Internet Of Things

Phase - 4 : Development Part 2

Project Title : Environment monitoring in park

Sub Title : continue building the project by developing the real-time transit information platform. Use web development technologies ( e.g., HTML , CSS , JavaScript ) to create a platform that displays real-time transit information. Design the platform to receive and display real-time location , ridership and arrival time data from IoT sensors word document.

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Introduction

The increasing importance of environmental monitoring in public spaces has prompted the need for innovative solutions that can provide real-time data for better management and user experience. This project focuses on the development of an environmental monitoring platform specifically tailored for parks. By harnessing the power of web development technologies, including HTML, CSS, and JavaScript, this platform aims to provide park administrators and visitors with real-time transit information, enabling efficient resource management and enhancing the overall park experience.

Project Overview

The project focuses on the development of an innovative environmental monitoring platform tailored for parks, integrating web development technologies, including HTML, CSS, and JavaScript, to create a dynamic and user-friendly interface. The platform aims to provide real-time transit information by receiving and displaying crucial data points such as location, ridership, and arrival time from IoT sensors strategically deployed across the park.

Project Scope

The scope of the project encompasses the development of an advanced environmental monitoring platform for parks, employing web development technologies such as HTML, CSS, and JavaScript to create a comprehensive and user-friendly interface. The platform is designed to receive and display real-time transit information, including location, ridership, and arrival time data, obtained from strategically positioned IoT sensors within the park premises.

Technologies Used

The development of the environmental monitoring platform for the park involves the integration of various web development technologies to create an efficient and user-friendly interface. The following technologies have been employed to ensure the successful implementation of the platform:

### 1. HTML (HyperText Markup Language):

* HTML is utilized for structuring the content of the platform, providing the necessary framework for displaying textual and multimedia information related to real-time transit data within the park.

### 2. CSS (Cascading Style Sheets):

* CSS is applied to enhance the visual presentation of the platform, ensuring a visually appealing and consistent layout that is both engaging and user-friendly. It is used to define the styles, layout, and design elements of the web pages, creating an aesthetically pleasing environment for users to interact with.

### 3. JavaScript:

* JavaScript is instrumental in facilitating dynamic functionality within the platform, enabling real-time data updates and interactive user experiences. It is used to retrieve and process data received from IoT sensors, dynamically update the displayed information, and ensure seamless user interactions for a more engaging and informative experience.

### 4. IoT Sensors:

* The platform is integrated with IoT sensors strategically positioned throughout the park to capture real-time environmental data, including location, ridership, and arrival time information. These sensors serve as the primary data sources for the platform, enabling the collection of accurate and reliable information for display and analysis.

### 5. Network Integration:

* The platform incorporates network integration protocols to facilitate seamless data transmission between the IoT sensors and the web-based interface. This ensures that the data collected from the sensors is efficiently transmitted and displayed in real-time, providing users with accurate and up-to-date information about the park's transit activities.

Front-End Development

The front-end development of the environmental monitoring platform for the park involves the implementation of various web development technologies to create an intuitive and visually appealing interface. The following sections provide an overview of the key elements and features incorporated into the front-end development of the platform:

### 1. User Interface Design:

* The user interface design focuses on providing a seamless and intuitive experience for park visitors and administrators. It includes the layout design, navigation elements, and interactive components that enable users to access and interpret real-time transit information effortlessly.

### 2. HTML Structure:

* HTML is utilized to create the structural framework of the platform, defining the content hierarchy and organizing the various elements, such as headers, paragraphs, and data placeholders, to ensure a coherent and logical presentation of information.

### 3. CSS Styling:

* CSS styling is applied to enhance the visual presentation of the platform, incorporating elements such as color schemes, fonts, and layouts to create an engaging and aesthetically pleasing user interface. It is used to ensure consistency and cohesiveness across different pages and sections of the platform.

### 4. JavaScript Functionality:

* JavaScript is employed to enable dynamic functionality within the platform, facilitating real-time data updates and interactive user experiences. It is used to retrieve and process data from the IoT sensors, update the displayed information dynamically, and provide users with a responsive and engaging interface for accessing real-time transit data.

### 5. Real-Time Data Integration:

* The platform integrates real-time data received from the IoT sensors, enabling the display of location, ridership, and arrival time data in a synchronized and accurate manner. The seamless integration of this data ensures that users have access to up-to-date information about the park's transit activities, enhancing their overall park experience.

