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# WATER DISTRIBUTION AND MONITORING SYSTEM USING IOT

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**Abstract**: Water is an essential necessity for all living things, including humans. Nowadays, there is a shortage of water and an uneven distribution of it due to the rapid population expansion that has led to insufficient supplies and water waste. This project's main objectives are to ensure that water is distributed evenly to all homes, to prevent wastage and blockages in the water supply, and to produce water bills for individual families utilizing IoT platforms. We will use Arduino to put this system into action. Water sensors and a valve are used to control how much water is drawn from the tank. Water used by the flow sensor is passed via a sequence of electric pulses that are generated. Calculations can be made of the user, flow rate, and supplied water volume. The goal of this project is to use IoT platforms and embedded technology to supply water in a properly channeled manner and address problems.

**Keywords:** Ultrasonic sensor, Water flow sensor, Arduino UNO, LCD Display, Wi-Fi Module, Relay, Electronic Valve, Blynk Application, Water Tank, Battery and Charger.

## I. INTRODUCTION

All living creatures, including humans, must have access to water. Due to the fast population growth that has resulted in inadequate supplies and water waste, there is currently a shortage of water and an uneven distribution of it. The main goals of our project are to use IoT platforms to produce water bills for each family, make sure that water is supplied equally to all residences, and check for trash and obstructions in the water system. To build this system and control the water flow from the tank, we'll use an Arduino, water flow sensors, and a valve. A series of created electric pulses transport the water that the flow sensor needs. The volume of water supplied, the flow rate, and the amount of water utilised by the user may all be calculated using the series of electrical pulses generated by a flow sensor. This project aims to employ embedded and IoT platforms to provide water in a correctly routed manner and solve issues.

## II. EXISTING SYSTEM

India has experienced a sharp rise in water demand in recent years as a result of several socioeconomic factors. Due to the overuse of groundwater resources and the bulk of water bodies, there is a water shortage. We must be aware of our water resources' availability. The management and distribution of water resources is a crucial topic since it entails finding strategies to safeguard water bodies from contamination and overuse.

The main problem in India is the management, quality, and availability of water. In established metropolitan areas, water demand exceeds supply, which reduces the amount of water available and necessitates effective management. It takes labour to provide water to diverse locations. The volume of water distributed and the water bills aren't kept track of in these situations. Water-intensive industries are often unaware when pipelines are broken, resulting in leaks and water waste.

## III. LITERATURE SURVEY

[1] As new technologies are regularly created and accepted in agricultural and daily life, water quality monitoring plays a vital role in the transition to intelligent and smart agriculture and enables a simple transition to automated monitoring of essential elements of human requirements (water). Yet, this effort requires trustworthy

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models with accurate and complete datasets for the monitoring and control of water quality. The need for accuracy in modelling makes it feasible to analyze water quality monitoring models using sensors that collect data on water parameters during real-world trials.

[2] The major objective of this project is to create water bills for individual houses using IoT platforms and to verify and maintain an equitable distribution of water to all homes to ensure that there is no wastage or blockage in the delivery of water. We will use Arduino to put this system into action. Water sensors and a valve are used to control how much water is drawn from the tank. A flow sensor produces a sequence of electronic pulses that may be used to compute the amount of water provided, the flow rate, and the amount of water used by the user. The goal of this project is to use IoT platforms and embedded technologies to deliver water in a properly channeled manner and address problems.

[3] Water is an essential natural resource for maintaining both the environment and life. For sustainable development to be achieved, water resources must be managed effectively and sustainably. In this essay, we examine the water issues in India and provide an effective method for process automation and monitoring. One of the primary obstacles to generating food, sustaining health, protecting the environment, and ensuring social stability is water shortage. Competition is growing, and When it comes to water management, disagreements present social and ecological problems. Conflicts within sectors are also expected to increase along with shortages. An entry point into a new era is a smart city. There are several homes available nowadays where folks may have the comforts of their choice. Based on the population, season, and other factors, the water is used. Hence, managing the water supply is necessary in addition to maintaining it. Many of us might not be aware of how much water is lost or consumed according to current procedures. The suggested system has been created for efficient management of the water supply with the aid of IoT devices in order to achieve automation of the system and prevent water waste.

