INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 06 ISSUE: 12 | DECEMBER - 2022 IMPACT FACTOR: 7.185 ISSN: 2582-3930

# Weather Monitoring System Using Node MCU

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ABSTRACT:

In this paper, a new approach to practical and meaningful application of technology within a smart rainfall station system is presented. Weather station gives effectiveness with instruments as well as outfit for measuring atmospheric data about the rainfall cast conditions. Weather checking of the terrain is essential because rainfall changes uncertainly every day. From rainfall updates, first understand the outside condition. So, we can take medication according to rainfall. Weather also plays a vital part in mortal physical and cerebral health. For these reasons, we always need to know about the current rainfall information. In this case, a rainfall station makes our life way easier by streamlining us about current rainfall countries. We can fluently see rainfall updates and information from rainfall stations by using apps. This paper has developed and tested a rainfall station grounded on Node MCU Board and Blynk – IoT technology, which measures the meteorological data, including temperature, pressure, moisture, and downfall.

INTRODUCTION:

IOT or Internet Of effects in our day to day life plays an important part and life without it ca n't be imagined indeed. Wireless networking adds further inflexibility to the system as it's now worldwide available through network technology. Weather conditions impact our lives through colorful factors so it's veritably important for us to gather information related to it directly and effectively. counting on the rainfall reports available on the internet currently isn't a good idea, because it shows the rainfall of a vast area and fails to give warnings and admonitions ahead of time. With the help of IOT we can break this problem which can be life saving for a huge number of people around the globe. Instant rainfall analysis and participating the parameters collected by the device around the network will be useful to every individual living in the area. IOT ensures the device to be cost effective, secure, and affordable for the use of everyone.

A weather station is a device that collects data related to the weather & environment using different sensors.

There are two types of weather stations, one which is having own sensors and the second type of weather station is where we pull data from the weather station servers. In this tutorial, we will go for the first one, i.e.

we will design our own weather station.

Weather station sensors may include a thermometer to take temperature readings, a barometer to measure the atmospheric pressure, Hygrometer to measure humidity, rain sensor to measure rainfall, an anemometer to measure wind speed, and more. Weather stations are also called weather centers, personal weather stations, professional weather stations, home weather stations,weather forecaster, and forecasters.

**Requirement Analysis**

**Hardware And Software Specifications:**

1. NodeMCU

2. BMP180 sensor

3. Rain sensor

4. DHT 11 sensor

5. Resistors

6. Jumper wires

7. Breadboard

**Software:**

Arduino software

PROPOSED DESIGN OF THE WEATHER STATION:

**A. Weather System**

Figure 1 shows the introductory design of the rainfall station. This system consists of an Esp8266 Wi- Fi microchip as both data processor and TCP/ IP mound, DHT11 temperature and moisture detector, BMP180 pressure detector and SEN- 00194 rain detector and connecting string.

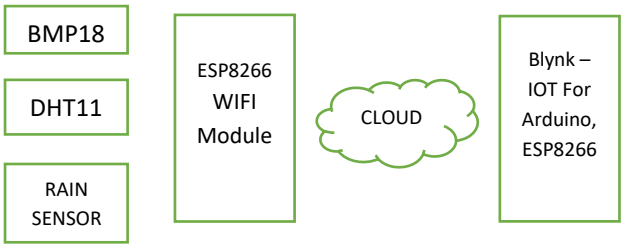



Fig. 1. Weather Station Block Diagram

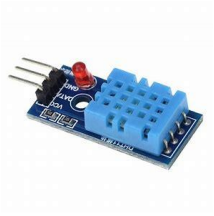
**B. Rain Sensor**


To descry the droplet, this detector is used. By measuring the moisture of the water drops on the detector board, The detector works. The resemblant resistance on the detector board is changed by the water drops. This module has two affair system – digital & analog affair. For digital affair, if rain is detected, affair is low( 0) else affair is high( 1). For analog affair, value changes according to downfallintensity.However, the resistance value increases as a result, affair voltage will be diminishments, If water drops on the board increase. As small water drops fall on board, affair voltage is so high. When the detector board is dry, it produces 255 on analog affair. As rain intensity increases, affair go towards 0.

**C. BMP 180 sensor**

Bosch company brought the pressure detector BMP180. This detector measures the absolute pressure around its atmosphere. Detector BMP180 can be used to measure atmospheric pressure and altitude too as it varies according to height from the ocean position. BMP180 can test to a rate up to 128 samples per second. The BMP180 four legs- GND,3.3 V, SCL, SDA.

### D. DHT 11 Temperature and moisture Sensor



Sensor DHT11( 11) measures the temperature and humidity of the quadrangle terrain. Thermistors and capacitive humidity detectors are used to calculate the rainfall temperature and also it is transferred to data leg. DHT11 uses substrate humidity between two electrodes to measure moisture. Changes in conductivity of the substrate indicate the changes in moisture. The thermistor is used to measure temperature. A thermistor is type of resistor whose resistance is dependent on temperature. Semiconductive accoutrements like pottery or polymers are used to make this detector. A small temperature change can produce a large change in resistance value. This detector has three legs- VCC, DATA, GND.

### E. Wireless Module ESP8266

For the requirements of new connections with the world, largely intertwined chip ESP8266 chip is designed. It offers a complete and intertwined Wi-Fi networking result, allows us to be either host the operation or use of all network functions of other wireless executions. The ESP8266 is a budget-friendly Wi- Fi microchip with full TCP/ IP mound and microcontroller capability, produced by manufacturer Espressif Systems in Shanghai, China. This module allows us to connect to the internet via Wi- Fi networks. To program the module on periodical communication, Arduino software can be used.

