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Design and Implementation of IOT based Android Application for Weather Monitoring

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Abstract: The IoT and android-based Weather Monitoring System project is used to get Live reporting of weather conditions. This system is to provide an efficient weather monitoring system by monitoring the weather data based on Internet of Things (IoT) technology and to show the weather data by using the mobile application with quick and easy access for end users. The system uses NodeMCU microcontroller board which is used to collect weather parameters from temperature and humidity sensor (DHT22), digital Barometric Pressure Sensor (BMP280), digital Ambient Light Sensor (BH1750), Rain Sensor (FC37) and digital Air Quality Sensor (CCS811). Data collected from the sensors are then stored into the Firebase real-time database, a cloud-hosted database and mobile application are developed using Android Studio to show the real-time weather conditions in an android mobile phone**.**

Keywords: NodeMCU, Barometric, Ambient, Arduino IDE, Android studio, Firebase.

I. INTRODUCTION

Weather delineates the situation of the environment at a particular place and duration of time. Weather or changes in climate affects many human activities. Predicting the weather parameters plays important role in industrial purpose like medical, food sector and farming. Monitoring the weather parameter considering the surrounding where agriculture as considered it will be only up to farms. Weather keeps changing with time and due to pollution and global warming it is sometimes unable to get exact parameters from satellite.so that's when this monitoring app is coming into picture. The use of smart phone has increased rapidly. Every family member holds a phone nowadays. We have proposed a system where monitoring of data can be done sitting at particular distance in the click of the hands. [1]. Accurate prediction of weather parameters is the toughest task because the nature of the atmosphere is dynamic. The changes in climate conditions have been noticed for centuries. Observing the fluctuations of environmental parameters is indispensable for determining the weather changes. The measured parameter of weather is not productive unless they are conveyed to the end-users quickly. Therefore, real-time data is important. The farmers can get the weather forecasting through their android mobile phones and take the appropriate steps for irrigation and farming.

II. COMPONENTS USED

2.1 Temperature and Humidity Sensor

The DHT22 is an extensively used temperature and moisture detector. The detector comes with a special NTC to measure temperature and an 8- bit microcontroller to affair the values of temperature and moisture as periodical data. The detector is also plant calibrated, making it easy to affiliate with other microcontrollers. The detector can measure temperature from 0 °C to 50 °C and moisture from 20 to 90 with an delicacy of ± 1 °C and ± 1. This detector may be the right choice for some operations, similar as measuring temperature and moisture, setting up original rainfall stations, automatic climate control process and exploration work related to environmental monitoring.

Fig. 1. Temperature and humidity sensor

2.2 Barometric Pressure Sensor

The BMP180 barometric pressure detector can be used to prognosticate the rainfall, descry altitude, and measure perpendicular haste. It's perfect for rainfall stations, remote- controlled vehicles, rainfall balloons, and lots of other

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Systems. In this exploration work, a barometric pressure detector measures pressure at the current position and altitude near the husbandry and pressure values reported in hectopascals(hPa).

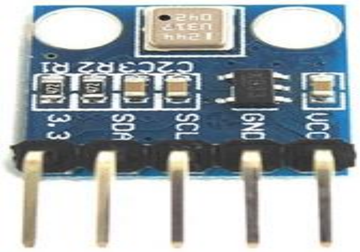

Fig. 2. Barometric Pressure Sensor Module

2.3 Raindrop Sensor

Raindrop detector is principally a board on which nickel is carpeted in the form of lines. It works on the star of resistance. Rain Detector module allows to measure humidity via analog affair legs and it provides a digital affair when a threshold of humidity exceeds. The module is grounded on the LM393 op amp. It includes the electronics module and a published circuit board that collects the rain drops.

Fig. 3. Rain Sensor Module

2.4 Ambient Light Sensor

This detector converts analog light intensity to digital LUX values. BH1750 can measure light intensity up to the range of 65535 lx units. The power force demanded for the proper working of this detector is2.4 V-3.6 V. This detector consumes a veritably less current of 0.12 mA.

Fig. 4. Ambient Light Sensor

2.5 CO2 and VOC sensor

The CCS811 is a digital Air Quality detector result that senses a wide range of Total unpredictable Organic composites. This rout is intended for inner air quality monitoring. The CCS811 measures the eCO2(original calculated Carbon Dioxide) attention within 400 to 8192 ppm and TVOC(Total unpredictable Organic composites) within a range of zero to 1187 ppb. Operating voltage is 3.3V- 5V.

