Air Quality Monitoring System

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1)Introduction

Project Objective

The primary objective of the Air Quality Monitoring System is to provide real-time air quality data for a specific region. This system aims to enable website owners and the general public to access accurate air quality information and take appropriate actions to protect their health and the environment.

Design Thinking Process

The project's design thinking process involved understanding the user's needs, ideation, prototyping, and testing to ensure that the system meets its objectives effectively and efficiently.

2)Development Phases

Phase 1: Data Collection

In this phase, a network of air quality sensors was deployed across the target region. These sensors continuously collect data on various air pollutants such as particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), and ozone (O3).

Phase 2: Data Analysis

Data collected from the sensors is processed to calculate air quality index (AQI) values. This phase includes data cleansing, quality checks, and statistical analysis to ensure the accuracy of the data.

Phase 3: Data Visualization

IBM Cognos is used to create interactive and user-friendly dashboards that display real-time air quality data. Users can access this data on the project website, enabling them to monitor air quality easily.

Phase 4: Python Code Integration

Python code is integrated into the system to handle data processing, calculation of AQI, and to provide an API for accessing real-time air quality information.

3)Analysis Objectives

Air Quality Metrics

The system provides air quality metrics such as AQI, concentration levels of pollutants, and trends over time. These metrics help users understand the current state of the air quality in their area.

User Experience Improvement

Website owners can use the air quality data to improve user experience by providing:

Alerts and Notifications: When air quality reaches critical levels, the system sends alerts and notifications to users, enabling them to take preventive actions.
Actionable Insights: The data can be used to provide recommendations to users, such as suggesting outdoor activities on days with good air quality.

4)Data Collection Process

Sensor Network

The sensor network includes a variety of air quality sensors placed strategically throughout the target region. These sensors continuously measure pollutant concentrations and transmit data to a central server.

Data Storage

Data from sensors is stored in a secure and scalable database, allowing for historical data analysis and real-time access.

5)Data Visualization using IBM Cognos

Dashboard Creation

IBM Cognos is used to create customizable dashboards that display air quality data. Users can view data in different formats, including charts and maps.

Real-time Updates

The dashboards provide real-time updates, ensuring that users have access to the latest air quality information.

6)Python Code Integration

Data Processing

Python scripts are employed for data preprocessing, quality control, and calculation of AQI values. These scripts ensure data accuracy and reliability.

API Integration

Python provides an API for website owners to access real-time air quality data and integrate it into their websites or applications.

7)Improving User Experience

Alerts and Notifications

Website owners can utilize the API to integrate alerts and notifications into their platforms. Users receive alerts when air quality becomes hazardous, promoting health and safety.

Actionable Insights

The insights gained from the air quality data can be used to provide users with recommendations, such as suggesting indoor activities during days with poor air quality.

This documentation outlines the Air Quality Monitoring System, its objectives, development phases, data collection, data visualization, Python integration, and its potential to improve the user experience on websites. By providing accurate air quality data and actionable insights, this system aims to empower individuals and website owners to make informed decisions and prioritize health and well-being.