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IOT Based Weather Monitoring System

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Abstract
The technology behind this is Internet of Things (IOT), which is an advanced and efficient solution for connecting the things to the internet and to connect the entire world of things in a network. Here things might be whatever like electronic gadgets, sensors and automotive electronic equipment. The system deals with monitoring and controlling the environmental conditions like temperature, relative humidity and CO level with sensors and sends the information to the web page and then plot the sensor data as graphical statistics. The data updated from the implemented system can be accessible in the internet from anywhere in the world.
The system proposed is an advanced solution for weather monitoring that uses IOT to make its real time data easily accessible over a very wide range. This deals with monitoring weather and climate changes like temperature, humidity, wind speed, moisture and even carbon monoxide levels in the air; using multiple sensors. These sensors send the data to the web page and the sensor data is plotted as graphical statistics. The data uploaded to the web page can easily be accessible from anywhere in the world. The data gathered in these web pages can also be used for future references. The system engages an Arduino UNO board, sensors, WIFI Module which sends data to cloud computing services. A web page is also created which exhibits the data and displays it to users.
The project even consists of an app that is the blynk app that sends notifications as an effective alert system to warn people about sudden and drastic weather changes. For predicting more complex weather forecast that can't be done by sensors alone we can use an API that analyses the data collected by the sensors and predicts an accurate outcome. This API can be used to access the data anywhere and at any time with relative ease and can also be used to store data for future use. Due to the compact design and fewer moving parts this design requires less maintenance.

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I. INTRODUCTION

Climate plays an important role in human life the unprecedented growth of industries and vehicular traffic has seriously affected the purity of clean air and environment. Satellite weather report system gives condition of present which does not give the exact condition of the particular place. The building sector offers a great potential for the energy savings, where it is necessary to have accurate weather data in the exact location where the building is being built in order to improve the calibration of energy simulation programs. By develop a controlling local weather reporting system with NodeMCU microcontroller can minimize the error in weather forecast system at exact location. Even though water is a scarce resource, overall 50% of water is wasted in agriculture due to the improper scheduling of irrigation. In this context, the real-time monitoring of water usage in the fields can prevent misuse of water. Use of technology in the field of agriculture plays important role in increasing the production as well as in reducing the extra man power efforts, some of the researches tried for betterment of farmers and provides the systems that use technologies which are helpful for increasing the agriculture yield. Difficulty to monitor weather parameters through offline system such as agriculture zone during certain hazardous envy and critical situations where the people need to check manually the weather condition at the places and it will take time unless it is online system. In the evolving generation of wireless technology, the concept of smart cities and IOT has given a new remark in the world. One such remark leads towards the online smart weather station system. The weather parameters should be able displaying, analyzing and monitoring system using Thing Speak or BLYNK App that connect user with internet that visible anywhere in the world. To analyze and monitoring system using Thing Speak or BLYNK App that connect user with internet that visible anywhere in the world. IOT is playing a leading role in providing solutions to many applications with the support of software, internet and embedded systems.

II. METHODOLOGY

In this project, we will measure Humidity, Temperature and Pressure parameters and display them on the Blynk application, which makes it an IOT based Weather Station where the weather conditions can be monitored from anywhere using the Internet. The DHT11 module features a humidity and temperature complex with a calibrated digital signal output. The DHT11 sensor module is a combined module for sensing humidity and temperature which gives a calibrated digital output signal. DHT11 gives us a very precise value of humidity and temperature and ensures high reliability and long term stability. 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.

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BMP 180 Pressure Sensor .It 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.

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 boards printed leads. The sensor board acts as a variable resistor that will change from 100k ohms when wet to 2M ohms when dry. In short, the wetter the board the more current that will be conducted. We have also connected soil moisture and Gas sensor to measure water content in soil and fire or smoke detection using Gas sensor.

