6115- MAHENDRA INSTITUTE OF ENGINEERING AND TECHNOLOGY

"SMART WATER FOUNTAINS"

TEAM : proj_223281_TEAM_2

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DECLARATION :

We, student of Computer Science and Engineering , MAHENDRA INSTITUTE OF ENGINEERING AND TECHNOLOGY ,TAMILNADU that the work entitled " SMART WATER FOUNTAINS "

has been Sucessfully completed under the guidance of **Asst.prof.Mrs.ARUNA** , Computer science and Engineering and Technology ,Namakkal.This dissertation work is submitted in partial fulfillment of the requirement for award of Degree of Bachelor of Engineering in Computer Science and Engineering during the academic year 2021-2025.

ABSTRACT :

Water Fountains have been a major tourist attraction.thesa days which freeze the attention of tourists with their variety of lights,designs and heights. Musical water fountaion consist of Arduino, sound sensor with external MIC, submersivle motors, LCD, Relay modules, sound generation using mobile, ARGB LED light strip and adapters.

Introduction

Objective:

Today, more people around the world have pets than ever before. According to American Pet Products Association’s survey in 2020, 67% of U.S.

households own a pet which is about 84.9 million homes. This proportion has been increased by 20% in thirty years .

A source of fresh clean running water can encourage pets to drink. As a result, a water fountain is essential to most households having cats or dogs as pets.

"Our goal is to design a smart water fountain that can monitor the water quality and automatically replace water when polluted(not healthy) or running out ".

We will use sensors to measure the water quality. Common water quality measurement factors include temperature, Ph-value, conductance, turbidity and hardness. .

High-level requirements list:

• Able to drain the polluted water and replace it with fresh water. Specifically, the polluted water will be drained by a motor-controlled valve to the “polluted water temporary storage tank” part.

• The fountain must accurately monitor the water quality, including measuring water temperature up to 48.89C and pH values between 6.5 and 8.5.

• Able to be connected to the users' devices through WIFI.

Sensor Unit

This block contains the four sensors. **For the PH-value sensor, temperature sensor and conductivity sensor,** values will be retrieved and calculated to determine the overall water quality level. When poor water quality is determined, the water replacement procedures will take place.

Temperature Sensor:

A water-proof temperature sensor is going to be used. The measured temperature ranges from -55 to +125 celsius degrees. Between -10 to + 85 degrees, the accuracy is up to +-0.5 degrees. This sensor can

fulfill all requirements needed for this project.

PH-sensor:

PH value is a valued indicator of water quality. This PH-sensor[7] works with 5V voltage, which is also compatible with the temperature sensor. It can 6measure the PH value from 0 to 14 with an accuracy of +- 0.1 at the temperature of 25 degrees.

Conductivity sensor:

Conductivity sensor is also part of the water quality assessment. The input voltage is from 3.0 to 5.0V. The error is small, +-5%F.S. The measurement value ranges from 0 to 20 ms/cm which is enough for water quality monitoring.

PROPOSAL SYSTEM FOR SMART WATER FOUNTAINS :

The existing water fountain system provides a basic functionality of dispensing water for visitors. However, with advancements in technology, integrating smart features can enhance user experience, improve water management, and promote sustainability. This proposal outlines the enhancement of the existing water fountain system

to a smart water fountain

system.

Objectives

1 .Smart Dispensing:

Implement a sensor-based dispensing system to

provide water on-demand and prevent water wastage.

2 .User-Friendly Interface:

Develop an intuitive user interface for users to easily

access the smart features and customize their water dispensing

preferences.

3 .Water Quality Monitoring:

Integrate sensors to monitor water quality and

ensure the dispensed water is safe for consumption.

4 .Energy Efficiency:

Optimize the system for energy efficiency by

incorporating power-saving features and utilizing renewable

energy sources.

5.Data Analytics and Reporting:

Implement data collection and analytics capabilities to monitor water usage patterns, track water consumption, and generate reports for better water management.