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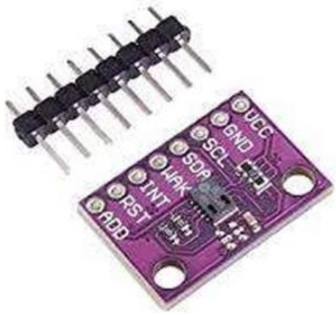

Fig. 4. CO2 and VOC sensor

2.6 Arduino IDE

The main software that we used for programming our microcontroller board is Arduino IDE. It's written in C and C++ .It provides an inbuilt library which provides us numerous affair and input procedures. Also it's an open source software. It uses argued as a dereliction uploading tool to flash the stoner law to arduino programs which are written in arduino ide are known as sketches. These are written in the editor and are saved with the extension. It has a press which displays affair including error dispatches and some other information. This IDE supports the C and C languages by using some special rules structuring the law.

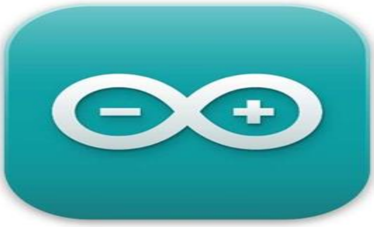

Fig. 5. Arduino IDE

2.7 OLED Display

OLED panels are made from organic stuff that emit light when electricity is applied through them. Since OLEDs don't bear a backlight and pollutants(like TV displays do), they're more effective, simpler to make, and important thinner- and in fact can be made flexible and indeed rollable. OLEDs have a great picture quality-brilliant colors, horizonless discrepancy, fast response rate and wide viewing angles. OLEDs can also be used to make OLED lighting-thin, effective and without any bad essence. It's having a resolution of 128x64 pixels and Input Voltage is3.3 V- 6V.

Fig. 6. OLED display

2.8 Firebase Cloud Database

The Firebase Realtime Database is a cloud-hosted NoSQL database that lets us to store and sync data between database and user in real time. Data is stored as JSON and synchronized in real time to the connected client. Realtime Database uses data synchronization instead of typical HTTP requests

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Fig. 7. Firebase cloud database

III. SYSTEM MODEL

The proposed system goes in a way where we are collecting the data from the sensor, organizing the data and uploading it to the cloud using IOT device. Later we're retrieving and representing the data using android application. The proposed system uses different sensors to detect the weather conditions and also the users are alerted for the extreme weather conditions.

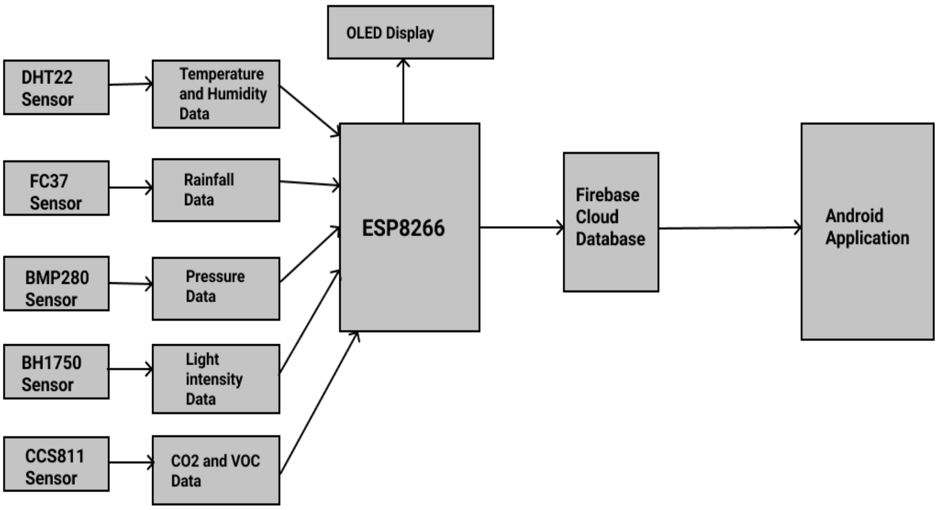

Fig. 8. Block diagram

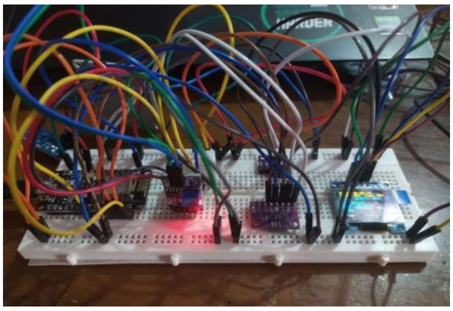

Fig. 9

IV. RESULTS AND DISSCUSSION

The figure – 9 represents the snapshot of the interface. A breadboard is used and ESP8266 is attached on the breadboard. DHT22, BMP280, FC37, BHI1750, CCS811 sensors and OLED display is connected to respective pins of NodeMCU using jumper wires.

The figure 10(a) represents the Serial Monitor of the Arduino IDE. The weather parameters values are printed for every 5 seconds along with the timestamp. The figure 10(b) represents the real time database of the project on the firebase console. The weather parameter values are continuously updated.

