sensors should be sent to the Arduino Uno in the form of digital signals. Here, the analog to digital converter are used for converting the signals. The temperature and humidity sensor values sprightly fed into the Arduino Uno.

The Arduino can send the information to the cloud which is acquired from the moisture sensors for storing and processing. The values sent from the Arduino are going to be processed with the reference values which is shown to the mobile. The sensors value will be updated to cloud database continuously for data processing. After processing the signals, an actual signal will be sent to the GSM module.The arduino transfers the data information obtained from the sensor units to both the mobile app and webpage. The forest fire officer will be given with an android mobile application with their login id and password so they can monitor and manage the irrigation system anytime and anyplace.

- It is quite obvious that any power system contains harmonics and many techniques have been implemented to measure them so far.
- Following are some methodologies that have been use for harmonics measurement. For the consistent and proficient working of any system a properly designed electrical system is necessary. And the system should

- in this project have discussed two harmonic detection methods. The methods are selective harmonic compensation and overall harmonic compensation . A inventive system is presented and which is made from a combination of the controller chip and virtual instrument methodology. It is designed for measurement of real-time harmonics . Frequency is a significant factor for harmonics measurement. The Project contains a review of several commonly used methods for power system harmonics measurement. And those methods are compared according to the feature of frequency recognition .This gives a new idea for harmonic detection adopting the algorithm n with combination of FFT with and wavelet transform for obtaining parameters of harmonic . Harmonic components and harmonic distortion can be calculated using distortion meter. This paper presents the harmonic distortion meter based on microcontroller and its software part carries out calculations using DFT. DFT is used to find amplitude in order to measure THD in power system . In this review paper an author has discussed harmonic detection methods in frequency domain as well as in time domain .
- Usage of non-linear loads in power system is leading sources of harmonics; and this has become much serious problem. One of the widely used algorithms for harmonic analysis is Fast Fourier Transform (FFT). In this project, a harmonic analyzer is implemented] using FFT on controller core processor (LPC2138). This system has the advantage of being available in at low cost . It is very well known that harmonics is a very basic property of power quality. So it has become necessary a thing to measure these harmonics.

Instead of using traditional measurement device a new method to detect and measure harmonics is presented. This device consists of the analog to digital converter, FFT unit, LCD display unit, and network communication unit. This methodology adopts FPGA and DSP processor.

CHAPTER 5

5.1 SOFTWARE REQUIRMENTS

i. ARDUINO IDE

Fig 5.1 arduino IDE

Arduino IDE is an open source programming which is basically used to write & compile code using a module that is Arduino. This is an official programming software which makes compiling of code simple so a typical man can understand the learning procedure. This software is readily available for all operating systems like MAC, windows, Linux. Arduino Mega, Arduino Uno, Arduino Leonardo and more are range of Arduino modules that are available. It basically has a text editor which is used for writing code, a text console, a message area, a toolbar with buttons for some of the common functions. Sketches are called as the programs that are written using this software. Coding on this software mostly uses functions of c/c++.

- The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board.
- It runs on Windows, Mac OS X, and Linux.
- The environment is written in Java and based on Processing and other open-source software.
- This software can be used with any Arduino board or AVR IC.

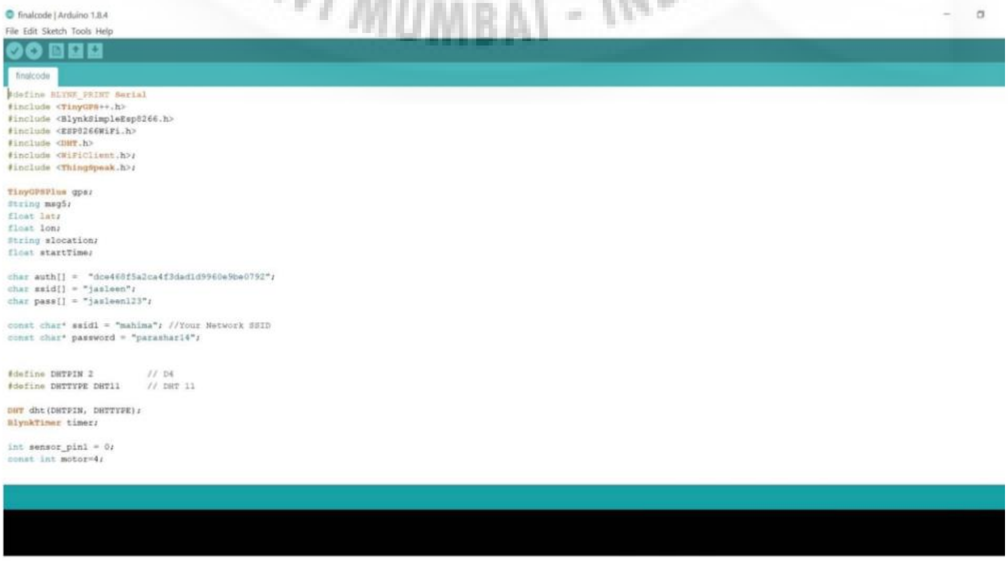


Fig 5.2 Sketch of arduino

The above figure shows the picture of Arduino sketch. The tool bar consists of many icons. The first icon from the left is to verify, the second one is to upload, the third one is for opening new project, the fourth one is to open a project and the fifth one is to save the project. The icon on the extreme right is for opening serial monitor. The white area in the middle is coding area.

ii. Thingspeak Cloud Server

It is an open source application. This platform provides services that allows to visualize, analyse & aggregate live data streaming on cloud server. It presents instant visualizations of information published by different devices to this cloud server. It has the capacity to execute MATLAB code on this server we can carry out online evaluation and processing of statistics as it comes in. It is regularly used for prototyping.

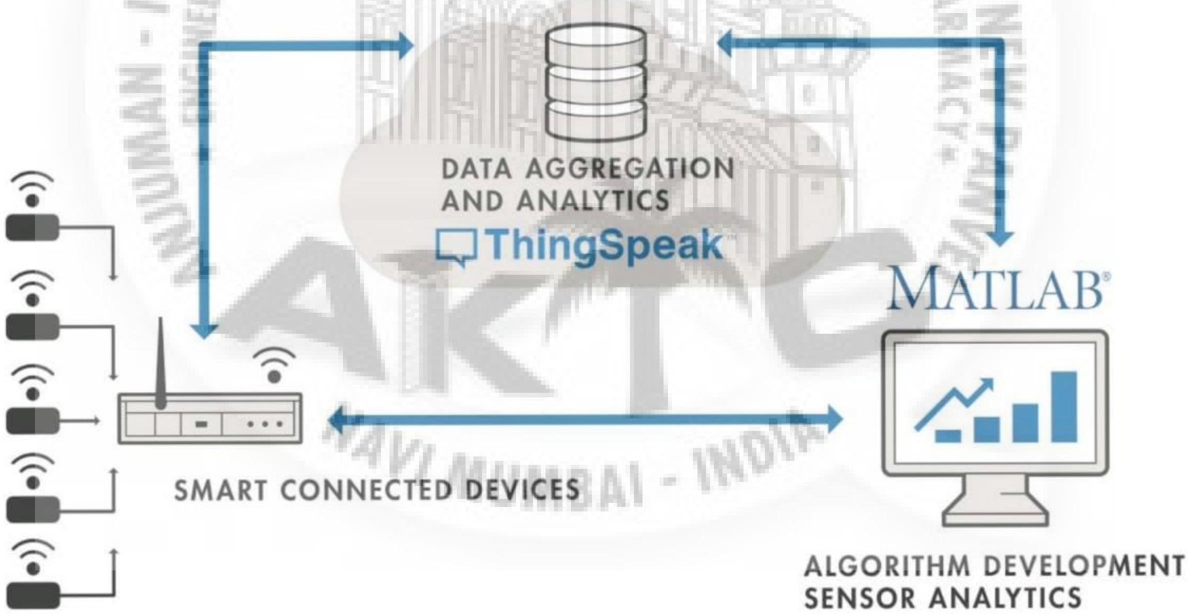


Fig 5.3 IoT System

On the left side there are smart devices that live at the edge of the network. These devices collect information and include things like heart rate monitors, wireless sensors, wearable devices etc. In the middle there is a cloud where data from different sources is analysed in real time. The right side depicts the algorithm development connected with IoT application.