III. Block diagram of proposed system

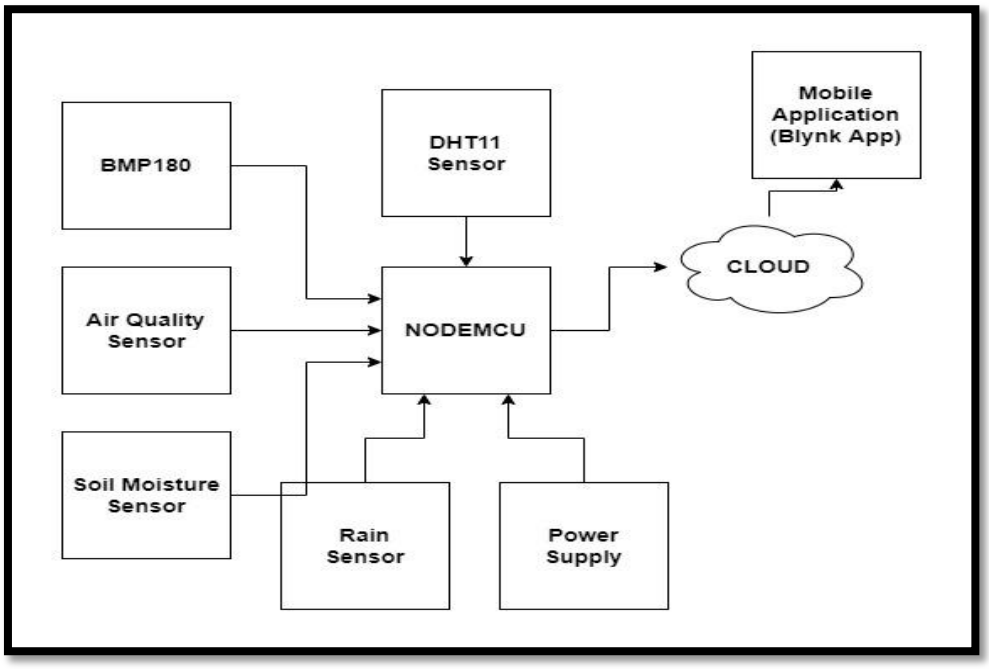

Figure 1 : Block Diagram of IOT Based Weather Monitoring System

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IV. Flow Chart

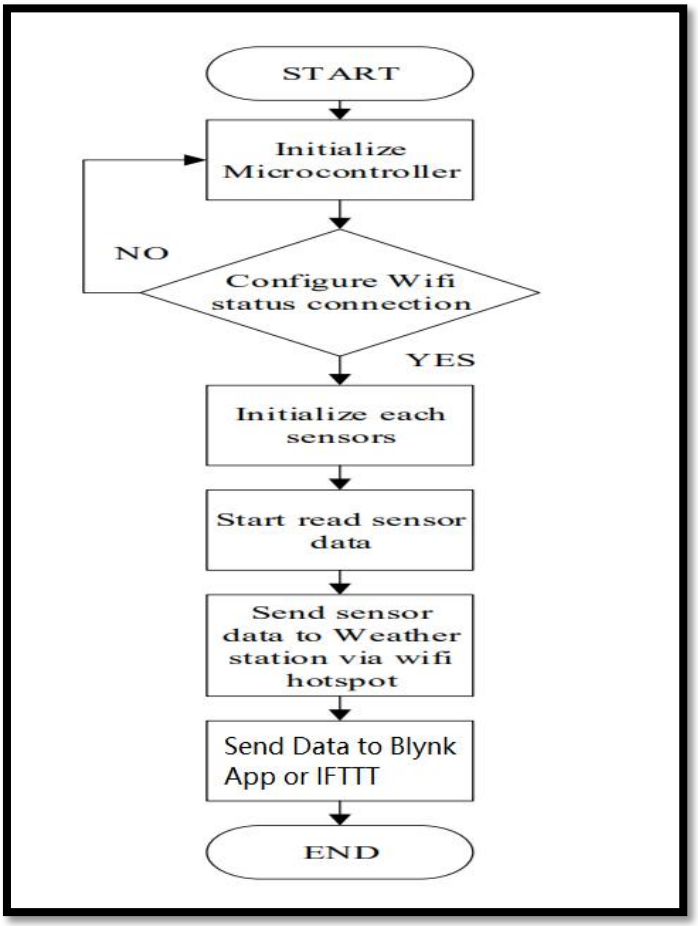

Figure 2 : Flow Chart

V. Circuit Simulation

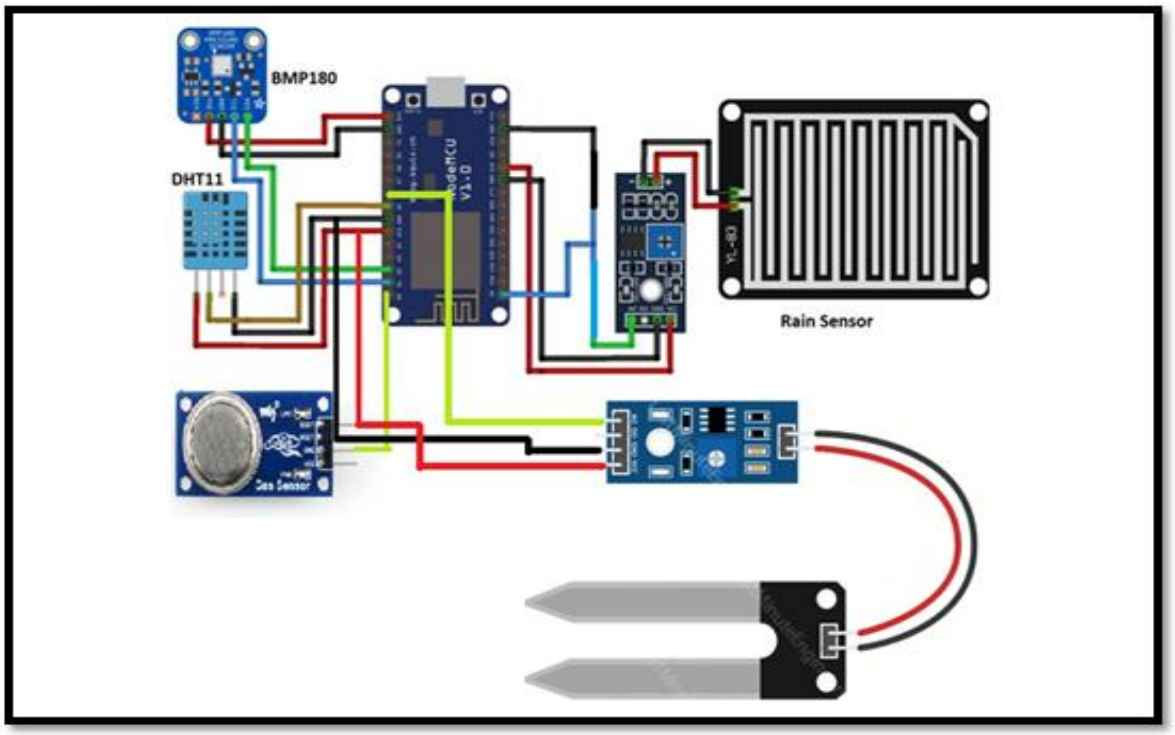

Figure 3 : Circuit diagram of IOT Based weather monitoring System

Working: Assemble all systems as per circuit diagram. Program the Node MCU using Arduino IDE. You will get confirmation on your screen once The Node MCU is a programmable controller which has inbuilt wi-fi module We connect three sensors.1) BMP180 2) DHT11 3) Rain Sensor 4) Gas sensor 5) Soil Moisture sensor to Node MCU. By using these five sensors, we can collect the required weather data for monitoring purposes. This pooled data is streamed over the Internet to display it or read it from anywhere.

After the successfully programmed hardware, the data is sent to the blynk application so we can observe data from anywhere. The weather parameters that we monitor are Temperature, Pressure, Humidity and Rain, fire or smoke and soil moisture .This project is all about IOT based Live Weather Station Monitoring using NODEMCU ESP266 We will interface DHT11 Humidity and temperature sensor, BMP280 Barometric pressure, Gas sensor, Soil moisture sensor and rainfall and upload the data to a Blynk Application to the smart phone via Wi-Fi module inbuilt in Node MCU ESP8266.

