PROJECTTITLE:AIRQUALITYMONITORING

Phase5:ProjectDocumentation&Submission

INTRODUCTION:

ThefundamentaltargetofIoTairqualityMonitoringSystemisthatthe Air contamination is a rising issue nowadays. It is obligatory to screen airqualityandmonitoritforamorebeneficialfutureandsolidlivingfor all. Web of things (IoT) is picking up prominence step by step as it can changelifemakingitsimplerforpeople.

Inthisprojectwecanmeasureairqualitybyusing*Raspberrypi*, temperatureandhumiditysensor,gassensor,dustsensor.Sensorshave been used to detect the presence of harmful gases/compounds, which are continually transmitted to a controller. Air quality monitoring and controlling system is proposed in this project, which enable us to monitorandcheckrealtimequalityortheairtemperature,humidityin specific region through IOT . In this project we can also control the qualityofairpollutionbyusingairfilteringwhichabsorbthecarbonin the air and produce a fresh air.

OBJECTIVES:

- Mainobjectiveofthisprojectistogetacleanpureair.Inthis projectwillbedesigningadevicewhichcandetectairpollutionin the environment.
- ThisIoTdeviceswillbehavingmicrocontrolleraswellasairquality sensor charges mq2 sensor. This IoT device will be continuously monitoringairqualityanduploadthedatatoserver.
- Wewillmakeaairpurifierwhichworksondryairpurifierconcept. This air purifier will be started once the air quality has been

decreased.oncetheairqualityhasbeenrestoredthisairpurifier will be switched off.

CODE:

WOKWi SAVE SHARE

sketch.ino | diagram.json | libraries.txt | Library Manager

```
#define BLYNK_TEMPLATE_ID "TMPLwToQUqRw"
#define BLYNK_TEMPLATE_NAME "Air Quality Monitoring"
#define BLYNK_AUTH_TOKEN "C8Y7T0Fr54QF8pdfQ5dZsdfhhSdiQBFLj8mYe"

#define BLYNK_PRINT Serial
#include <WiFi.h>
#include <BlynkSimpleEsp32.h>

#include <DHT.h>

#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16, 2);

  byte degree_symbol[8] =
                  {
                    0b00111,
                    0b00101,
                    0b00111,
                    0b00000,
                    0b00000,
                    0b00000,
                    0b00000,
                    0b00000
                  };

char auth[] = BLYNK_AUTH_TOKEN;
```

```
29  char ssid[] = "WiFi Username";  // type your wifi name
30  char pass[] = "WiFi Password";  // type your wifi password
31
32  BlynkTimer timer;
33
34  int gas = 32;
35  int sensorThreshold = 100;
36
37  #define DHTPIN 2 //Connect Out pin to D2 in NODE MCU
38  #define DHTTYPE DHT11
39  DHT dht(DHTPIN, DHTTYPE);
40
41
42  void sendSensor()
43  {
44
45
46    float h = dht.readHumidity();
47    float t = dht.readTemperature(); // or dht.readTemperature(true) for
48
49
50      if (isnan(h) || isnan(t)) {
51     Serial.println("Failed to read from DHT sensor!");
52     return;
53    }
54     int analogSensor = analogRead(gas);
55    Blynk.virtualWrite(V2, analogSensor);
```

```
54      int analogSensor = analogRead(gas);
55    Blynk.virtualWrite(V2, analogSensor);
56    Serial.print("Gas Value: ");
57      Serial.println(analogSensor);
58    // You can send any value at any time.
59    // Please don't send more that 10 values per second.
60      Blynk.virtualWrite(V0, t);
61      Blynk.virtualWrite(V1, h);
62
63      Serial.print("Temperature : ");
64      Serial.print(t);
65      Serial.print("    Humidity : ");
66      Serial.println(h);
67
68
69  }
70  void setup()
71  {
72
73    Serial.begin(115200);
74
75   //pinMode(gas, INPUT);
76    Blynk.begin(auth, ssid, pass);
77    dht.begin();
78    timer.setInterval(30000L, sendSensor);
79
80   //Wire.begin();
81      lcd.begin();
```