Implementation Plan

1 .System Design and Architecture

2.Hardware Procurement and Integration

3.Software Development

4.Deployment and Training

5.Monitoring and Optimization

Hardware Components:

1. Dispensing Mechanism

2. Sensors

3. Interface

4. Power Management

5. Microcontroller/Processor:

Microcontroller (e.g., Arduino, Raspberry Pi) for system control .

Software Architecture:

1. Embedded Software

2. User Interface Software

3. Mobile App

4. Cloud Infrastructure

Cloud server (e.g., AWS, Azure) for data storage and processing.Enables data analytics and remote monitoring.

5. Data Analytics and Reporting.

proposed Enhancements:

1. Smart Dispensing

2. User Authentication

3. User Preferences

4. Water Quality Monitoring

5. Remote Monitoring and Control

6. Energy Efficiency

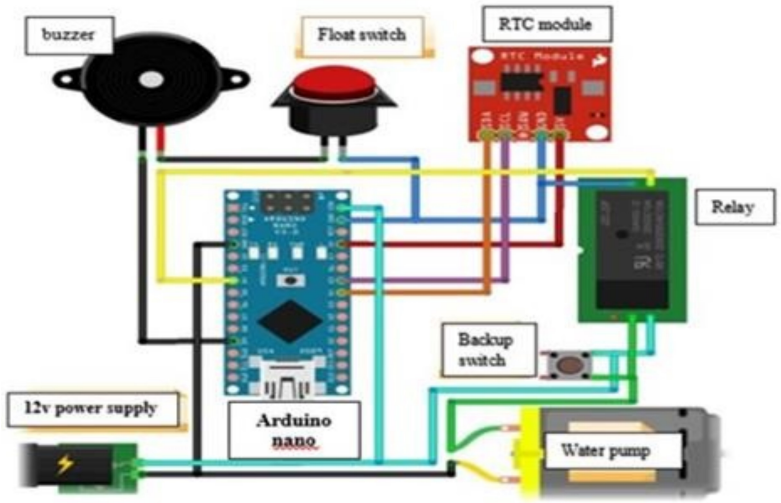
7. Data Analytics and Reporting

watering plants.

By enhancing the existing system with these features, we aim to create a more user-centric, efficient, and sustainable smart water fountain system.

PROBLEM STATEMENT :

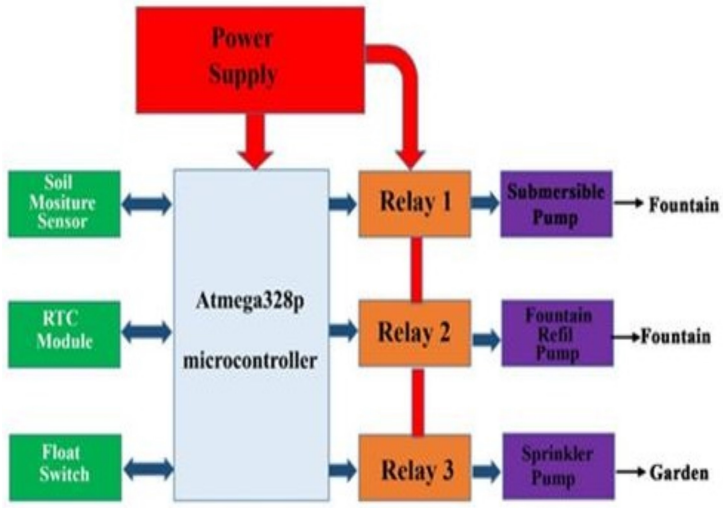
Constant evaporation and splashes from the fountain will reduce the water level, and in a long run the water in the fountain reservoir will dry off, therefore we need a system that can constantly monitor the water level.



Automatic refill system provides a simple method to refill a fountain or an aquarium automatically when the water level is below a desired threshold. The reduction in water level might be caused by evaporation or water splash. The system consists of an electronic water pump, a float-switch and a microcontroller. When the water gets too low, the float switch sends a pulse to the microcontroller, and the microcontroller activates the pump. To operate a pump using an Arduino microcontroller, a relay is needed to switch on and off a separate power supply.