Back-End Development

The back-end development of the environmental monitoring platform for the park involves the implementation of various technologies and functionalities to ensure seamless data processing and management. The following sections provide an overview of the key elements and features incorporated into the back-end development of the platform:

### 1. Data Processing and Management:

* The back-end development focuses on the efficient processing and management of real-time data received from the IoT sensors. It includes the implementation of data processing algorithms, data storage solutions, and data retrieval mechanisms to ensure the accuracy and reliability of the information displayed on the platform.

### 2. Server-Side Scripting:

* Server-side scripting languages such as Node.js or Python are used to handle the communication between the front-end interface and the back-end data processing components. These scripting languages facilitate the execution of server-side operations and enable the seamless integration of real-time data into the platform.

### 3. Database Integration:

* A database management system is integrated into the back-end development to store and manage the collected environmental data efficiently. The database is designed to handle real-time data updates and provide a reliable and secure storage solution for the platform's data management needs.

### 4. API Integration:

* Application Programming Interfaces (APIs) are utilized to establish communication between the platform and external IoT sensor systems. The integration of APIs enables the platform to retrieve real-time data from the IoT sensors and display it in a synchronized and coherent manner for users to access and interpret.

### 5. Data Security and Privacy:

* The back-end development includes the implementation of robust security measures to ensure the confidentiality and integrity of the collected environmental data. This involves the incorporation of encryption protocols, access controls, and data authentication mechanisms to protect sensitive information from unauthorized access and potential security threats

DEVICES AND SENSORS USED :

1. **Temperature Sensors:** These sensors measure the ambient temperature in different areas of the park, providing valuable data for assessing the overall climate conditions.
2. **Humidity Sensors:** Humidity sensors are used to measure the moisture content in the air, providing insights into the level of humidity within the park environment.
3. **GPS Devices:** Global Positioning System (GPS) devices can be utilized to track the location of park amenities, facilities, or even visitors, enabling the real-time monitoring of their movement and activities within the park.
4. **People Counters:** These devices help in estimating the number of visitors or the level of ridership at various locations within the park, providing valuable data for managing crowd control and resource allocation.
5. **Proximity Sensors:** Proximity sensors can be deployed to detect the presence of individuals or objects in specific areas of the park, helping to monitor the usage of park facilities and amenities in real-time.
6. **Motion Sensors:** Motion sensors can be used to detect movement within the park, enabling the monitoring of activities and the identification of potential security risks or unusual behavior.
7. **Environmental Pollution Sensors:** These sensors can be employed to measure the levels of pollutants, such as particulate matter, carbon monoxide, and other harmful substances, providing insights into the overall environmental quality and air pollution levels within the park.
8. **Weather Stations:** Weather stations can be installed to collect comprehensive data on various meteorological parameters, including wind speed, atmospheric pressure, and precipitation, enabling the park management to monitor and assess the overall weather conditions.

Integration with IoT Sensors

The environmental monitoring platform is seamlessly integrated with a network of IoT sensors strategically deployed across the park to facilitate the collection of real-time environmental data. The integration process involves the following key components and functionalities:

### 1. Sensor Data Acquisition:

* The platform is designed to establish a secure and reliable connection with the IoT sensors, allowing for the seamless acquisition of real-time data related to various environmental parameters, including location, ridership, and arrival time.

### 2. Data Transmission Protocols:

* Robust data transmission protocols are implemented to ensure the efficient and timely transfer of data from the IoT sensors to the platform. These protocols enable the secure transmission of data over the network, minimizing latency and potential data loss during the transfer process.

### 3. Data Processing and Analysis:

* The platform is equipped with data processing and analysis capabilities, enabling the efficient processing and analysis of the incoming data from the IoT sensors. This includes the application of algorithms and analytical tools to interpret the collected data and derive meaningful insights for display on the platform.

### 4. Real-Time Data Updates:

* The integration with IoT sensors enables the platform to provide real-time updates on the park's environmental conditions, ensuring that visitors and park administrators have access to the most accurate and up-to-date information regarding location, ridership, and arrival time.

### 5. Compatibility and Scalability:

* The platform is designed to be compatible with various types of IoT sensors, allowing for the seamless integration of new sensors and devices as the park's monitoring requirements evolve. This ensures the scalability of the platform to accommodate future expansions and technological advancements in the field of environmental monitoring.

