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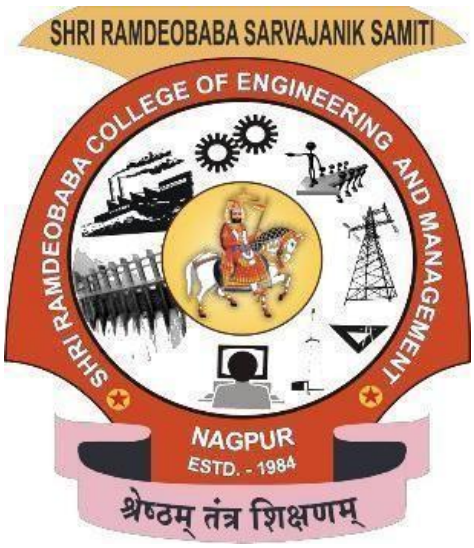

Introduction to IoT

TEACHER'S ASSESSMENT

(6TH SEM-B, SESSION 2021-2022, ECT-359-4)

"Weather station using Raspberry pi"

Submitted By: -

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1. Introduction:

1.1. Problem statement: -

Climate change is very much observable, uneven heatwaves, unseasonal Rainfall, unpredictable dust storms and many other natural phenomena can be easily seen today, these weather phenomena can be predicted with local weather data and environmental data available from a large no of edge devices, present in the region of interest and through their analysis the weather prediction system can be made more accurate.

1.2. Objectives: -

1.2.1. Collecting local Weather and environmental data.

1.2.2. This IoT based Project Aims to show the current Humidity, Temperature and Pressure (etc.) parameters on the screen as well on the Internet server using Raspberry Pi.

1.2.3. To produce a compact and portable product which can be installed at various location for Environmental research purposes.

A weather station for collecting local Weather and environmental data. First of all, we will develop and build a prototype weather station using breadboard and jumper wires. Once we have got everything running and tested, we will put efforts to turn this prototype into a more robust build so that we can deploy it outside and it will be reliable in the long term.

2. Existing Approaches or algorithm:

2.1. The two different types of forecasting models, one of them based on finite differences, the other one based on the spectral method, are currently competing as to which one of them yields more accurate forecasts for a given computational cost. But at the end of the day, each model has its strengths and weaknesses; so, using both models' side by side will probably give the best results.

2.2. Hygrometer for measuring humidity.

2.3. Barometer for measuring atmospheric pressure.

2.4. Thermometer for measuring air and sea surface temperature.

3. Implemented approach or Algorithm:

Weather station using raspberry pi, this is a IoT based Project aims to record the current Humidity, Temperature and Pressure parameters from a particular spot and send them on the Internet server using Raspberry Pi, which makes it a Portable Raspberry Pi Weather Station. There are different instruments concerning weather and certain calculation to reach the proper conclusion of weather condition, we are going to use weather sensing sensors and assemble them in single model to get the weather forecast.