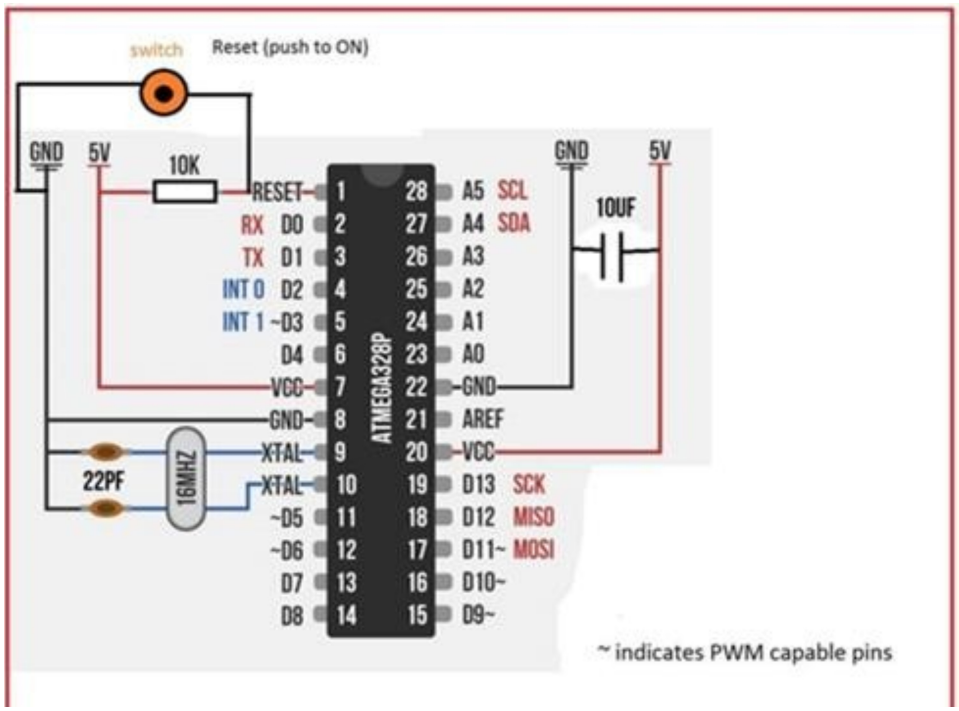
Aquarium auto refill with Arduino is a simple example of how to use a float switch, small liquid

pump and a relay to refill an aquarium once the water level gets too low. But this same technique can be used for pet dishes, water fountains, or any other number of similar applications.



ATmega328P Microcontroller IC

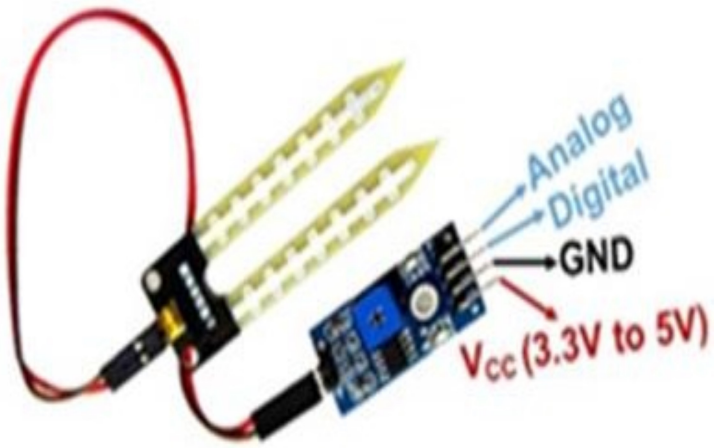
ATmega328P is a low-power 8-bit microcontroller based on the enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P achieves throughputs approaching 1MIPS per MHz allowing the system designed to optimize power consumption against processing speed.



2.Soil Moisture Sensor

The soil moisture sensor module is used to detect the moisture level of the soil. It measures the volumetric content of water inside the soil and gives the moisture level as output. This Moisture sensor module consists of a moisture

sensor, Resistors, Capacitor, Potentiometer, Comparator (LM393 IC), Power and Status LED in an integrated circuit. The moisture sensor probes are coated with immersion gold that protects Nickel from oxidation.



