NOISE POLLUTION MONITORING

Noise pollution is a growing issue these days. It is necessary to monster quality and keep it under control for a better future and healthy living for all. Here we propose an noise pollution monitoring system that allows us to monitor and check live as noise pollution in the particular area through IOT. Noise pollution is caused by increased use of machinery and resources as a result of industrialization. It hurts both humans and animals. Noise pollution is becoming a bigger problem, therefore it is important to keep an eye on it for a brighter future and a healthier lifestyle for everyone. In recent years, pollution as had a direct impact on people.

COMPONENTS:

1. Arduino UNO
2. MQ135(Gas sensor)
3. LM393(Noise sensor)
4. ESP8266 WIFI Module
5. 16*2 LCD Display
6. LED
7. Buzzar

NOISE POLLUTION OVER IOT SENSOR:

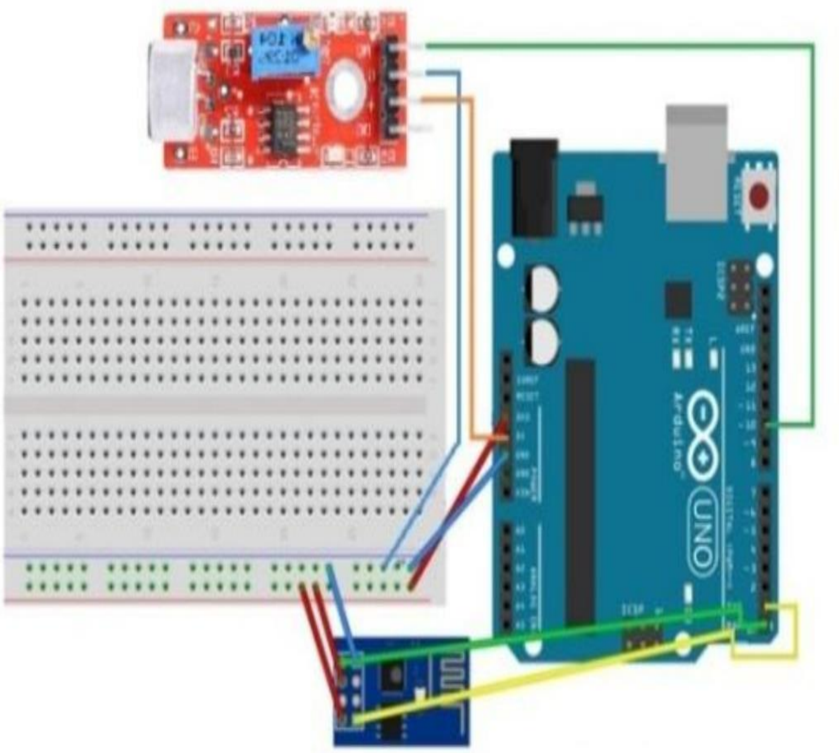
1. CO2 Sensor: The co2 sensor measures the carbon emission levels.

2. Methane Sensor: It measures the level of methane gas in the air.

3. Sound sensor (Microphone): It measures the level of sound pollution.

TABLE CONNECTION AND CIRCUIT:

Module	Arduino Uno
LM 393 Sound Detection Sensor	
A0	10
Vcc or +	5V
G	Gnd
ESP8266 WiFi Module	
Tx	Rx
Rx	Tx
CH_PD	3.3 V
VCC	3.3 V
Gnd	Gnd



CIRCUIT DIAGRAM OF THE PROPOSED SYSTEM

WORKING PRINCIPLE

ARDUINO UNO: Arduino uno arduino is 8 bit microcontroller board based on the atmega328p. The operating voltage is 5v. It has 14 pins digital input output pins (of which can be used 6 as pwm output) oscillator frequency is 16 mhz it contains everything needed to support the microcontroller simply connect it to a computer with usb cable. It has 6 analog input pins.

