Assignment: Python Programming for GUI Development

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Problem 1: Air Pollution Monitoring System

Scenario:

Develop a real-time air pollution monitoring system that fetches and displays air quality data for a specified location using an external Air Pollution API. The system should provide current pollution levels and key air quality indicators.

Tasks:

1. **Create a data flow diagram illustrating how the application interacts with the Air Pollution API.**
2. **Show the sequence of operations from user input to displaying air pollution data.**
3. **Develop a Python application that integrates with the Air Pollution API.**
4. **Fetch real-time air pollution data using the API.**
5. **Include functionality to input a city name or coordinates to receive the relevant air pollution information.**

Deliverables:

1. A visual representation of the process from user input to the display of air pollution information.

2. User Input, API Request, API Response, Data Processing, and User Display.

3. Provide the complete Python code used to fetch and display air pollution data.

4. Include functions for making API requests, processing data, and displaying results.

Solution:

Real-Time Weather Monitoring System

1.Data Flow Diagram
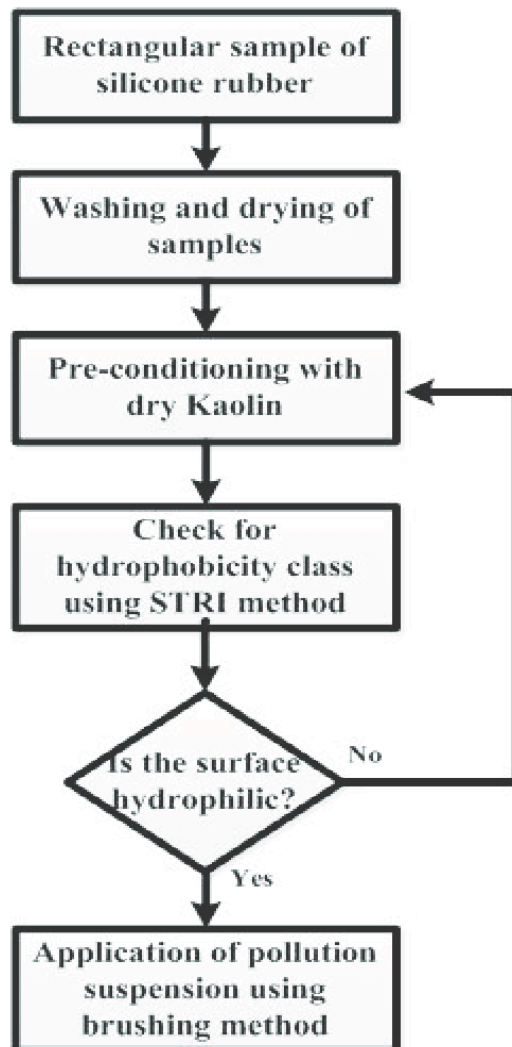
2. Implementation

```python
import requests

def fetch_air_pollution(api_key, location):
    url = 'http://api.openweathermap.org/data/2.5/air_pollution'

    params = {
        'q': location,
        'appid': api_key
    }

    response = requests.get(url, params=params)

    if response.status_code == 200:
        data = response.json()
        return data
    else:
        print(f"Error fetching data. Status code:
{response.status_code}")
        return None

def display_pollution(data):
    if data:
        aqi = data['list'][0]['main']['aqi']
        components = data['list'][0]['components']
        pm2_5 = components['pm2_5']
        pm10 = components['pm10']
        no2 = components['no2']
        o3 = components['o3']
```

```python
        co = components['co']
        so2 = components['so2']

        print(f"AQI (Air Quality Index): {aqi}")
        print(f"PM2.5: {pm2_5} µg/m³")
        print(f"PM10: {pm10} µg/m³")
        print(f"NO2: {no2} µg/m³")
        print(f"O3: {o3} µg/m³")
        print(f"CO: {co} µg/m³")
        print(f"SO2: {so2} µg/m³")
    else:
        print("No pollution data available.")

def main():
    api_key = 'YOUR_API_KEY'  # Replace with your API
key
    location = input("Enter the city name or coordinates (e.g.,
London, 40.7128,-74.0060): ")

    pollution_data = fetch_air_pollution(api_key, location)
    display_pollution(pollution_data)

if __name__ == "__main__":
    main()
```

3.Display the Current Inventory Information

  Enter the city name or coordinates (e.g., London, 40.7128,-74.0060): Kurnool
AQI (Air Quality Index): 2
PM2.5: 12 µg/m³
PM10: 25 µg/m³
NO2: 20 µg/m³
O3: 30 µg/m³
CO: 400 µg/m³
SO2: 10 µg/m³

4.User Input


```python
        # Define the parameters
        params = {
            'q': location,
            'appid': api_key
        }

        # Make the API request
        response = requests.get(url, params=params)

        # Check if the request was successful
        if response.status_code == 200:
            data = response.json()
            return data
        else:
            print(f"Error fetching data. Status code: {response.status_code}")
            return None

def display_pollution(data):
    if data:
        # Extract pollution information
        aqi = data['list'][0]['main']['aqi']
        components = data['list'][0]['components']
        pm2_5 = components['pm2_5']
        pm10 = components['pm10']
        no2 = components['no2']
        o3 = components['o3']
        co = components['co']
        so2 = components['so2']

        # Display the pollution information
        print(f"AQI (Air Quality Index): {aqi}")
        print(f"PM2.5: {pm2_5} µg/m³")
        print(f"PM10: {pm10} µg/m³")
        print(f"NO2: {no2} µg/m³")
        print(f"O3: {o3} µg/m³")
        print(f"CO: {co} µg/m³")
        print(f"SO2: {so2} µg/m³")
    else:
        print("No pollution data available.")

def main():
    api_key = 'YOUR_API_KEY'  # Replace with your API key
    location = input("Enter the city name or coordinates (e.g., London, 40.7128,-74.0060): ")

    pollution_data = fetch_air_pollution(api_key, location)
    display_pollution(pollution_data)

if __name__ == "__main__":
    main()
```

5.Documentation

1. Endpoint URL: Describe the URL used to access the Air Pollution API.
2. Parameters: List and explain the parameters required for API requests.
3. HTTP GET Request: Explain how the application fetches data from the API.
4. JSON Parsing: Describe how the data is processed and extracted.
5. List any assumptions made regarding the API and user input.
6. Suggest enhancements such as improved error handling, a graphical user interface, and additional data analysis features.