The **DS3231 is a low-cost, extremely accurate I^2C real-time clock (RTC)** with an integrated temperature- compensated crystal oscillator and crystal. The device incorporates complementary metal oxide semiconductor (CMOS) battery to maintains accurate timekeeping when main power to the device is interrupted. The integration of the crystal resonator enhances the long-term

accuracy of the device.

IMPLEMENTATION :

PLAN: Planning including identifying smart water fountain aspects and establishing goals .

STEP 1: Define Organization goals for smart water fountain.

STEP 2: Secure Top Management commitment.

STEP 3:Select an SMF Champion .

STEP 4:Build an Implementation Team.

STEP 5:Hold Kick-Off Meeting.

STEP 6:Conduct Preliminary Review.

Implementing smart water fountains involves integrating technology to enhance the functionality and efficiency of traditional water fountains.

These smart features can include water purification, touchless operation, real-time

monitoring, and data collection.

Below is a general overview of the steps and components involved in implementing smart water fountains:

Design and Planning:

Start by defining the goals and requirements for your smart water fountain. Consider factors like the location, user preferences, and the level of automation desired.

Determine whether it will be a standalone unit or part of a larger water management system.

Sensors and Monitoring:

Incorporate sensors to monitor various aspects of the fountain, such as water quality, water level, and usage statistics. These sensors can provide real-time data that can be used for maintenance and optimization.

Touchless Operation:

To enhance hygiene and convenience, consider touchless operation through proximity sensors or motion detectors. Users can activate the fountain without physical contact.

Connectivity:

Ensure the fountain is connected to a network (Wi-Fi, Ethernet) for data transmission and remote control. This allows you to monitor and manage the fountain from a central location.

Maintenance and Alerts:

Set up automated alerts and maintenance schedules based on sensor data. This ensures timely servicing and cleaning of the fountain.

Energy Efficiency:

Make the fountain energy-efficient by using low-power components and optimizing the cooling and purification systems for minimal

energy consumption.

Security:

Implement security measures to protect the fountain from unauthorized access and ensure the safety of the water supply.

User Education:

Provide user education and information on how to use the smart water fountain, including how to access data, adjust settings, and maintain proper hygiene.

Regulatory Compliance:

Ensure that the smart water fountain complies with relevant safety and water quality regulations in your area.

Implementing smart water fountains can provide a more efficient, hygienic, and user-friendly water source while also enabling data-driven water management. It's important to

regularly update and maintain the

technology to ensure its long-term functionality.

PROGRAM :

Below is a simplified example using an Arduino

microcontroller and an ultrasonic sensor to measure water level

java

```
import java.util.Scanner;

// Simulated hardware interfaces and sensors

class UltrasonicSensor {

 public int getDistance() {

 // Simulated method to get water level (distance)

from the ultrasonic sensor

 // Replace this with the actual sensor reading

 return (int) (Math.random() * 100); //
```

```
Simulated value
6
for testing
 }
}
class SmartWaterFountain {
 private boolean isFountainOn = false;
 private int waterLevel = 0;
 private UltrasonicSensor ultrasonicSensor;
 public SmartWaterFountain(UltrasonicSensor
sensor) {
 ultrasonicSensor = sensor;
 }
 public void turnOnFountain() {
 isFountainOn = true;
```

```
 System.out.println("Fountain is now ON.");
 }
7
 public void turnOffFountain() {
 isFountainOn = false;
 System.out.println("Fountain is now OFF.");
 }
 public int getWaterLevel() {
 waterLevel = ultrasonicSensor.getDistance();
 System.out.println("Water level: " + waterLevel
+ "
cm");
 return waterLevel;
 }
 public static void main(String[] args) {
```

```
 UltrasonicSensor sensor = new
UltrasonicSensor();
 SmartWaterFountain fountain = new
SmartWaterFountain(sensor);
 Scanner scanner = new Scanner(System.in);
8
 while (true) {
 System.out.println("\nChoose an option:");
 System.out.println("1. Turn on the fountain");
 System.out.println("2. Turn off the fountain");
 System.out.println("3. Check water level");
 System.out.println("4. Exit");
 int choice = scanner.nextInt();
 switch (choice) {
 case 1:
```

```
fountain.turnOnFountain();
break;
case 2:
fountain.turnOffFountain();
break;
case 3:
9
fountain.getWaterLevel();
break;
case 4:
System.out.println("Exiting...");
scanner.close();
System.exit(0);
default:
System.out.println("Invalid option. Please
```

```
choose a valid option.");
 }
 }
 }
}
```

This is a basic example to get you started with hardware

interfaces and sensors for a smart water fountain. A complete implementation would depend on your specific hardware and sensor choices and their corresponding libraries and drivers.