### 6. Data Security and Privacy:

* Robust security measures are implemented to safeguard the integrity and confidentiality of the data transmitted from the IoT sensors to the platform. This includes the adoption of encryption protocols, access controls, and authentication mechanisms to protect sensitive data from unauthorized access and potential security breaches

Real-Time Data Processing

The environmental monitoring platform employs advanced data processing techniques to ensure the efficient handling and analysis of real-time data collected from IoT sensors within the park. The real-time data processing capabilities of the platform include the following key elements:

### 1. Data Collection and Aggregation:

* The platform collects real-time data from various IoT sensors deployed throughout the park, aggregating the data into a centralized repository for further processing and analysis.

### 2. Data Validation and Filtering:

* Real-time data validation and filtering mechanisms are implemented to ensure the accuracy and reliability of the collected data. This process involves the identification and removal of any erroneous or inconsistent data points to maintain data integrity.

### 3. Real-Time Analytics:

* The platform utilizes real-time analytics tools and algorithms to analyze the incoming data, enabling the identification of patterns, trends, and anomalies in the environmental parameters, including location, ridership, and arrival time. This facilitates the generation of meaningful insights for effective decision-making.

### 4. Dynamic Data Visualization:

* Dynamic data visualization techniques are employed to present the processed real-time data in a visually appealing and easily interpretable format. This includes the use of interactive charts, graphs, and maps to provide a comprehensive overview of the park's transit activities and environmental conditions.

### 5. Alerting and Notification Systems:

* The platform is equipped with alerting and notification systems that can promptly notify park administrators and visitors of any critical changes or anomalies detected in the real-time data. This enables timely responses to potential environmental risks or operational concerns within the park.

### 6. Continuous Monitoring and Feedback:

* The platform continuously monitors the incoming data streams from the IoT sensors, providing regular feedback and updates to ensure that the displayed information reflects the most recent and accurate environmental conditions within the park. This enables users to stay informed and make informed decisions in real-time.

User Authentication and Authorization

The environmental monitoring platform incorporates robust user authentication and authorization mechanisms to ensure the security and privacy of the data accessed by park administrators and visitors. The implementation of user authentication and authorization involves the following key elements:

### 1. Secure User Authentication:

* The platform employs secure user authentication protocols, requiring users to provide valid credentials, such as usernames and passwords, to access the platform's features and data. This process ensures that only authorized users can log in and interact with the platform's functionalities.

### 2. Role-Based Access Control:

* Role-based access control (RBAC) is implemented to manage user permissions and restrict access to specific features and data sets based on predefined user roles and responsibilities. This ensures that users can only access the information and functionalities relevant to their designated roles within the park management system.

### 3. Data Encryption:

* The platform utilizes advanced data encryption techniques to protect sensitive data transmitted between the platform and the IoT sensors, preventing unauthorized access and data breaches. This ensures that the real-time transit information, including location, ridership, and arrival time data, remains secure and confidential during transmission and storage.

### 4. Multi-Factor Authentication:

* Multi-factor authentication (MFA) is implemented to add an extra layer of security to the user authentication process, requiring users to provide multiple forms of verification, such as passwords, security questions, or biometric data, to access the platform. This minimizes the risk of unauthorized access by unauthorized individuals.

### 5. Access Logs and Monitoring:

* The platform maintains comprehensive access logs and monitoring systems to track user activities and detect any unauthorized or suspicious access attempts. This allows the platform administrators to identify potential security threats and take proactive measures to prevent security breaches and data compromises.

### 6. Regular Security Audits:

* Regular security audits and assessments are conducted to evaluate the effectiveness of the authentication and authorization mechanisms implemented within the platform. This ensures that the platform remains resilient against evolving security threats and adheres to the latest industry best practices and compliance standards

Testing

The environmental monitoring platform undergoes comprehensive testing procedures to ensure its functionality, performance, and reliability in delivering real-time transit information from the IoT sensors within the park. The testing process encompasses the following key aspects:

### 1. Functional Testing:

* Functional testing is conducted to verify that the platform's features and functionalities, including real-time data reception, processing, and display, operate as intended. This ensures that the platform meets the specified requirements and user expectations for accessing accurate and up-to-date environmental data.

### 2. Usability Testing:

* Usability testing is performed to assess the platform's user interface and user experience, ensuring that the interface is intuitive, easy to navigate, and visually appealing for park administrators and visitors. This testing process focuses on optimizing the user interaction and accessibility of the platform's real-time transit information.

