Smart Water Fountains

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Project Name	**Smart Water Fountains**

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1. Introduction

Optimizing the efficiency of smart water fountains is crucial to promote water conservation and responsible usage. In this document, we will outline a Internet of Things (IoT) project focused on maximizing the efficiency of smart water fountains. We'll define the problem statement, outline the steps involved, and discuss how an automated approach can benefit water management and sustainability efforts.

2. Problem Statement

It is hard for us to optimize the water fountain to minimize the water usage based on various factors. We going to develop a model that optimizes the water usage of smart water fountains based on various factors such as foot traffic, weather, and time of day.

3. Design and Innovation Strategies

3.1. Microcontroller Selection:

Innovation: Real time environmental data processing

The ESP32 is a popular and versatile microcontroller and Wi-Fi/Bluetooth module developed by Espressif Systems. It's known for its powerful processing capabilities, dual-core CPU, and built-in wireless connectivity, making it a top choice for IoT and embedded projects. The ESP32 features a 32-bit Tensilica Xtensa LX6 CPU, up to 520KB of SRAM, various GPIO pins, support for Wi-Fi 802.11 b/g/n, Bluetooth 4.2 and BLE (Bluetooth Low Energy), and a wide range of peripherals. It can be programmed using the Arduino IDE or the Espressif IDF, and it's widely used for IoT devices, home automation, wearables, and more, thanks to its small form factor and low power consumption. The ESP32 is favored for its affordability, robust community support, and extensive features, making it an ideal choice for a wide range of embedded applications.

This processor is best suitable for the Real time data processing and wireless connectivity in efficient cost.

3.2. Components

Sensor selection

- Water level sensor- To monitor the water level in the fountain.
- Turbidity sensor- To monitor the quality of water used in fountain.
- Temperature sensor -To monitor the temperature of water

Other components

- Relay- To connect the microcontroller to the Water pump to actuate the water pump
- Water pump – To draws water into its housing, where an forces the water out through the pump's outflow fitting. In other word used to recirculate the water. It also used to fill the reservoir.
- Power supply- To make the components work. We need two power supply for the fountain 5v for microcontroller and 230 v for water pump
- Fountain- Tubing and fountain nozzle, water proof container required to make the water fountain.

3.3. Cloud platform

Innovation: Realtime data access

Cloud computing in IoT enables centralized data storage, scalable processing, remote device management, and global accessibility, making it essential for managing and analyzing IoT data efficiently and securely.

We decided to use firebase because of its real time data transmission, user-friendly, robust security features.

3.4. Connectivity

Innovation: Real time connectivity

IoT devices communicate through the internet, collecting data and enabling remote control and monitoring, creating interconnected and smart systems for various applications

Wifi- We decided to use "Wireless Fidelity," which is a wireless technology that enables devices to connect to the internet and communicate with each other without physical cables, using radio waves over short distances. It's commonly used for wireless internet access, networking, and IoT connectivity

3.5. Protocol

Innovation: Used to communicate

Protocol is a set of rules used in communication

In esp32 we use

Wi-Fi (IEEE 802.11): ESP32 provides built-in Wi-Fi support for wireless internet connectivity and communication with other Wi-Fi devices. It enables IoT devices to connect to networks, access the internet, and exchange data.

Bluetooth and Bluetooth Low Energy (BLE): The ESP32 includes Bluetooth and BLE capabilities for wireless communication with smartphones, sensors, and peripherals. This enables seamless data exchange and control between devices.

Serial Communication (UART, SPI, I2C): The ESP32 supports standard serial communication protocols like UART, SPI, and I2C, allowing it to interface with a wide range of sensors, displays, and other microcontrollers.

HTTP and HTTPS: ESP32 can communicate over HTTP and secure HTTPS protocols, facilitating web-based data transfer and interactions with cloud services.

And Bluetooth , Low power Bluetooth etc

3.6. Working Principle

Innovation: Automation

Software:

a. Developing the firmware for your microcontroller. Use a programming language Arduino IDE (for Arduino, ESP8266, or ESP32).

b. Implementing logic to monitor the water level and temperature using the sensors.

c. Creating a web MQTT broker on the microcontroller to handle control and communication.

d. Developing a mobile app or web interface for remote control and monitoring. Using platforms like Blynk, Node-RED, or develop a custom app.

