WEATHER AND AIR QUALITY MONITORING USING IOT

ABSTRACT

The IOT based Weather Monitoring and Reporting System project is used to get Live reporting of weather conditions. It will Monitor temperature, humidity, air. Suppose Scientists/nature analysts want to monitor changes in a particular environment like volcano or a rain-forest. And these people are from different places in the world. In this case, SMS based weather monitoring system has some limitations. Since it sends SMS to few numbers. And time for sending SMS increases as the number of mobile numbers increases. In order to know the information about weather of a particular place then they have to visit those particular sites. Where everyone can see it.

INTRODUCTION

Climatic change and environmental monitoring have received much attention recently. Man wants to stay updated about the latest weather conditions of any place like a college campus or any other particular building. Since the world is changing so fast so there should be the weather stations. Here in this paper, we present a weather station that is very helpful for any places. This weather station is based on IOT (internet of things). It is equipped with environmental sensors used for measurements at any particular place and report them in real time on cloud. To accomplish this, we used Arduino Uno and different environmental sensors like DHT11, soil moisture sensor and rain drop sensor. The sensors constantly sense the weather parameters and keeps on transmitting it to the online web o over a Wi-Fi connection. The weather parameters are uploaded on the cloud and then provides the live reporting of weather information. This paper also focuses on the IOT application in the new generation of environmental information and provides a new paradigm for environmental monitoring in future. The system has been development particularly in the view of building smart city by giving the weather update of any particular place like a particular office or room.

COMPONENTS REQUIREMENTS:

HARDWARE REQUIREMENTS:

- Arduino Uno

-ESP8266 Node MCU

-DHT11 Temperature and Humidity sensor

-MQ135-Air quality gas sensor

-LED bulb of input 3v-3.2v

-Jumper wires

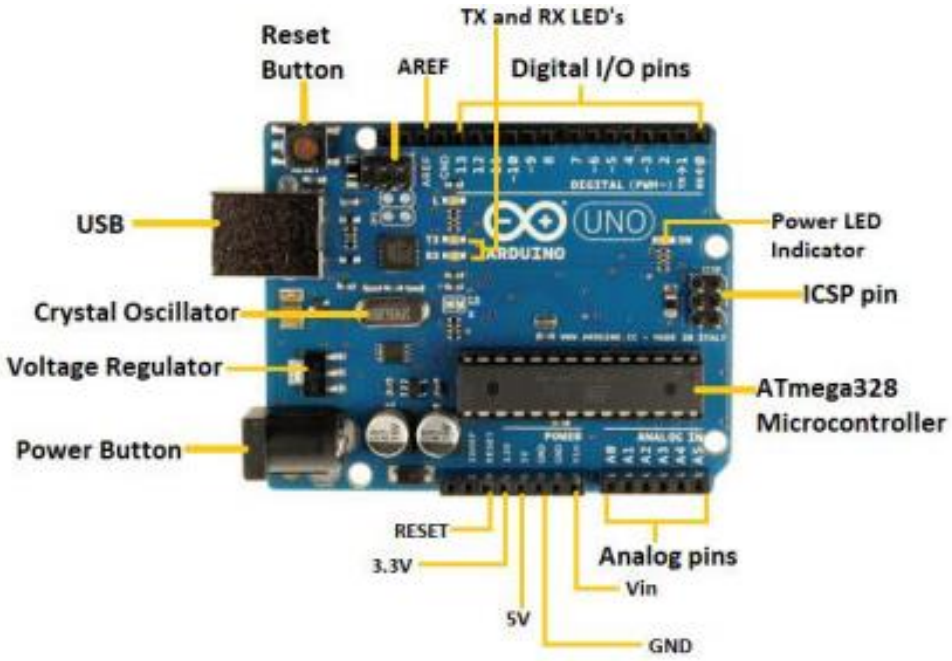
SOFTWARE REQUIREMENTS:

-Arduino IDE

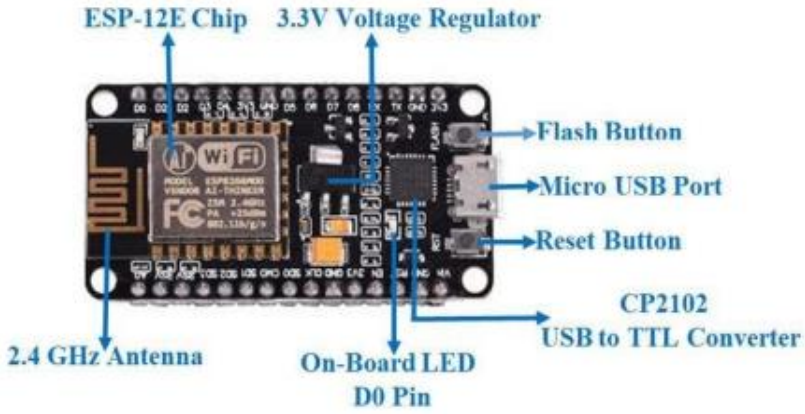
Description of the Components Used:

1. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328p. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 Analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.8.1of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.



2. ESP8266 Node MCU



Node MCU is an IoT Module based on the ESP8266 wi-fi chip Module. Node MCU uses the Lua Scripting language and is an open-source Internet resource (IoT) platform. This module has CH340g USB to TTL Converter IC on board. The ESP8266 Node MCU CP2102 board has ESP8266 which is a highly integrated chip designed for the needs of the new IoT- connected world. Provides a complete solution and contains a Wi-Fi network, allowing it to host an application or download all Wi-Fi communication activities from another app processor.

3.MQ135 GAS SENSOR MODULE

MQ135 Gas Sensor module for Air Quality having Digital as well as Analog output. Sensitive material of MQ135 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exists, the sensors conductivity is higher along with the gas concentration rising. MQ135 gas sensor has high sensitivity to Ammonia, Sulphide and Benze steam, also sensitive to smoke and other harmful gases. It is with low cost and suitable for different application.
Used for family, surrounding environment noxious gas detection device, Apply to ammonia, aromatics, sulfur, benzene vapor, and other harmful gases/smoke, gas detection, tested concentration range: 10 to 1000 ppm.

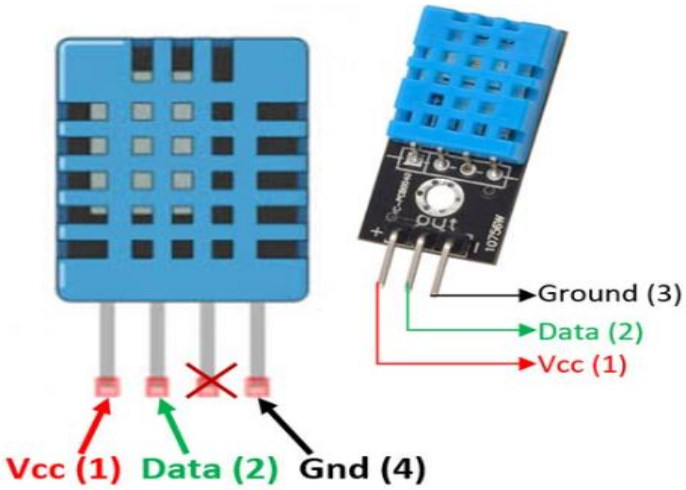
Specifications of MQ135 Gas Sensor Module: -

- Working voltage: DC 5V
- Working Current: 150mA
- DOUT: TTL output
- AOUT: Analog output
- Preheat time: Over 20s
- Dimension: 32mm x 22m x 27mm(HIGH 27mm)

4. DHT11 Temperature and Humidity sensor:

DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc… to measure humidity and temperature instantaneously.

DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative



humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.