An Integrated TCP/IP protocol stack is used for transmitting and receiving sensor information. Depending on the status of weather information to the wireless remote location. The NodeMCU-12E controls the entire weather Prediction system peripherals and status on a Blynk app / web page or mobile application. In this way, a secure, flexible, trust- able and economical system is developed to solve the above-mentioned weather parameters. Also, you can check whether data is through anywhere using the Internet.

VI. RESULT AND CONCLUSION

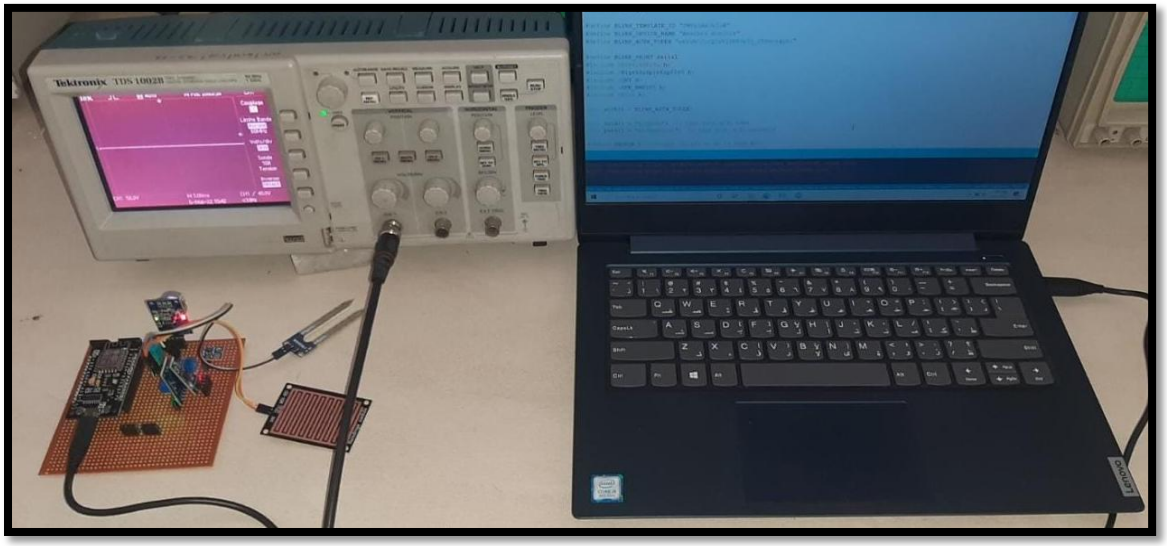

Figure 4: Experimental Setup of Proposed System

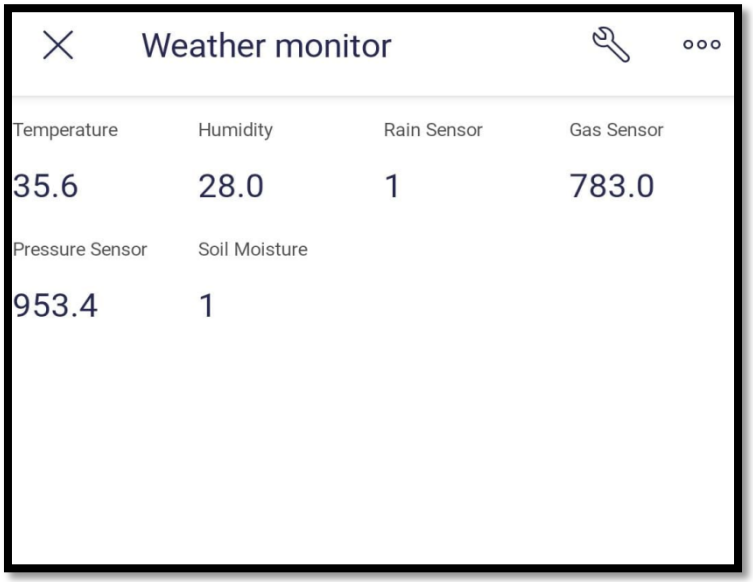

Figure 5: Result on blynk app

VII.RESULT AND DISCUSSION

- **Interfacing of Node MCU and Rain Sensor**

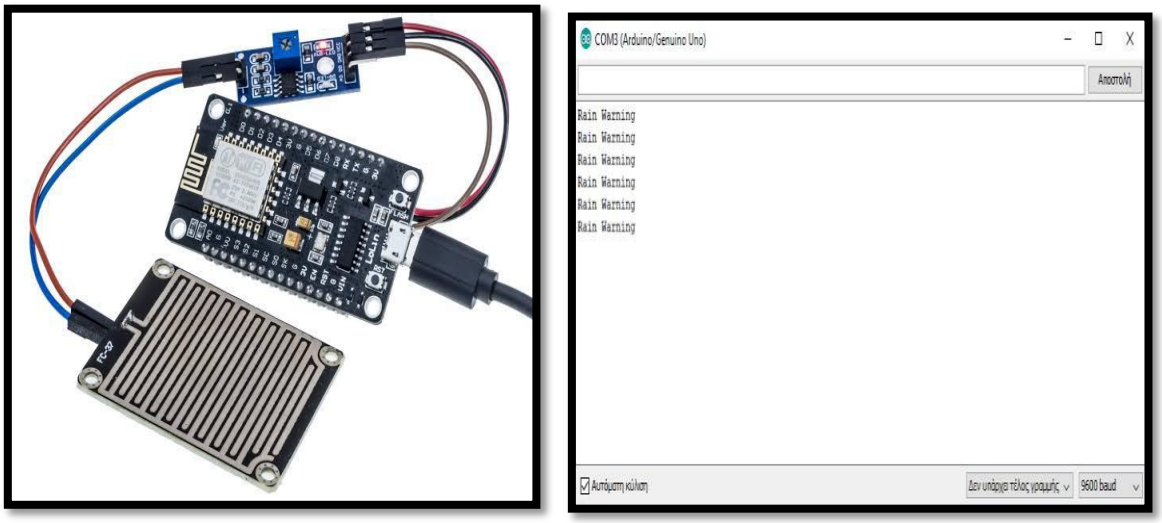

Figure 6 : Interfacing of Node MCU with rain sensor and it's result

To test this here we added few water drops on the sensor soon it detected the presence of water and give the "Rain Warning" in the Arduino software and in blynk app.

