

` ***IoT-FUNDAMENTALS-EPJ***

***REVIEW-3***

***FINAL REPORT***

***IOT Based Air Pollution Monitoring System***

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ACKNOWLEDGEMENT

We would like to acknowledge thanks to our faculty, Prof.Sangeetha A, for

providing us with the opportunity of preparing this project report for the

subject of IoT-Fundamentals. This project work binds up a combined

experience of working on Arduino-UNO and and hardware components-sensors like MQ-135,MQ-6, DHT module and Wi-Fi module and software like Firebase and basic knowledge of HTML,CSS and JavaScript to design our website for successfully completing this project. It would be a bright opportunity to work on any such project work in future too.

ABSTRACT

Vehicles are essential in the modern day. It enables people to go from

one end of the city to the other and almost all sectors of work benefit

from the convenience of this.But they come at a cost I.e damaging the environment by emitting various harmful gases and eventually polluting the air we breathe.

Therefore,in this model of Air Pollution Monitoring System we try to keep a check on vehicles by monitoring the levels of carbon-di-oxide ,LPG and various other gases by continously dectecting the ppm levels emitted by the vehicle .Real time data is sent to the website and is displayed for further processing .Thus we can monitor the vehicles’ gas emission from any part of the world.

AIM

To design and build an Air Pollution monitoring system using IOT concepts which will monitor the air quality over a web server using the Internet and will trigger an alarm when the air quality goes down beyond a certain threshold level. Different harmful gases present in the air like CO2, smoke, alcohol, benzene, NH3, LPG and NOx can be sensed and monitored. Temperature and humidity sensors are additional blocks added to optimize the system.

COMPONENTS REQUIRED

HARDWARE:

1. **MQ135 Gas sensor** :The MQ-135 Gas sensor can detect gases like Ammonia (NH3), sulfur (S), Benzene (C6H6), CO2, and other harmful gases and smoke. Similar to other MQ series gas sensor, this sensor also has a digital and analog output pin. When the level of these gases go beyond a threshold limit in the air the digital pin goes high.
2. **Wi-Fi module ESP8266 :**

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor.

**3)MQ 6 LPG gas sensor:**

MQ-6 gas sensor has high sensitity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different application.

**4)DHT 11 Temperature and Humidity sensor :**

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SOFTWARE:

1. ARDUINO-UNO
2. VS CODE
3. FIREBASE:WEBSITE HOSTING PLATFORM

METHODLOGY

We have used 3 sensors in this system- MQ135 which measures the CO2 level and provides the output in ppm levels. The MQ6 sensor or LPG sensor tells us whether LPG is found or not. The DHT 11 sensor is used to measure the temperature in real time as well as the humidity. Following this, the real time data is sent to the firebase database that we have created using the firebase tool. This happens with the help of the ESP8266 NodeMCU or WiFi module. We then host a website using firebase and this real time data is then displayed on our website.

CODE

FIREBASE CODE:

#include <DHT.h>

#include <DHT\_U.h>

//Including the libraries

#include <Arduino.h>

#include <ESP8266WiFi.h>

#include <Firebase\_ESP\_Client.h>

#include <Wire.h>

#include <MQ135.h>

#include "DHT.h"

//Initializing the variables

#define DHTPIN D0

#define lpgsensor D1

#define gassensor A0

long duration, inches, cm;

#define DHTTYPE DHT11 // DHT 11

//#define DHTTYPE DHT22 // DHT 22 (AM2302), AM2321

//#define DHTTYPE DHT21 // DHT 21 (AM2301)

DHT dht(DHTPIN, DHTTYPE);

// Provide the token generation process info.

#include "addons/TokenHelper.h"

// Provide the RTDB payload printing info and other helper functions.