Features of Thingspeak

1. With the use of IoT protocols devices are easily configured to transmit data to the cloud.
2. In actual time the data of sensors are visualized
3. Collect data on demand from sources.
4. Makes sense of IoT data with the power of MATLAB.
5. Builds IoT system and prototype without developing softwares and servers.

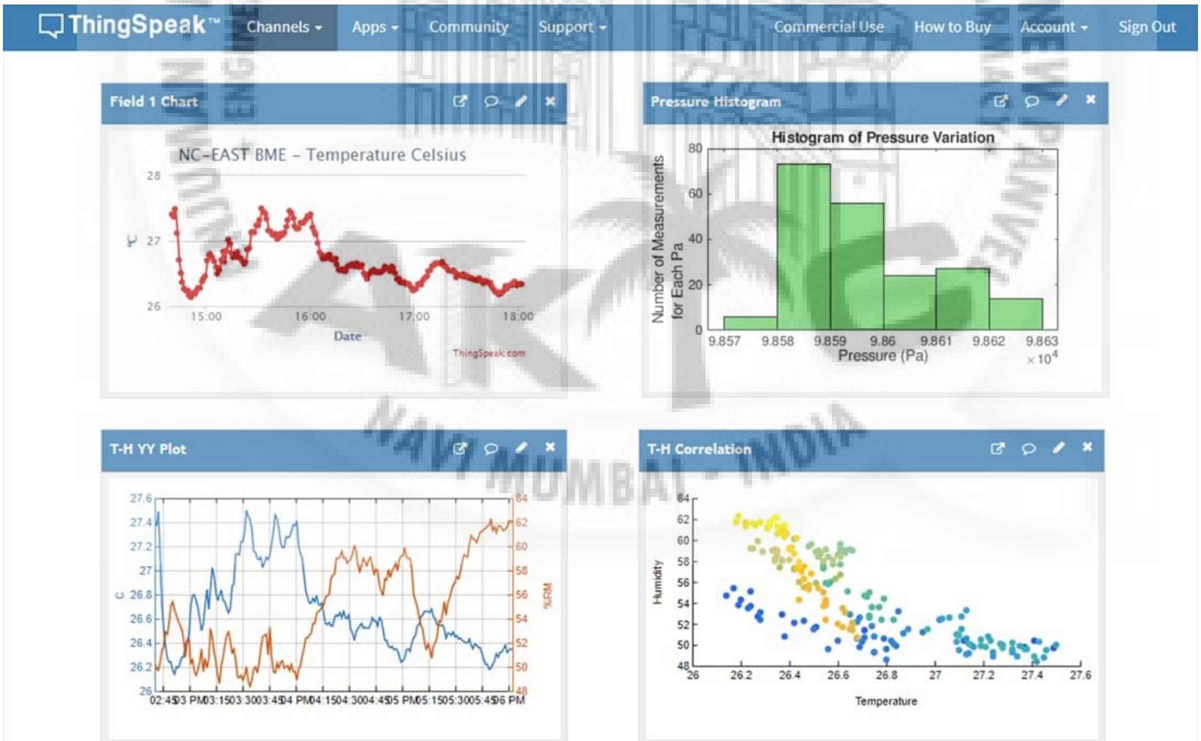


Fig 5.4 Plots of Thingspeak

iii. PROTEUS ISIS [SYSTEM DESIGN]

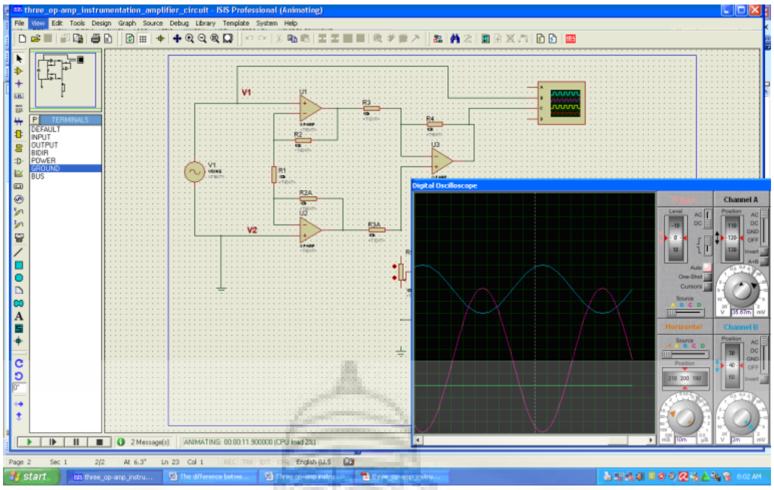


Fig 5.5 Proteus Design Suite

- The Proteus Design Suite is an Electronic Design Automation (EDA) tool including schematic capture, simulation and PCB Layout modules. It is developed in Yorkshire, England by Lab center Electronics Ltd with offices in North America and several overseas sales channels. The software runs on the Windows operating system.
- The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables it's used in a broad spectrum of project prototyping in areas such as motor control, temperature control and user interface design.

iv. PROTEUS ARES [PCB DESIGN]

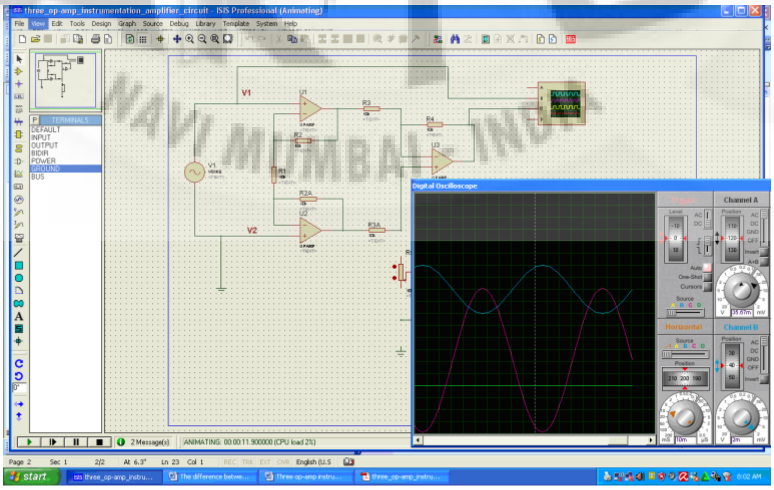


Fig 5.6 PCB design

- High performance netlist based PCB design package perfectly complements our powerful schematic capture software and features both automatic component placement and a truly world class shape based auto-router.

v. P.C.B. MAKING

- P.C.B. is printed circuit board which is of insulating base with layer of thin copper-foil.
- The circuit diagram is then drawn on the P. C. B. with permanent marker and then it is dipped in the solution of ferric chloride so that unwanted copper is removed from the P.C.B., thus leaving components interconnection on the board.
- The specification of the base material is not important to know in most of the application, but it is important to know something about copper foil which is drawn through a thin slip.