- **Interfacing of Node MCU and DHT11**

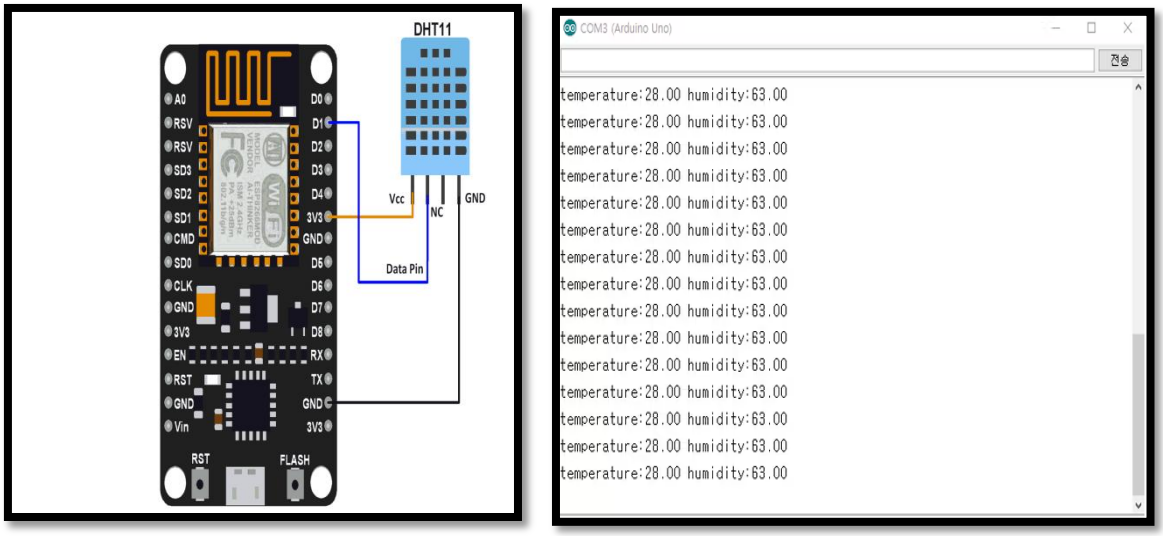

Figure 7: Interfacing of Node MCU with DHT11 sensor and it's result

To test this we simply placed the sensor in an open area. The sensor sensed the temperature and humidity (moisture level present) of that specific place. Later the information obtained from the sensor will get displayed in the Arduino software and in blynk app.

- **Interfacing of Node MCU and BMP180**

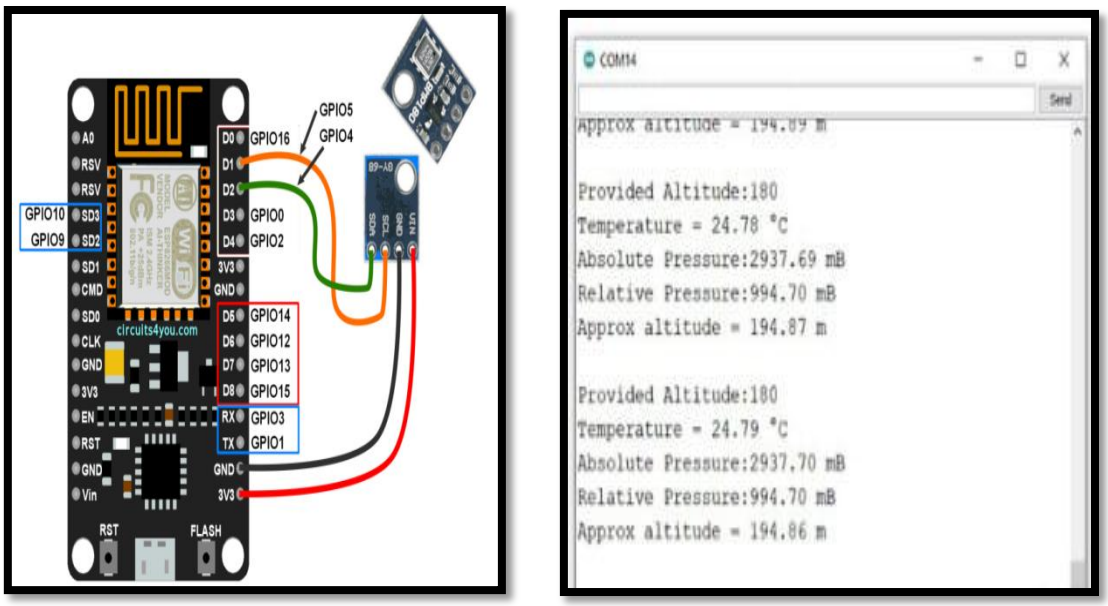

Figure 8: Interfacing of Node MCU with BMP180 sensor and it's result

The BMP180 barometric pressure sensor from Bosch is used to predict the weather, detect altitude, and measure vertical velocity. It can be used to measure environmental temperature, absolute & relative pressure & estimated altitude.

The atmospheric pressure which is also called Barometric pressure is the pressure caused by the weight of air pressing down on the Earth. The air in the atmosphere has mass, so gravity causes the weight of that column to exert pressure on the surface. The BMP180 outputs pressure readings in Pascals which is its SI unit.

