

Phase 3: Development part 1

PMS5003 (Particulate Matter Sensor) by Plantower:

These sensors can measure particulate matter (PM), a frequent air pollutant in metropolitan environments, at three different concentrations: PM1.0, PM2.5, and PM10.

Air quality sensor (MQ-135):

The gas MQ-135 is sensitive to includes smoke, benzene, ammonia, nitrogen dioxide, carbon monoxide, and carbon dioxide (NO₂). Urban regions frequently have higher amounts of NO₂ and CO due to industrial activity and transportation.

Environmental Sensor (BME680):

Temperature, humidity, gas (VOCs), and barometric pressure can all be measured by the BME680. In order to evaluate indoor air quality and potential pollutants from diverse sources, it is crucial to monitor VOCs in urban environments.

VOC and eCO₂ Sensor SGP30:

Total volatile organic compounds (TVOC) and equivalent CO₂ (eCO₂), important indices of indoor air quality that can be used in urban settings, are measured by SGP30.

LCD display:

16x2 character LCD display used for see the realtime output.

Python script:

First need to install libraries for LCD display

"Adafruit_Python_CharLCD" library.

Base command:

```
pip install Adafruit-CharLCD
```

Python code:

```
import time
import serial
from datetime import datetime
from pms5003 import PMS5003
from Adafruit_BME680 import BME680
import Adafruit_CharLCD as LCD

# LCD pin configuration (adjust these for your
setup)
lcd_rs = 26
lcd_en = 19
lcd_d4 = 13
lcd_d5 = 6
lcd_d6 = 5
lcd_d7 = 11
lcd_columns = 16
lcd_rows = 2

# Initialize the LCD
lcd = LCD.Adafruit_CharLCD(
    lcd_rs, lcd_en, lcd_d4, lcd_d5, lcd_d6,
    lcd_d7,
    lcd_columns, lcd_rows
)

# Setup the PMS5003 particulate matter sensor
pms5003 = PMS5003()
if not pms5003.init():
    print("Failed to initialize PMS5003 sensor.
Please check your connections.")
    exit(1)
```

```

# Setup the BME680 sensor
bme680 = BME680()

try:
    while True:
        # Read PM data from PMS5003 sensor
        pm_data = pms5003.read()
        pm1 = pm_data['pm1.0']
        pm2_5 = pm_data['pm2.5']
        pm10 = pm_data['pm10']

        # Read temperature, humidity, and gas
        resistance from BME680 sensor
        bme680_data = bme680.get_sensor_data()
        temperature = bme680_data.temperature
        humidity = bme680_data.humidity
        gas_resistance =
bme680_data.gas_resistance

        # Format the data to display on the LCD
        lcd_text = "PM2.5: {:.2f} ug/m3\nTemp:
{:.2f}C Humidity: {:.2f}%".format(pm2_5,
temperature, humidity)

        # Clear the LCD and display the data
        lcd.clear()
        lcd.message(lcd_text)

        # Delay before updating the display
        time.sleep(10)

except KeyboardInterrupt:
    pass

# Clear the LCD before exiting
lcd.clear()

```