Design Paper On Hydro Track And Automatic Water Dispenser

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Peer Review Information	Abstract
	Water conservation and efficient resource management are crucial in modern times. This project presents an IoT-based smart water management system that integrates automatic water dispensing, water level monitoring, and temperature control. The system ensures optimal water usage by automatically dispensing water in predefined quantities, monitoring real-time water levels in tanks, and adjusting water temperature as needed.

Introduction

Efficient water management has become a critical concern due to increasing global demand, resource scarcity, and environmental sustainability challenges. Monitoring and controlling water levels, temperatures, and usage in real-time are crucial steps towards better water conservation practices. The integration of IoT (Internet of Things) technology into water management systems presents an innovative solution that enhances automation and reduces manual intervention.

This project focuses on designing an IoT-based system that measures water levels in tanks, monitors and controls water temperature, and automatically dispenses specific quantities of water as required. By utilizing IoT devices, sensors, and actuators, this system not only improves the precision of water management but also offers a scalable and flexible solution for various applications, from household settings to industrial water usage. The real-time data collection and automated response mechanisms ensure efficient water usage, minimize wastage, and contribute to sustainable resource management.

Literature Survey

This study highlights the importance of water level monitoring in dispensers using IoT. The primary focus is on tracking water levels to prevent wastage. Water is a crucial resource in daily life, and many institutions and organizations rely on water tanks. Monitoring these tanks is essential, and this paper addresses the issue of preventing water waste by utilizing IoT technology. An Arduino microcontroller and ultrasonic sensor are employed to monitor the water levels in tanks, ensuring that water wastage is minimized [1].

Another paper extends this concept by integrating water quality monitoring in addition to water level tracking. This approach solves the problem of water wastage by employing a Raspberry Pi microprocessor, turbidity and pH sensors for quality assessment, and an ultrasonic sensor to monitor water levels. Future work could focus on monitoring larger water sources [2].

A third paper reviews the use of automatic level indicators in water tanks. Often, water is pumped into tanks using motors, but human error can lead to wastage when motors are left running after the tank is full. This issue is addressed by measuring water levels and using a buzzer to alert users when the tank is full. Technologies such as ultrasonic sensors, buzzers, LCD displays, integrated circuits, and other IoT-based systems are used in this solution [3].

The concept of a smart water dispenser monitoring system is discussed in another paper, which focuses on human health. Water intake is essential for well-being, and dehydration can lead to health risks. The proposed system measures the water level in a tank and sends notifications to users when they need to refill the tank, promoting better hydration habits [4].

Another study presents an IoT-based smart water tank level monitoring system that includes motor pump control to prevent water waste. The system utilizes technologies such as NodeMCU, Arduino UNO, ultrasonic sensors, water depth detection sensors, relay modules, and LCD displays to ensure efficient water usage [5].

The importance of automation in water dispensers, especially during the COVID-19 pandemic, is discussed in another paper. Contactless operation became critical during the pandemic, leading to the design of a system that automatically dispenses water when an object is detected beneath the tap. This system is based on IoT technologies [6].

A review of microcontroller-based water level indicators and controllers highlights the necessity of water conservation. To address the issue of overflow, a system is proposed that indicates water levels using transistors, relays, water level sensors, and buzzers to notify users when the tank is full [7].

A similar paper explores microcontroller-based automatic control systems for water pumps, where water is pumped from a source into a tank using an electric pump. The system automatically detects water levels using an Arduino and ultrasonic sensor, displaying the data on a screen to help prevent overflow and wastage [8].

Another design for automatic water dispensers uses a microcontroller, IR sensor, relay, and LCD display. The IR sensor detects the presence of a bottle, and the system automatically dispenses water when the bottle is in place [9].

Lastly, a system designed to assist visually impaired individuals in accessing water is reviewed. This automatic water dispenser ensures contactless operation and addresses the needs of visually impaired people, a significant population as per WHO statistics from 2018, which reported 36 million blind and 253 million visually impaired individuals globally [10].

