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# Weather Monitoring System

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***Abstract—This paper illustrates the configuration of a weather monitoring system. Weather plays an important role in various fields like farming, sports, factory setup locations etc. .In all these fields the sole aim is to improve the performance or improve quality of products manufactured. Hence in all these weather plays a very important role and for this we need a technology with which can monitor it from any part of the world. And with the help of IoT analyzing part can be made simpler as it provides various graph for better understanding of it and also we can monitor it from any part of the world.***

**Keywords- NodeMCU ESP8266, DHT11, BMP 180,**
**Rain Sensor, ThingsSpeak, IoT.**

## I. INTRODUCTION

In the recent years the concern for climatic conditions have increased largely. Climatic changes can affect human and animal race badly hence it becomes an important task to monitor and analyze the slightest of weather changes. In this paper we are presenting a system which includes sensors which helps in analyzing various factors of weather like temperature, humidity, pressure and rain[1]. The system is based on Internet of Things (IoT) because of which when sensors senses the weather and transmits the information on web with the help of Wi-Fi connection. Because of IoT we can get live updates of weather in regular time intervals. All such technologies can widely help in improving our

environment and also help in better planning of upcoming infrastructure.

## II. THE KEY TECHNOLOGIES

The key technologies of Weather monitoring system have mainly several technologies as follows:

1. Hardware specifications
2. Software specifications
3. Flowchart

### *A. Hardware Specifications*

**NodeMCU ESP8266:** It is an open-source development board that is generally used for making IOT based projects. It has an ESP-12E module that contains the ESP8266 chip. The chip contains 32-bit LX106 RISC microprocessor. This microprocessor hold-up RTOS and operates at a clock frequency of 80MHz to 160MHz[9]. The memory specifications of NodeMCU comprises 128KB RAM and 4MB of flash memory to store data and programs. With the help of built-in Wi-Fi, Bluetooth and Deep Sleep Operating features it is compatible for making IOT projects. It has a Micro USB port and Vin pin that is used for its powering up, and it also supports SPI, UART, and 12C interface.

**2. DHT11 sensor**: It is a sensor that is used in the measurement of temperature and humidity values. It has a built-in NTC to measure temperature and an 8-bit microcontroller to generate the output values of temperature and humidity as serial data. This sensor is already calibrated in the factory and therefore it is easy to use with other microcontrollers [9]. It measures a temperature range of 0°C to 50°C and humidity of 20% to 90%. It has an accuracy of ±1°C and ±1%.

**3. BMP180 sensor:** It is a sensor from BMP

XXX series that is used in the measurement of Barometric pressure or atmospheric pressure.The precision of this sensor is very much high which makes it compatible with consumer applications. The weight applied by air on everything present around us is known as barometric pressure[9]. So wherever the air is present the pressure is also present over there. The BMP180 sensor senses that pressure and provides that data in the form of digital output. The pressure measured by the BMP180 sensor is temperature compensated pressure reading. This compensation is done by its temperature sensing ability.

**4. Rain sensor:** It is a sensor that is used for the measurement of rainwater. It is a combination of two modules. The first module is the rain module that detects the rain and the second is the control module, which compares and converts the analog value to digital value[9]. It can also be used in the automobile sector for controlling the windshield wipers automatically.

### *B. Software Specifications*

- **Arduino IDE version 1.8.15:** Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux). It is used to write and upload programs to Arduino compatible boards, but also with the help of third party cores other development boards[3].
- **ThingSpeak:** ThingSpeak is an IOT cloud platform service where you are allowed to aggregate, visualize and analyze live data streams in the cloud.

