IOT based Weather Station Using NodeMCU

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Abstract- IoT based weather station is used for getting the temperature, humidity and pressure data from BMP180, DHT11 sensors. Also, the data is displayed on the OLED present in circuit so as to monitor the data. The NodeMCU ESP8266 is used for Wi-Fi module and to process the data. The thingspeak web server is used to display the data online.

Keywords: IoT, Weather Station, Weather monitoring, NodeMCU.

1. INTRODUCTION

Personal Weather Station, that monitors temperature, humidity, pressure and light intensity of room and uploads it to a web server and displays on OLED [4]. Using NodeMCU[1] with Wi-Fi connection to post data on Web server and to upload on OLED. We will interface DHT11 Humidity and Temperature Sensor, BMP180.

2. System Design

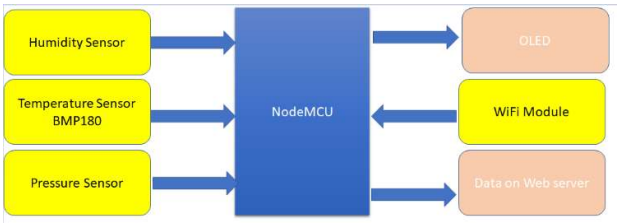

Fig 2.1 Block Diagram

3. METHODOLOGY

The NodeMCU [1] is used as Wi-Fi module as well as microcontroller. Through Arduino IDE we will push the code to NodeMCU. The BMP180 temperature sensor, DHT11 sensor is connected to NodeMCU and is used to get the sensor data. The data is processed with the help of NodeMCU and displayed on the OLED. The data is also written on web server. We are using the internal 3V from NodeMCU to OLED and other VCC connection.

3.1 Hardware

List of components:

1. NodeMCU, ESP8266 Wi-Fi module.
2. BMP180 and DHT11 sensors
3. OLED
4. Power supply with replaceable batteries or micro USB.

3.1.1 NodeMCU

NodeMCU [1] is an open-source development board specially targeted for IoT based applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The NodeMCU can be easily programmed with Arduino IDE since it is easy to use.

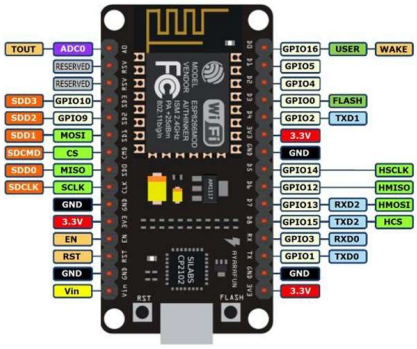

Fig 3.1 NodeMCU

3.1.2 Sensors

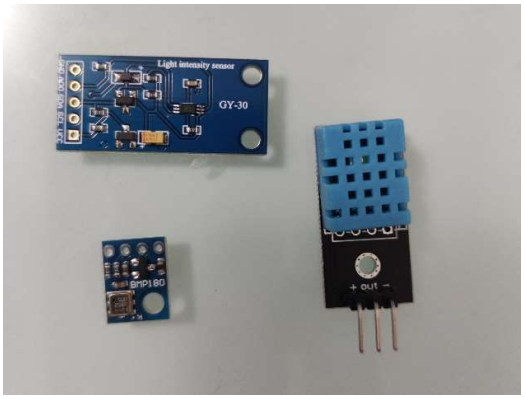

Fig 3.1 Light intensity sensor, BMP180, DHT11

The DHT11 [2] is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin. It's fairly simple to use, but requires careful timing to grab data. The digital signal is fairly easy to read using any microcontroller.

The BMP180 [3] is the new digital barometric pressure sensor of Bosch Sensortec, with a very high performance, which enables applications in advanced devices such as smartphones, tablet PCs, and sports devices. It follows the BMP085 and brings many improvements, like the smaller size and the expansion of digital interfaces. The ultra-low power consumption down to 3 µA makes the BMP180 the leader in power saving for your devices. BMP180 is also distinguished by its very stable behaviour (performance) with regard to the independence of the supply voltage.

3.1.3 OLED

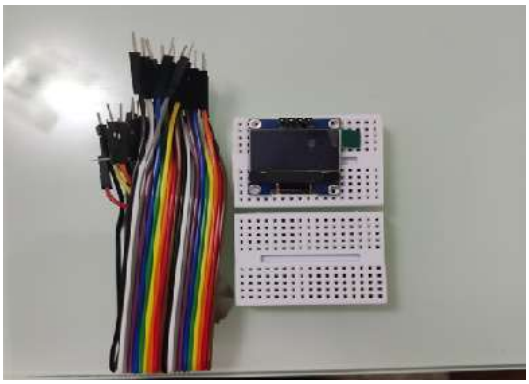

Fig 3.2 OLED

The SDA and SCL lines of the I2C bus come from GPIO0 (D3) and GPIO2 (D4) of the NodeMCU board (respectively), they are connected to SDA and SCL (SCK) pins of the SSD1306 display module. The OLED [4] display module is supplied with 3V from the Vin pin of the NodeMCU board.

3.2 Software

List of software:

1. Arduino IDE
2. Web server platform
3. Google sheets

3.2.1 Arduino IDE

The open-source Arduino Software (IDE) [6] makes it easy to write code and upload it to the board. This software is used to push the code to NodeMCU. NodeMCU is compatible with the Arduino IDE.

3.2.2 Thingspeak

The sensor data output will be stored on a webserver. Thingspeak [5] will store the output data.