OUTPUT:

vbnet

```
Choose an option:
1. Turn on the fountain
```

2. Turn off the fountain

3. Check water level

4. Exit

1

Fountain is now ON.

Choose an option:

1. Turn on the fountain

2. Turn off the fountain

3. Check water level

4. Exit

3

11

Water level: 73 cm

Choose an option:

1. Turn on the fountain

2. Turn off the fountain

3. Check water level

4. Exit

2

Fountain is now OFF.

Choose an option:

1. Turn on the fountain

2. Turn off the fountain

3. Check water level

4. Exit

4

Exiting...

In this example, the program allows you to turn the fountain on and off and check the water level, which is simulated by a random value between 0 and 100 centimeters. The actual

sensor readings would replace the simulated values in a real-world implementation.

APPLICATIONS:

Public Spaces and Parks: Install smart water fountains in public parks and recreational areas to provide clean and safe drinking water.

Schools and Universities: Implement smart water fountains in educational institutions to promote hydration among students. Monitoring water usage data can help track hydration habits.

Office Buildings: Smart water fountains in office environments can encourage employees to stay hydrated. Monitoring water quality and consumption can help with maintenance and health initiatives.

Healthcare Facilities: Smart water fountains can be vital in healthcare settings where sanitation

and cleanliness are critical. Real-time monitoring can ensure that water remains safe for patients and staff.

Phase 1: Project Initiation and Planning

Project Kickoff:

Assemble a project team, including engineers, designers, and stakeholders.

Phase 2: Design and Prototyping

Hardware Selection:

Choose the ultrasonic sensor, microcontroller, and other hardware components that meet the project requirements.

Sensor Integration: Integrate the ultrasonic sensor into the fountain's design.

Ensure it can accurately measure water levels.

Phase 3: Development and Testing

Software Development: Develop the software

to control the fountain's operation, data collection, and monitoring features.

Phase 4 : Deployment and modelling

Pilot Installation:

Install the smart water fountain in a pilot location. Monitor its performance and user feedback.

Phase 5: Evaluation and Expansion

Data Analysis: Analyze data collected from the smart water fountain, including water usage patterns and water quality metrics.

Phase 6: Sustainability and Ongoing Management

Sustainability Initiatives:

Implement sustainability features such as energy-efficient components and eco-friendly materials.

Public awareness: promote the benefits of the smart water fountains to the community and encourage their use.

Project Overview:

The implementation of ultrasonic sensors in this smart water fountain project brings a new level of sophistication and functionality. This review examines the project's hardware components, specifically the ultrasonic sensors, and the advantages they offer in creating a more efficient and user-friendly water fountain system.

Hygiene:

Touchless operation promotes user hygiene by

reducing physical contact, especially important in high traffic areas where multiple individuals may use the

fountain.

Energy Efficiency:

The project's hardware components are designed with energy efficiency in mind, making it an environmentally responsible solution.

User Experience:

The project excels in improving the user experience. The real-time monitoring, touchless operation, and constant availability of clean water contribute to a user-friendly design. The intuitive interface, whether through a touchscreen display or mobile app, enhances the overall interaction with the fountain.

Conclusion:

The smart water fountain project with ultrasonic sensors and hardware integration is a promising endeavor that represents a significant advancement in public water

sources.

The implementation of ultrasonic sensors and hardware features ensures precision, efficiency, and an exceptional user experience. Moreover, the project aligns well with water conservation and sustainability initiatives.

It serves as an excellent example of how technology can be harnessed to address real-world challenges in an innovative and efficient way.

THANK YOU...