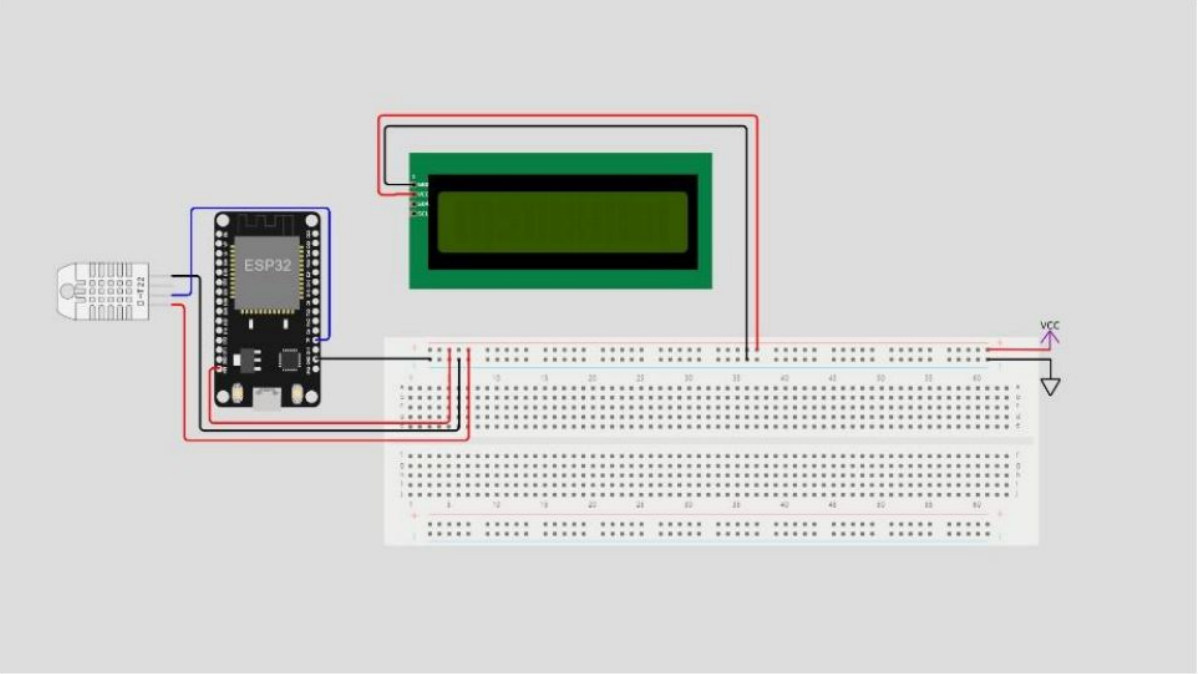
```
78    timer.setInterval(30000L, sendSensor);
79
80   //Wire.begin();
81    lcd.begin();
82
83
84  //  lcd.backlight();
85   // lcd.clear();
86    lcd.setCursor(3,0);
87    lcd.print("Air Quality");
88    lcd.setCursor(3,1);
89    lcd.print("Monitoring");
90    delay(2000);
91    lcd.clear();
92    }
93
94  void loop()
95  {
96    Blynk.run();
97    timer.run();
98   float h = dht.readHumidity();
99    float t = dht.readTemperature(); // or dht.readTemperature(true) for
100     int gasValue = analogRead(gas);
101   lcd.setCursor(0,0);
102   lcd.print("Temperature ");
103   lcd.setCursor(0,1);
104   lcd.print(t);
```

```
lcd.write(1);
lcd.createChar(1, degree_symbol);
lcd.setCursor(7,1);
lcd.print("C");
delay(4000);
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Humidity ");
lcd.print(h);
lcd.print("%");
delay(4000);
lcd.clear();
//lcd.setCursor(0,0);
// lcd.print(gasValue);
// lcd.clear();
Serial.println("Gas Value");
Serial.println(gasValue);
if(gasValue<1200)
{
  lcd.setCursor(0,0);
  lcd.print("Gas Value: ");
  lcd.print(gasValue);
  lcd.setCursor(0, 1);
  lcd.print("Fresh Air");
  Serial.println("Fresh Air");
  delay(4000);
  lcd.clear();
```

```
    lcd.print("Fresh Air");
    Serial.println("Fresh Air");
    delay(4000);
    lcd.clear();
  }
  else if(gasValue>1200)
  {
    lcd.setCursor(0,0);
    lcd.print(gasValue);
    lcd.setCursor(0, 1);
    lcd.print("Bad Air");
    Serial.println("Bad Air");
    delay(4000);
    lcd.clear();
  }

   if(gasValue > 1200){
    //Blynk.email("shameer50@gmail.com", "Alert", "Bad Air!");
    Blynk.logEvent("pollution_alert","Bad Air");
  }
}
```

