IoT based Weather Detection System

#1 A. Kathiresan
Faculty Guide (IT), PSG Polytechnic
Peelamedu, TN, India

#3 Rahul.M. S
Information Technology, PSG Polytechnic
Peelamedu, TN, India

#2 Rakshak. S
Information Technology, PSG Polytechnic
Peelamedu, TN, India

#4 Dharani Shankar. S
Information Technology, PSG Polytechnic
Peelamedu, TN, India

Abstract: **The IoT Technology provided in this project is a good option for surveillance the weather data at a particular region and make the data visible anywhere in the world. The idea behind this is electronic sensors connected to the Public Internet by using IoT technology. The data fetched from the embedded system can be accessible over the Internet from anywhere in the world. In some area, it will be challenging to check and monitor the vital weather parameter through wires and analogue devices during some weather hazards. To resolve this problem here, electronic sensors are used to review and monitor the weather parameters. The project is implemented using Node MCU ESP-8266 with Wi-Fi inbuilt used for TCP/ IP protocol in the smart phone for wireless remote monitoring. An Integrated TCP/IP protocol stack is used for transmitting and receiving sensor information. Depending on a status of weather information to the wireless remote location. The NodeMCU-12E controls the entire weather Prediction system peripherals and status on a web page or mobile application. In this way, a secure, flexible, trust-able and economical system is developed to solve above mentioned weather parameters. Once the code is uploaded you can find the IP address of NodeMCU in the serial monitor. With the same IP, you can go to any web browser and display the data in a beautiful widget format. The project is very interesting and can be used in remote areas or in a freezer where the data is to be monitored.**

Keywords- Sensor information; Weather data, Internet of Things, Temperature sensors.

I. INTRODUCTION

A weather station is a technology that collects data related to the weather & environment using different electronics sensors. There are two types of weather station, one who is having their sensors and the second type of weather station is where we pull data from the weather station servers. In this project, we are designed by our weather station.

We all know that a weather station is not a single device, but it is a combination of many small tools to form a larger system. It contains various sensors and gadgets that work together but in specific ways to transmit proper and accurate data of the weather parameters. It is quite tricky to uses of WEB server-based weather station to non-technical peoples, so we are providing web server-based user interface as well as Android application. We are well known today most mobile units running on Android OS, and many peoples are well known to use the android phone. So, our application is

beneficial for such purpose this device is all about IoT based Live Weather data Monitoring Using NodeMCU ESP8266.

We will interface DHT11 Humidity & Temperature Sensor, BMP180 Barometric Pressure Sensor and Rain Sensor with NodeMCU ESP8266-12E wi-fi Module.

II. LITERATURE SURVEY

There are possible to make the user-friendly live weather monitoring system using IoT technology. IoT is an Internet of things which capable of transferring data over a network without requiring human interaction [1]

With the development of a cloud-based system, the cloud platform can give better weather availability of data anywhere and anytime. The weather needs easy ways and new techniques for surveillance and management. Monitoring the weather parameter is required to assess the live condition of the weather to takes the right life action according to fetched data from the device. [2]

It is an embedded system which consists of web enabled smart such as processors, sensors and communication hardware, to fetch, transmit and work on available data they obtained from their weather. The IoT devices sent this processed data to the network gateway, and from there, it will be available to within network. But by designing such a system which also available on public Internet also is make more advantage to human life. [3]

Previously many of IoT based weather monitoring system design used third parties IoT platform such as Thing Speak. But we have designed our cloud-based server because of that anyone can easily access our web-based service or through android app [4].

III. Working

Assemble all system as per circuit diagram. Program the NodeMCU using Arduino IDE. You will get confirmation on your screen once

The NodeMCU is a programable controller which has inbuilt wi-fi module We connect three sensors 1) BMP180 2) DHT11 and 3) Rain Sensor to NodeMCU. By using these three sensors, we can collect the required weather data for monitoring purpose. This pooled data is stream over the Internet to display it or read it from anywhere. After the

successfully programmed hardware, the NodeMCU get one IP address. We can browse this IP address from any of WEB browser like Chrome, Firefox, Internet Explorer etc.so we display the required live data which fetched by sensors in beautiful Graphical User Interface format. The weather parameters that we monitor are Temperature, Pressure, Humidity and Rain.

Also, you can check whether data through anywhere using Internet as we hosted this server publicly. We developed an android application for easy access to our weather monitoring system.