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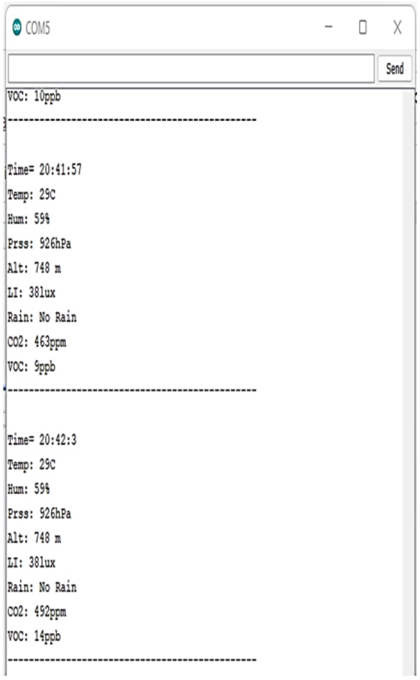


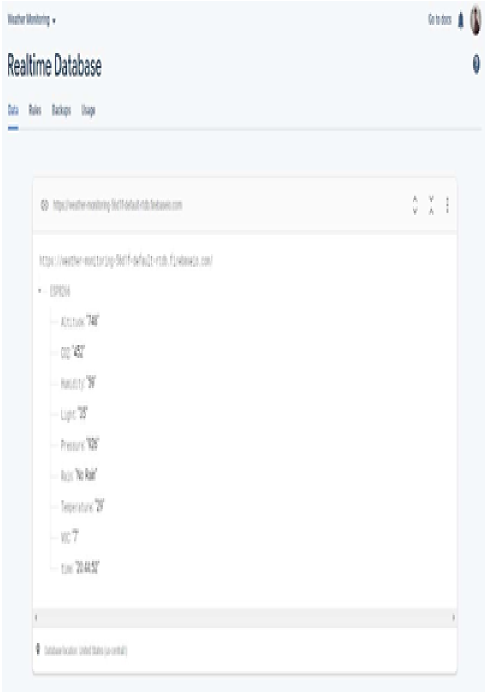
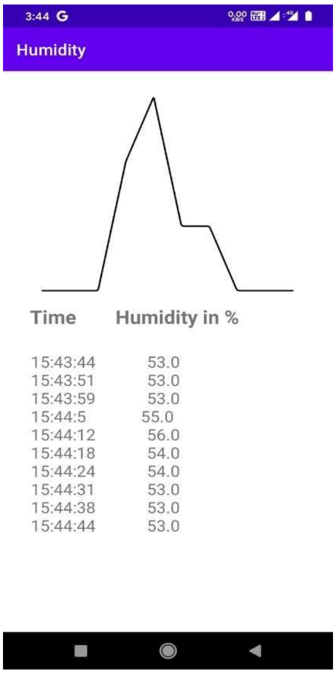


Fig .10(a) Fig. 10(b)

Figure 11(a) represents the home screen of the application, where user can select any one of the weather parameters to monitor. Figure 11(b) represents the sparkline and humidity values along with their timestamp. Figure 11(c) represents the alert dialog when humidity value less than 40% is recorded.



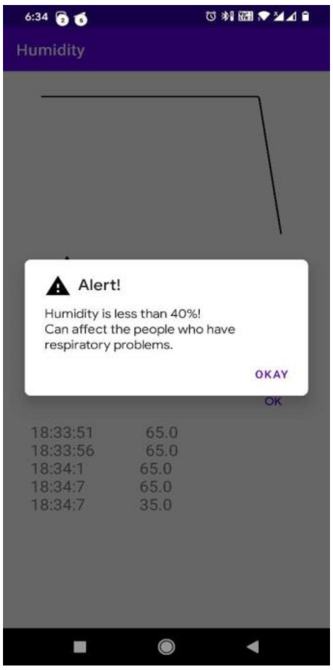


Fig.11(a) Fig.11(b) Fig.11(c)

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V. CONCLUSION

Looking back on this project, the overall outcome of results to be observed. This can be evaluated by looking at how well our objectives were met. Our first objective is to control the engine valve of an engine, select a linear actuator that meets specifications, and construct an electronic control system, deal with the design aspect of our project and were all almost achieved. More specifically, next objective, the electronic control system we constructed is able to read engine speeds from 0 to 3600 rpm and vary the valve timing depending on engine speed and operator inputs. However, our final objective, to obtain gains in horsepower, torque, and efficiency of 2% was not met because of not setting up in an engine but theoretically it should be done. We are confident though that this objective of installing in an engine can be met if more time for testing and facilities is given. There is a lot we could say about the need for variable valve timing. This design is very realistic for the future of the automotive industry as well as our education

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