#include "addons/RTDBHelper.h"

// Insert your network credentials

#define WIFI\_SSID "Galaxy A52"

#define WIFI\_PASSWORD "\*\*\*\*\*"

// Insert Firebase project API Key

#define API\_KEY "AIzaSyC5epcOeHvFq7VZo0hMoDaKEEhi7HZAmTo"

// Insert Authorized Email and Corresponding Password

#define USER\_EMAIL "sulakheatharv@gmail.com"

#define USER\_PASSWORD "\*\*\*\*\*\*\*\*\*\*"

// Insert RTDB URLefine the RTDB URL

#define DATABASE\_URL "https://air-pollution-monitoring-5ef12-defaultrtdb.asia-southeast1.firebasedatabase.app/"

// Define Firebase objects

FirebaseData fbdo;

FirebaseAuth auth;

FirebaseConfig config;

// Variable to save USER UID

String uid;

// Variables to save database paths

String databasePath;

String slot1;

String slot2;

String slot3;

String slot4;

//sensors

float air\_quality;

float LPG;

float humidity;

float temperature;

// Timer variables (send new readings every second)

unsigned long sendDataPrevMillis = 0;

unsigned long timerDelay = 1000;

// Initialize WiFi

void initWiFi() {

WiFi.begin(WIFI\_SSID, WIFI\_PASSWORD);

Serial.print("Connecting to WiFi ..");

while (WiFi.status() != WL\_CONNECTED) {

Serial.print('.');

delay(1000);

}

Serial.println(WiFi.localIP());

Serial.println();

WiFi.setAutoReconnect(true);

//WiFi.persistent(true);

}

ARDUINO-UNO CODE:

void setup(){

Serial.begin(115200);

pinMode(gassensor,INPUT);

pinMode(lpgsensor,INPUT);

pinMode(DHTPIN,INPUT);

initWiFi();

// Assign the api key (required)

config.api\_key = API\_KEY;

// Assign the user sign in credentials

auth.user.email = USER\_EMAIL;

auth.user.password = USER\_PASSWORD;

// Assign the RTDB URL (required)

config.database\_url = DATABASE\_URL;

Firebase.reconnectWiFi(true);

fbdo.setResponseSize(4096);

// Assign the callback function for the long running token generation task \*/

config.token\_status\_callback = tokenStatusCallback; //see addons/TokenHelper.h

// Assign the maximum retry of token generation

config.max\_token\_generation\_retry = 5;

// Initialize the library with the Firebase authen and config

Firebase.begin(&config, &auth);

// Getting the user UID might take a few seconds

Serial.println("Getting User UID");

while ((auth.token.uid) == "") {

Serial.print('.');

delay(1000);

}

// Print user UID

uid = auth.token.uid.c\_str();

Serial.print("User UID: ");

Serial.println(uid);

// Update database path

databasePath = "/user/";

// Update database path for sensor readings

slot1 = databasePath + "co2";// --> user/co2

slot2 = databasePath + "mq6";// --> user/mq6

slot3 = databasePath + "temp";// --> user/temp

slot4 = databasePath + "humidity";// --> user/humidity

}

void sendstring(String path, String value){

if (Firebase.RTDB.setString(&fbdo, path, value)){

Serial.print("Writing value: ");

Serial.print (value);

Serial.print(" on the following path: ");

Serial.println(path);

Serial.println("PASSED");

Serial.println("PATH: " + fbdo.dataPath());

Serial.println("TYPE: " + fbdo.dataType());

}

else {

Serial.println("FAILED");

Serial.println("REASON: " + fbdo.errorReason());

}

}

void loop(){

// Send new readings to database

if (Firebase.ready() && (millis() - sendDataPrevMillis > timerDelay || sendDataPrevMillis == 0)){

sendDataPrevMillis = millis();

// Send readings to database:

humidity = dht.readHumidity();

temperature = dht.readTemperature();

sendfloat(slot3,temperature);

sendfloat(slot4,humidity);

MQ135 gasData = MQ135(gassensor);

air\_quality = (gasData.getPPM())/1000;

sendfloat(slot1,air\_quality);

int value = digitalRead(lpgsensor);

sendstring(slot2,

"LPG not found");

if (value){

sendstring(slot2,

"LPG Detected");