## Limitations Of Existing System

There is no existing system that simultaneously integrates three essential functionalities for institutional-level water tanks: automatic water dispensing in specific measures, water level monitoring, and water temperature adjustment based on environmental conditions. Despite considering all reviews, no proposed solution effectively addresses these three domains together.

Proposed System
Problem Statement:

Traditional methods of managing water resources in tanks, such as manually checking water levels and adjusting temperatures, are inefficient, labor-intensive, and prone to errors. These methods often result in water wastage, inaccurate control of water temperature, and inconsistent water distribution. In industries or households where water is stored and used in large quantities, optimizing the management of water levels and controlling the temperature is essential to ensure both sustainability and energy efficiency. This project addresses these challenges by developing an IoT-based solution that monitors water levels in tanks, sets the temperature of stored water, and automatically dispenses water in pre-defined quantities. The proposed system offers a scalable, real-time, and efficient approach to water management.

System Architecture
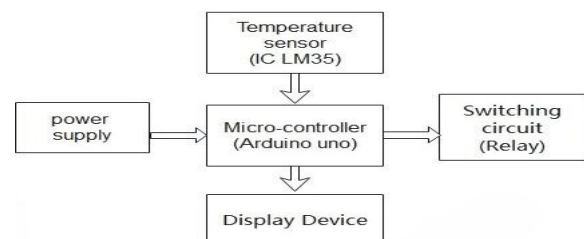
Work Flow / Algorithm
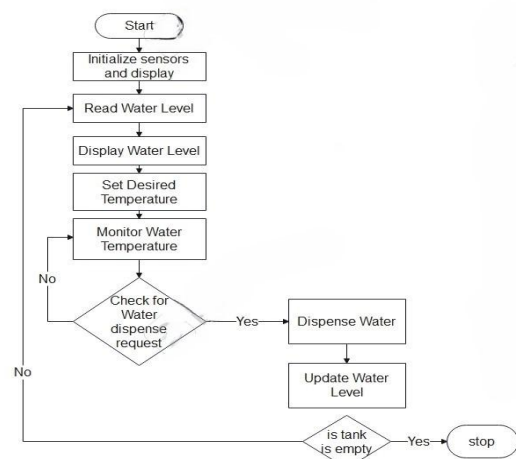
Hardware Requirement

- Arduino Uno
- Ultrasonic sensor
- Temperature Sensor
- Relay module
- 16x2 LCD display
- Power Supply
- Resistors
- jumper wires
- breadboard

Software Requirement

- Arduino IDE
- C/C++

RESULT

Automatic Water Dispensing: The system accurately dispenses water in predefined measures, ensuring controlled usage.

Water Level Monitoring: Real-time water level tracking helps in efficient resource management and prevents overflow or shortages.

Temperature Regulation: The system adjusts the water temperature based on environmental conditions, enhancing usability.

Advantages Of The Proposed System

1. **Efficient Water Management** – Prevents water wastage by ensuring controlled dispensing and real-time monitoring.
2. **Energy Saving** – The automated temperature regulation optimizes energy consumption by adjusting water temperature based on environmental conditions.
3. **Cost-Effective** – Reduces manual intervention, minimizing labor costs and water wastage expenses.
4. **Integrated Functionality** – Combines dispensing, level monitoring, and temperature control in a single system, eliminating the need for multiple separate devices.

Applications

1. Smart Water Management in Homes & Offices.

2. Public Drinking Water Dispensers.

3. Smart Cities & Water Conservation Programs

Conclusion

The development of an IoT-based system for water level monitoring, temperature control, and automatic water dispensing successfully integrates various sensors and control mechanisms to create a user-friendly and efficient solution. The system effectively measures and displays real-time water levels and temperature on a 16x2 LCD, while also providing automatic water dispensing in specified amounts. With the ability to set and maintain desired water temperatures, this project offers practical applications in both household and industrial water management.

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