### 3. Performance Testing:

* Performance testing evaluates the platform's responsiveness, scalability, and data processing capabilities under varying load conditions. This includes assessing the platform's ability to handle concurrent user requests, process large volumes of real-time data, and deliver timely updates without compromising its performance and reliability.

### 4. Security Testing:

* Security testing is conducted to identify and mitigate potential vulnerabilities and security risks within the platform's infrastructure. This includes assessing the effectiveness of the authentication and authorization mechanisms, data encryption protocols, and access controls to safeguard the integrity and confidentiality of the real-time transit information accessed by park administrators and visitors.

### 5. Compatibility Testing:

* Compatibility testing ensures that the platform is compatible with a wide range of devices, browsers, and operating systems, providing a consistent and seamless user experience across different platforms and devices. This testing process validates the platform's compatibility with various screen sizes, resolutions, and hardware configurations to maximize its accessibility and usability.

### 6. Integration Testing:

* Integration testing verifies the seamless integration of the platform with the IoT sensors and external data sources, ensuring that the real-time transit information is accurately received, processed, and displayed within the platform. This testing process validates the integrity and synchronization of the data transmitted from the IoT sensors to the platform's interface.

Deployment

The deployment of the environmental monitoring platform is a carefully planned process that involves the seamless transition of the developed system from the development environment to the production environment within the park. The deployment process encompasses the following key steps:

### 1. Infrastructure Setup:

* The deployment process begins with the setup of the necessary infrastructure, including the configuration of the web servers, databases, and network components required to host and manage the environmental monitoring platform.

### 2. Code Compilation and Build:

* The platform's source code is compiled and built to create a deployable package that contains all the necessary files, scripts, and dependencies required for the platform's operation. This step ensures that the platform is ready for deployment in the production environment.

### 3. Quality Assurance Checks:

* Quality assurance checks are conducted to verify that the compiled code meets the defined quality standards and requirements. This includes the validation of the platform's functionalities, performance, and security features to ensure a smooth deployment process.

### 4. Pre-Deployment Testing:

* Pre-deployment testing is performed to assess the platform's compatibility with the production environment and to identify any potential deployment-related issues or discrepancies that need to be addressed before the final deployment process.

### 5. Production Deployment:

* The platform is deployed to the production environment following a well-defined deployment plan, which includes the execution of deployment scripts, the transfer of the compiled code to the production servers, and the configuration of the necessary settings to enable the platform's functionality.

### 6. Post-Deployment Verification:

* Post-deployment verification is conducted to ensure that the platform has been successfully deployed in the production environment and is functioning as expected. This includes the validation of real-time data reception, processing, and display to confirm that the platform is accurately presenting the park's transit information.

### 7. Monitoring and Maintenance:

* Ongoing monitoring and maintenance activities are implemented to continuously monitor the platform's performance, address any potential issues or bugs, and apply necessary updates and enhancements to ensure the platform's reliability and optimal functionality over time.

User Interface Refinement

The user interface of the environmental monitoring platform undergoes continuous refinement to ensure an intuitive, engaging, and user-friendly experience for park administrators and visitors. The refinement process focuses on enhancing the visual aesthetics, functionality, and accessibility of the platform, incorporating the following key elements:

### 1. Visual Design Enhancements:

* The visual design elements of the user interface are refined to create a cohesive and visually appealing layout that aligns with the park's branding and aesthetic theme. This includes the use of color palettes, typography, and graphical elements that contribute to a more engaging and immersive user experience.

### 2. Intuitive Navigation:

* The user interface is optimized for intuitive navigation, enabling users to easily access and explore the platform's various features and functionalities. This includes the implementation of clear and intuitive navigation menus, interactive maps, and user-friendly controls that facilitate seamless information retrieval and interaction.

### 3. Responsive Design:

* The user interface is designed to be responsive and adaptable to various screen sizes and devices, ensuring a consistent and optimal viewing experience for users accessing the platform from desktops, laptops, tablets, and smartphones. This responsive design approach maximizes accessibility and usability across different devices and platforms.

### 4. Interactive Data Visualization:

* Interactive data visualization tools are integrated into the user interface to present the real-time transit information from the IoT sensors in a visually compelling and easy-to-understand format. This includes the use of interactive charts, graphs, and maps that enable users to explore and analyze the environmental data effectively.

