WEATHER MONITORING

AND

ALERTING SYSTEM

(IOT based)

A report submitted in partial fulfilment of the
requirement for the award of degree of
BACHELORS OF ENGINEERING
in
ELECTRONICS AND COMMUNICATION ENGINEERING

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Acknowledgement

I really appreciate that I have such an opportunity to express my great gratitude and respect to people who helped me when I prepared my BE project. Without their supports and encouragements I cannot go so far.

It is difficult to overstate my greatest gratitude to my project mentor **Mr. Nitin Sharma**, Assistant Professor, ECE Department. First, I would like to thank him for their patient guiding and inspiring throughout my study period. Secondly, I highly appreciate their encouragement and support in my project work, which helped me build confidence and courage to overcome difficulties. Finally, I am grateful for their great insight and suggestions and sharing so much time in project completion. I would have been lost without their support.

I am as ever, truly and deeply indebted to Prof. (Dr.) S. S. Sehgal, Executive Director & Director Engineering, and Prof. (Dr.) Paras Chawla, Head of ECE Department for their great supports at every stage of my academic life, and longed to see this achievement come true.

Abstract

This project is based on weather monitoring and detecting biological hazardous gases (that includes carbon dioxide, carbon monoxide, ammonium gas)

Basically based on IOT we have combined our knowledge and we have implemented the knowledge of embedded programming inside this project

Our project detects the weather and altitude and further more the main implication of this project is to detect hazardous gases which is affecting the atmosphere

Basic examples: carbon dioxide, ammonium and one of the most harmful gas i.e. carbon monoxide.

The device is capable of sensing pressures, water vapor, temperature via a BMP280

The quality of air is also detected via a sensor MQ135.

List of Figures and Tables

CHAPTER 1

INTRODUCTION

As we are advancing towards a futuristic enigma in this century the major cause of creation of our project is to take a step against weather anomaly created by global warming, and rising of environmental hazardous gases. there is an old Chinese proverb: **"*If you want to kill the tree cut the stem first*"**

It signifies that if we want reduce the pollution & global warming we need to be aware of our environment and be prepared for its causalities it minimal its rate of destruction

We have designed our device to basically minimize the upcoming problems which we or our future generation might face because of us**.**

Technology can be a coin with two faces one side good and one side evil

If implemented in a perfect gesture we can improvise things that can make a perfect "IDEAL FUTURE".

A device is a form of technology capable of performing logical implication on the environment capable of sensing as well deriving a graphical and human understandable data

The main objective of this project is to extract and assemble minor to minor data from the environment in order to use them in designated programs, for future scopes.

This project consists of different types of sensors i.e. altitude, temperature, barosensor and different gas indicators. The transmitter consists of a NodeMCU and the sensors, which then send the data to the cloud.

The receiver collects the data from the cloud and the process of displaying the data to the LCD is conveyed via another NodeMCU.

The BMP-280 is a precisely compact sensor which can sense temperature ,altitude and pressure.

The MQ-135 sensor is capable of sensing the gases.

Thing speak helps in the connecting both the NodeMCU's via internet. It is an open platform . Thingspeak applies the MATLAB environment and is quite popular because of the visualization of the data in turms of graphical design. The ardiuno IDE software is used to generate the code for the NodeMCU's

CHAPTER 2

Problem Identification & Solution

As the climate change is in the limelight of 21st century. Due to the increase in the global warming the concern for it is also increasing. So, for this there is a great need for devices that check the change in the environment that can alert the people about these changes and make them aware.

For this many devices are installed for the change but the problem is that these devices act at extreme conditions. This was the main concern while making the project so we used the devices which can survive in extreme temperatures like the sensor BMP-280 is rated to be used in conditions from -40*C to 85*C.

By using these robust sensors, the survival of the device in extreme conditions can be increased exponentially. Also because of small size there are minimum requirement for the infrastructure.

The more we use the compactness with high efficiency of this devices helps us to revitalize the degradation and exploitation of the resources. The MQ-135 sensor is highly stable and has a long turm duration.

Our main concern was to collect high efficient precise data's with less expenditure in the infrastructure.

We also, used NodeMCU instead of using Ardiuno board as it is attached with a integrated wifi module.

We choose this idea as it compraises with Less expandature more longitivity and highly efficient data collection.