### *C. Flowchart*

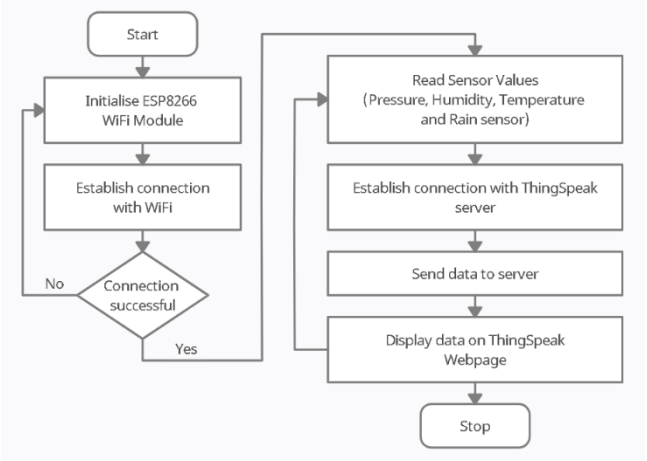


Fig 1. Flowchart of Weather Monitoring System

## III. SYSTEM OPERATION AND ARCHITECUTRE

The implementation of 'Weather Monitoring System' is quite simple[2]. Firstly, the Vin of the NodeMCU ESP8266 is connected to positive(+) and Ground is connected to negative(-). The DHT11 sensor consists of three pins Vin, Out, GND. The Vin of DHT11 sensor is connected to positive(+), Out pin is of DHT11 sensor is connected to the D3 pin of NodeMCU ESP8266 and Ground pin is connected to negative(-).

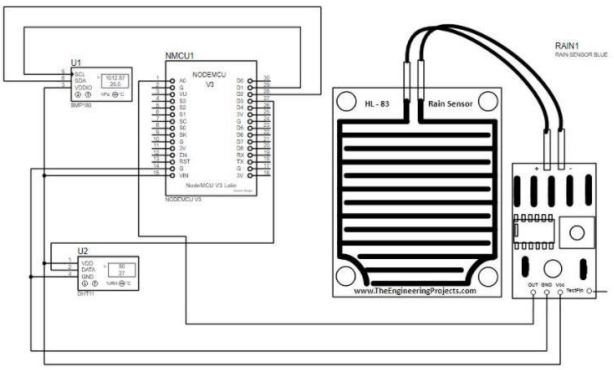


Fig. 2 Circuit diagram as simulated on Proteus software

The BMP180 sensor consists of four pins Vin, GND, SCL, SDA. The Vin of BMP180 sensor is connected to positive(+), the ground pin is connected to negative(-), the SCL pin is connected to the D1 pin of NodeMCU ESP8266 and the SDA pin is connected to D2 pin of NodeMCU ESP8266.

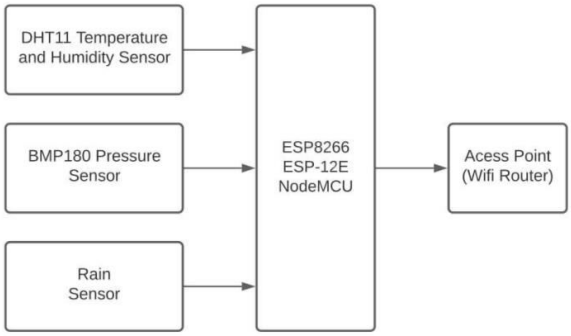


Fig 3. Block diagram of Weather Monitoring system using IoT.

The Rain sensor consists of four pins Vcc, GND, D0, A0. The Vcc pin of the Rain sensor is connected to positive(+), ground pin is connected to negative(-) and the A0 pin of the Rain sensor is connected to the A0 pin of the NodeMCU ESP8266.

In this DHT11, BMP180 and rain sensor senses the weather from the environment and sends the sensed value to NodeMCU ESP8266 and further this values are transmitted to online web with the help of an access point which is Wi-Fi Router and thus we can successfully monitor the weather.