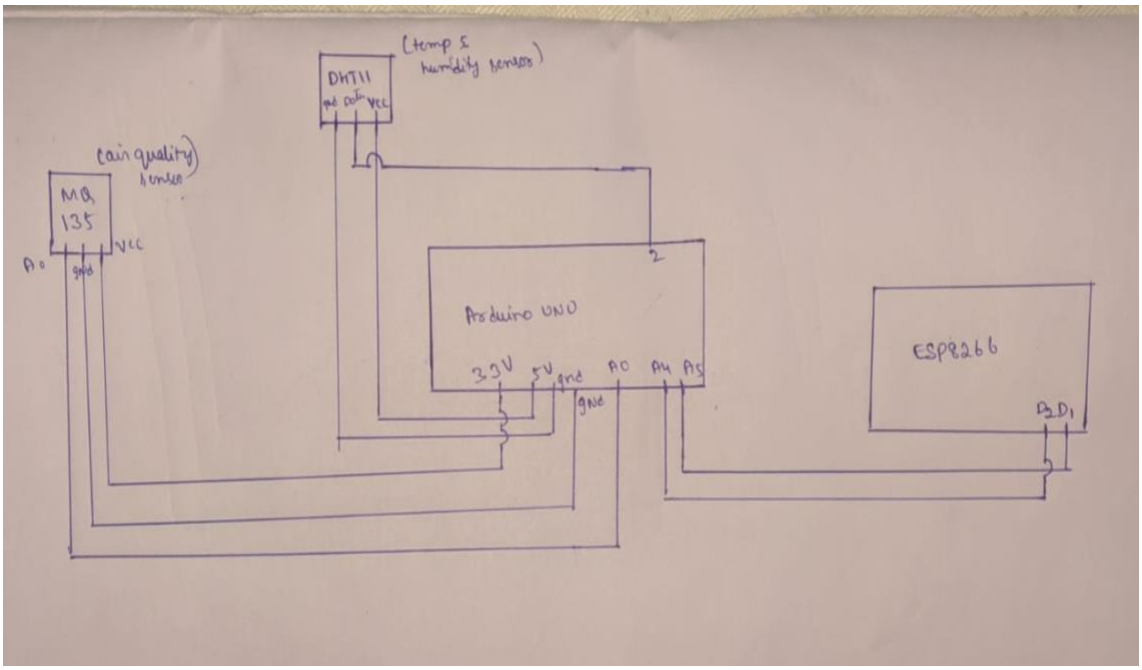
DHT11 Specifications

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%

5.Jumper wires

A jumper wire is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

CIRCUIT DIAGRAM:

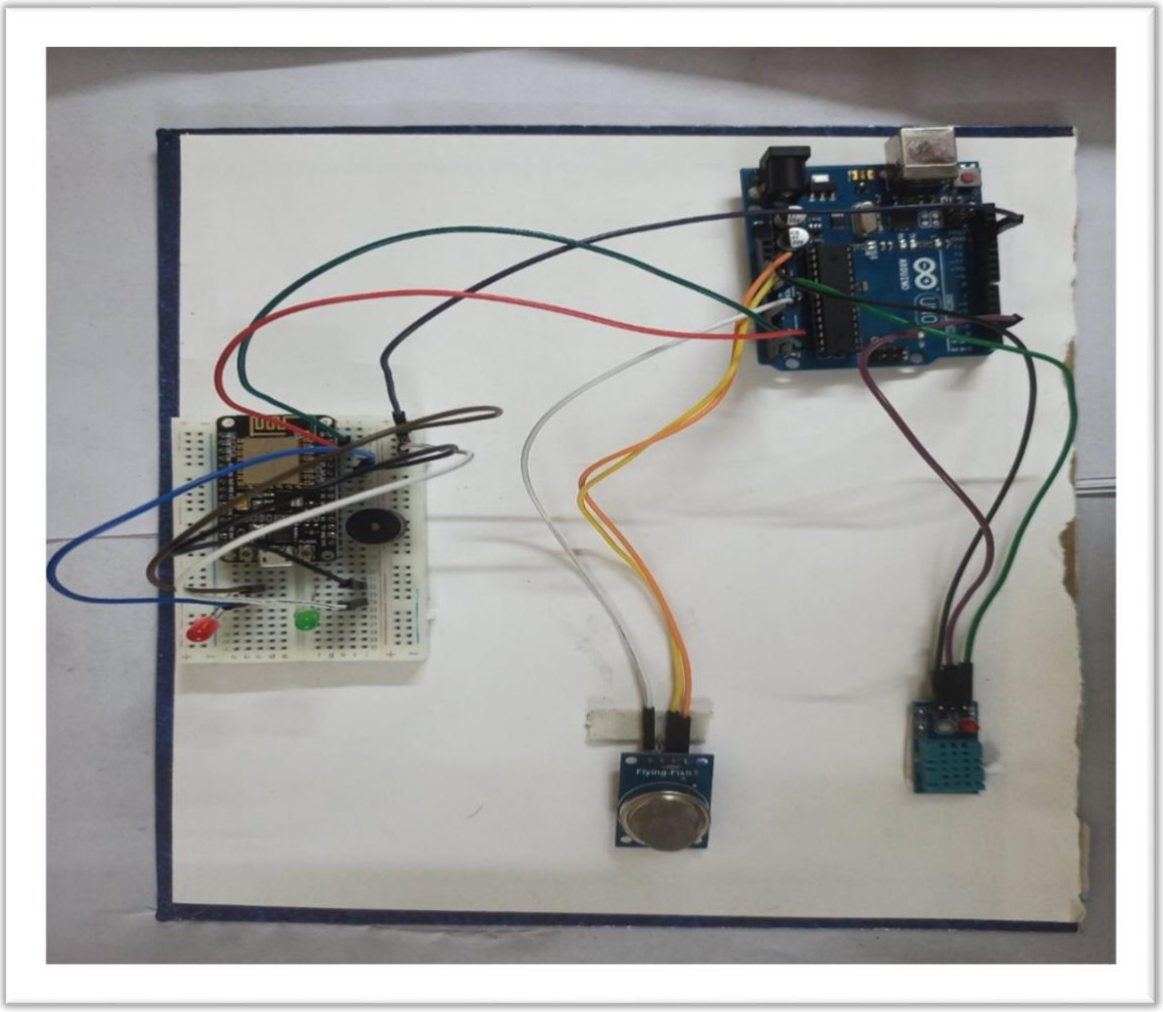


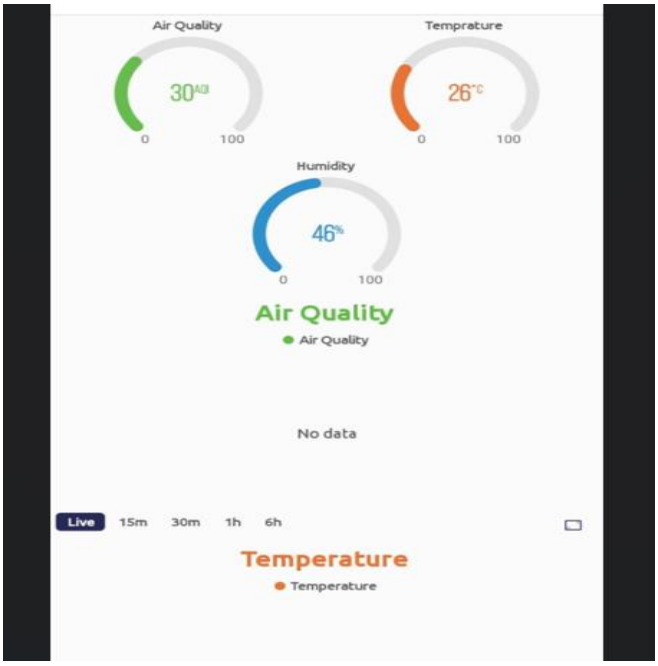
WORKING

In this project we are using Arduino UNO, Node MCU(ESP8266), DHT11 Temperature and Humidity sensor, MQ135 -Air quality gas sensor to build the circuit. In iot enabled weather and air monitoring system project, Arduino uno measures the weather parameters using the sensors as mentioned above. These sensors are directly connected with the Arduino uno. Arduino uno has inbuilt analog to digital converter. Arduino calculates and displays these valves in app that installed in mobile or any internet connected device. The process of sending the data to the internet using the Wi-Fi is repeated after constant time intervals. Then the user needs to visit a particular website to view this weather data. The project connects and stores the data on a web server. Hence user gets Live reporting of weather conditions. Internet connectivity or Internet connection with Wi-Fi is compulsory in this IOT based weather monitoring reporting system project.

The data stored in cloud can be used for the analysis of the parameter and continuous monitoring purpose. The temperature and humidity levels and CO levels in air at regular time intervals. All the above information will be stored in the cloud, so that we can provide trending of temperature and humidity levels and CO levels in a particular area at any point of time.

WORKING MODEL:





PROGRAMS:

❖ Program for Arduino UNO

```
#include <SoftwareSerial.h>
#include <PulseSensorPlayground.h>
#include <DHT.h>
#include <Wire.h>

#define DHTPIN 2 // Sensor Input pin Connection to Arduino
#define DHTTYPE DHT11 // Sensor Input pin Connection to Arduino

DHT dht(DHTPIN, DHTTYPE);
int mq135 = A0;     //smoke sensor is connected with the analog pin A0



void setup() {
  Serial.begin(9600);
  Wire.begin(2);
  Wire.onRequest(Request);

  dht.begin();// Sensor Setup and Intalising
}

char air[5]; // How Many Character Send from Arduino to ESP8266 Mention in Digits
char temp[5]; // How Many Character Send from Arduino to ESP8266 Mention in Digits
char hum[5];  // How Many Character Send from Arduino to ESP8266 Mention in Digits

void loop() {
  char cdata; // Character Loop
  int data = analogRead(mq135); // Mention In Integer form from data Recived by Sensor
  int temperature = dht.readTemperature(); // Mention In Integer form from data Recived by Sensor
```

```
  int humidity = dht.readHumidity(); // Mention In Integer form from data Recived by Sensor


  // Send the sensor data to the ESP8266
  Serial.print("Airquality: ");
  Serial.print(data);
  Serial.print(", Temperature: ");
  Serial.print(temperature);
  Serial.print(", Humidity: ");
  Serial.println(humidity);


   itoa(data,air,10);
    Serial.println(air);


    itoa(temperature,temp,10);
    Serial.println(temp);


    itoa(humidity,hum,10);
    Serial.println(hum);



}
void Request()
{
  Wire.write(air);
  Wire.write(",");
  Wire.write(temp);
  Wire.write(",");
  Wire.write(hum);
  Wire.write("\n");
}
```

❖ Program for NODE MCU (ESP8266)

```
#define BLYNK_TEMPLATE_ID "TMPLUeoE95KX"
#define BLYNK_DEVICE_NAME "Health Monitor"
#define BLYNK_AUTH_TOKEN "VZrM6Ekrgur8JERPEliIBBvGOcPp--sk"
#include<Wire.h>

#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>



char auth[] = "VZrM6Ekrgur8JERPEliIBBvGOcPp--sk";
char ssid[] = "Hotspot";
char pass[] = "12345678@@##";

void setup() {
  Wire.begin();
  Serial.begin(9600);
   Blynk.begin(auth, ssid, pass);
}



void loop() {
  Blynk.run();
  Wire.requestFrom(2,15);
  String string,string1,string2,string3;
  do
  {
    char c = Wire.read();
    string = string+c;
```

```
  string1 = string.substring(0);
  string2 = string.substring(3);
  string3 = string.substring(6);
 } while (Wire.available());

char buf1[10];
char buf2[10];
char buf3[10];

Serial.println(string);
string1.toCharArray(buf1, 10);
int air = atoi(buf1);
Serial.println(air);
string2.toCharArray(buf2, 10);
int temp = atoi(buf2);
Serial.println(temp);
string3.toCharArray(buf3, 10);
int hum = atoi(buf3);
Serial.println(hum);

  Blynk.virtualWrite(V0, (air));
  Blynk.virtualWrite(V1, String(temp));
  Blynk.virtualWrite(V2, String(hum));
  }
```

ADVANTAGES:

- IOT weather mentoring system project using Arduino Uno is fully automated.

- It does not require any human attention.

- We can get prior alert of weather conditions

-The low cost and efforts are less in this system

-Accuracy is high.

- Self Protection

-Smart way to monitor Environment

-Efficient

APPLICATIONS:

- The weather forecasting plays very important role in the field of agriculture.

-It is also helpful at places like volcano and rain forests.

- It is quite difficult for a human being to stay for longer time at such places

FUTURE SCOPE:

-One can implement a few more sensors and connect it to the satellite as a global feature of this system.

- Adding more sensor to monitor other environmental parameters such as CO2, Pressure and Oxygen Sensor

-In aircraft, navigation and military there is a great scope of this real-time system.

- It can also be implemented in hospitals or medical institutes for the research & study in "Effect of Weather on Health and Diseases", hence to provide better precaution alerts.

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 results will be available to the user through the Wi-Fi. The smart way to monitor environment an efficient, low-cost embedded system is presented in this paper. It also sent the sensor parameters to the cloud. This data will be helpful for future analysis and it can be easily shared to other users also. This model can be expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low-cost solution for continuous monitoring of environment.

REFERENCE:

1. https://components101.com/sensors/dht11-temperature-sensor

2. https://www.electronicscomp.com/mq135-air-quality-gas-sensor-module-india?gclid=CjwKCAiAoL6eBhA3EiwAXDom5tagvaojKUU1VZ09lVFwwz3CMBkKdkYMZpJ4kgLHQbdyvefp89-J6RoCRP0QAvD_BwE

3. https://youtu.be/kdXK3aBL8aE