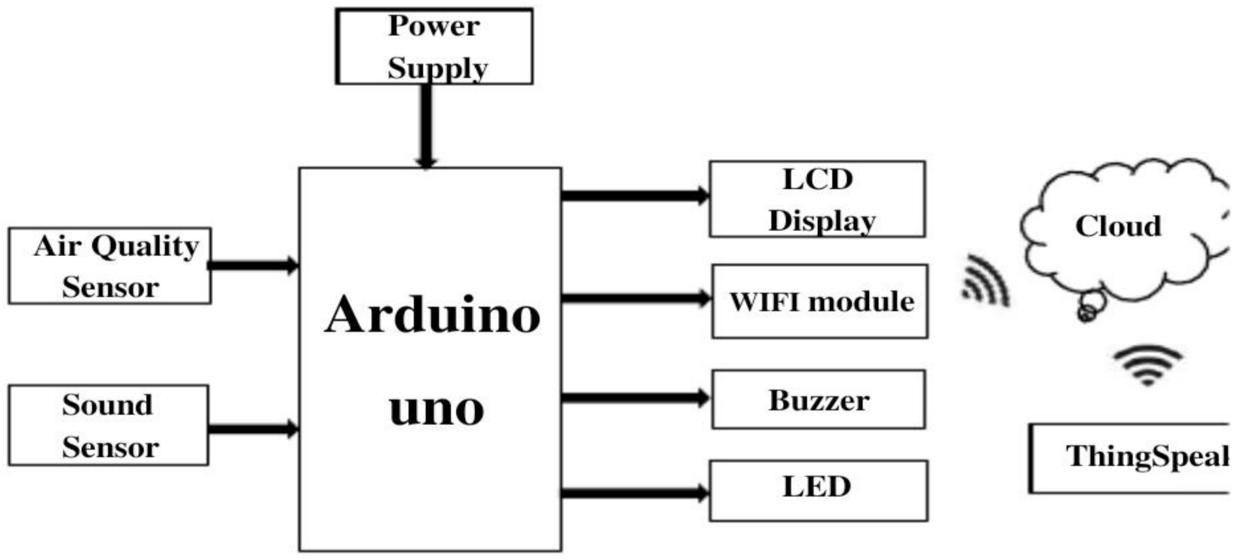
MQ135:MQ135 gas sensor the MQ135 is a gas sensor it used for detecting or sensing harmful gases in the atmosphere. It has wide detecting scope. It gives fast response and also it high sensitivity sensor. It is simple and long life device. they are used in air quality control equipment for building offices are suitable for detecting of NH3, alcohol, benzene, smoke CO2 etc.

LM393: LM393 sound sensor the sound sensor module provide an easy way to detect sound and it generally used for detecting sound intensity. Module detect the sound has exceeded a threshold value. Sound is detected via microphone and fed into an lm393 opamp. The sound level adjust through pot. The sound increases set value output is low. These module work on DC 3.3-5 voltage.

ESP8266: The esp8266 WIFI module is a self containedsoc 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.

16*2LCD DISPLAY: LCD is used for to display the condition there are three conditions in air pollution and three conditions in noise pollution means air and sound is clear, moderately polluted or highly polluted that is displayed on LED.

BLOCK DIAGRAM:



APPLICATIONS:

1. To estimate the pollution.
2. Indoor Air Quality Monitoring.
3. To design server and upload data on that server with date and time.
4. We can use it at industrial area as there is lot of noise pollution.
5. In city roads traffic noise.
6. IOT based noise pollution monitoring system using raspberry pi can be used as a sub-system for smart cities.
7. We can monitor the real time of sound pollution levels in any area.

SOURCE CODE:

```
#define BLYNK_PRINT Serial

#include <WiFi.h>

#include <BlynkSimpleEsp32.h>

#include <Wire.h>

#include <Adafruit_GFX.h>

#include <Adafruit_SSD1306.h>

#define AO 34

Adafruit_SSD1306 display = Adafruit_SSD1306(128, 64, &Wire, -1);

unsigned int output;

int Decibels;

char auth[] = "eO3YD5N52-kdPn3-Ttqu6AfnG0Ik**";

char ssid[] = "YOUR_SSID";

char pass[] = "YOUR_PASSWORD";

BLYNK_READ(V0)

{

  Blynk.virtualWrite(V0, Decibels);

}

void setup() {
  Serial.begin(115200);
  pinMode (AO, INPUT);
  display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
if(!display.begin(SSD1306_SWITCHCAPVCC, 0x3C)) {
  Serial.println(F("SSD1306 allocation failed"));
  for(;;);
}
  delay(2000);
display.clearDisplay();
display.setTextColor(WHITE);
  Blynk.begin(auth, ssid, pass);
}
void loop() {
  Blynk.run();
  unsigned long start_time = millis();
  float PeakToPeak = 0;
  unsigned int maximum_signal = 0;  //minimum value
  unsigned int minimum_signal = 4095;  //maximum value
  while (millis() - start_time < 50)
  {
```

```
 output = analogRead(AO);
  if (output < 4095)
  {
    if (output > maximum_signal)
    {
      maximum_signal = output;
    }
    else if (output < minimum_signal)
    {
      minimum_signal = output;
    }
  }
}
PeakToPeak = maximum_signal - minimum_signal;
Serial.println(PeakToPeak);
Decibels = map(PeakToPeak, 50, 500, 49.5, 90);
display.setTextSize(2);
display.setCursor(0,10);
display.print(Decibels);
display.setTextSize(2);
display.setCursor(40,10);
display.print("db");
display.display();
if (Decibels <= 50)
{ display.setTextSize(2);
  display.setCursor(0,30);
  display.print("LOW");
  display.display();
}
else if (Decibels > 50 && Decibels < 75)
{
  display.setTextSize(2);
  display.setCursor(0,30);
  display.print("Moderate");
  display.display();
}
else if (Decibels >= 75)
{
  display.setTextSize(2);
  display.setCursor(0,30);
```

```
   display.print("HIGH");
    display.display();
  }
  delay(1000);
  display.clearDisplay();
}
```