IV. SYSTEM FABRICATION
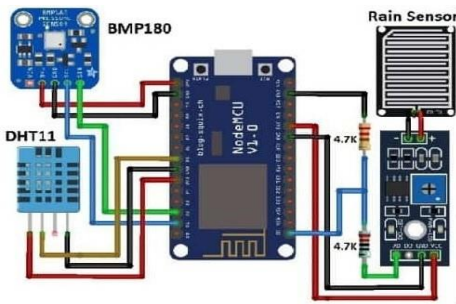
Fig 1 Circuit Fabrication

The DHT11 sensor, BMP 180 sensor, rain sensor, all are connected with the node MCU pins and the power supply is done by USB cable to connect the hardware to the system. The prototype model is represented in the above images. All the connections should be done in the same manner then will get a proper result. The below tables show the pin connection for each sensor.

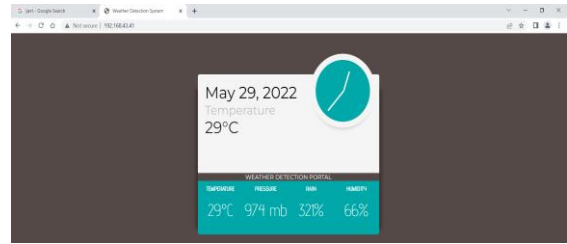## V. SYSTEM ARCHITECTURE

Fig 2 flowchart diagram

Fig 3 Webpage of Weather detection system

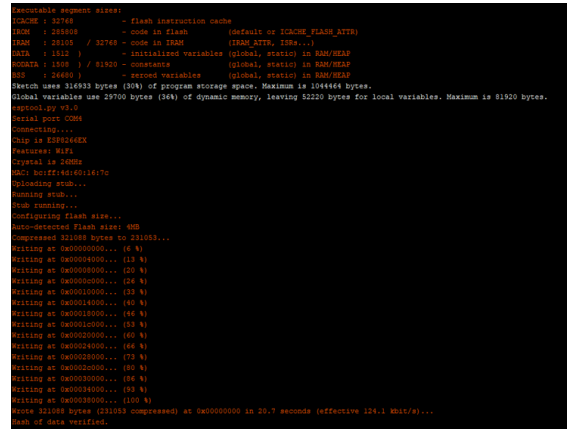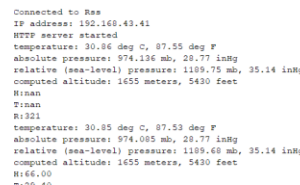Fig 4 Running status in console space in Arduino ide
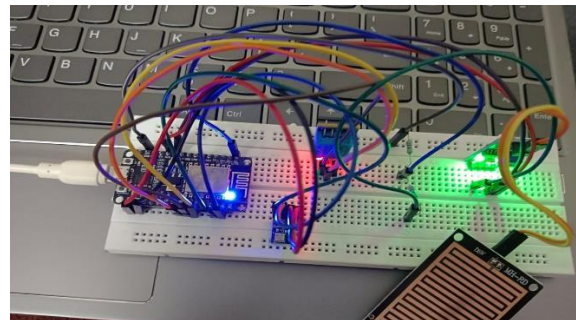

Fig 5 Weather data in Arduino com4 port

Fig 6 Circuit image

VI. HARDWARE AND SOFTWARE REQUIREMENTS

IoT Based Weather Monitoring System is required hardware as well as the software needed to implement. The details are given follow

Hardware Requirements

The things needed for this project are given below.

1. Nodemcu ESP8266 12E Board

NodeMCU is an integrated chip that provides full internet connectivity to the embedded circuit in which it is present. It can be programmed through USB port using

Arduino IDE. It has a total of 30 pins in which 9 pins are digital pins while 1 pin is analogue pin. It is a tool that is employed for Wi-Fi networking. It has low power consumption. In this project it has been employed as the main microcontroller owing to its inbuilt Wi-Fi connecting capacity which can be exploited to transmit real-time monitored sensor data to web and mobile interfaces.
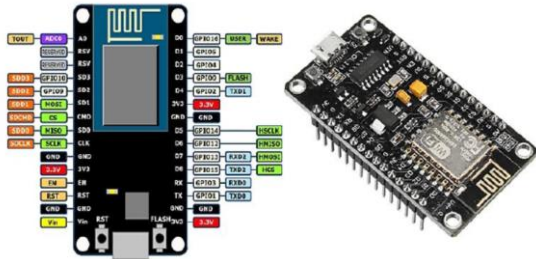