- The resistance of copper foil will have an affect on the circuit operation.
- Base material is made of lamination layer of suitable insulating material such as treated paper, fabric; or glass fibers and binding them with resin. Most commonly used base materials are formed paper bonded with epoxy resin.
- It is possible to obtain a range of thickness between 0.5 mm to 3 mm.
- Thickness is the important factor in determining mechanical strength particularly when the commonly used base material is "**Formea**" from paper assembly.
- Physical properties should be self supporting these are surface resistivity, heat dissipation, dielectric, constant, dielectric strength.
- Another important factor is the ability to wishstand high temperature.

5.2 DESIGNING THE LAYOUT :

- While designing a layout, it must be noted that size of the board should be as small as possible.
- Before starting, all components should be placed properly so that an accurate measurement of space can be made.
- The component should not be mounted very close to each other or far away from one another and neither one should ignore the fact that some component reed ventilation, which considerely the dimension of the relay and transformer in view of arrangement, the bolting arrangement is also considered.
- The layout is first drawn on paper then traced on copper plate which is finalized with the pen or permanent marker which is efficient and clean with etching.
- The resistivity also depends on the purity of copper, which is highest for low purity of copper. The high resistance path are always undesired for soldered connections.
- The most difficult part of making an original printed circuit is the conversion from, theretical circuit diagram into wiring layout. without introducing cross over and undesirable effect.
- Although it is difficult operation, it provides greatent amount of satisfaction because it is carried out with more care and skill.
- The board used for project has copper foil thickness in the range of 25 40 75 microns.
- The soldering quality requires 99.99% efficiency.
- It is necessary to design copper path extra large. There are two main reasons for this,
- The copper may be required to carry an extra large overall current:-
- It acts like a kind of screen or ground plane to minimize the effect of interaction.
- The first function is to connect the components together in their right sequence with minimum need for interlinking i.e. the jumpers with wire connections.

- It must be noted, that when layout is done, on the next day it should be dipped in the solution and board is move continuously right and left after etching perfectly the board is cleaned with water and is drilled.
- After that holes are drilled with 1 mm or 0.8 mm drill. Now the marker on the P. C. B. is removed.
- The Printed Circuit Board is now ready for mounting the components on it.

SOLDERING :

- For soldering of any joints first the terminal to be soldered are cleaned to remove oxide film or dirt on it. If required flux is applied on the points to be soldered.
- Now the joint to be soldered is heated with the help of soldering iron. Heat applied should be such that when solder wire is touched to joint, it must melt quickly.
- The joint and the soldering iron is held such that molten solder should flow smoothly over the joint.
- When joint is completely covered with molten solder, the soldering iron is removed.
- The joint is allowed to cool, without any movement.
- The bright shining solder indicates good soldering.
- In case of dry solder joint, a air gap remains in between the solder matenal and the joint. It means that soldering is improper. This is removed and again soldering is done.
- Thus is this way all the components are soldered on P. C. B

CHAPTER 6

6.1 RESULTS AND DISCUSSION

We have measured the moisture of soil at different times of the day and figures below show the results of all the sensor readings at different platforms.

1) At the time of day

a) The figures shown below depict the sensor readings of temperature, humidity and soil moisture, GPS location when the soil is DRY on serial monitor, mobile App and Cloud server

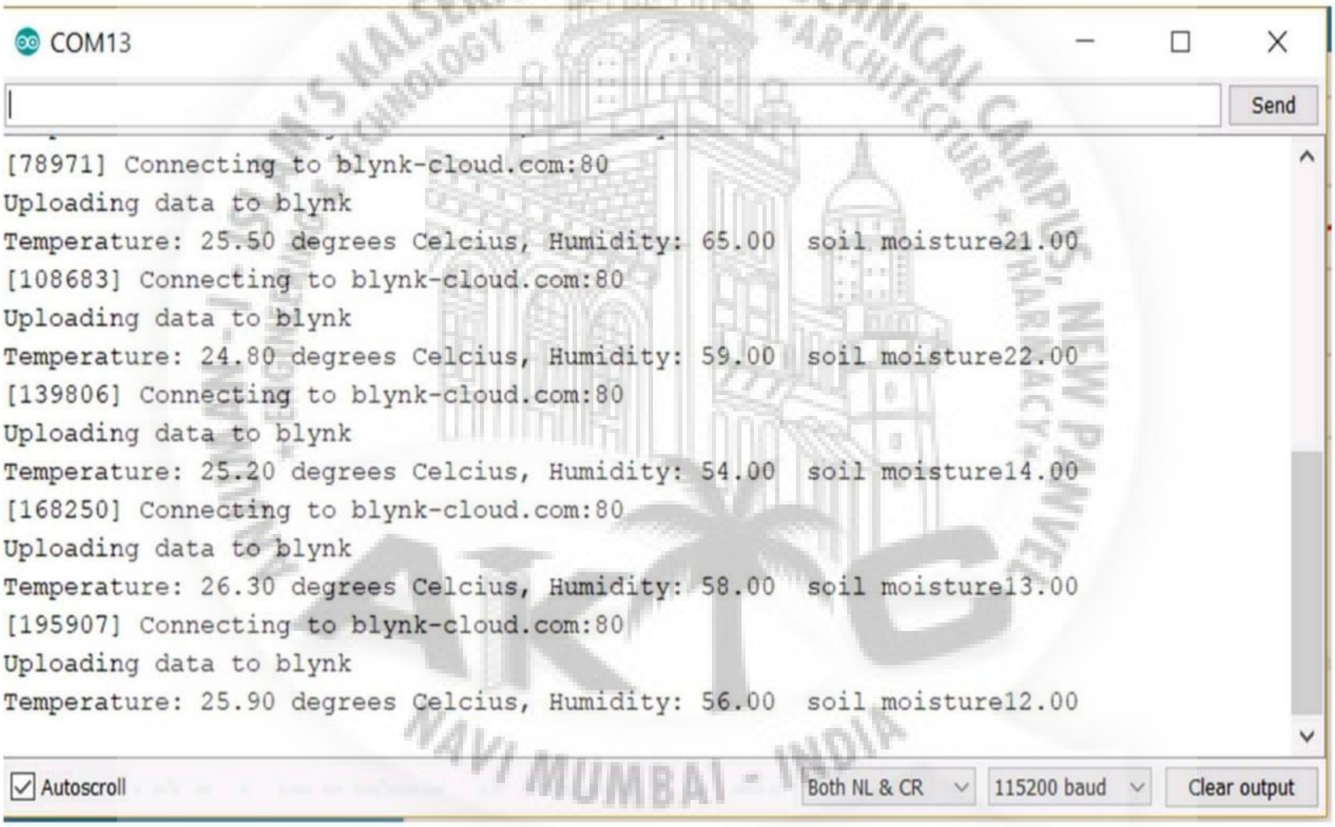


Fig 6.1 Sensor Reading on serial monitor

Above Figure 6.1 shows the value of temperature that is 25.4 deg celcius , value of humidity that is 61% and value of soil moisture is 13% on the mobile app during the day when the soil is dry