SETUP:



PROJECTDESCRIPTION:

MQ135sensorcansenseNH3,NOx,alcohol,Benzene,smoke,CO2and some other gases, so it is perfect gas sensor for our Air Quality Monitoring System. When we will connect it to Arduino then it will sense the gases,and wewillget the Pollution level in PPM (parts per million).MQ135gassensorgivestheoutputinformofvoltagelevels and we need to convert it into PPM. So for converting the output in PPM,herewehaveusedalibraryforMQ135sensor,itisexplainedin detail in "Code Explanation" section below.

Sensorwasgivingusvalueof90whentherewasnogasnearitandthe safe levelof air quality is 350 PPM anditshould not exceed 1000PPM. Whenitexceedsthelimitof1000PPM,thenitstartscauseHeadaches, sleepiness and stagnant, stale, stuffy air and if exceeds beyond 2000 PPM then it can cause increased heart rate and many other diseases. Whenthevaluewillbelessthan1000PPM,thentheLCDandwebpage will display "Fresh Air".

Whenever the value will increase 1000 PPM, then the buzzer will start beeping and the LCD and webpage will display "Poor Air, Open Windows".Ifitwillincrease2000thenthebuzzerwillkeepbeepingand the LCD and webpage will display "Danger! Move to fresh Air".

Thecodehasbeencomputedsuccessfully.Itisuserfriendly,andhad required options, which can be utilized by the user to perform the desiredoperationsThecodeneedtobedumpedintheArduinoIDE software. The goals that are achieved by the code.