The transmitter sends the data extracted by the sensors and is sent to the cloud which is connected with the Internet and the data is received through the cloud from the internet to the another NodeMCU and is displayed in the LCD

CHAPTER 3

Design Flow

Design Flowof weather monitoring system is given below:

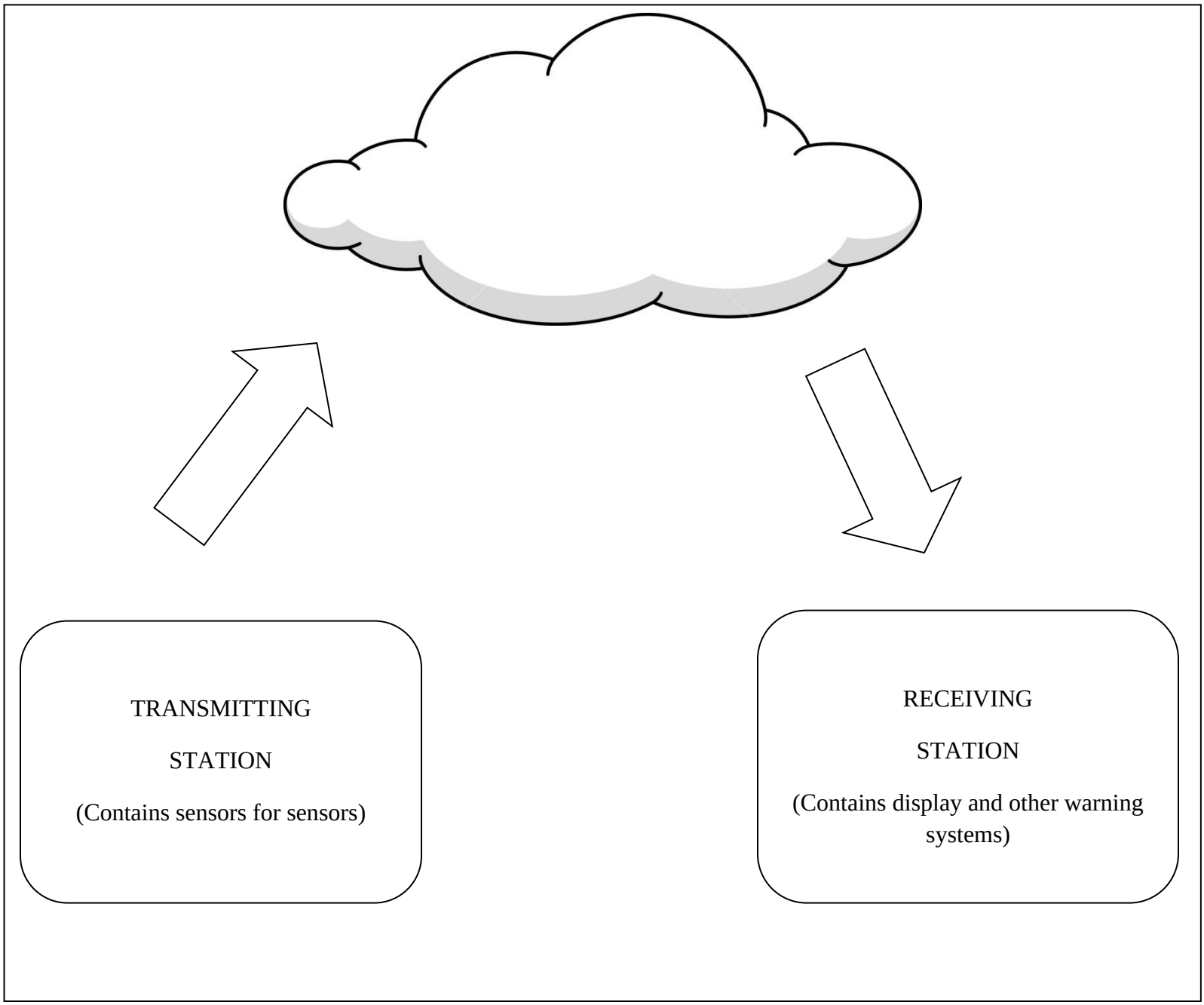

Figure 3. 1 Design Flow

CHAPTER 4

Flowchart

Transmitter

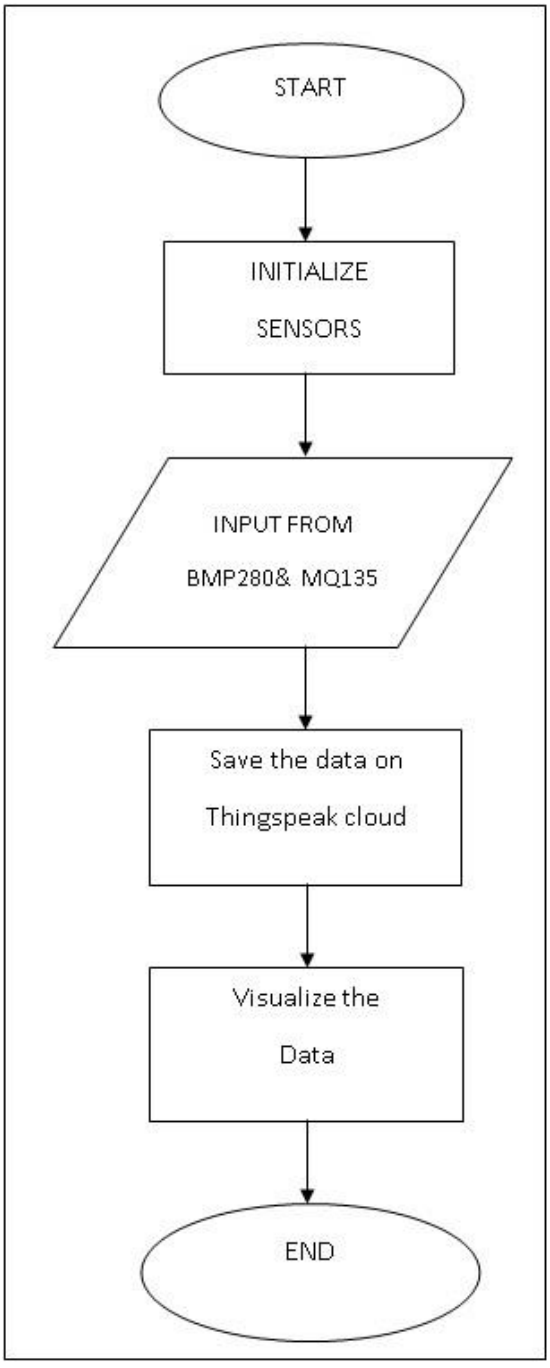

Figure 4. 1 Transmitter Flowchart

Receiver

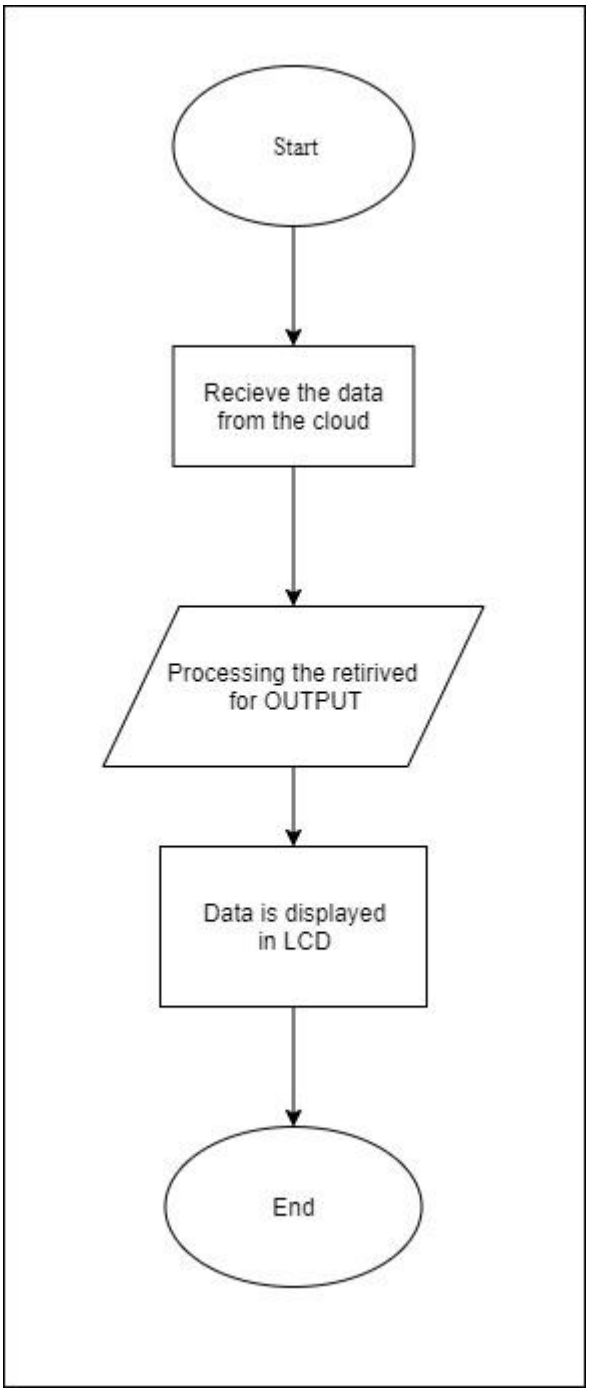

Figure 4. 2 Receiver Flowchart

CHAPTER 5

TECHNICAL SPECIFICATIONS

Software Used:

1. **Arduino IDE:**

Figure 5. 1 Arduino

The Arduino Integrated Development Environment (IDE) is a cross platform application that is written in Java. It is used to write programs and then upload to the board. It can be used to program many different boards like Intel Edison, Node MCU, etc. It is popular among electronic enthusiasts because of its easy programming interface and user-friendly interface.

Hardware Required:

1. NodeMCU

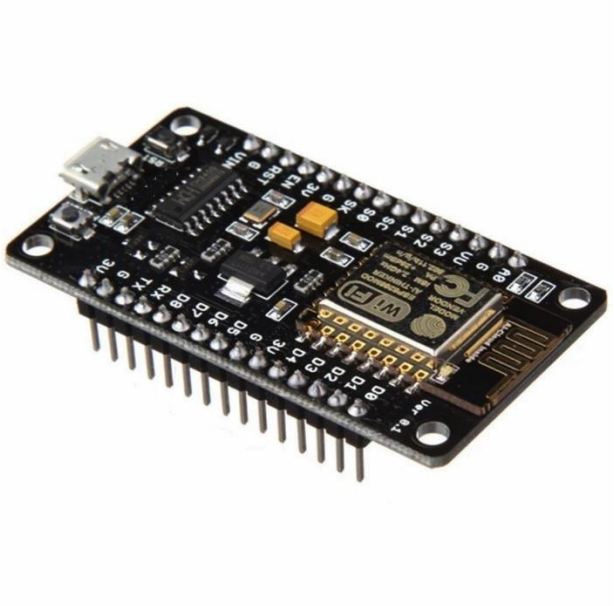

Figure 5. 2 NodeMCU

NodeMCU is the main building block in sending and receiving the data. It consists of ESP8266 Wi-Fi module which helps us to connect with the internet. It can also be programmed by using the Arduino IDE by adding the board and required library to the IDE. It supports various modes of communications like I2C, SPI, UART, etc.

TECHNICAL SPECIFICATIONS:

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB

2. BMP-280

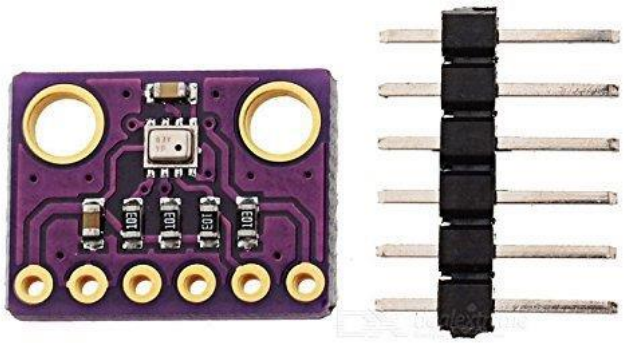

Figure 5. 3 BMP-280

BMP-280 is an barometric pressure, temperature, and altitude sensor. It is a extremely compacted packaged device. It is used in mobiles mostly because of its small size and its low power consumption. It is used in GPS navigation, weather forecasting, vertical velocity indication. It can survive in extreme weather conditions with temperature ranging from -40*C to 85*C.

TECHNICAL SPECIFICATIONS:

- Supply Voltage: 1.7V – 3.6V
- Average measurement time: 5.5ms
- Average current consumption: 2.74uA
- Relative accuracy: 0.12 hPa equivalent to 1m
- Operation Range: Pressure: 300hPa to 1100hPa
  Temperature: -40*C to 85*C
- Interfaces: I2C & SPI

3. MQ-135

Figure 5. 4 MQ-135

MQ-135 is a air quality sensor used for detecting gases like CO2 (Carbon Dioxide), NH4(Ammonia), CO (Carbon Dioxide) in the atmosphere. It is able to measure the gases in parts per million (ppm). This sensor is popular because of its high accuracy and low cost. It operates at 5V. The MQ-135 Gas sensors are used in air quality control equipment and are suitable for detecting or measuring of NH3, NOx, Alcohol, Benzene, Smoke, CO2.