ADVANTAGES:

1. Sensors are easily available.
2. Sensors are effortlessly accessible.
3. Detecting of wide range of gases.
4. Simple, compact and easy to handle.

PYTHON PROGRAM FOR NOISE POLLUTION MONITORING:

tion monitoring system is a complex project that involves hardware and software components. Below, I'll provide you with a high-level Python program outline for such a project. Please note that this is a simplified example, and you'll need specific sensors and IoT hardware to build a real-world system.

SOURCE CODE:

```
python

import time

import random

from mqtt import MQTTClient  # You'll need an MQTT library

# Set up MQTT client and connect to your broker

client = MQTTClient("noise_monitor")

client.connect("your_broker_ip", port=1883)

while True:

    # Simulate noise sensor data (replace with actual sensor readings)

    noise_level = random.randint(40, 100)  # Example noise level in Db

# Publish the noise data to a specific MQTT topic

    topic = "noise_sensor/data"

    payload = f"Noise Level: {noise_level} dB"

    client.publish(topic, payload)

     # You can also include logic to trigger alerts based on noise
thresholds

    if noise_level > 80:

        alert_topic = "noise_sensor/alert"

        alert_payload = "High noise level detected!"

        client.publish(alert_topic, alert_payload)
```

```
# Sleep for a specific interval before taking the next reading
    time.sleep(10)  # Adjust the interval as needed
# Close the MQTT client connection when done
client.disconnect()
```

In this program:

1. We import necessary libraries, including an MQTT client for communication.
2. We set up an MQTT client and connect it to your MQTT broker.
3. Inside the loop, we simulate noise sensor data using a random value.
4. We publish the noise level data to an MQTT topic.
5. You can include logic to trigger alerts based on predefined noise thresholds.
6. We introduce a delay to control the frequency of data readings.
7. The program runs indefinitely, periodically collecting and publishing noise data.

To build:

Building a complete IoT-based noise pollution monitoring system requires a combination of hardware and software components. Here's a step-by-step guide to build such a system:

Hardware Components:

1. **Noise Sensor:** Choose a suitable noise sensor that can measure sound levels in decibels (dB). Common sensors include microphones with integrated preamplifiers or dedicated noise sensors.

2. **Microcontroller:** Select a microcontroller platform like Raspberry Pi, Arduino, or ESP32 to interface with the noise sensor, collect data, and communicate with the cloud or a local server.

3**. Power Supply:** Provide a stable power source for your microcontroller and sensor, whether through a battery or a dedicated power supply.

4**. Internet Connectivity:** For IoT functionality, you'll need an internet connection, typically through Wi-Fi, Ethernet, or a cellular module.

5**. Enclosure:** Protect your hardware components from environmental factors by placing them in a weatherproof enclosure.

Software Components:

1**. Sensor Interface:** Write or use existing code to interface with the noise sensor and obtain noise level readings.

2. **Data Processing:** Process the sensor data, including calibration, filtering, and data smoothing, to obtain accurate noise level measurements.

3**. IoT Communication:** Implement communication protocols to send the data to a central server or cloud platform. MQTT or HTTP can be used for this purpose.

4. **Cloud Platform (Optional):** If you prefer cloud-based IoT, set up an IoT platform like AWS IoT, Google Cloud IoT, or Microsoft Azure IoT to receive and store the data.

5. **Database:** Store the collected data in a database for long-term storage and analysis. You can use databases like MySQL, PostgreSQL, or cloud-based solutions like AWS DynamoDB.

6**. User Interface:** Develop a web-based dashboard or mobile app to visualize noise data, set thresholds, and receive alerts. You can use technologies like HTML, CSS, JavaScript, and frameworks like React or Vue.js.