- Lessnumberofhumaninvolvement
- Efficientmanagementofwaterusage
- Costeffective

PYTHONCODE:

```
from MQ135 import MQ135
import serial
import time
import RPi.GPIO as GPIO
import Adafruit_DHT
import requests

GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)

DHT_SENSOR = Adafruit_DHT.DHT11
DHT_PIN = 4

MQ135_PIN = 17

GPIO.setup(MQ135_PIN, GPIO.IN)

ser = serial.Serial('/dev/ttyS0', 9600, timeout=1)

def sendData(command, timeout, debug):
    ser.write(command.encode('utf-8'))
    if debug:
        print('Sent: ' + command)
    time.sleep(timeout / 1000)
    while ser.inWaiting() > 0:
        if debug:
            print('Response: ' + ser.readline().decode('utf-8').strip())

def readDHT():
    humidity, temperature = Adafruit_DHT.read_retry(DHT_SENSOR, DHT_PIN)
    return humidity, temperature

def readMQ135():
    return GPIO.input(MQ135_PIN)
```

```
def sendToServer(air_quality):
    url = 'http://your_server_url'
    data = {'air_quality': air_quality}
    response = requests.post(url, data=data)
    print(response.text)

def setup():
    sendData('AT+RST\r\n', 2000, True)
    sendData('AT+CWMODE=2\r\n', 1000, True)
    sendData('AT+CIFSR\r\n', 1000, True)
    sendData('AT+CIPMUX=1\r\n', 1000, True)
    sendData('AT+CIPSERVER=1,80\r\n', 1000, True)

def loop():
    air_quality = readMQ135()
    sendToServer(air_quality)
    time.sleep(1)

if __name__ == '__main__':
    setup()
    while True:
        loop()

webpage = "<h1>IOT Air Pollution Monitoring System</h1>"
webpage += "<p><h2>"
webpage += " Air Quality is "
webpage += str(air_quality)
webpage += " PPM"
webpage += "<p>"
if air_quality <= 1000:
    webpage += "Fresh Air"
elif air_quality <= 2000 and air_quality >= 1000:
    webpage += "Poor Air"
elif air_quality >= 2000:
```

```
    webpage += "Danger! Move to Fresh Air"
webpage += "</h2></p></body>"
cipSend = "AT+CIPSEND="
cipSend += str(connectionId)
cipSend += ","
cipSend += str(len(webpage))
cipSend += "\r\n"
sendData(cipSend, 1000, DEBUG)
sendData(webpage, 1000, DEBUG)
cipSend = "AT+CIPSEND="
cipSend += str(connectionId)
cipSend += ","
cipSend += str(len(webpage))
cipSend += "\r\n"
closeCommand = "AT+CIPCLOSE="
closeCommand += str(connectionId)
closeCommand += "\r\n"
sendData(closeCommand, 3000, DEBUG)

lcd.setCursor(0, 0)
lcd.print("Air Quality is ")
lcd.print(air_quality)
lcd.print(" PPM ")
lcd.setCursor(0, 1)
if air_quality <= 1000:
    lcd.print("Fresh Air")
    digitalWrite(8, LOW)
elif air_quality >= 1000 and air_quality <= 2000:
    lcd.print("Poor Air, Open Windows")
    digitalWrite(8, HIGH)
elif a
lcd.print("Danger! Move to Fresh Air")
digitalWrite(8, HIGH)   # turn the LED on
```

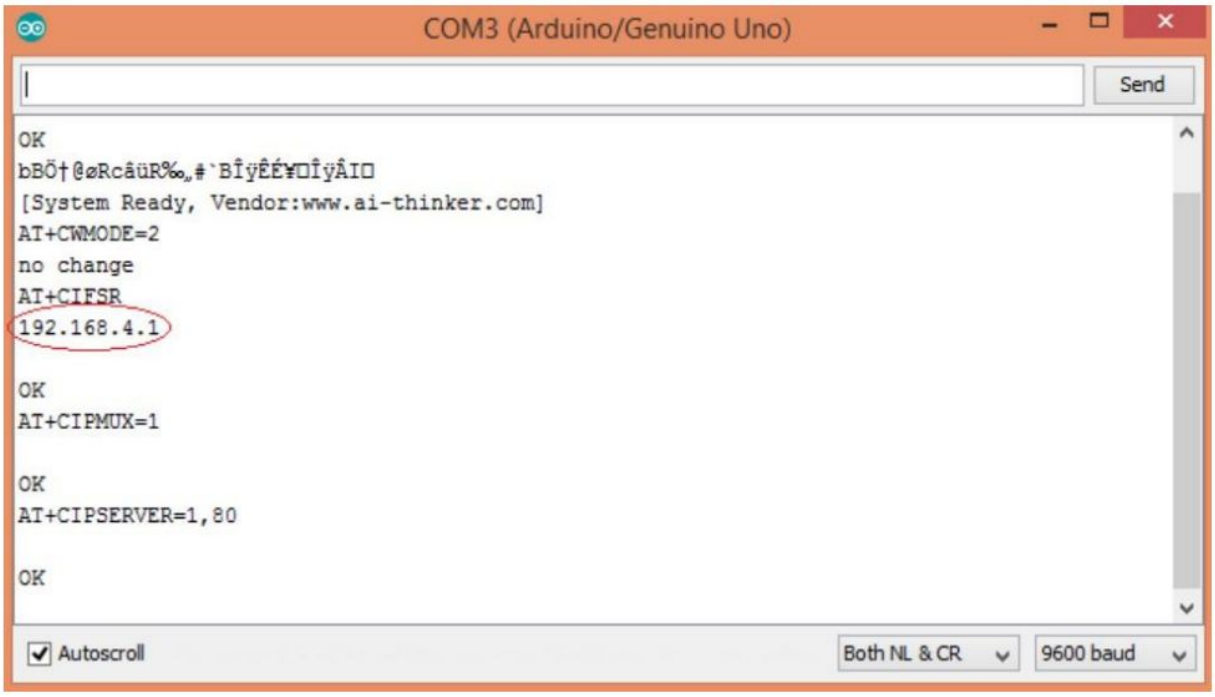
```
lcd.scrollDisplayLeft()
delay(1000)

def sendData(command, timeout, debug):
    response = ""
    esp8266.print(command)  # send the read character to the esp8266
    time = millis()
    while (time + timeout) > millis():
        while esp8266.available():
            # The esp has data so display its output to the serial window
            c = esp8266.read()  # read the next character.
            response += c
    if debug:
        Serial.print(response)
    return response
```