Graphs of sensor data on Thingspeak cloudserver

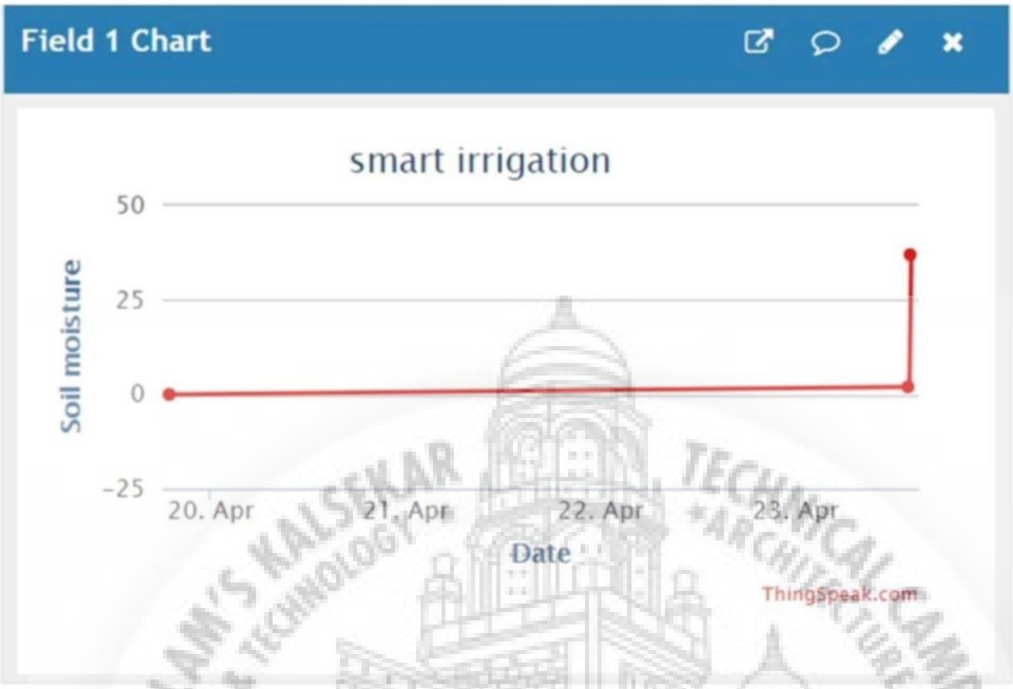


Fig 6.2 Graph of soil moisture

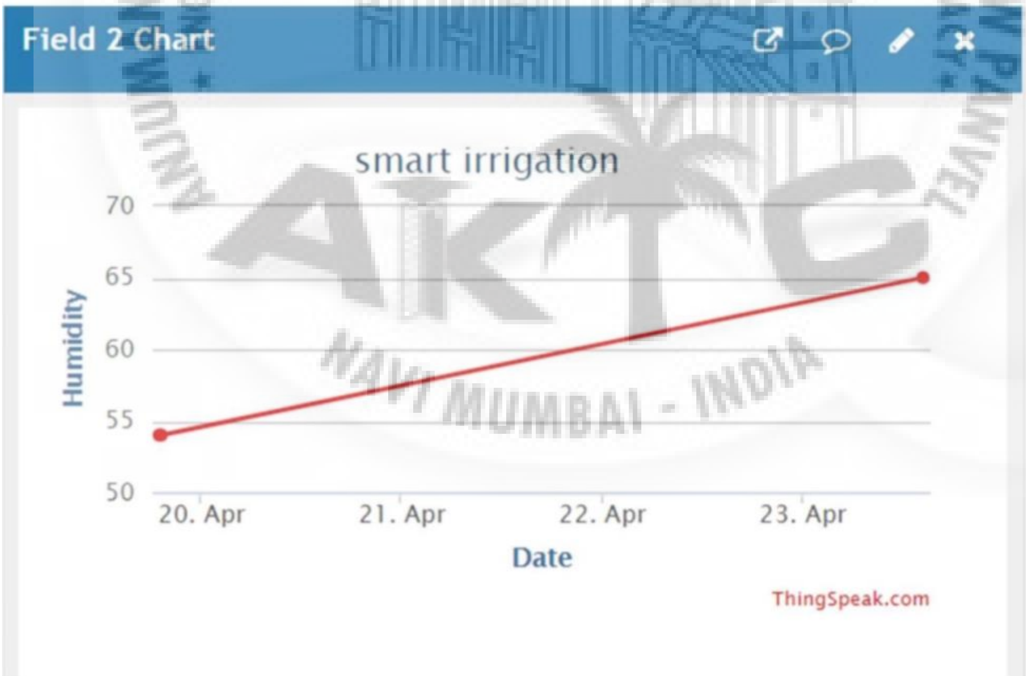


Fig 6.3 Graph of Humidity

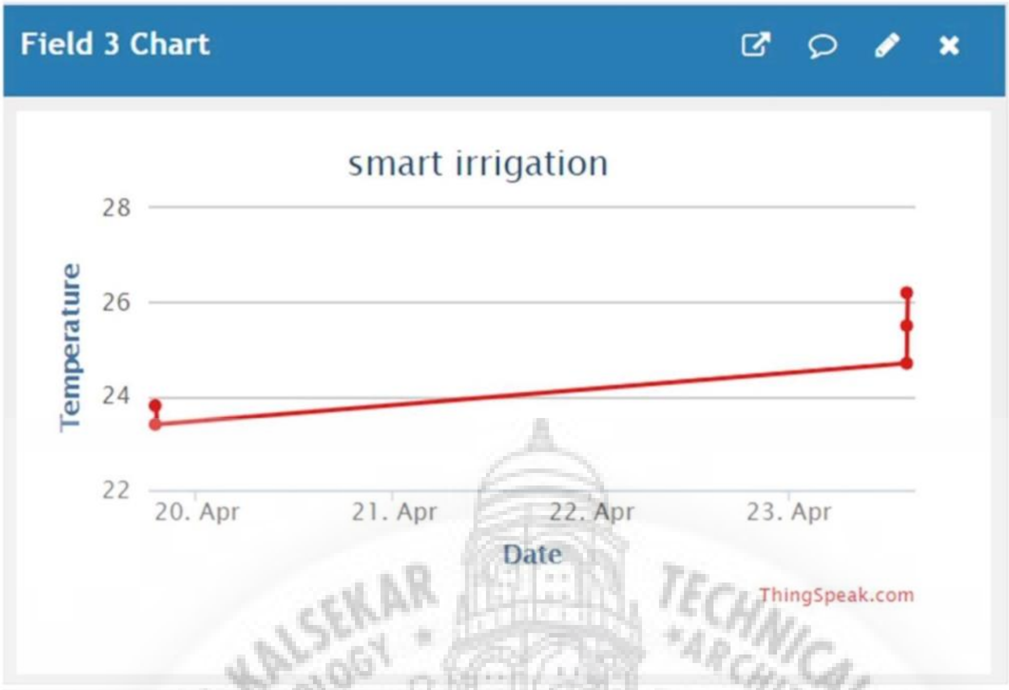


Fig 6.4 Graph of Temperature

Figure 6.2, Figure 6.3 and Figure 6.4 shows the variation of soil moisture, humidity and temperature respectively with time. These graphs depict the real time data acquired on thingspeak.

b) The figures shown below depicts

the sensor readings of temperature, humidity and soil moisture when the soil is WET on serial monitor, mobile App and Cloud server.

