SMART WATER MANAGEMENT -PHASE 1
PROJECT SUBMISSION

Project Definition:

The project involves implementing IoT sensors to monitor water consumption in public places such as parks and gardens. The objective is to promote water conservation by making real-time water consumption data publicly available. This project includes defining objectives, designing the IoT sensor system, developing the data-sharing platform, and integrating them using IoT technology and Python.

Design Thinking:

1. Project Objectives: Define objectives such as real-time water consumption monitoring, public awareness, water conservation, and sustainable resource management.
2. IoT Sensor Design: Plan the design and deployment of IoT sensors to monitor water consumption in public places.
3. Real-Time Transit Information Platform: Design a mobile app interface that displays real-time parking availability to users.
4. Integration Approach: Determine how IoT sensors will send data to the data-sharing platform.

Problem Statement:

"Inefficient Water Usage in Public Areas"

Many public spaces such as parks, gardens, and recreational areas suffer from inefficient water usage due to outdated irrigation systems, lack of real-time monitoring, and ineffective usage patterns. This leads to water wastage, high operational costs, and environmental impact. There is a critical need for a smart water management solution that optimizes

water usage, reduces wastage, and promotes sustainable practices in public areas. This solution should incorporate IoT sensors, data analytics, and automation to enable real-time monitoring, intelligent decision-making, and efficient water distribution, ensuring a balance between conservation and meeting the water needs of these areas.

Introduction

The goal of this project is to implement an IoT-based water consumption monitoring system in public places like parks and gardens. The primary objective is to promote water conservation by providing real-time water consumption data to the public. This document outlines the project's scope, objectives, design considerations, and the proposed approach for implementation.

Project Scope

The project can be broken down into several key components:

1.Definition:

Clearly define the project's objectives and key performance indicators (KPIs). This includes specifying what data should be collected, how it should be presented, and the desired impact on water conservation.

2.IoT Sensor System Design:

Design the hardware and software components of the IoT sensor system. This includes selecting appropriate sensors, microcontrollers, communication protocols, and power sources.

3.Data Sharing Platform Development:

Create a platform to collect, store, and present water consumption data. Ensure that the platform is user-friendly, accessible to the public, and can handle real-time data updates.

4.Integration with IoT Technology:

Implement the necessary IoT connectivity to transmit data from sensors to the data sharing platform. This involves setting up communication protocols and security measures.

5.Data Analysis and Visualization:

Develop tools and dashboards to analyze and visualize the collected data. This can include historical trends, real-time usage, and comparisons across different locations.

6.Promotion and Awareness:

Develop strategies for promoting the use of the system among the public and local authorities. Create awareness campaigns to educate users about water conservation.

Project Approach

Phase 1: Objective Definition

In this phase, we will:

*Define specific objectives, such as reducing water consumption by a certain percentage.

*Identify key performance indicators (KPIs) to measure the project's success.

*Determine the geographical locations for sensor deployment.

*Establish data privacy and security policies to protect user information.

System Architecture:

1.IoT Sensors: Select appropriate water flow sensors or meters to measure water consumption accurately. These sensors should be capable of providing data in real-time or at regular intervals.

Depending on the deployment location, consider weather-resistant and vandal-proof sensor enclosures.

2.Microcontroller Unit (MCU): Choose a microcontroller platform (e.g., Arduino, Raspberry Pi) to interface with the sensors, collect data, and transmit it to a central server or cloud platform.

Implement power management to ensure efficient energy usage and potentially incorporate battery or solar power sources.

3.Connectivity: Use communication modules such as Wi-Fi, LoRa (Long Range), or cellular (e.g., 4G/5G) to transmit data from the MCU to a central server or cloud platform.

Ensure data security during transmission, possibly using encryption protocols.

4.Central Server/Cloud Platform: Set up a central server or cloud platform to receive, store, and manage data from multiple sensor nodes.

Implement a database to store historical data for analysis and reporting.

Develop APIs for data retrieval and integration with other systems or applications.

5.Data Processing and Analysis: Develop data processing algorithms to analyze water consumption patterns, detect anomalies, and calculate usage metrics.

Implement real-time alerting for abnormal water consumption events (e.g., leaks or excessive usage).

6.User Interface: Create a web-based or mobile application for end-users to access real-time and historical water consumption data.

Design user-friendly dashboards with visualizations and reports.

Implement user registration and authentication for secure access.

7.Alerts and Notifications: Configure the system to send notifications via email, SMS, or push notifications to users or authorities when water consumption exceeds predefined thresholds or in case of anomalies.

8.Power Management: Implement power-saving features to extend the sensor node's battery life. This may include sleep modes or on-demand data transmission.

9.Scalability: Design the system with scalability in mind, allowing for the addition of more sensor nodes and users as the project expands.

The different sensors that may find use are,

***Water Level Sensors:** These sensors determine the water level in tanks or reservoirs. They are useful for tracking water usage and ensuring that water levels remain within desired ranges.

***Temperature Sensors:** Temperature sensors can monitor the temperature of the water. This information can be valuable for identifying unusual patterns in water consumption.

***Humidity Sensors:** In outdoor environments like parks and gardens, humidity sensors can provide data on environmental conditions that may affect water demand.

***Rainfall Sensors:** Rainfall sensors can be used to detect precipitation, which can influence watering schedules in gardens and parks. Integrating rainfall data can help optimize water usage.

***Water Quality Sensors:** While primarily used for water quality monitoring rather than consumption, these sensors can ensure that the water being used is of the required quality, especially in applications where water quality is critical.