TECHNICAL SPECIFICATIONS:

- Analog output voltage: 0V to 5V
- Digital output voltage: 0V or 5V (TTL Logic)
- Preheat duration 20 seconds
- Stable and long life
- Operating Voltage is +5V
- Can be used as digital as well as analog sensor.

4. LCD

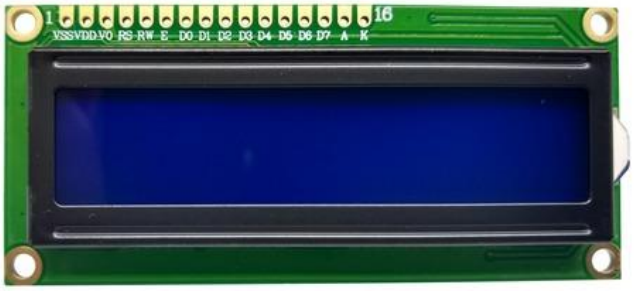

Figure 5. 5 LCD

LCD stands for Liquid Crystal Display. It is an output device which prints the data on the screen. LCD uses a liquid crystal to produce a visible image. Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. LCD technology is used for displaying the image in notebook or some other electronic devices like mini computers. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the colored image. This image is then displayed on the screen.

TECHNICAL SPECIFICATIONS:

- Character LCD 16X2
- +5V input supply
- 5X8 dots contains cursor
- Interface: 6800, SPI & I2C

Cloud Used:

1. ThingSpeak

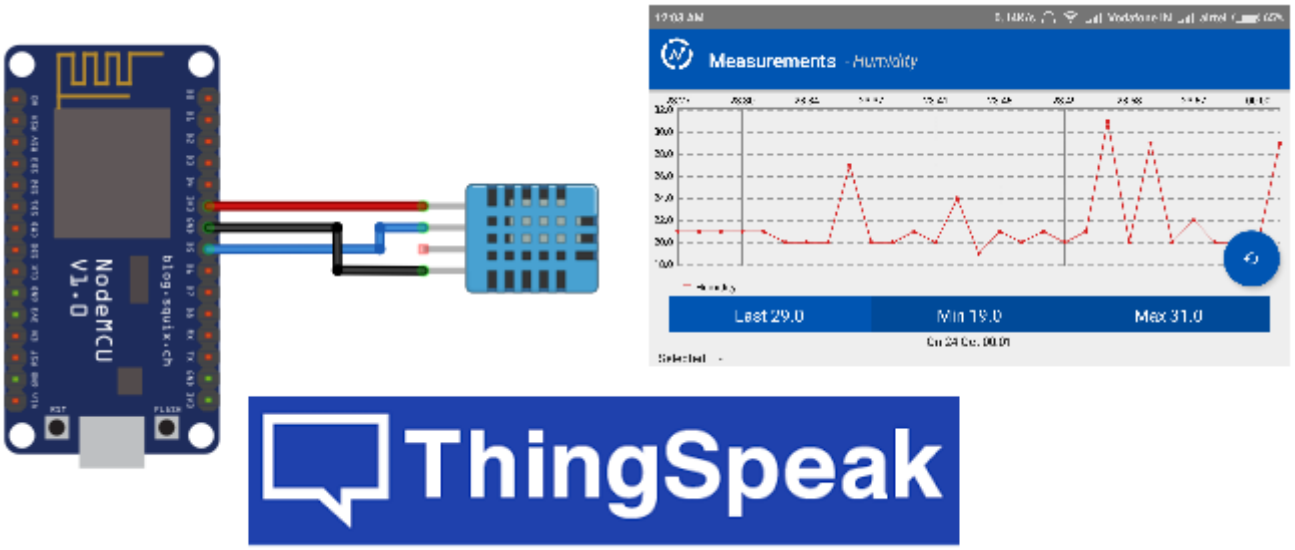

Figure 5. 6 ThingSpeak Cloud

ThingSpeak is an online Internet of Things (IOT) cloud used in IOT applications. It is an open data platform and API for the Internet of Things that enables us to collect, store, analyze, visualize, and act on data from sensors. ThingSpeak is a product created by MathWorks Ltd... It is popular because it is easier to visualize data on the cloud as it used MATLAB at the backend to make the graphs of the visualized data making it easier to analyze.

