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Water Scheduling in Municipalities using RTC

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Abstract: *Water is a precious natural resource that serves various purposes such as drinking and cooking. However, it is often wasted and not efficiently utilized. The conservation of water has become increasingly crucial due to the growing gap between diminishing water supplies caused by inadequate water management and the rising demand from population growth. Consequently, the cost of water is continuously rising. Therefore, it is essential to monitor daily water usage. Moreover, residents living in apartments face the issue of unfair billing, where customers who use minimal water and those who consume the maximum amount are charged the same. To address this problem, a proposed system utilizes RTC (Real-Time Clock) to track water usage accurately. Additionally, the project incorporates a TDS (Total Dissolved Solvents) sensor to measure the level of dissolved solvents in the water. Furthermore, a soil moisture sensor is employed to detect any water leakage by monitoring the moisture level in the soil. If an increase in moisture level is detected, the system sends a text message to registered recipients, alerting them of the potential leakage and helping to minimize water wastage. Another feature of this project is a push button that allows users to view their bill on an LCD display when pressed.*

Keywords: Real-Time Clock

I. INTRODUCTION

World Water Day is celebrated annually on March 22nd to address water crises and prepare for the future. The theme for the 2022 Water Day is "Groundwater Making the ”Invisible Visible." In India, water characteristics are changing due to development pressure and increased demand. Groundwater is depleting while surface water is becoming more polluted and unsuitable for human use. Ensuring good water quality is crucial for human health and the ecosystem. One of the major challenges is to provide sufficient water for everyone, as about 70% of surface water resources are polluted. Factors contributing to water pollution include wastewater, intensive agriculture, industrial production, infrastructure development, and untreated urban runoff. Waste management in India, particularly in cities, is not efficient enough to handle the increasing volume of waste generated daily. This water crisis leads to insufficient drinking water availability and highlights the importance of water distribution and management. Automation, utilizing advanced technology and control systems, plays a significant role in optimizing water distribution, saving labor, energy, and ensuring precision. The conventional water distribution system faces issues such as water leakage, improper supply, and water theft, resulting in consumers receiving less water. Minimizing these problems is the main objective of the system, aiming to provide sufficient water to every consumer effectively.

II. RELATED WORK

1) Real-Time Control in Water Distribution Systems: A Review

This paper reviews the application of real-time control in water distribution systems, focusing on the challenges and opportunities. It discusses the use of various control strategies and the impact of RTC on water quality and system performance.

2) Real-Time Hydraulic Model Calibration for Water Distribution Systems

The paper explores the integration of real-time hydraulic model calibration techniques in water distribution systems. It discusses the benefits of continuously updating the hydraulic model to enhance the accuracy of the control strategies.

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3) Optimal Pump Scheduling for Water Distribution Systems Using Model Predictive Control

This research focuses on optimal pump scheduling using Model Predictive Control (MPC) in water distribution systems. It discusses the advantages of MPC in handling uncertainties and variations in demand.

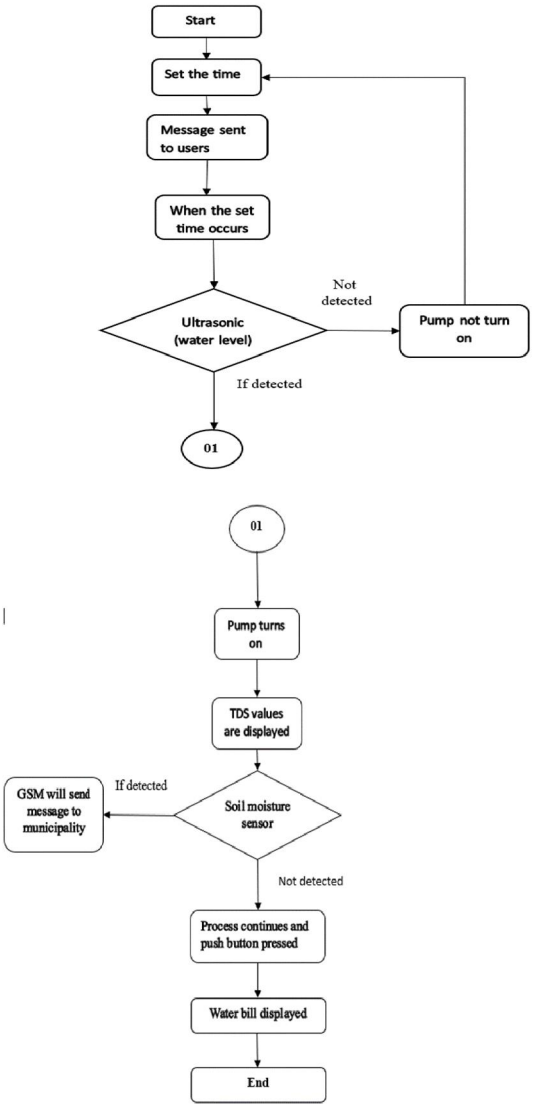
4) Real-Time Optimization of Water Distribution Systems Considering Energy Costs