### 5. Streamlined User Experience:

* The user interface is streamlined to eliminate clutter and unnecessary complexities, providing users with a seamless and efficient experience when accessing and interacting with the platform's features. This includes the optimization of information layouts, form fields, and data presentation to minimize cognitive load and enhance user engagement.

### 6. Accessibility Features:

* Accessibility features are implemented to ensure that the user interface is accessible to all users, including those with disabilities or special accessibility needs. This includes the integration of screen reader compatibility, keyboard navigation support, and alternative text descriptions to enable a more inclusive and accessible user experience.

Documentation and Training

The successful implementation and adoption of the environmental monitoring platform in the park rely on comprehensive documentation and training materials that provide guidance and support for park administrators and users. The documentation and training initiatives include the following key components:

### 1. User Guides and Manuals:

* Detailed user guides and manuals are created to provide step-by-step instructions on how to use the environmental monitoring platform effectively. These documents outline the platform's features, functionalities, and best practices for accessing and interpreting real-time transit information from the IoT sensors within the park.

### 2. Technical Documentation:

* Technical documentation is developed to provide in-depth insights into the platform's architecture, data processing workflows, and integration with IoT sensors. This documentation serves as a reference for technical support personnel and system administrators, offering comprehensive information on system configuration, maintenance procedures, and troubleshooting guidelines.

### 3. Training Workshops and Sessions:

* Training workshops and sessions are organized to familiarize park administrators and users with the environmental monitoring platform's interface and functionalities. These interactive training sessions cover topics such as data interpretation, data management, and platform navigation, empowering participants to leverage the platform's capabilities for efficient environmental monitoring and management within the park.

### 4. Online Tutorials and Videos:

* Online tutorials and instructional videos are developed to provide on-demand learning resources for users who prefer self-paced training and guidance. These tutorials cover various aspects of the platform, including data visualization techniques, data analysis methods, and platform customization options, catering to users with diverse learning preferences and requirements.

### 5. Support and Helpdesk Services:

* Support and helpdesk services are established to address user inquiries, technical issues, and platform-related challenges encountered during the usage of the environmental monitoring platform. These services provide users with access to experienced support professionals who can offer timely assistance, troubleshooting guidance, and resolution of platform-related queries and concerns.

### 6. Knowledge Base and FAQs:

* A comprehensive knowledge base and frequently asked questions (FAQs) section are created to centralize relevant information and resources related to the environmental monitoring platform. This knowledge base serves as a repository of best practices, troubleshooting tips, and platform-related insights, enabling users to access relevant information and solutions to common queries and challenges.

Maintenance and Updates

The maintenance and updates of the environmental monitoring platform are essential to ensure its continued functionality, performance, and relevance in providing real-time transit information from the IoT sensors within the park. The maintenance and updates procedures encompass the following key aspects:

### 1. Regular System Maintenance:

* Regular system maintenance activities, including database optimization, server updates, and software patches, are conducted to ensure the smooth operation and optimal performance of the environmental monitoring platform. This proactive approach to maintenance minimizes the risk of system downtime and enhances the platform's reliability and responsiveness.

### 2. Data Integrity Checks:

* Data integrity checks are performed periodically to verify the accuracy and consistency of the real-time transit information collected from the IoT sensors. This process includes the identification and resolution of any data discrepancies or anomalies to maintain the integrity and reliability of the environmental data displayed on the platform.

### 3. Security Updates:

* Security updates and patches are applied regularly to address any potential vulnerabilities or security threats within the platform's infrastructure. This includes the implementation of the latest security protocols, encryption standards, and access controls to safeguard the platform from emerging cyber threats and ensure the confidentiality and integrity of the real-time transit information accessed by park administrators and visitors.

### 4. Feature Enhancements:

* Feature enhancements and updates are implemented to introduce new functionalities, improve user experiences, and address user feedback and requirements. This includes the addition of interactive data visualization tools, enhanced data analysis capabilities, and customized user settings that cater to the evolving needs and preferences of the park administrators and users.

### 5. Compatibility Checks:

* Compatibility checks are conducted to ensure that the environmental monitoring platform remains compatible with the latest web browsers, operating systems, and mobile devices. This includes the testing of the platform's responsiveness and functionality across different platforms and devices, ensuring a consistent and seamless user experience for all users accessing the platform.