Communication Protocol Used:

1. I2C Communication:

I2C combines the best features of SPI and UARTs. With I2C, you can connect multiple slaves to a single master (like SPI) and you can have multiple masters controlling single, or multiple slaves. This is really useful when you want to have more than one microcontroller logging data to a single memory card or displaying text to a single LCD. Like UART communication, I2C only uses two wires to transmit data between devices:

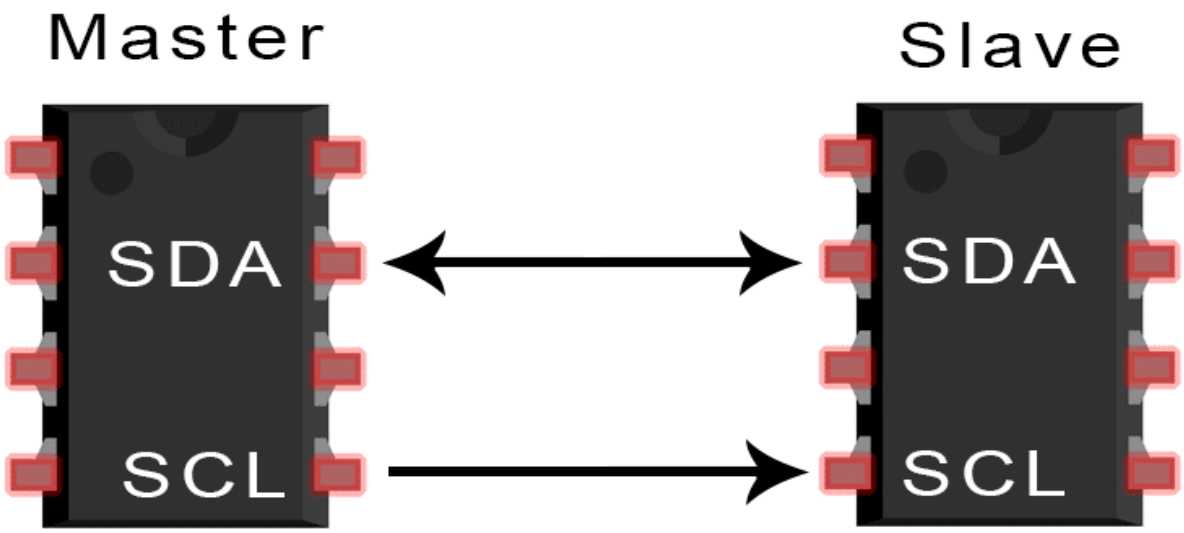

Figure 5. 7 I2C Communication Protocol

SDA: Serial Data used to transmit data between the master and the slave.

SCL: Serial Clock use to carry the clock signal.