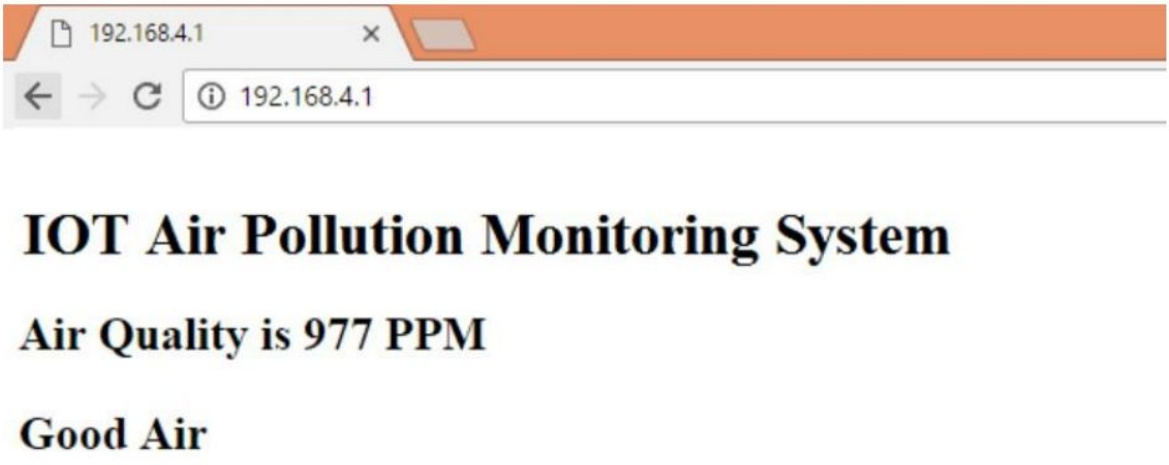
TestingandOutputoftheProject:

Beforeuploadingthecode,makesurethatyouareconnectedtotheWi- Fi of your ESP8266 device. After uploading, open the serial monitor and it will show the IP address like shown below.

The critical got the opportunity to screen air quality is very obvious, in light of expanded mechanical exercises over the previous years. Individuals got the chance to perceive the degree that their exercises affect air quality [4]. This undertaking proposes air contamination observing framework. The framework was created utilizing the Arduino microcontroller.Thecontaminationrecognitionframeworkwasintended towatchanddissectairqualityinperiodandlogdatatoafarawayserver, keeping the data refreshed over the net.