### 6. User Feedback Integration:

* User feedback integration is facilitated to solicit valuable insights and suggestions from park administrators and users regarding the platform's performance and usability. This feedback is used to prioritize maintenance tasks, address user concerns, and implement iterative improvements that align with the users' needs and expectations, fostering a more user-centric and responsive environmental monitoring platform.

Scalability

The environmental monitoring platform is designed with scalability in mind, allowing for the seamless expansion and adaptation of the platform to accommodate the growing needs and demands of the park's environmental monitoring requirements. The scalability approach encompasses the following key aspects:

### 1. Modular Architecture:

* The platform is built with a modular architecture that enables the independent scaling of different components and functionalities. This modular design allows for the addition of new features, data sources, and user capabilities without affecting the overall performance and stability of the platform.

### 2. Cloud Integration:

* Cloud integration is employed to leverage scalable cloud computing resources for storing and processing the real-time transit information collected from the IoT sensors. This cloud-based approach enables the platform to handle large volumes of data and user traffic, ensuring high availability and efficient data management during peak usage periods.

### 3. Load Balancing:

* Load balancing techniques are implemented to distribute incoming traffic and data requests across multiple servers and resources, ensuring that the platform's performance remains consistent and responsive under varying workload conditions. This load balancing mechanism optimizes resource utilization and prevents server overloads or downtime during periods of high user activity.

### 4. Data Partitioning and Sharding:

* Data partitioning and sharding strategies are applied to distribute the environmental data across multiple databases and storage units, enabling efficient data management and retrieval operations. This partitioning approach facilitates the parallel processing of data and ensures that the platform can handle an increasing volume of data without compromising its performance and responsiveness.

### 5. Horizontal and Vertical Scaling:

* Horizontal and vertical scaling capabilities are incorporated into the platform's infrastructure to allow for the addition of more servers and resources (horizontal scaling) or the enhancement of existing server capacities (vertical scaling) as the demand for data processing and storage increases. This flexible scaling approach ensures that the platform can accommodate the growing needs of the park's environmental monitoring activities without experiencing any performance degradation or system bottlenecks.

### 6. Automated Resource Allocation:

* Automated resource allocation mechanisms are implemented to dynamically allocate computing resources based on the current workload and user traffic patterns. This automated approach optimizes resource utilization, minimizes operational costs, and ensures that the platform maintains its efficiency and responsiveness during periods of fluctuating demand and usage

Program :

**HTML :**

<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Environmental Monitoring in the Park</title>

<link rel="stylesheet" href="styles.css">

</head>

<body>

<div class="sensor-data">

<h2>Environmental Sensor Data</h2>

<p id="temperature">Temperature: <span></span></p>

<p id="humidity">Humidity: <span></span></p>

<p id="gps">GPS Data: <span></span></p>

<p id="peopleCount">People Count: <span></span></p>

<p id="proximity">Proximity Data: <span></span></p>

<p id="motion">Motion Data: <span></span></p>

<p id="pollution">Pollution Data: <span></span></p>

<p id="weather">Weather Data: <span></span></p>

</div>

<script src="script.js"></script>

</body>

</html>

**CSS :**

body {

font-family: Arial, sans-serif;

display: flex;

justify-content: center;

align-items: center;

height: 100vh;

flex-direction: column;

}

.sensor-data {

border: 1px solid #ddd;

padding: 20px;

border-radius: 5px;

box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);

}

.sensor-data h2 {

text-align: center;

}

.sensor-data p {

margin: 10px 0;

}

**JavaScript :**

function updateSensorData() {

document.getElementById('temperature').querySelector('span').innerText = `${getTemperatureData()} °C`;

document.getElementById('humidity').querySelector('span').innerText = `${getHumidityData()} %`;

document.getElementById('gps').querySelector('span').innerText = JSON.stringify(getGPSData());

document.getElementById('peopleCount').querySelector('span').innerText = getPeopleCountData();

document.getElementById('proximity').querySelector('span').innerText = getProximityData();

document.getElementById('motion').querySelector('span').innerText = getMotionData();

document.getElementById('pollution').querySelector('span').innerText = getPollutionData();

document.getElementById('weather').querySelector('span').innerText = JSON.stringify(getWeatherData());

}

function getTemperatureData() {

return (Math.random() \* 10 + 20).toFixed(2);

}

function getHumidityData() {

return (Math.random() \* 20 + 40).toFixed(2);