CHAPTER 6

Simulation and Outcomes

1. Sending Data to Cloud

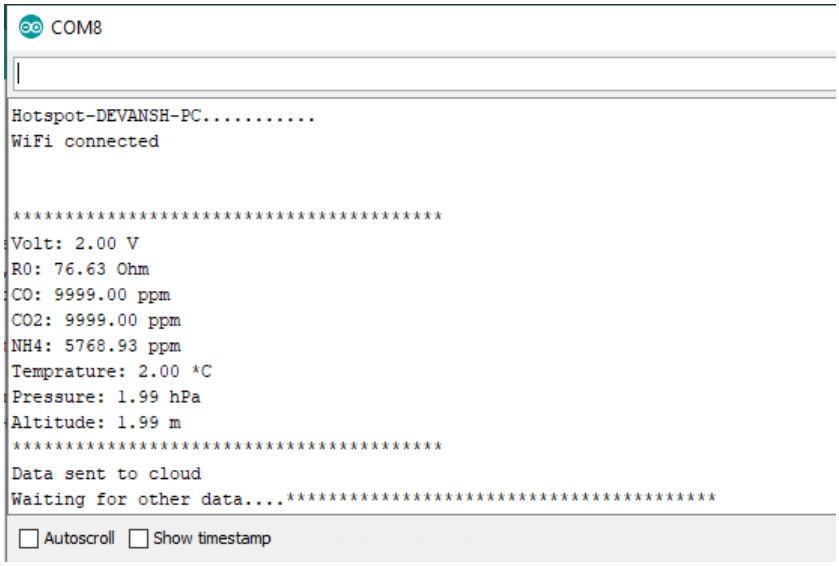

Figure 6. 1 Sending data to cloud

2. Visualizing Data on cloud

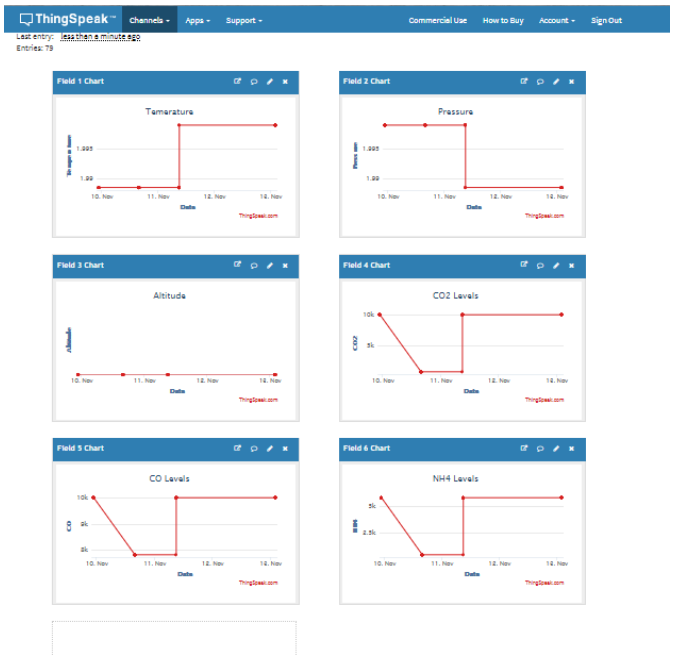

Figure 6. 2 Visualizing Data

3. Receiving Data back from Cloud

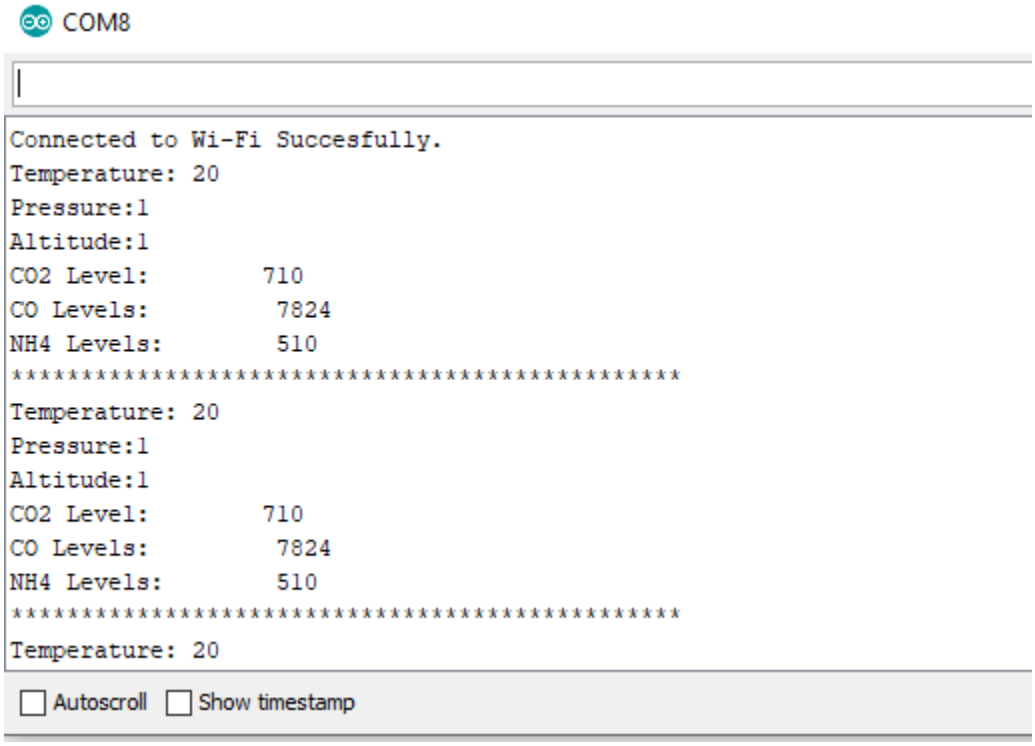

Figure 6. 3 Receiving Data

CHAPTER 7

Conclusion and Future Scope

Conclusion

With advancement in technological field and miniature criterion of product sizes our project has a lead role in monitoring weather anomaly furthermore is a Campbell in a futuristic world.

Hence, we can conclude it as

“Size can be only toughed by intelligence”

A small weather monitoring can take a huge lump in controlling disastrous impacts on planet earth.