Fig 6 Nodemcu

2. BMP180 Pressure Sensor

BMP 180 Pressure Sensor is a barometric pressure sensor and it works with an I2C interface. This sensor measures the absolute pressure of the air around it. The pressure value depends on both the weather and altitude. It depends on how you interpret the data, and can easily monitor changes in the weather, measure the altitude, or any other tasks that require an accurate pressure reading.
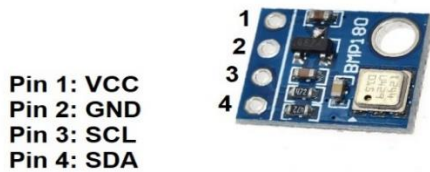

Fig 7 BMP180 sensor

3. DHT11 Humidity Temperature Sensor

DHT11 module features a humidity and temperature complex with a calibrated digital signal output means DHT11 sensor module is a combined module for sensing humidity and temperature which gives a calibrated digital output signal. DHT11 gives us very precise value of humidity and temperature and ensures high reliability and long-term stability.
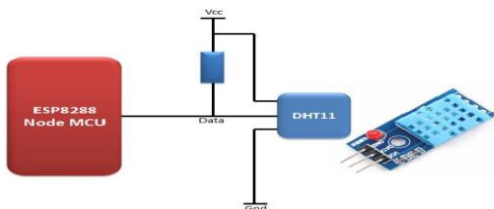

Fig 8 DHT sensor fabricated with Nodemcu

4. Rain Sensor FC37

Rain sensors are used in the detection of water beyond what a humidity sensor can detect. The rain sensor detects water that completes the circuits on its sensor board's printed leads. The sensor board acts as a variable resistor that will change.
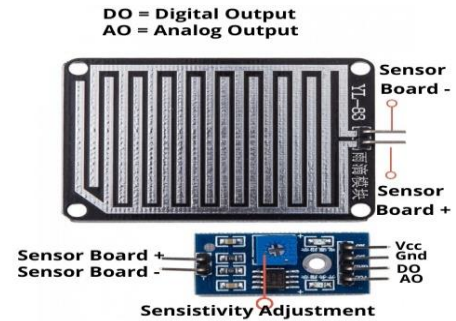

Fig 9 Rain sensor

5. 4.7K Resistors – 2

The resistance of each is 4.7K Ohm and the rated power is 2W. The main function of carbon film resistors is to reduce the current flow in a circuit. It can be used for current limiting, voltage division, resistance matching, load and capacitor matching.

Fig 10 4.7k resistors

6. Breadboard

A thin plastic board used to hold electronic components (transistors, resistors, chips, etc.) that are wired together. Used to develop prototypes of electronic circuits, breadboards can be reused for future jobs. They can be used to create one-of-a-kind systems but rarely become commercial products. The breadboard contains spring clip contacts typically arranged in matrices with certain blocks of clips already wired together. The components and jump wires (assorted wire lengths with pins at both ends) are plugged into the clips to create the circuit patterns. The boards also typically include metal strips along the side that are used for common power rails and signal buses.


Fig 11 Bread board

HD44780 LCD Features and Technical Specifications: -

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is built by a 5×8-pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

Software Requirements:

1. Arduino IDE

Arduino IDE (Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the Arduino. It is a cross-platform software which is available for every Operating System like Windows, Linux, macOS. It supports C/C++ language. It is open-source software, where the user can use the software as they want it to. They can also make their own modules/functions and add them to the software. It supports every available Arduino board including Arduino mega, NodeMCU board, Arduino Ethernet and more.
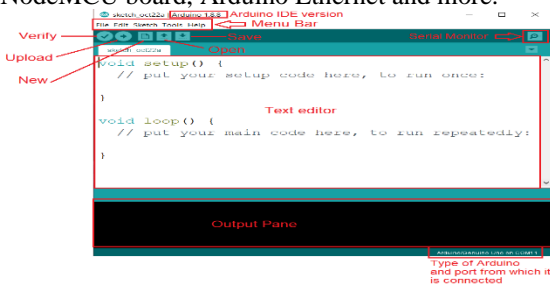
2. HTML File Library.

3. Pressure Sensor BMP180 Library

4. Humidity Temperature Sensor DHT11 ESP Library

VII. CONCLUSION

To make this idea, genuine need to take help of electronic sensor devices which are needed to place in the environment. By using this sensor, we can stream real-time data over the web server using ESP8266. We also required one dedicated public IP to available this server over the open Internet. The excellent and low-cost weather are monitoring real-time system presented in this paper.

VIII. REFERENCES

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