Air quality monitoring

Problem Statement:

Air pollution poses a significant threat to public health and the environment. Monitoring air quality is crucial for identifying pollution sources, assessing its impact on health, and implementing effective mitigation strategies. The problem is the lack of accessible, real-time air quality data at the community level.

Components and uses:

Arduino Board:

(You can use an Arduino Uno, Arduino Nano, or other compatible boards.)

Air Quality Sensor:

(The commonly used sensor for air quality monitoring is the CCS811 sensor, which measures CO2 and total volatile organic compounds (TVOC). Other options include the MQ series sensors for specific gases like CO, NO2, or methane.)

Temperature and Humidity Sensor:

(A DHT22 or DHT11 sensor can be used to measure temperature and humidity, which can be important factors in air quality.)

Display:

(An OLED or LCD display is useful for real-time data visualization. Alternatively, you can transmit data to a computer for display.)

Power Supply:

(Depending on your deployment, you may use a USB connection, a battery, or a power adapter.)

Wiring and Breadboard:

(Wires and a breadboard for connecting components.)

Steps to Create the Project:

1.Connect the Air Quality Sensor (CCS811):

- Connect the CCS811 sensor to your Arduino as follows:
- CCS811 VCC to Arduino 3.3V or 5V

- CCS811 GND to Arduino GND
- CCS811 SDA to Arduino A4 (for I2C communication)
- CCS811 SCL to Arduino A5 (for I2C communication)

2. Connect the Temperature and Humidity Sensor (DHT22 or DHT11):

Connect the DHT sensor to your Arduino as follows:

DHT VCC to Arduino 3.3V or 5V

DHT GND to Arduino GND

DHT Data Pin to a digital pin (e.g., Pin 2)

3. Connect the Display (if used):

If you're using an OLED or LCD display, follow its datasheet or pinout diagram to connect it to your Arduino. Typically, you'll need to connect power (VCC and GND) and data pins (SDA and SCL for I2C displays).

4. Connect the Power Supply:

Connect the power supply to your Arduino board. This can be a USB cable, a battery, or a dedicated power adapter, depending on your project's power requirements.

5. Assemble the Circuit:

Use a breadboard to connect the components according to the connections mentioned above.

Ensure that all wires and connections are secure and free from shorts.

6. Install Necessary Libraries:

In the Arduino IDE, go to "Sketch" > "Include Library" > "Manage Libraries..." and search for the required libraries (e.g., Adafruit CCS811 and Adafruit DHT sensor). Install them.

7. Write and Upload the Arduino Code:

Write the Arduino sketch based on the code provided earlier or create your own code to read data from the sensors and display it on the serial monitor or display (if used).

Verify and upload the code to your Arduino board via the Arduino IDE.

8. Monitor Air Quality:

Open the Arduino Serial Monitor to view real-time air quality data from your sensors. You should see readings for CO2, TVOC, temperature, and humidity.

9. Display Data (if using a display):

Modify the Arduino code to display air quality data on the OLED or LCD screen if you have one connected.

10. Calibration (if necessary):

If your sensors require calibration for accurate measurements, follow the manufacturer's calibration guidelines.

11. Power Supply and Enclosure (if necessary):

Depending on your project's deployment, provide a stable power supply and enclose the components in a suitable enclosure for protection.

conclusion:

the Arduino-based air quality monitoring project provides a valuable and accessible solution for measuring and analyzing air quality parameters, such as CO2, TVOC, temperature, and humidity. This project serves as an excellent introduction to IoT and sensor-based environmental monitoring. Here are some key takeaways and potential future directions for this project.