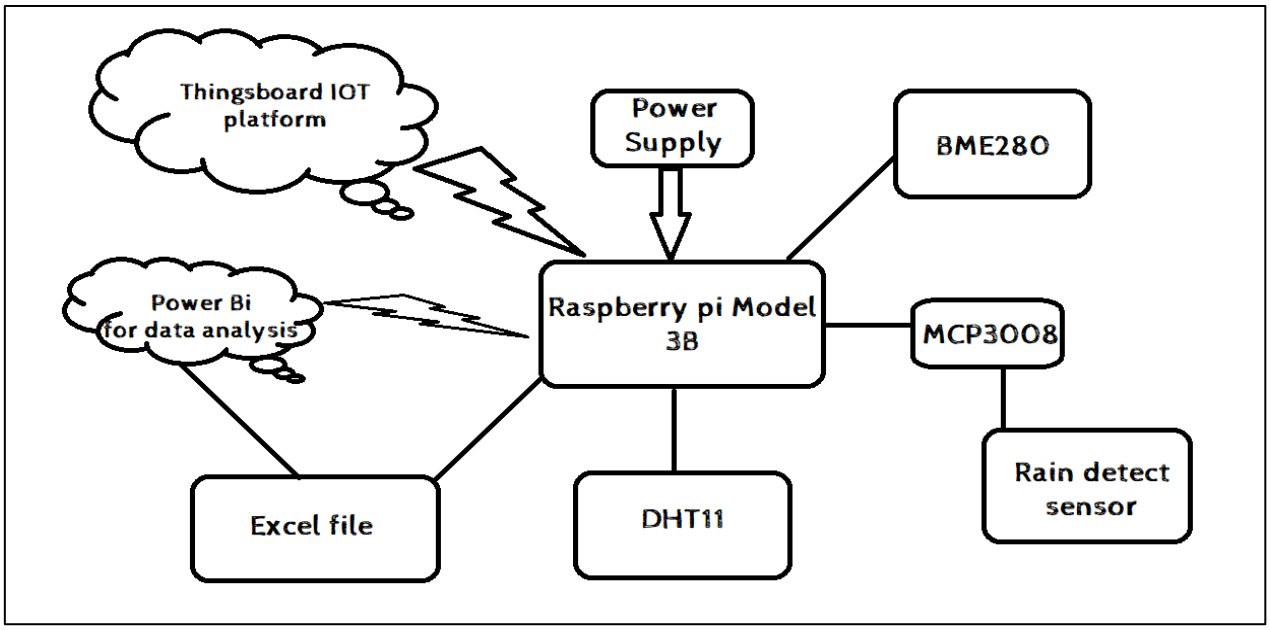
3.1. We have used **DHT11 Humidity & temperature sensor** for sensing the temperature and humidity, **BMP180 Pressure sensor module** for measuring barometric pressure,

Rain detection sensor with **MCP 3008** is a low cost 8-channel 10-bit analog to digital converter for giving the amount of rainfall.

3.2. This Celsius scale Thermometer and percentage scale Humidity meter displays the ambient temperature and humidity which is recorded and display locally and barometric pressure is displayed in millibar or hPa (hectopascal).

3.3. All this data is sent to the Thingboard server for live monitoring from anywhere in the world over the internet.

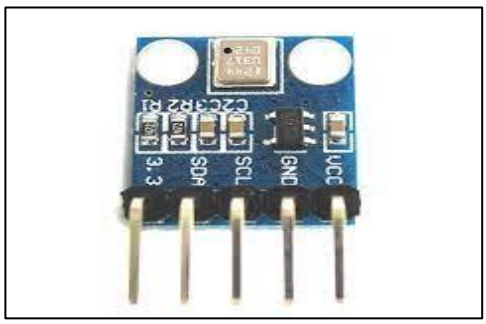
3.4. All the data collected locally will be Recorded in a excel file and will be send to Microsoft Power Bi Platform for data analysis, the platform is prefeed with weather data of past 10 years based on which it predicts the weather condition using persistence method.



