AIR QUALITY MONITORING SYSTEM (IOT);

An IoT-based air and sound pollution monitoring system is implemented using a network of sensors, connectivity technologies, and data analytics platforms. Air quality sensors are deployed in strategic locations to measure pollutant levels such as particulate matter, gases, and volatile organic compounds (VOCs).

SENSORS:

PM2.5 AND PM10 SENSORS:

- PM2.5 and PM10 Sensors: These sensors measure the concentration of fine particulate matter with a diameter of 2.5 micrometers (PM2.5) and 10 micrometers (PM10) in the air. They are crucial for assessing airborne particulate pollution, which can have adverse health effects.

GAS SENSORS:

- Carbon Monoxide (CO) Sensors: CO sensors measure the concentration of carbon monoxide, a colorless, odorless gas that can be harmful when inhaled.
- Nitrogen Dioxide (NO2) Sensors: NO2 sensors measure the concentration of nitrogen dioxide, a common air pollutant produced by combustion processes.
- Ozone (O3) Sensors: Ozone sensors detect the concentration of ozone, which is a component of smog and can have health implications.
- Sulfur Dioxide (SO2) Sensors: SO2 sensors measure the concentration of sulfur dioxide, a gas produced by burning fossil fuels and industrial processes.
- These sensors measure the ambient temperature and relative humidity, as these factors can influence air quality and the behavior of air pollutants.

VOLATILE ORGANIC COMPOUND(VOC) SENSORS:

VOC sensors detect various compounds in the air, which can originate from industrial processes, transportation, and natural sources.

CARBON DIOXIDE(CO2) SENSORS:

- CO2 sensors monitor the concentration of carbon dioxide in the air. High CO2 levels can indicate inadequate ventilation and may affect indoor air quality.

AIR QUALITY INDEX(AQI) SENSORS:

- These sensors calculate an air quality index based on data from multiple sensors, providing an overall measure of air quality. The AQI is often used to communicate air quality to the public.

METEOROLOGICAL SENSORS:

- Wind speed and direction sensors, as well as barometric pressure sensors, help in understanding how weather conditions impact air quality.

PARTICULATE MATTER SAMPLERS:

- These devices collect air samples for laboratory analysis to determine the chemical composition of particulate matter, which can provide more detailed information than real-time sensors.

REMOTE SENSING DEVICES:

- Satellite-based sensors and aerial drones equipped with air quality monitoring instruments are used to monitor air quality over large geographic areas.

- Hydrogen Sulfide (H2S) Sensors:
  - H2S sensors are used to detect hydrogen sulfide, a toxic gas with a characteristic "rotten egg" smell, often found in industrial settings.
- **Ammonia (NH3) Sensors:**

        - NH3 sensors measure ammonia, which is released from agricultural and industrial activities.
    - Radon Gas Sensors:
        - Radon sensors detect radon gas, a naturally occurring radioactive gas that can seep into homes and pose health risks.
    - Weather Sensors:
        - Weather sensors can provide information on temperature, humidity, wind speed, and wind direction, which can influence pollutant dispersion and air quality.

These sensors can be used in stationary monitoring stations, mobile units, or integrated into wearable devices and smartphones for personal air quality monitoring. The data collected from these sensors is typically sent to centralized databases and displayed on air quality indices, websites, and mobile apps, providing real-time information to the public and policymakers.

It's important to ensure that air quality monitoring sensors are calibrated, maintained, and regularly checked for accuracy to provide reliable data for decision-making

PYTHON SCRIPT ON THE IOT DEVICE IN AIR QUALITY MONITORING:

```
import time

import Adafruit_DHT

from miio import AirQualityMonitor

import requests

import json



# Sensor pins
```

```
DHT_SENSOR = Adafruit_DHT.DHT22

DHT_PIN = 4  # GPIO pin for the DHT sensor



# CO2 sensor details

CO2_SENSOR_IP = 'YOUR_CO2_SENSOR_IP'

CO2_SENSOR_TOKEN = 'YOUR_CO2_SENSOR_TOKEN'



# API endpoint for sending data to a server or cloud service

API_ENDPOINT = 'YOUR_API_ENDPOINT'



def read_dht_sensor():

    humidity, temperature = Adafruit_DHT.read(DHT_SENSOR, DHT_PIN)

    if humidity is not None and temperature is not None:

        return {

            'temperature': temperature,
```

```
            'humidity': humidity
        }
    else:
        return None


def read_co2_sensor():
    co2_sensor = AirQualityMonitor(CO2_SENSOR_IP, CO2_SENSOR_TOKEN)
    data = co2_sensor.status()
    return data


def send_data_to_server(data):
    headers = {'Content-Type': 'application/json'}
    response = requests.post(API_ENDPOINT, data=json.dumps(data),
headers=headers)
    if response.status_code == 200:
```

```
        print('Data sent successfully')
    else:
        printf('failed to send data. Status code: {response.status_code}')


if __name__ == '__main__':
    while True:
        dht_data = read_dht_sensor()
        co2_data = read_co2_sensor()

        if dht_data and co2_data:
            combined_data = {
                'temperature': dht_data['temperature'],
                'humidity': dht_data['humidity'],
                'co2': co2_data['co2'],
                'pm2.5': co2_data['pm25']
```

```
    }

    send_data_to_server(combined_data)


time.sleep(300)
```