Control and Monitor:

With the software in place, We can now control and monitor your smart water fountain from a smartphone or computer. we can turn the fountain on/off remotely, check water levels, and receive alerts if water levels drop too low or if there are temperature issues.

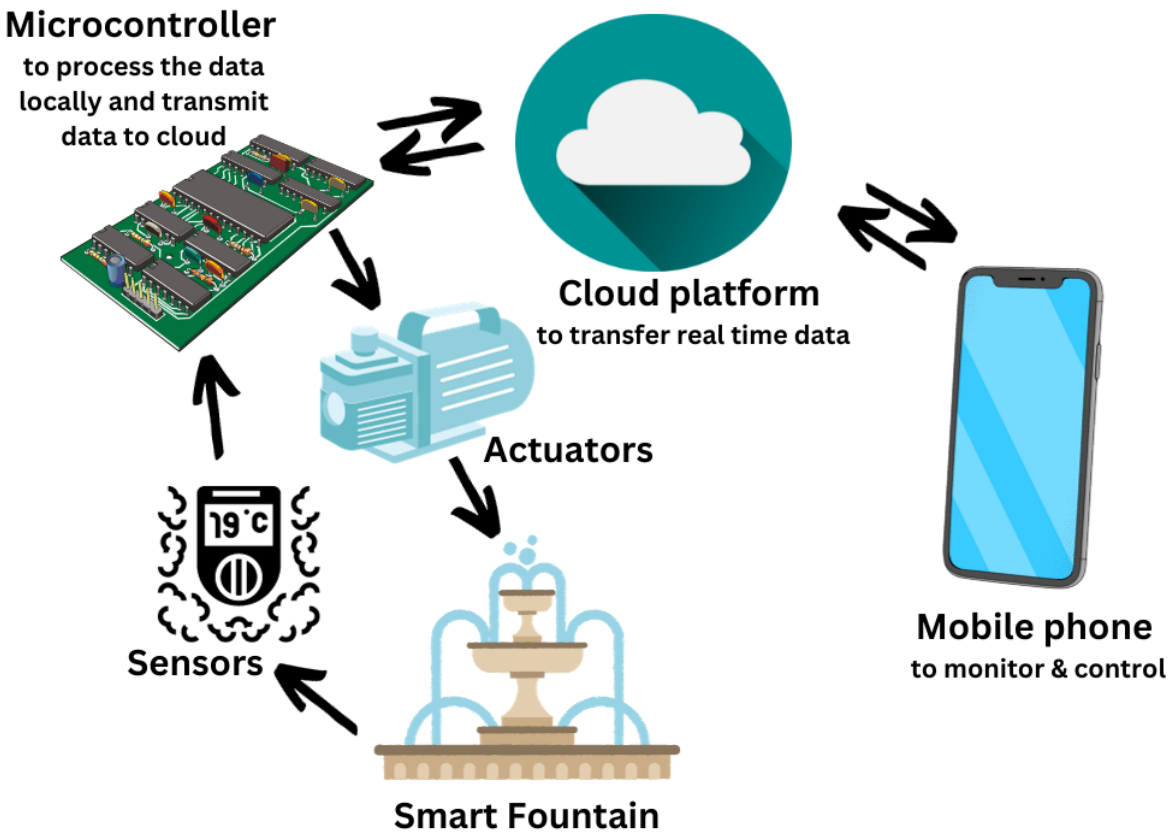
Automation:

We can automate our smart water fountain. For example, we could set schedules for the fountain to turn on and off automatically or create triggers based on environmental conditions.

Enclosure and Maintenance:

Ensure that all components are housed in a waterproof enclosure to protect them from water damage. Regularly check and maintain the fountain, including cleaning the pump and sensors.

3.7. Block Diagram



4. Conclusion

In this document, we have outlined a Internet of Things (IoT) project focused on optimizing water usage in smart water fountains to promote water conservation and responsible resource usage. By following a design thinking approach, water management authorities and environmentalists can leverage automation, ultimately leading to efficient water usage, conservation, and a more sustainable future.