}

else{

sendstring(slot2,

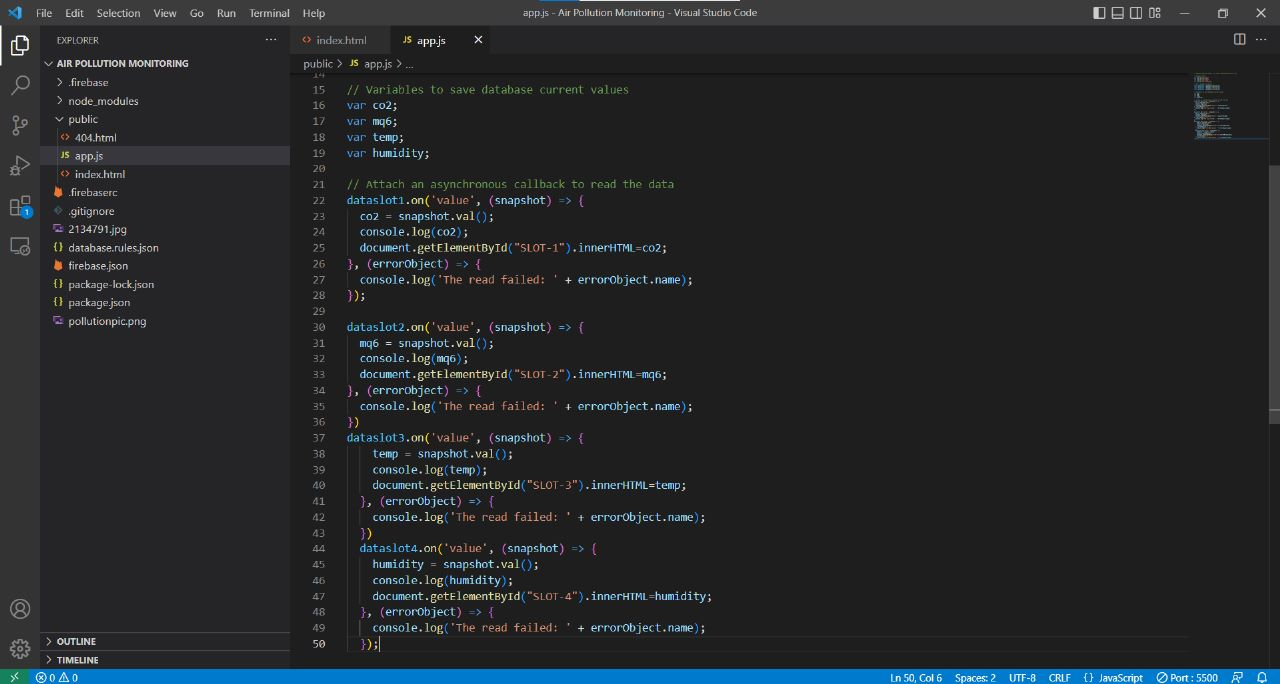
"LPG not found");