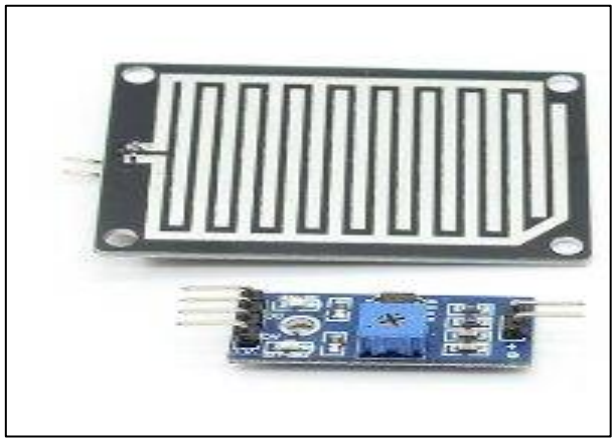
3.5. The Components used are: -

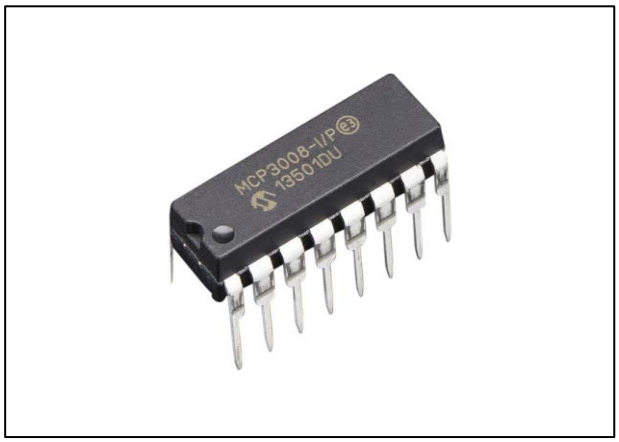
- **3.5.1.** Raspberry pi Model 3B
- **3.5.2.** DHT11(Temperature and Humidity)
- **3.5.3.** Rain detection sensor
- **3.5.4.** BMP 280(pressure, temperature and altitude)
- **3.5.5.** MCP 3008(analog to digital converter)
- **3.5.6.** Jumper wires

DHT11 Humidity & temperature sensor



BMP 280 Pressure sensor



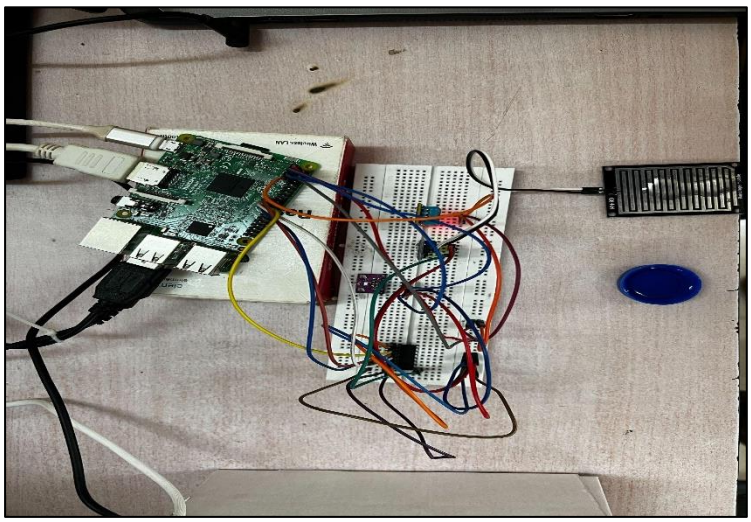


Rain detection sensor **MCP 3008**

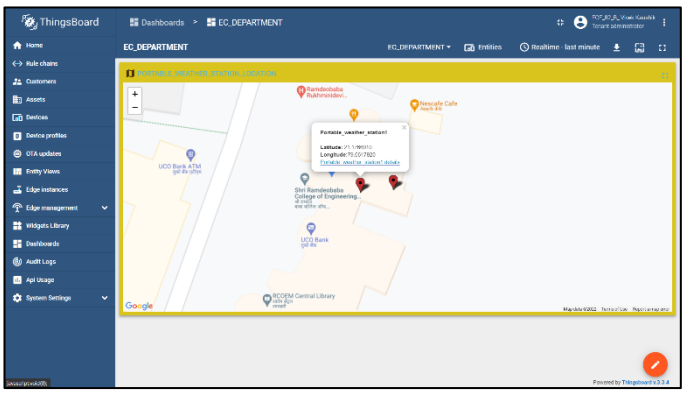
4. Results:

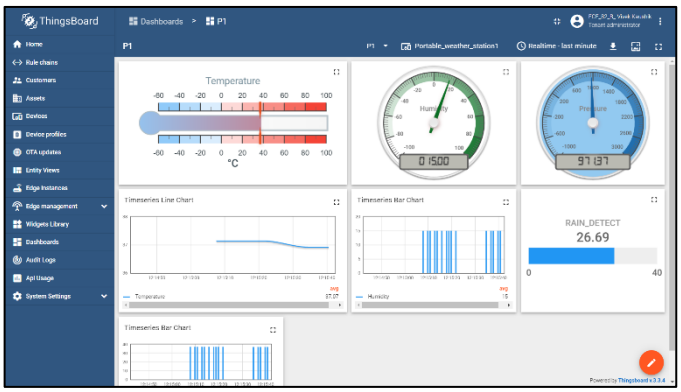
4.1. Hardware Design:

The hardware of the weather station is built using raspberry pi 3B which is connected to sensors.

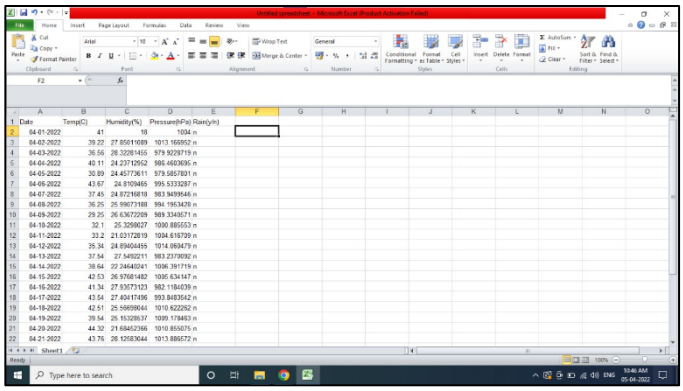


4.2. Displaying weather data:

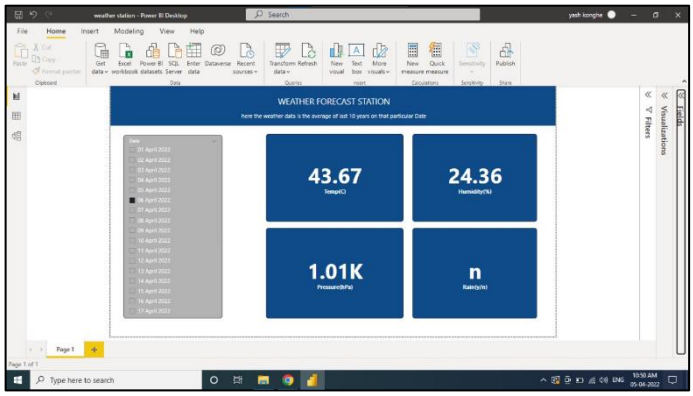




Thingsboard IOT Dashboard



Excel sheet



Microsoft Power Bi

5. Conclusion:

In conclusion, a weather station was Build using Raspberry pi Model 3B, DHT11 humidity and temperature sensor, Rain detect sensor, BMP280 pressure, temperature and relative altitude sensor Thingsboard as the IoT Platform. All the weather parameters were successfully recorded in a excel sheet and displayed using Thinngsboard IOT platform various graphical methods were used which visualized the data recorded by the various sensors. Initial weather prediction was done by using a persistence method and displayed on Microsoft Power Bi. How-ever, the accuracy was considerable due to a smaller number of edge devices used for the project but can be improved to a greater scale with the installation of similar devices at various places to gather local weather data.

6. References:

1. ***https://www.adafruit.com/product/2651***
2. ***https://components101.com/sensors/dht11-temperature-sensor***
3. ***https://www.researchgate.net/publication/332676356_Iot_Based_Weather_Station_Using_Raspberry_Pi_3.***
4. ***https://www.researchgate.net/publication/328865076_Raspberry_Pi_Based_Weather_Station***
5. ***https://www.semanticscholar.org/paper/WEATHER-FORECASTING-USING-RASPBERRY-PI-WITH-OF-(-)-VivekBabu-Reddy/5995b99f3af12c742245dbb97ba9708dd0328a13.***
6. ***https://mathshistory.st-andrews.ac.uk/HistTopics/Weather_forecasts/#4***