## IV. RESULT AND DISCUSSION

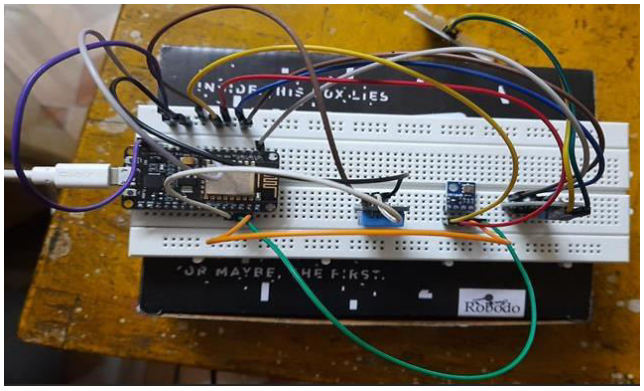

Fig 4. Weather monitoring system module

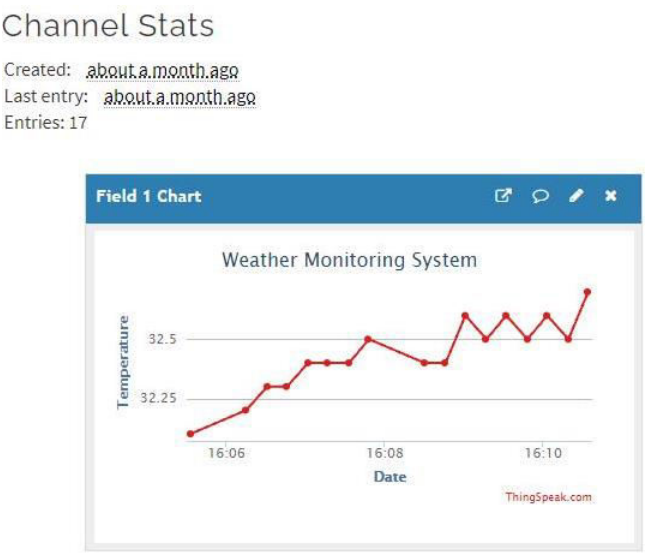


Fig 5. Temperature Measurement

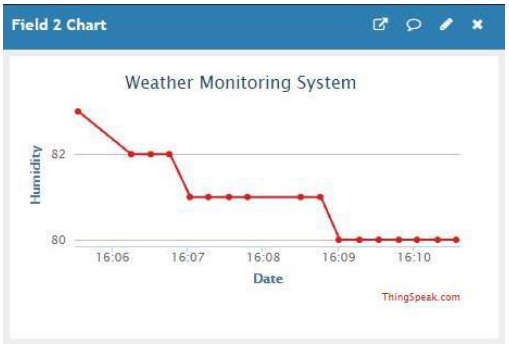


Fig 6. Humidity Measurement

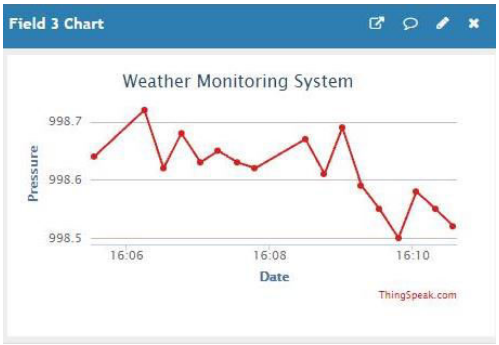


Fig 7. Pressure Measurement

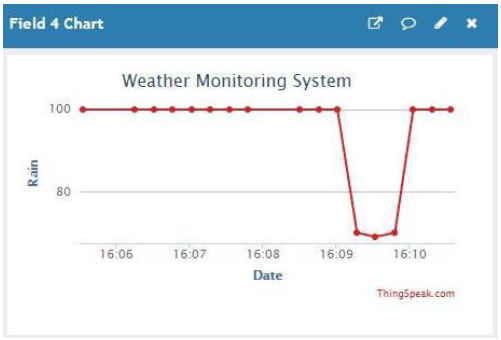


Fig 8. Rain Measurement

Fig 4. Shows the hardware implementation part of the Weather Monitoring system. Fig 5, Fig 6, Fig 7, Fig 8, Depicts the graphs obtained on ThingsSpeak Window of temperature(in °C), humidity(in %), pressure(in mbar) and rain(in analog value) repectively[4][5][6][7][8].

## V. CONCLUSION

Although science and technology have developed and evolved a lot**,** but availability of data anywhere and anytime still remains a issue. In order to address issues like this IoT technology can contribute largely and efficiently. When we keep weather station out in the environment the various sensor devices used collect the data from the environment and slowly within certain time we can observe the graph getting updated on ThingsSpeak window[2].

This model can also be expanded in order to make it available for large scale applications like putting such systems in emerging cities and industrial areas for monitoring various weather factors.

### *A. System Advantages*

i. Provides diverse function and complete services

ii. Climatic data is provided in an interval of every 15 seconds.

iii. Low cost and economical. Easy to use.

iv. The output data is in the form of graph.

## VI. REFERENCES

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