The paper explores the integration of real-time optimization considering both hydraulic and energy costs. It discusses the trade-offs between optimizing hydraulic performance and minimizing energy consumption.

III. PROPOSED SYSTEM AND IMPLEMENTATION

The current approach employed for the water distribution system encompasses issues such as water wastage caused by leaks, subpar water quality, inequitable water billing, and the need for manual intervention in pump operation.

IV. METHODOLOGY



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The suggested approach entails the implementation of a holistic water management system that tackles both conservation and equitable billing concerns. Through the integration of sensors such as RTC for time tracking, TDS for water quality evaluation, and soil moisture sensors for leak detection, the system is capable of efficiently monitoring water usage. By utilizing the data from RTC, the system guarantees fair billing by precisely documenting individual consumption patterns. Moreover, a push button and LCD display enable users to conveniently access their bills. With its ability to detect leaks and facilitate transparent billing, this system strives to minimize water wastage and encourage fair usage practices in residential complexes.

V. RESULTS

Water supply is automatically controlled without the need for manual intervention. Residents receive messages on their registered mobile numbers informing them of the water arrival time, accompanied by a buzzer sound. The level of dissolved solvents in the water is clearly displayed for easy reference. Any damages in the water supply system are promptly reported to the municipalities. Individual water bills are generated and shown on an LCD screen, ensuring fair billing practices.

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VI. CONCLUSION

Water conservation is of utmost importance, especially given the growing scarcity of clean water caused by factors such as inadequate water governance and population growth. As the cost of water rises, it is crucial to efficiently monitor and manage water usage. This proposed system tackles various key issues related to water conservation and fair billing. By incorporating real-time clock (RTC) functionality, the system can accurately track water usage over time, enabling more precise billing and encouraging responsible consumption. Additionally, the inclusion of a TDS sensor allows for the monitoring of water quality, ensuring that consumers receive safe and clean water. Furthermore, the system's integration of a soil moisture sensor provides an additional layer of functionality by detecting potential leaks and preventing water wastage. If moisture levels unexpectedly rise, indicating a possible leak, the system promptly alerts users via text message, facilitating timely repairs and reducing water loss. Moreover, the inclusion of a push button for billing enhances user convenience and transparency. With a simple press of a button, users can access their water consumption data displayed on an LCD screen, promoting awareness and accountability. In conclusion, this project offers a comprehensive solution to address the challenges of water conservation and fair billing. By leveraging sensor technology and real-time monitoring, it empowers users to make informed decisions about their water usage while promoting sustainability and equitable billing practices.

VII. FUTURE SCOPE

Water management in municipalities is being transformed by Real-Time Control (RTC) systems, paving the way for more efficient resource allocation. The future holds exciting possibilities with advancements in RTC technology, such as the integration of AI and machine learning for predictive modeling. Enhanced sensor networks and IoT devices offer real-time data on water usage and infrastructure health. The incorporation of renewable energy sources can lead to more energy-efficient water systems. Collaborative efforts between municipalities, developers, and researchers will drive innovation in RTC systems for sustainable water management.

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