7**. Alerting System:** Implement alerting mechanisms that notify users or stakeholders when noise levels exceed predefined thresholds. This can be done using email, SMS, or push notifications.

Steps to Build:

1. **Connect the Hardware:** Assemble the hardware components, including the noise sensor and microcontroller. Ensure proper wiring and connections.

2. **Install the Operating System:** Set up the operating system (e.g., Raspbian for Raspberry Pi) on your microcontroller and configure the network connection.

3. **Sensor Calibration:** Calibrate the noise sensor to provide accurate dB readings. This often involves testing it in a controlled noise environment and adjusting the sensor's output accordingly.process it,

and send it to your chosen data storage solution (database or cloud platform).

4**. Software Development:** Write the software to collect noise data,

5**. Cloud Integration:** If using a cloud platform, create a project, set up IoT device management, and configure data ingestion.

6. **Database Configuration:** Set up a database to store the collected noise data, including the time and location of measurements.

7. **User Interface:** Develop a user-friendly interface to display noise data and configure alert settings.

8. **Alerting System:** Implement an alerting system that triggers notifications when noise levels cross specified thresholds.

9. **Testing and Deployment:** Thoroughly test your system in real-world conditions. Make any necessary adjustments and deploy the monitoring system in your target environment.

10. **Maintenance and Monitoring:** Regularly monitor and maintain the system to ensure its proper functioning.

Building a noise pollution monitoring project in web development technology involves several components and technologies. Here's a high-level overview of how you could approach it:
1. Front-end Development: HTML/CSS : Create the user interface for displaying noise data, charts, and controls. JavaScript : Implement interactive features, like real-time noise data updates and user interactions. Charting Library : Use a JavaScript charting library (e.g., Chart.js or D3.js) to visualize noise data in graphs.
2. Back-end Development : Server : Set up a server to handle incoming noise data, user requests, and data storage. Database: Choose a

database system (e.g., PostgreSQL or MongoDB) to store historical noise data.API : Create RESTful APIs to manage data collection, retrieval, and storage.
3. Noise Sensors: Connect noise sensors to the server or a microcontroller (e.g., Raspberry Pi) for data collection. Implement a data transmission mechanism, such as MQTT, to send data to the server.
4. Real-time Data Collection : Use WebSocket or Server-Sent Events (SSE) to stream real-time noise data to the user interface.
5. User Authentication : Implement user authentication for secure access to the monitoring system.
6. Geolocation Integration : Incorporate geolocation services to associate noise data with specific locations.
7. Data Analysis : Process and analyze the noise data to calculate noise levels, trends, and generate alerts if noise exceeds certain thresholds.
8. Notifications : Implement a notification system (e.g., email or SMS) to alert users when noise pollution levels are high.
9. Reporting : Create reports and historical data visualizations to help users understand noise patterns over time.
10. Deployment : Deploy your web application and database to a web server or cloud platform.
11. Testing and Optimization : Test your application thoroughly, identify bottlenecks, and optimize performance.
12. Compliance : Ensure your project complies with legal and environmental regulations.
13. User Interface : Design a user-friendly interface to access noise data, charts, and settings.
14. Documentation : Provide user and developer documentation for your project.
15. Maintenance : Regularly maintain and update your application as needed, including security patches and improvements. Please note that this is a complex project that requires a good understanding of web

development, data analysis, and hardware integration. Additionally, you may need to collaborate with experts in noise measurement and environmental science to ensure the accuracy of your monitoring system. Developing a complete noise pollution monitoring system involves a web application, sensors, data collection, and more. It's a substantial project. Here's a simplified Python code example for a basic web-based noise monitoring system. This example uses Python's Flask web framework for the server and JavaScript for the web interface: Python (app.py): python from flask import Flask, render_template, request, jsonify import random app = Flask(__name) @app.route('/') def index(): return render_template('index.html') @app.route('/noise_data') def get_noise_data(): # In a real system, this data would come from sensors. # Simulating noise data here. noise_level = random.uniform(50, 100) return jsonify({"noise_level": noise_level}) if __name__ == '__main__': app.run(debug=True) HTML (templates/index.html): html

Noise Pollution Monitoring

Noise Level: Loading... dB

This simple program uses Flask to create a web server and serves a basic web page. The JavaScript code in the HTML file uses AJAX to fetch noise data from the server at regular intervals (simulated in this example). In a real system, you would replace the random noise data with actual sensor data. Please note that this is a very basic example and lacks many features required for a full-fledged noise pollution monitoring system, including data storage, analysis, and real sensor integration. For a comprehensive system, you would need to integrate real sensors, database storage, and more advanced data processing and visulazation technique.