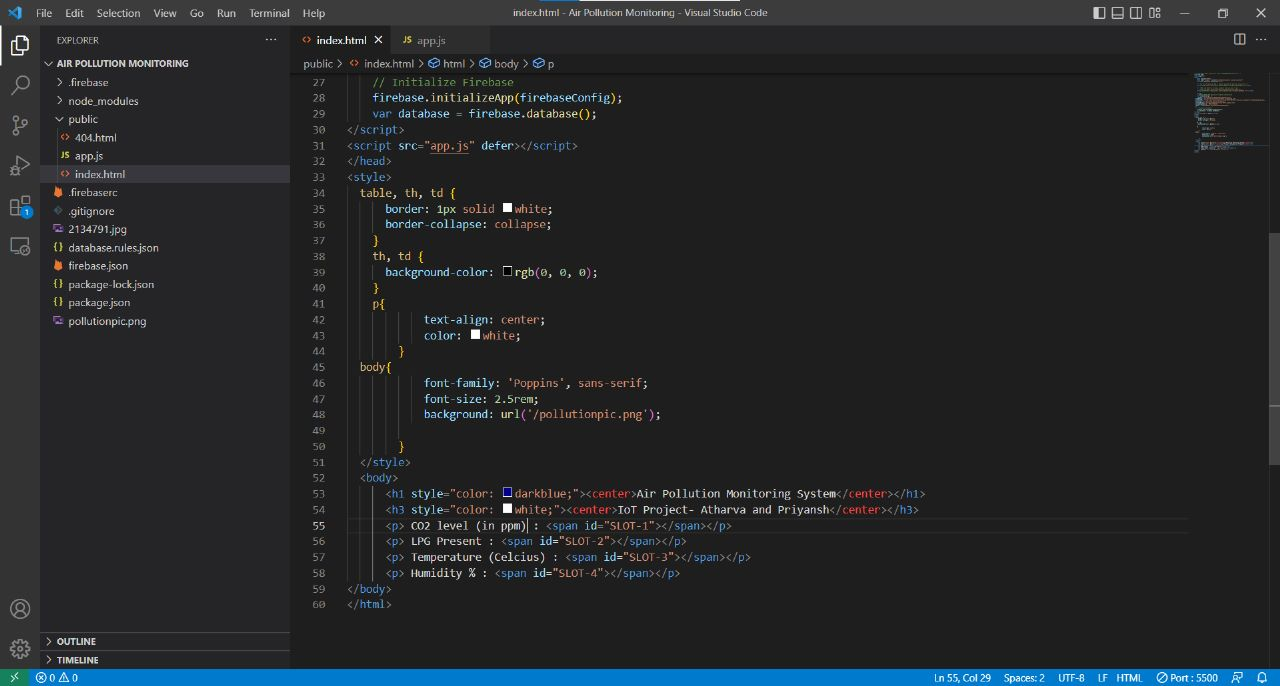
}

}

}

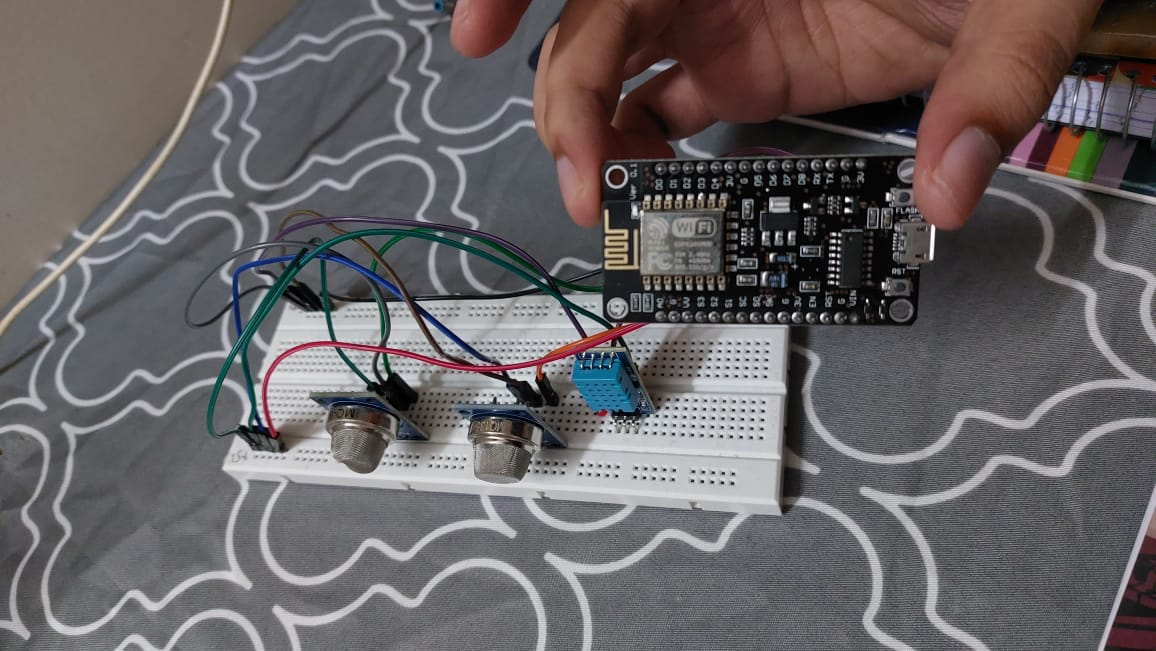
CODE IMPLEMENTATION SCREENSHOTS

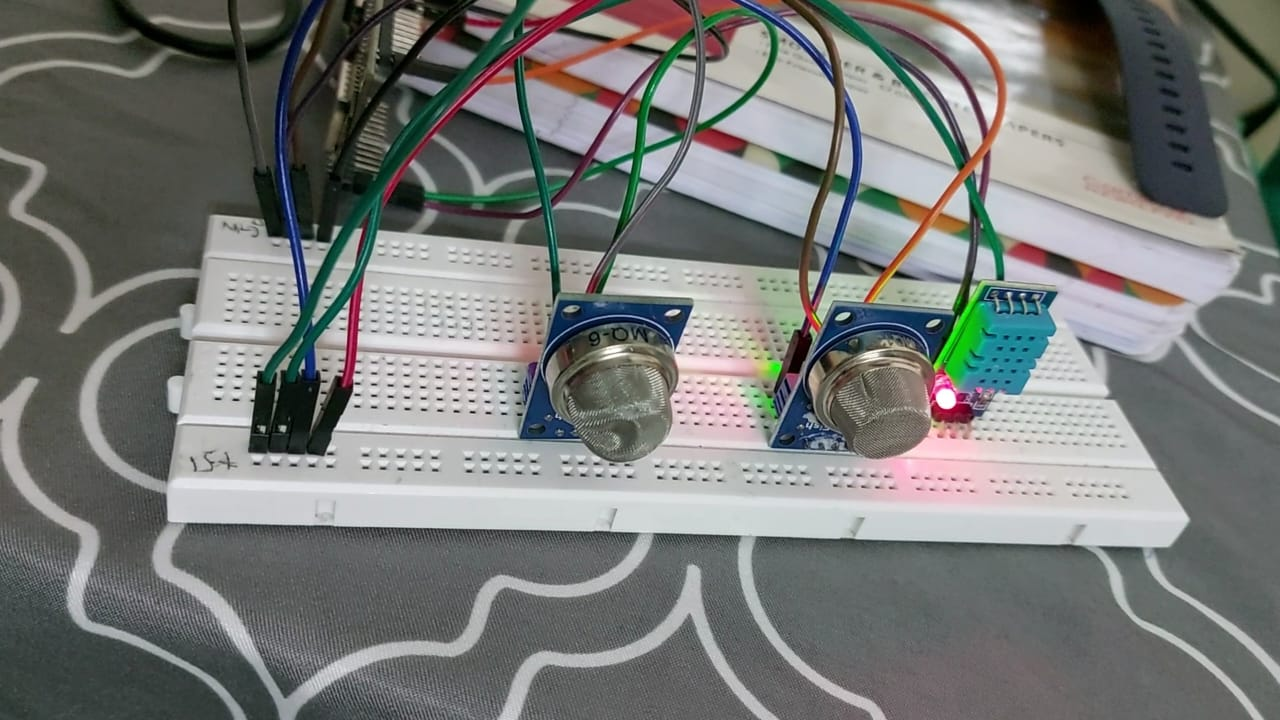




`HARDWARE IMPLEMENTATION SCREENSHOTS