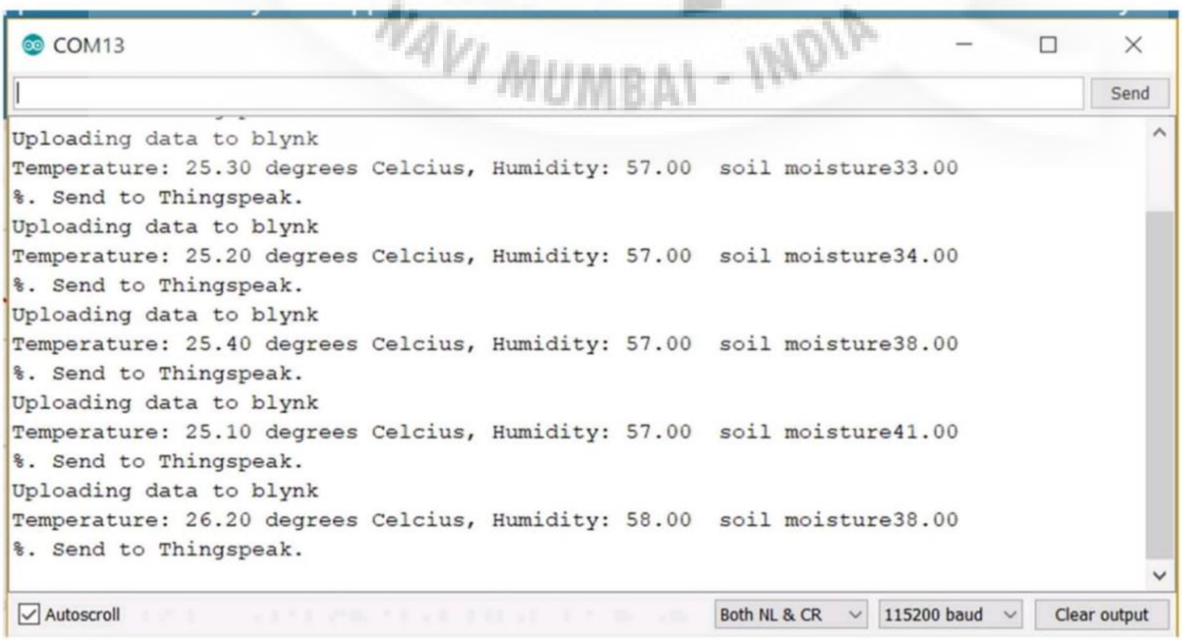


Fig 6.5 Sensor Reading on serial monitor

Figure 6.5 shows the value of temperature that is 25.1 deg celcius , value of humidity that is 57% and value of soil moisture is 41% on the mobile app during the day when the soil is wet