Future Scope

Our project can be a arbitrary revolving satellite if updated with a new archives of weather prediction and can be used in disaster management programs. It can also be used to collect data to train machine learning models

Cost Analysis

Sr. No.	Component	Price (in Rs)
1.	NodeMCU	270
2.	BMP-280	330
3.	MQ-135	150
4.	LCD	100
5.	I2C Connector	150
6.	Jumper Wires	50
Total Cost		1050

Table 1 Cost Analysis

ECE ARCHIVES PROJECT SUBMISSION FORM

Project Code: **CU/ECE/20____/Sem____/UID_____ (To be filled by Office)**

Project Name: Weather detection and Alerting System

Name and UID of student: Bedanta Bhandar Kayastha/17BEC1103

Team Members:

S. No.	Name	UID	Semester	Contact No.
1.	Abhinav	17BEC1075	5th	8894942250
2.	Gaurav Kumar	17BEC1087	5th	8219642322
3.	Devansh Sharma	17BEC1095	5th	9418096917
4.	Kunal Kumar	17BEC1099	5th	9354346672
5.				

Section to be filled by Project Mentor

Status (Please tick, whichever applicable)

Working		Not Working	
Marks Awarded		**60**	

Project Mentor Details:

Name Mr. Nitin Sharma Employee ID _____

Sign _____ Date _____

Section to be filled by Project Examiner(s)

Status (Please tick, whichever applicable)

Working		Not Working	

Project Examiner Signatures:

Internal _____ Employee ID _____

External _____ Employee ID _____

Date _____

ECE ARCHIVES PROJECT SUBMISSION FORM

Project Code: **CU/ECE/20____/Sem____/UID_____ (To be filled by Office)**

Project Name: Weather detection and Alerting System

Name and UID of student: Gaurav Kumar/17BEC1087

Team Members:

S. No.	Name	UID	Semester	Contact No.
1.	Bedanta Bhandar Kayastha	17BEC1103	5th	9101134794
2.	Abhinav	17BEC1075	5th	8894942250
3.	Devansh Sharma	17BEC1095	5th	9418096917
4.	Kunal Kumar	17BEC1099	5th	9354346672
5.				

Section to be filled by Project Mentor

Status (Please tick, whichever applicable)

Working		Not Working	
Marks Awarded		**60**	

Project Mentor Details:

Name Mr. Nitin Sharma Employee ID _____

Sign _____ Date _____

Section to be filled by Project Examiner(s)

Status (Please tick, whichever applicable)

Working		Not Working	

Project Examiner Signatures:

Internal _____ Employee ID _____

External _____ Employee ID _____

Date _____

ECE ARCHIVES PROJECT SUBMISSION FORM

Project Code: **CU/ECE/20____/Sem____/UID_____ (To be filled by Office)**

Project Name: Weather detection and Alerting System

Name and UID of student: Devansh Sharma/17BEC1095

Team Members:

S. No.	Name	UID	Semester	Contact No.
1.	Bedanta Bhandar Kayastha	17BEC1103	5th	9101134794
2.	Gaurav Kumar	17BEC1087	5th	8219642322
3.	Abhinav	17BEC1075	5th	8894942250
4.	Kunal Kumar	17BEC1099	5th	9354346672
5.				

Section to be filled by Project Mentor

Status (Please tick, whichever applicable)

Working		Not Working	
Marks Awarded		**60**	

Project Mentor Details:

Name Mr. Nitin Sharma Employee ID _____

Sign _____ Date _____

Section to be filled by Project Examiner(s)

Status (Please tick, whichever applicable)

Working		Not Working	

Project Examiner Signatures:

Internal _____ Employee ID _____

External _____ Employee ID _____

Date _____

ECE ARCHIVES PROJECT SUBMISSION FORM

Project Code: **CU/ECE/20____/Sem____/UID_____ (To be filled by Office)**

Project Name: Weather detection and Alerting System

Name and UID of student: Kunal Kumar/17BEC1099

Team Members:

S. No.	Name	UID	Semester	Contact No.
1.	Bedanta Bhandar Kayastha	17BEC1103	5th	9101134794
2.	Gaurav Kumar	17BEC1087	5th	8219642322
3.	Devansh Sharma	17BEC1095	5th	9418096917
4.	Abhinav	17BEC1075	5th	8894942250
5.				

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Name Mr. Nitin Sharma Employee ID _____

Sign _____ Date _____

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Status (Please tick, whichever applicable)

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Internal _____ Employee ID _____

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Date _____