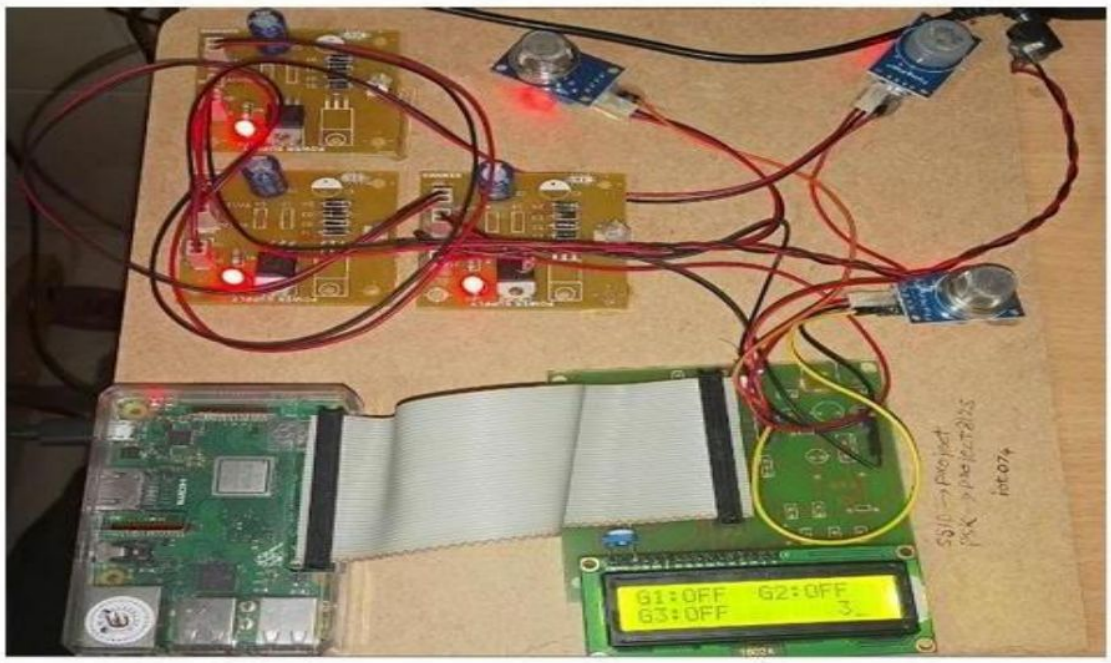
Type this IP address in your browser, it will show you the output as shownbelow.Youwillhavetorefreshthepageagainifyouwanttosee the current Air Quality Value in PPM.



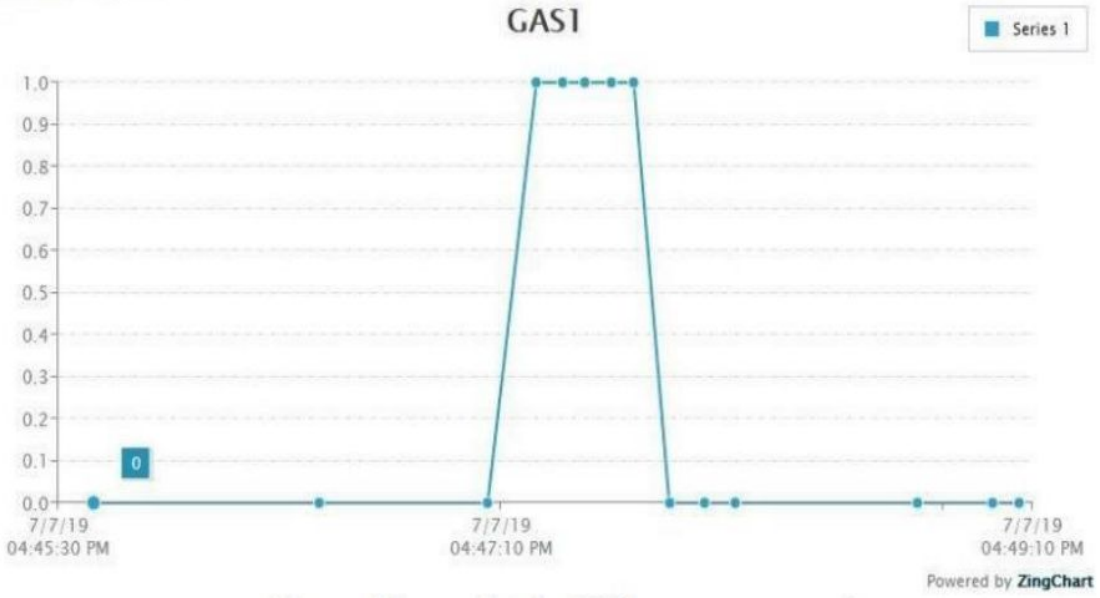
Wehavesetupalocalservertodemonstrateitsworking,youcancheck the **Video** below. But to monitor the air quality from anywhere in the world, you need to **forward the port 80 (used for HTTP or internet) to your local or private IP address** (192.168*) of you device. After port forwardingalltheincomingconnectionswillbeforwardedtothislocal address and you can open above shown webpage by just entering the publicIPaddressofyourinternetfromanywhere.Youcanforwardthe port by logging into your router (192.168.1.1) and find the option to setuptheportforwarding.