- **Interfacing of Node MCU and Gas Sensor**

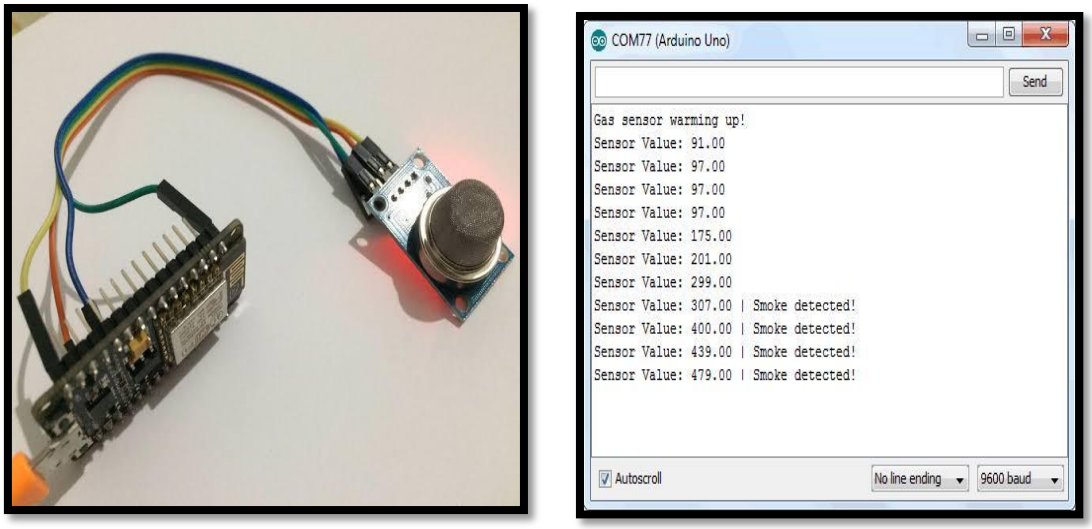

Figure 9 : Interfacing of Node MCU with gas sensor and it's result

We tested Gas Sensor by lighting the incense stick around the sensor as the fumes started rising and the temperature increased gas sensor gave the output as the "Smoke detected" in the Arduino software and in blynk app.

- **Interfacing of Node MCU and Soil Moisture Sensor**

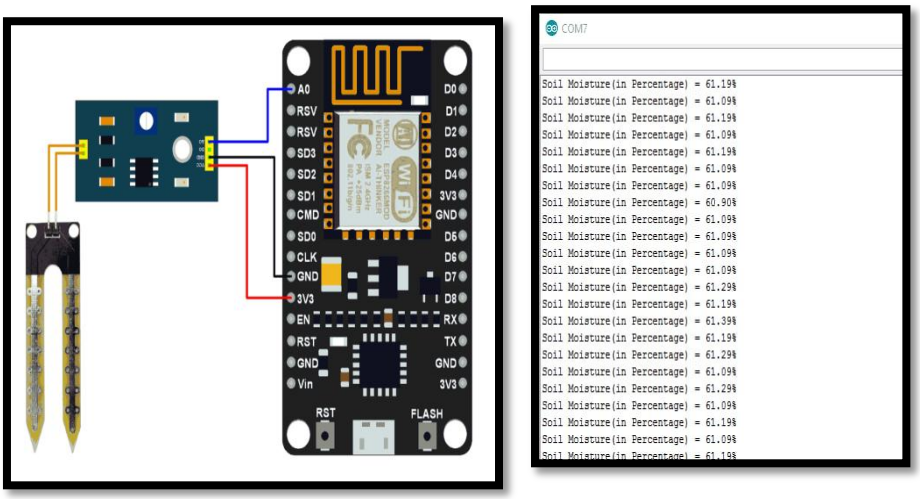

Figure 10 : Interfacing of Node MCU with Soil moisture sensor and it's result

Soil moisture is basically the content of water present in the soil. This can be measured using a soil moisture sensor which consists of two conducting probes that act as a probe. It can measure the moisture content in the soil based on the change in resistance between the two conducting plates.

VIII.CONCLUSION

By keeping the weather station in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to use the sensor devices in the environment for collecting the data and analysis. By using sensor devices in the environment, we can bring the environment into real life. Then the collected data and analysis result will be available to the user through the Wi-Fi. The smart way to monitor environment an efficient, It also sent the sensor parameter to the cloud. This data will be helpful for future analysis and it can be easily shared to other also. This model can be expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.

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