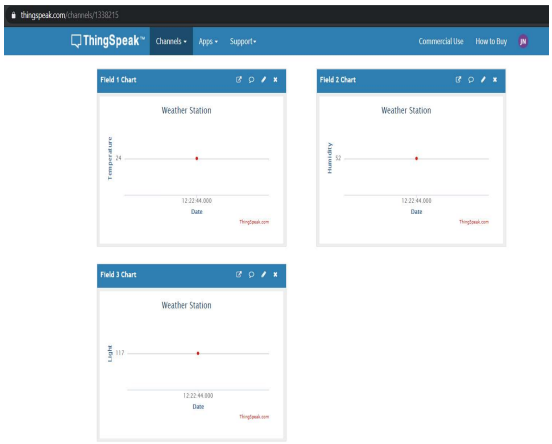

Fig 3.2 Output

4. Result:

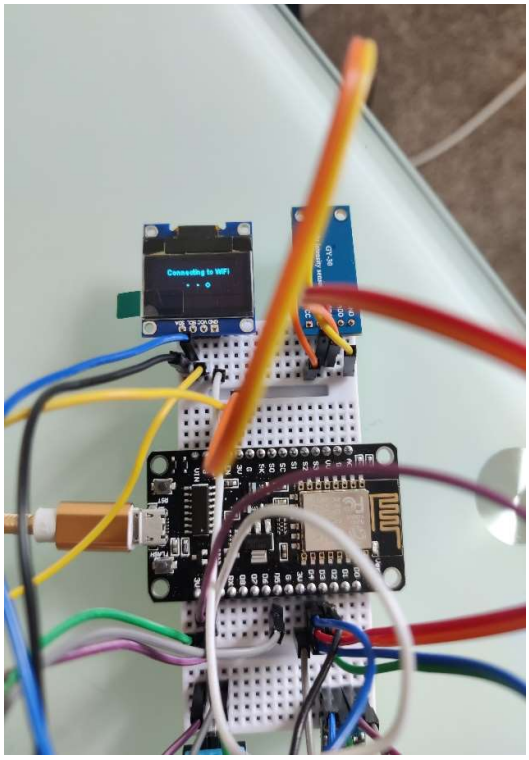

Fig 4.1 Connecting to Wi-Fi

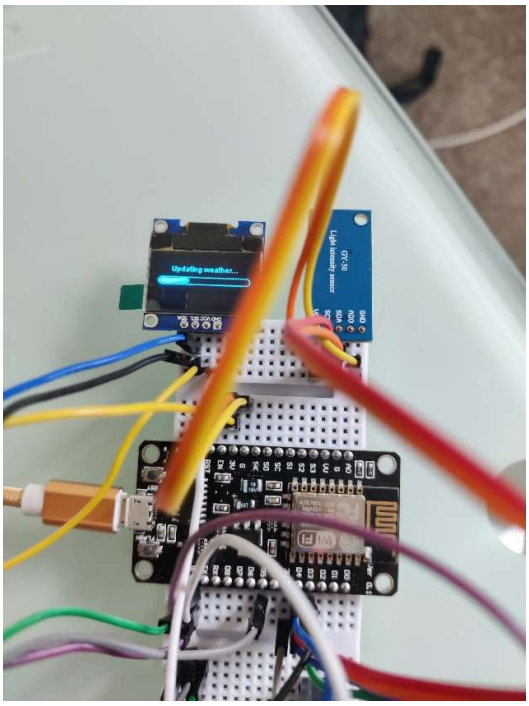

Fig 4.2 Updating weather

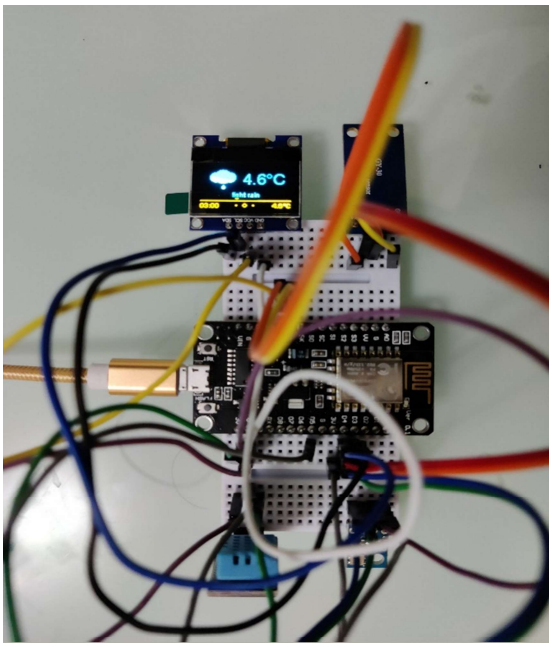

Fig 4.3 Temperature data on OLED

5. Conclusion and future work

In this paper we have completed the personal weather station which can be used remotely with the power bank. Also, the data is on the webserver thus we can observe the trends as well. The OLED [4] functionality gives the live data available.

Machine Learning can be used to train the model and predict the weather data. Google sheet can be used to store the data and the system can be used as data logger. The same data can be given to the machine learning model for training. The weather data can be hosted on a private IP. Also, which can trigger from machine learning model if there is any sudden change in data. Alarm can be setup with NodeMCU [1] to alert the user if any of the parameters are above the regular limit. The heater or AC in the house can be automatically adjusted according to the data.

References

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