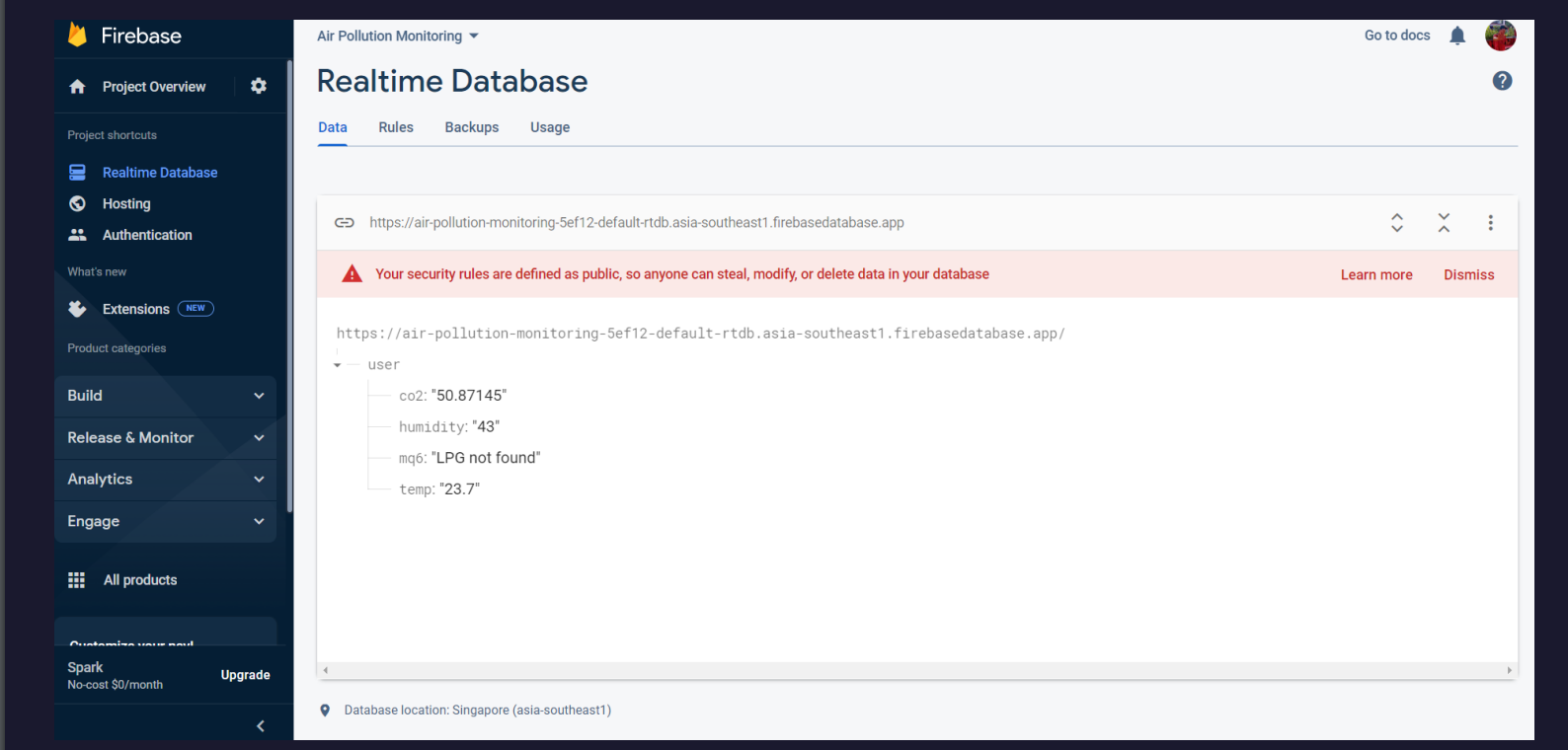


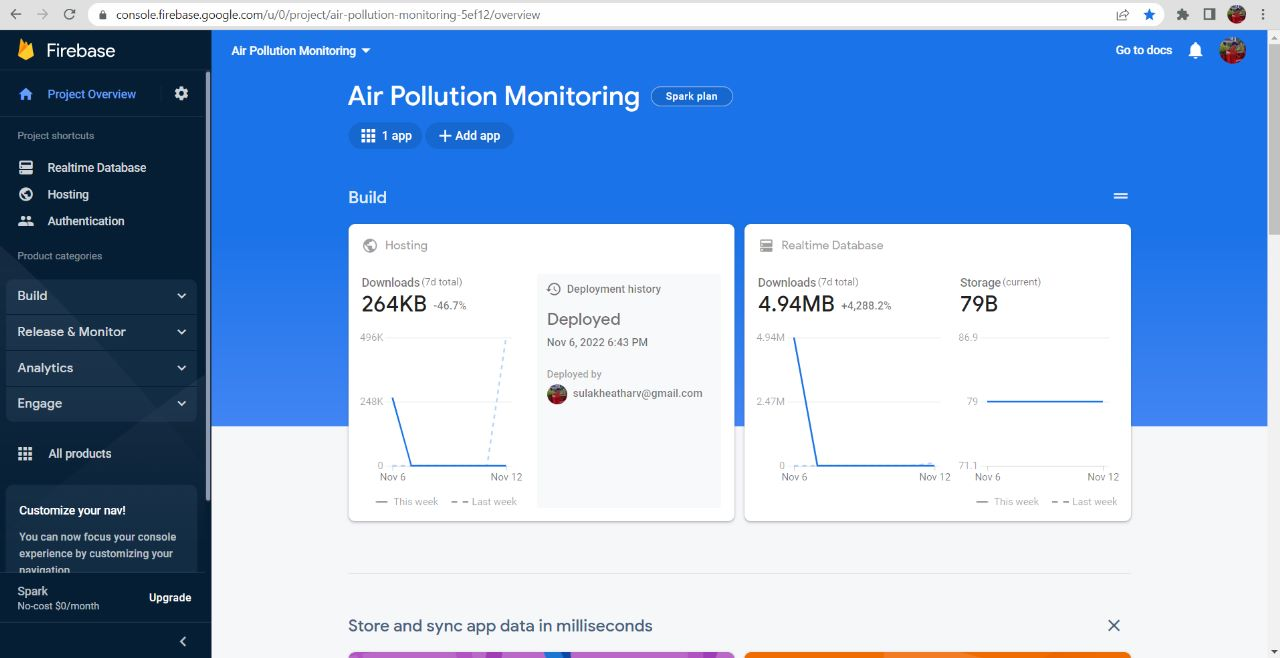




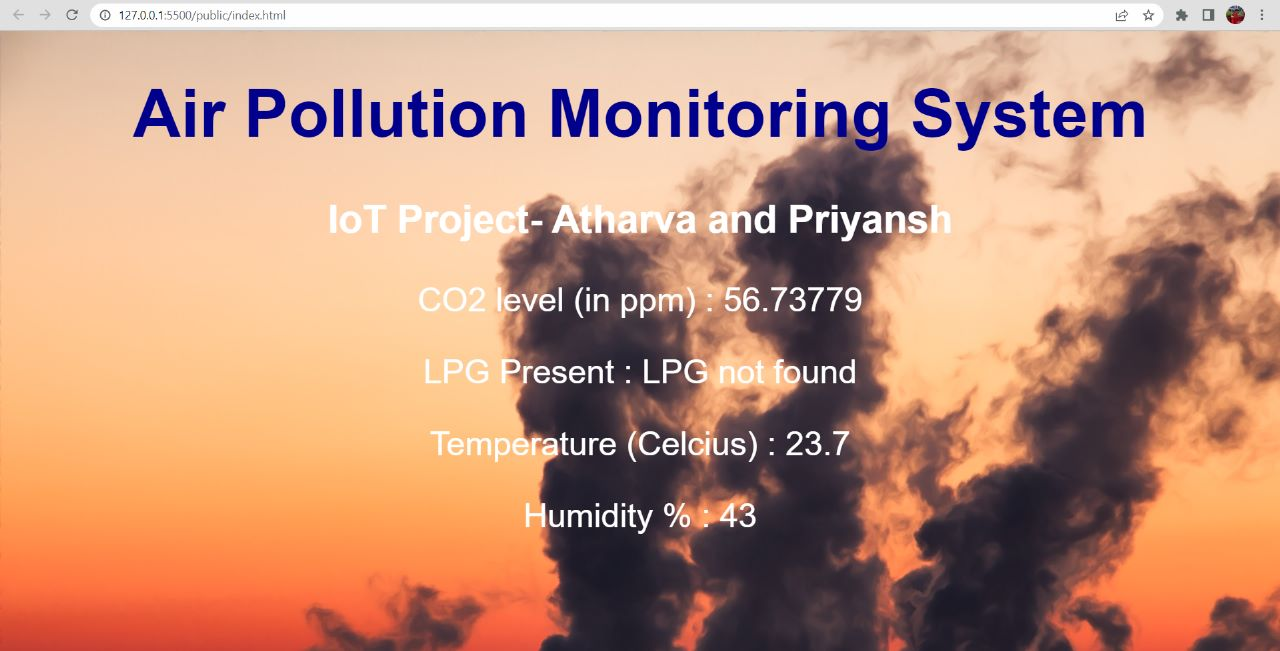
OUTPUT SCREENSHOTS

FIREBASE DATA DISPLAY:

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DATA DISPLAY ON THE WEBSITE:



RESULT

In this project, our aim was to create an air pollution monitoring system and we have successfully managed to do so. We used 3 sensors- MQ135, MQ6 and DHT11 sensor using ESP8266 wifi module, we sent real time data to our website over firebase which displayed the CO2 level, LPG detection as well as the temperature and humidity.

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