### F. Connecting Cable

To join electrical factors and produce an electricity inflow, a connecting string can be used. nearly every electrical connector has a gender – i.e. the manly element, womanish element. womanish to womanish muumuu cables are used for our purposes, which use both ends to plug effects.

### G. Arduino

The Arduino Integrated Development Environment( IDE)( 12) is across-stage operation and written in functions from C and C. It's used to write and transfer canons to Arduino compatible boards for illustration Arduino Uno, Arduino atmega, nodemcu and so on. The Arduino IDE employs the program avrdude to change over the executable law into a textbook train in hexadecimal encoding, at that point it's loaded into the Arduino board by a haul program in the board's firmware. Naturally, to flash the stoner law onto sanctioned Arduino boards, avrdude is used as the transferring instrument.

### Stepwise Procedure

The proposed system follows the following step to complete the tasks.

Step 1 First, detectors get the input and produce signal on the affair leg.

Step 2 ESP8266 module takes the detector affair, process it and shoot to cloud using Wi- Fi connection.

Step 3 Blynk- IoT app gets the inputs using virtual outstations and show it on favored settings

### Features of the design

The system has some features that make the system unique.

1. The cost of the full system is veritably low and the factors are veritably reasonable in price.

2. The size of the model is veritably small and it's easy to carry one place to another. 3. The stoner interface of the model is veritably stoner friendly. Any stoner can fluently understand the model medium in a veritably short time.

4. The response time of the model is veritably little.

5. As it's connected to the internet the content area is veritably large.

**Methodology**

This design will concentrate on development of the Thing Speak an IoT platform that to show the data of the detector. The system divided into two corridor which are tackle and software development part. The tackle development involves the circuit construction and develops the prototype. Meanwhile, the software part involves the IoT coding, circuit schematic illustration, circuit simulation and data accession.

By using three( 3) types of detector to covering the rainfall parameter that are temperature, moisture, rain, and atmospheric pressure. The system will be suitable to display the rainfall condition by an analysis about the current rainfall with the detector value data. All the data will be control by a microcontroller ESP8266 and NODEMCU as the customer that will admit the detector data from ESP8266. This system will be seen on ThingSpeak channel that has been created to simplify stoner to check online. The data collected will be assay and compare it with Jabatan Meteorologi Malaysia to insure the precise of data and rainfall condition on current condition. The Internet of effects( IoT) will connect the system with the stoner wireless and online without the need of checking manually

**MODELING AND ANALYSIS**

The circuit illustration consists of the factors that are employed in this design. There are two modes available in this design working operation. originally, controlling mode will involve ESP8266 and monitoring mode will involve NODEMCU. This two- microcontroller board will communicate each other in order the monitoring mode get detector data from controlling mode via wireless communication and hotspot Wi- Fi. Controlling mode will collect all the detector data also shoot to the Thing Speak website and monitoring mode to display on things peak display runner. The customer will display the detector data on Things peak. The data collected will be assay to configure the factual condition and the current condition by using simple formula in Equation 1. The result of this data analysis also will be made the rainfall state for this system to tell the stoner about the rain and air quality condition is it good or bad in factual condition.

**RESULTS AND DISCUSSION**

First the circuit of control unit system have been made that ESP8266 microcontroller control all rainfall parameters detector, that are DHT11( Temperature, moisture) detector, BMP180( Atmospheric pressure), Rain detector. also it powered by USB string also to upload the sketch of rendering in ESP8266 microcontroller. The detector data can be display on periodical examiner in Arduino IDE software. ESP8266 will connect with the Wi- Fi hotspot that have applied to this system so that the web garçon can be produce to display all the detector data. Data that entered by rainfall station will be displaying on thingspeak demonstrate the communication of both detector station and rainfall station by using Wi- Fi hotspot. The communication is successfully established. The

web garçon contains html that can display the detector data by simple coding and connection where the IP address of the ESP8266 are demanded to complete this action are shown in Figure. After that it'll read all the detector value and also shoot to the pall data where ThingSpeak has been uses for this. ThingSpeak will stored the detector value and display that data to the channel produce there. The stoner can check the rainfall parameter via ThingSpeak websites. The data has collected from the reading of ESP8266 for all detector and shoot that data to the ThingSpeak as the results of this design id

TABLE 1:

DHT11

| PARAMETER | TIME | VALUE |
|---|---|---|
| TEMPERATURE | 10AM | 24~28 C |
| TEMPERATURE | 1PM | 29~31C |
| TEMPERATURE | 10PM | 27~29C |
| HUMIDITY | 10AM | 78 |

| | | |
|---|---|---|
| HUMIDITY | 10PM | 77 |

TABLE 2:

BMP180

| PARAMETER | TIME | VALUE |
|---|---|---|
| PRESSURE | 10AM | 1001~1800 |
| PRESSURE | 1PM | 1006~1829 |
| PRESSURE | 10PM | 997~1560 |

## Conclusion

In this paper, we've developed an Node MCU grounded budget friendly Wireless Weather Station with IOT grounded graphical operation software for easy checking of the rainfall information. It can calculate temperature, pressure, moisture, downfall and altitude. The results shown good delicacy and stability compared to other budget friendly rainfall **s**tations. It has a stoner-friendly interface with a veritably low conservation charge. In future, further advancements like wind direction, solar radiation, rush can be added. further exploration can be done to make the system as cheap as possible.

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