Graphs of sensor data on Thingspeak cloudserver

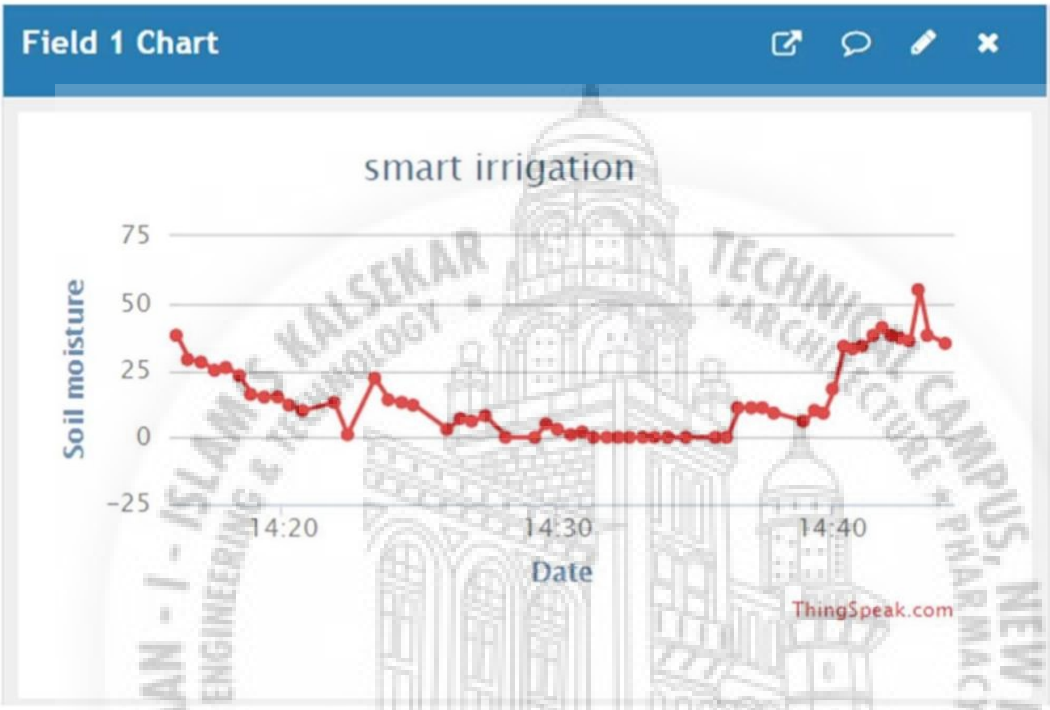


Fig 6.6 Graph of soil moisture

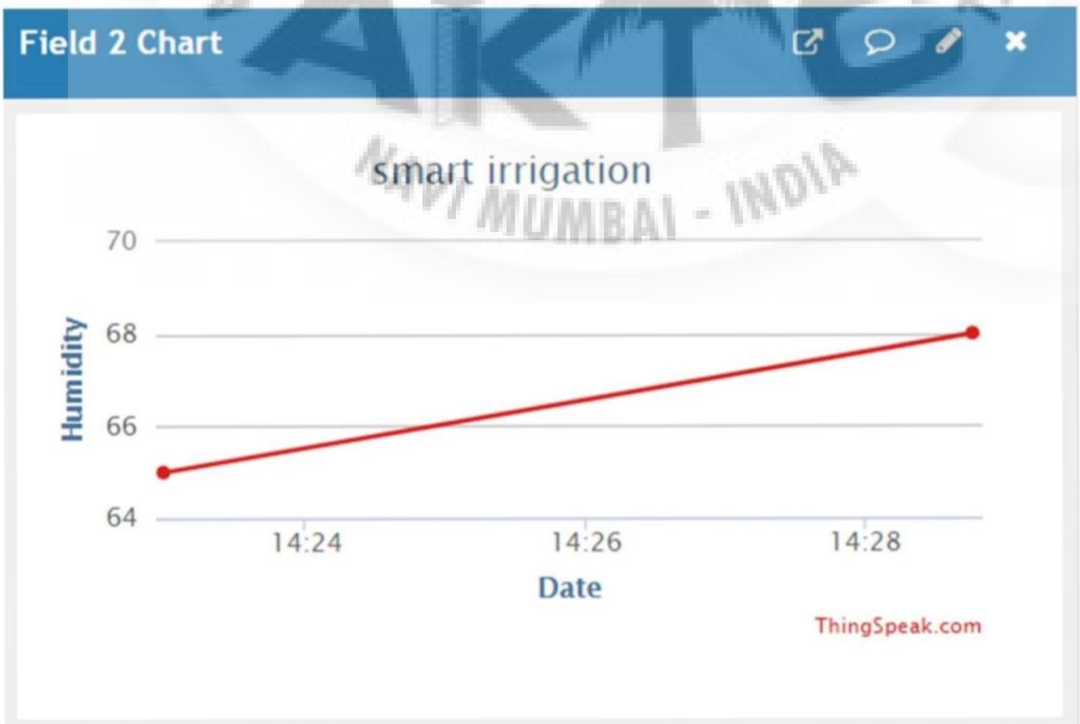


Fig 6.7 Graph of Humidity

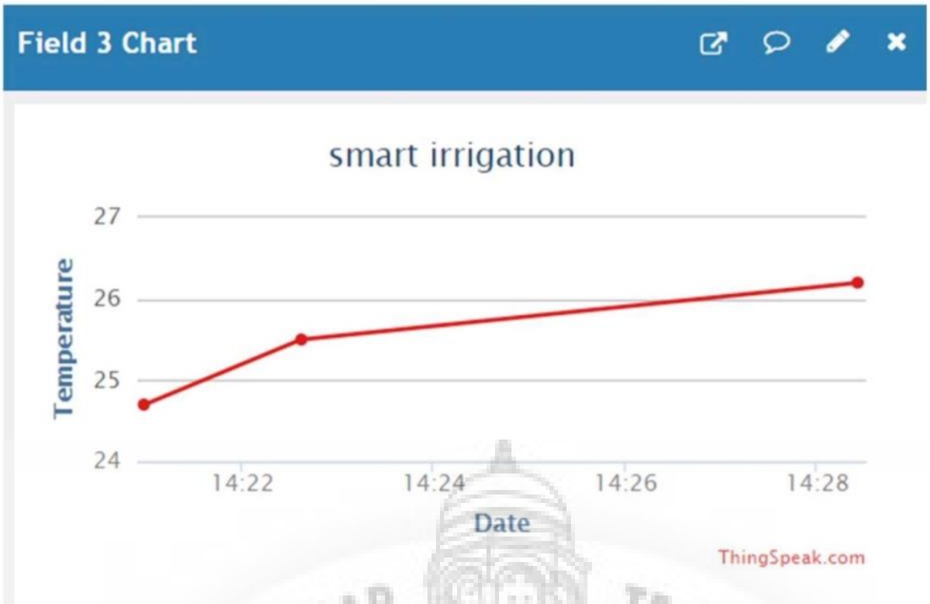


Fig 6.8 Graph of Temperature

Above Figure 6.6 , Fig 6.7 and Fig 6.8 shows the value of temperature that is 25.1 deg celcius , value of humidity that is 57% and value of soil moisture is 41%on the mobile app during the day when the soil is wet

2) At Night

a) The figures shown below depict the sensor readings of temperature, humidity and soil moisture, GPS location when the soil is **DRY** on serial monitor, mobile App and Cloud server.

Fig 6.9 Sensor Reading on serial monitor

Figure 6.9 shows the value of temperature that is 25.3 deg celcius , value of humidity that is 48% and value of soil moisture is 29% on the mobile app during the night when the soil is dry