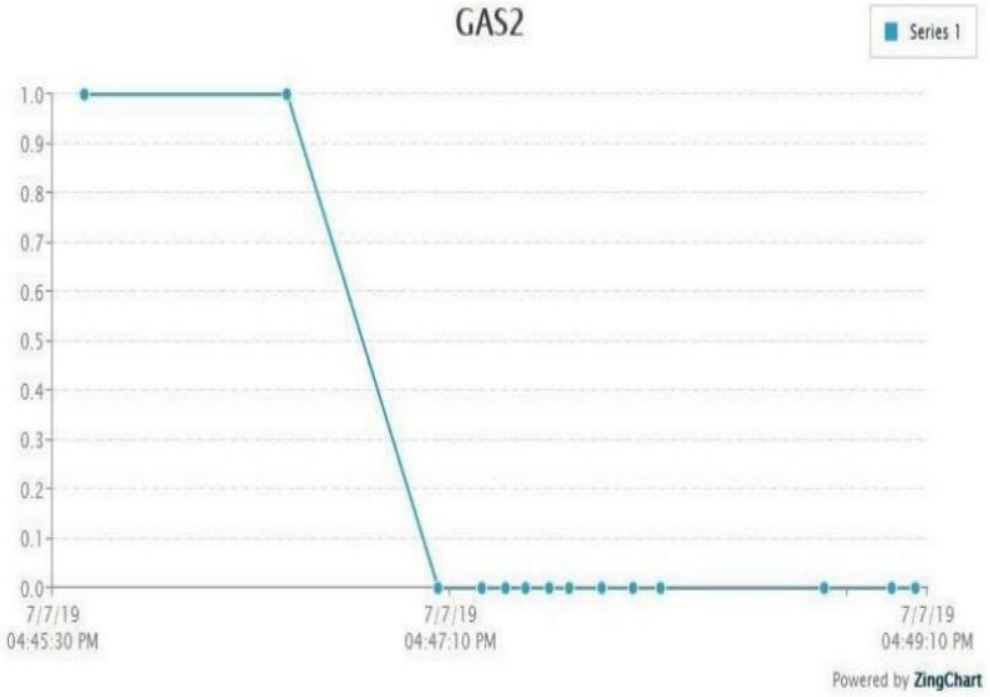
OVERVIEW:

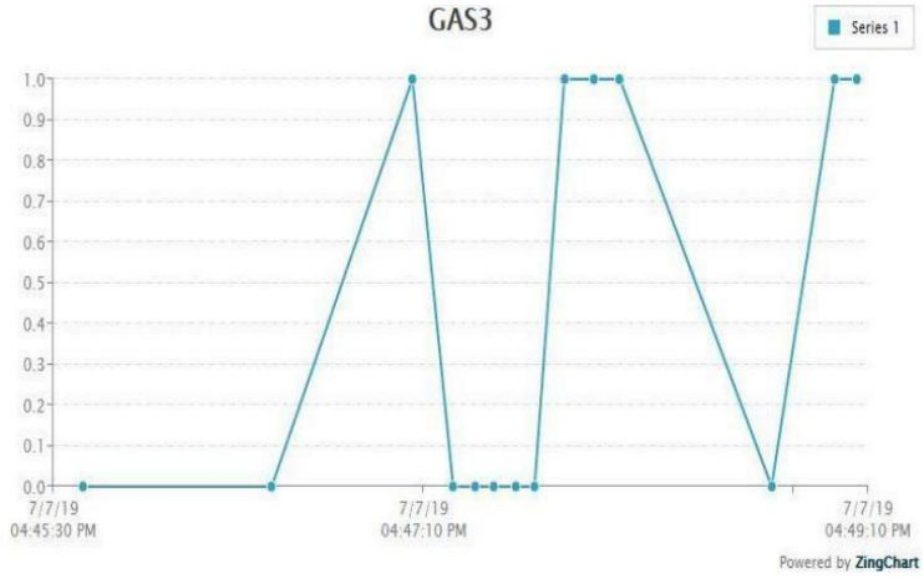
ThisShowsthecompletesetupoftheAirQualityMonitoringSystem Basedon the IotUsing Raspberry pi that contains Mq-2 Gas sensor , Mq-7 Gas Sensor and Mq-135 Gas Sensor and finally placed on the board for easy to use and Convince



Hello.. iot074
Logout Switch to Table View
Previous Page 4 of 4







APPLICATIONS:

- **Preventsmogdangers:**Thisisoneofthemostimportantreasons why people use the air pollution control.
- **Protecttheirhealth:**Thisispartofthereasonwhymostpeople install the air pollution control. Most of these chemicals could damagethelungs.
- **Improvetheirindoorairquality:**Peopleuseittoimprovetheair when they are indoors.

ADVANTAGES:

- **Airpollutioncontrolhelpstoprotectthehumanhealth:**Toevery human on earth, health is wealth; health is paramount for the runningofourdaytodayactivities,withoutwhichwewouldhave to rely on others to live. Air Pollution Scrubber Suppliers come to help protect our health, which is very valuable.

- **Airpollutioncontrolhelpspreventeconomicwastes**:Withair pollutioncontrol,thewastesaccruedfromdeadcropsandbad water will be limited or stopped.
- **Increasedworkerproductivity:**Nomatterhowstrongthe immunesystemis,therearetimeswhenitfails,especiallywhen thereisexcessairpollution.Aspollutioniscontrolled,workerscan now work for a longer period of time.
- **Helpsimproveindoorairquality:**Airpollutioncontrolhelpsto secure the quality of the air inside your house.
- **Preventsmogdangers:**Thisisoneofthemostimportantreasons why people use the air pollution control. Smog can be very hazardous,whichiswhyairpollutioncontrolshouldbeinstalledat an early stage to prevent smog.
- **Protecttheirhealth:**Thisispartofthereasonwhymostpeople install the air pollution control. Most of these chemicals could damagethelungs.
- **Improvetheirindoorairquality:**Peopleuseittoimprovetheair when they are indoors.

CONCLUSION:

Inthisproject,theintegratedIoTairqualitymonitoringsystemis developedtoovercometheissuesinairquality.Thesensorsmainly sense the various dangerous gases present in the environment. Safetyeffortscanbeupgradedtosecuretheinformationthatis beingsentthroughthesegmentsbypresentingnewconventions.

Theairmonitoringsystemcanhelpintheinnovationofnew practices to overcome the problems of the highly-polluted areas, whichisamajorissue.Itsupportsthenewtechnologyandeffectively supports the healthy life concept.