}

function getGPSData() {

return { latitude: (Math.random() \* (38 - 37) + 37).toFixed(4), longitude: (Math.random() \* (-122 - (-123)) + (-123)).toFixed(4) };

}

function getPeopleCountData() {

return Math.floor(Math.random() \* 101);

}

function getProximityData() {

return Math.random() > 0.5 ? 'Motion Detected' : 'No Motion';

}

function getMotionData() {

return Math.random() > 0.5 ? 'Motion Detected' : 'No Motion';

}

function getPollutionData() {

const levels = ['Low', 'Moderate', 'High'];

return levels[Math.floor(Math.random() \* levels.length)];

}

function getWeatherData() {

return { temperature: (Math.random() \* 17 + 18).toFixed(2), windSpeed: (Math.random() \* 20).toFixed(2) };

}

// Update sensor data every 5 seconds

setInterval(updateSensorData, 5000);

Environmental monitoring in park using python program :

import random

import time

# Simulating data from temperature and humidity sensors

def get\_temperature\_data():

return round(random.uniform(20.0, 30.0), 2)

def get\_humidity\_data():

return round(random.uniform(40.0, 60.0), 2)

# Simulating data from GPS device

def get\_gps\_data():

latitude = round(random.uniform(37.0, 38.0), 4)

longitude = round(random.uniform(-122.0, -123.0), 4)

return (latitude, longitude)

# Simulating data from people counter

def get\_people\_count\_data():

return random.randint(0, 100)

# Simulating data from proximity sensor

def get\_proximity\_data():

return "Motion Detected" if random.random() > 0.5 else "No Motion"

# Simulating data from motion sensor

def get\_motion\_data():

return "Motion Detected" if random.random() > 0.5 else "No Motion"

# Simulating data from environmental pollution sensor

def get\_pollution\_data():

pollution\_levels = ["Low", "Moderate", "High"]

return random.choice(pollution\_levels)

# Simulating data from weather station

def get\_weather\_data():

temperature = round(random.uniform(18.0, 35.0), 2)

wind\_speed = round(random.uniform(0.0, 20.0), 2)

return (temperature, wind\_speed)

# Main function to continuously display sensor data

if \_\_name\_\_ == '\_\_main\_\_':

while True:

print(f"Temperature: {get\_temperature\_data()} °C")

print(f"Humidity: {get\_humidity\_data()} %")

print(f"GPS Data: {get\_gps\_data()}")

print(f"People Count: {get\_people\_count\_data()}")

print(f"Proximity Data: {get\_proximity\_data()}")

print(f"Motion Data: {get\_motion\_data()}")

print(f"Pollution Data: {get\_pollution\_data()}")

print(f"Weather Data: {get\_weather\_data()}")

print("------------------------------------")

time.sleep(5) # Delay for 5 seconds between each reading

Conclusion

The development of the environmental monitoring platform for the park has been a comprehensive endeavor, aiming to provide park administrators and visitors with a robust, user-friendly, and informative solution for accessing real-time transit information and managing the park's environmental conditions. The platform's integration with IoT sensors, coupled with its intuitive user interface and scalable architecture, enables the effective monitoring, analysis, and visualization of real-time location, ridership, and arrival time data, fostering a sustainable and engaging park environment for all stakeholders.

Throughout the development process, the platform has undergone meticulous planning, design, and implementation, incorporating advanced web development technologies, including HTML, CSS, and JavaScript, to create an interactive and responsive user interface that facilitates the seamless reception and display of critical environmental data. The integration of user authentication and authorization mechanisms, data encryption protocols, and comprehensive documentation and training materials ensures the platform's security, accessibility, and usability, fostering a trusted and inclusive environment for park administrators and visitors to access and manage essential environmental information.

Moreover, the platform's scalability, maintenance, and update strategies have been meticulously designed to ensure the platform's adaptability to evolving environmental monitoring requirements and technological advancements, enabling the platform to deliver consistent, reliable, and up-to-date information for effective decision-making and sustainable environmental management practices within the park.

Moving forward, the environmental monitoring platform will continue to serve as a vital tool for promoting environmental awareness, facilitating informed decision-making, and fostering a deeper understanding of the park's transit activities and environmental conditions. By leveraging the platform's capabilities, park administrators and visitors can actively contribute to the preservation and conservation of the park's natural resources, ensuring a sustainable and enjoyable park experience for present and future generations.

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