Graphs of sensor data on Thingspeak cloudserver

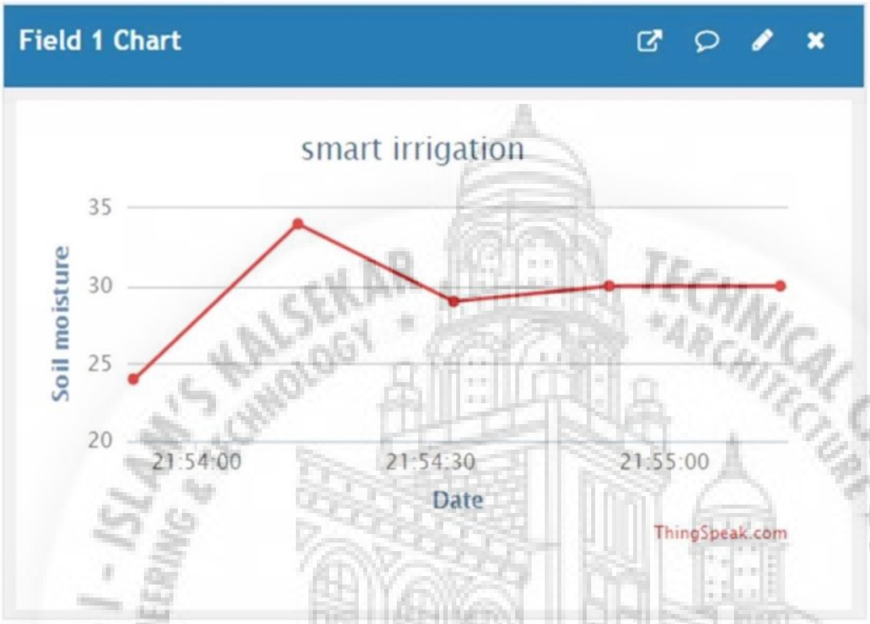


Fig 6.10 Graph of soil moisture

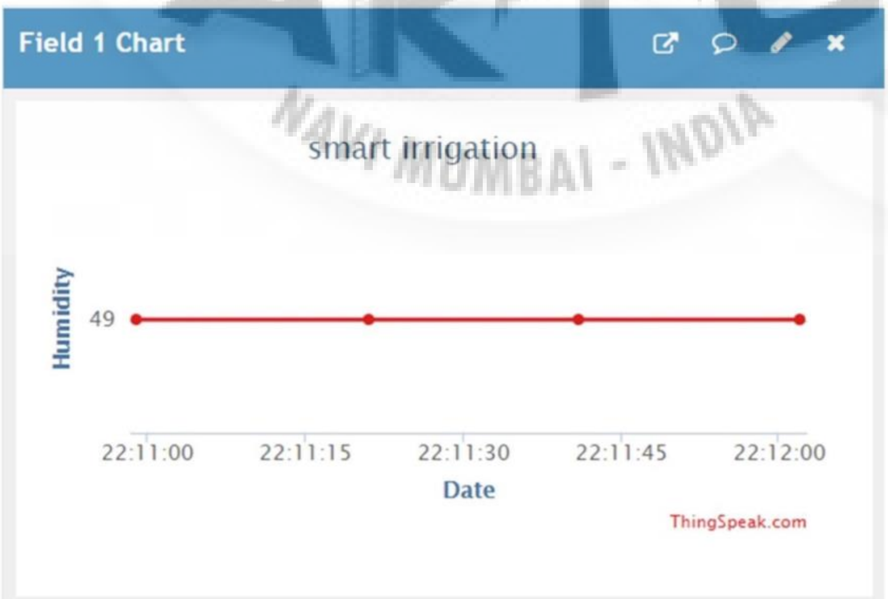


Fig 6.11 Graph of Humidity

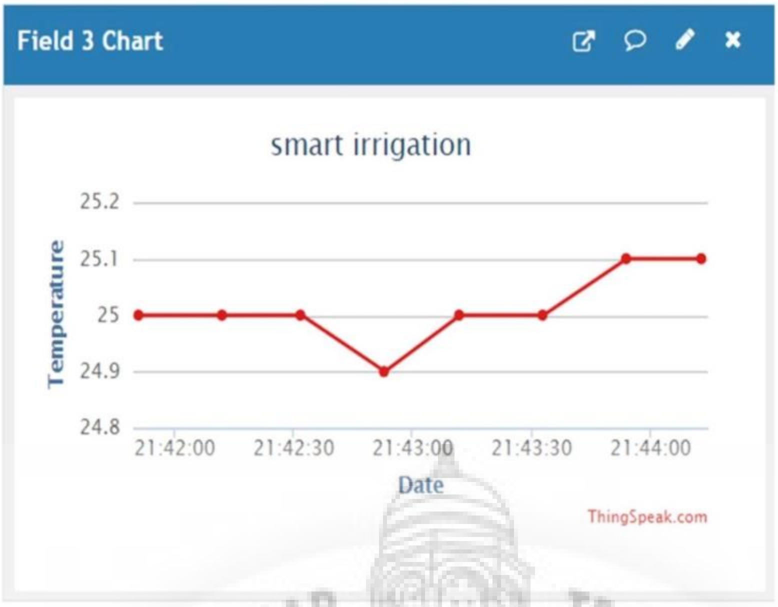


Fig 6.12 Graph of Temperature

Figure 4.14, Figure 4.15 and Figure 4.16 shows the variation of soil moisture, humidity and temperature respectively with time. These graphs depicts the real time data acquired on thingspeak.

b) The figures shown below depict the sensor readings of temperature, humidity and soil moisture, GPS location when the soil is WET on serial monitor, mobile App and Cloud server

Fig 6.13 Sensor Reading on serial monitor

Figure 6.13 shows the value of temperature that is 25.1 deg celcius, value of humidity that is 49% and value of soil moisture is 49% on the mobile app during the night when
the soil is wet.

Graphs of sensor data on Thingspeak cloudserver

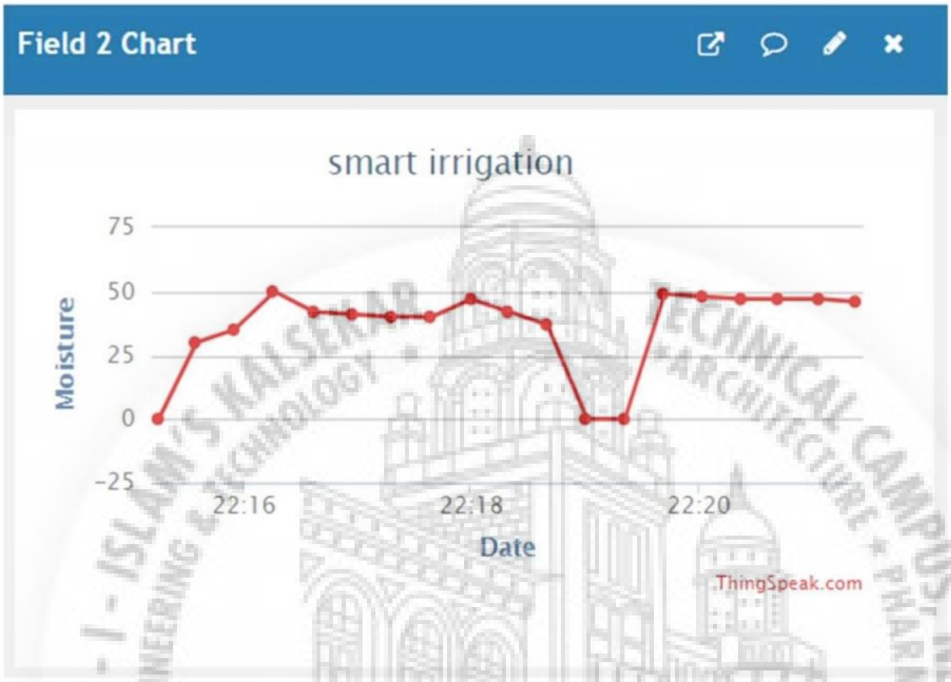


Fig 6.14 Graph of soil moisture

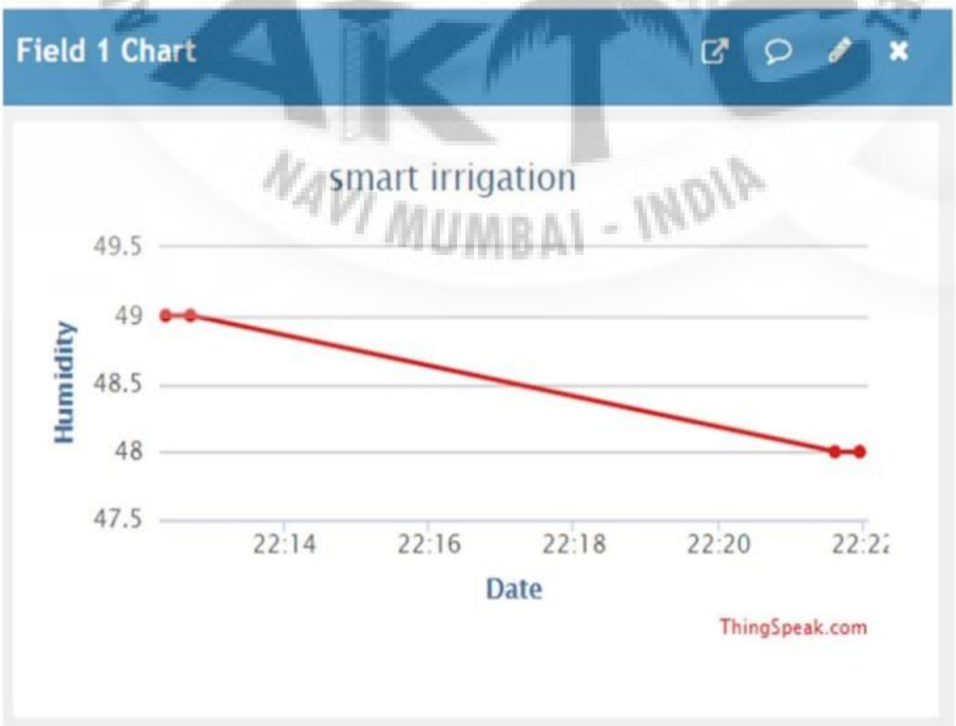


Fig 6.15 Graph of Humidity

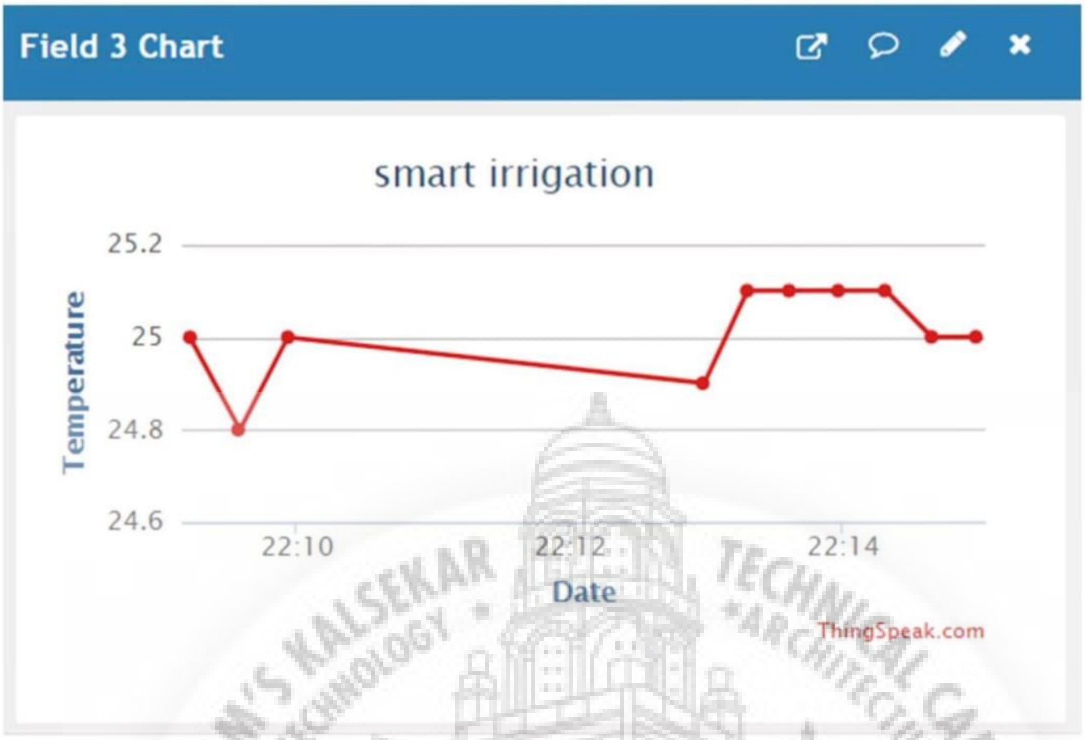


Fig 6.16 Graph of Temperature

Above Figure 4.19, Figure 4.20 and Figure 4.21 shows the variation of soil moisture, humidity and temperature respectively with time. These graphs depicts the real time data acquired on thingspeak.

From our above observations we can say that at the time of day the moisture in the soil is low as the temperature is high and at night moisture of the soil is high as the temperature reduces.

CHAPTER 7

7.1 ADVANTAGE

1) Real hardshipImplemented in large area in real time.
2) To conduct realiability.
3) More accurate GPS receiver, natural disaster warning.
4) Reduce death rates.
5) Reduce man power.

7.2 FUTURE SCOPE

1) Enhance the time complexity of the detection of fires to improve the speed.
2) Additional pump can be added so that it automatically sends water when there is a fire breakout. Also industrial sensors can be used for better ranging and accuracy.
3) One of the limitations of this system is that continuous internet connectivity is required at user end which might prove to be costly for farmer. This can be overcome by extending the system to send suggestion via SMS to the farmer directly on his mobile using GSM module instead of mobile app. Weather data from the meteorolo the future which can help farmer plan accordingly and improve his livelihood.

7.3 ESTIMATE COST

SR.NO	COMPONENT NAME	COST
1)	LM35 Temperature sensor	1300
2)	Humidity sensor	1000
3)	Soil moisture sensor	1000
4)	Arduino uno R3	1500
5)	GIM SIM800L	2,000
6)	12 Volt tranformer	800
7)	buzzer	300
8)	16*2 LCD Display	1000
9)	Miscellaneous cost	1000
		TOTAL COST
		9,900

CHAPTER 8

8.1 CONCLUSION

This paper, an IOT based forest fire detection was implemented using the Arduino So when the temperature is increased it will display on the LCD and also gives message authorities by using the registered mobile number.So by using this technic we can protect the forests and we can save wild animals.

In this paper early warning and fire detection system for forest fire on IoT platform is presented To detect the fire at the early stage and prototype was developed. Furthermore the proposed platform also provides a very prompt and cheaper embedded system to detect true incident of fire.

This paper proposed an intelligent and smart fire warning system for forest. This system not only analyses the fire presence, but also notifies the concerned people for severe fire chances in case of an emergency or critical situation. ANFIS architecture model makes the proposed system more efficient, robust and reliable; and reduces false alarms; the proposed system used easily available, lightweight and cost-effective sensors and is more reliable than conventional fire detection systems

CHAPTER 9

9.1 REFERENCES

1. Sahin, Y.G., Animals as mobile biological sensors for forest fire detection. Sensors, 2007.
(12): p. 3084–3099.

2. Luis, J.A., J.A.G. Galán, and J.A. Espigado, Low power wireless smoke alarm system in Home fires Sensors, 2015. 15(8): p. 20717–20729.

3. Bousack, H., et al., Towards Improved Airborne Fire Detection Systems Using Beetle Inspired Infrared Detection and Fire Searching Strategies. Micro machines, 2015. 6(6):p. 718–746.

4. Sardouk, A., et al., Crisis management using MAS-based wireless sensor networks. Computer Networks, 2013. 57(1): p. 29–45.

5. Clemente, A.D.S.B., J.R. Martínez-de Dios, and A.O. Baturone, A wsn-based tool for urban and industrial fire-fighting. Sensors, 2012. 12(11): p. 15009–15035

6. Ulucinar, A.R., I. Korpeoglu, and A.E. Cetin, A Wi-Fi cluster based wireless sensor network application and deployment for wildfire detection. International Journal of Distributed Sensor Networks, 2014.

7. Molina-Pico, A., et al., Forest Monitoring and Wild land Early Fire Detection by a Hierarchical Wireless Sensor Network. Journal of Sensors, 2016. 2016.

8. Hartung, C., et al. Fire WxNet: A multi-tiered portable wireless system for monitoring weather conditions in Wild land fire environments.in Proceedings of the 4th international conference on Mobile systems, applications and services. 2006. ACM.

9. Yan, X., et al., Real-Time Identification of Smoldering and Flaming Combustion Phases inForest Using a Wireless Sensor Network-Based Multi-Sensor System and Artificial Neural Network. Sensors, 2016. 16(8): p. 1228.

10. Premal, C.E. and S. Vinsley. Image processing based forest fire detection using YCbCr colour model.in Circuit, Power and Computing Technologies (ICCPCT), 2014 International Conference on. 2014. IEEE.

11. Angayarkkani, K. and N. Radhakrishnan. An effective technique to detect forest fire region through ANFIS with spatial data.in Electronics Computer Technology (ICECT), 2011 3rdInternational Conference on. 2011. IEEE

12. Poobalan, K. and S.-C. Liew. Fire detection algorithm using image processing techniques.in Proceedings of the 3rd Inter

13. Lloret, J., et al., A wireless sensor network deployment for rural and forest fire detection and verification. Sensors, 2009. 9(11): p. 8722–8747.

14. Millan-Garcia, L., et al., An early fire detection algorithm using IP cameras. Sensors, 2012.12(5): p. 5670–5686.

15. Tsiourlis, G., S. Andreadakis, and P. Konstantinidis, SITHON: a wireless network of in situ optical cameras applied to the early detection-notification-monitoring of forest fires. Sensors,2009. 9(6): p. 4465– 4482.

-