[4] The users as well as the whole water supply firm may be negatively impacted by a loss of continuity in the water delivery system. The Water Network Tool for Resilience (WNTR) library is used in this essay to highlight the issues that arise when this process is interrupted. This library enables modelling and simulation of the process of distributing water following a disaster. The algorithm helps to determine the order of repairs to be made so as to restore the continuity of the water supply process in the shortest amount of time using the hydraulic model implemented in EPANET and input data such as the list of failures, the number of repair teams, the equipment available, etc.

[5] The architecture, usage, and necessity of the Internet of Things (IoT) in water management systems are the main topics of this study. Public health is impacted when there is a significant decline in the water quality control system in the distribution system. Increased biological and non-biological contents, a change in the water's colour, and an odour might result from this. For the whole aquatic environment, these toxins pose a major hazard. The traditional approaches to water quality analysis take a lot of time and effort. A real-time water quality monitoring system is therefore required to keep an eye on the water and safeguard it, allowing for the active taking of measurements to lessen pollution.The development of effective strategies to address several significant problems in real time was made possible by the advancement of technology.The focus of the Internet of Things is on the architecture, usage, and necessity of IoT in water management systems.

[6] As we know water is so precious for human being as well as for the complete nature without which it will not be possible to survive. Even though lot many efforts have been taken by government through various schemes and it is becoming difficult day by day to save water for future and make efficient utilization of it. Here the main focus is on water utilization in big apartments and save water with proper distribution and monitoring system. The intension of this work is water management, monitoring and proper distribution of water to save water and make efficient use of it, so that we can satisfy the trust of others. The system has been designed in such a way that it will monitor the available water level continuously. System has been implemented by using embedded system and communication will takes through IoT.

[7] The population of metropolitan regions is clearly growing swiftly nowadays, along with the need for pleasant living, as a result of an increase in people moving from rural areas to urban areas. Urban areas have grown in size due to a rise in population, and water is now one of the main issues in a city, especially when it comes to distribution, supply, protection, use, and quality. It is necessary to put in place an appropriate monitoring and regulating system to address issues linked to the water supply. The constructed system is made up of several Internet of Things (IoT) components, such as an Arduino UNO microcontroller, a Raspberry PI, an ultrasonic sensor, a solid-state relay switch, and a motorized electric water valve. Monitoring and management of water

 

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distribution using an IOT-based model were the main topics of this article. It strives to produce a low-cost, dependable, and effective way to enhance community water delivery. To model the operation of a water distribution system, a prototype was created. Moreover, a web application was developed as a front-end system for managing and monitoring the condition of the various pumping stations. The prototype system also included a fuzzy logic algorithm to improve the decision-making process. The project was a success and met all of the criteria established for monitoring.

[8] A vital resource for every person and life on earth is water. Due to a certain quantity of individuals migrating from rural to urban regions, cities' populations are now growing quickly. A one-of-a-kind strategy based on the Internet of Things is proposed to address the needs of water supply, distribution, and quality control. The suggested system comprises several sensors, including a microcontroller, pH sensor, water control valve, and a water flow sensor. To provide appropriate and uniform water distribution to each connection, a water control valve is operated through a web interface based on the value of a water flow sensor (end point). The pH sensor is used to assess the water's purity. The water pressure is measured using the pressure sensor. The water flow pressure and pipe leakage detection are both monitored using a pressure sensor. Water is distributed, and with the help of this document, water flow through the pipe may be managed.

[9] A cost-effective and efficient system for monitoring water quality is the most dependable method of implementing clean water. When water utilities encounter growing difficulties, drinking water may become a valuable resource for everyone. These difficulties result from factors like a large population, a lack of water supplies, etc. Many techniques are used to monitor the water quality in real time. A new approach to "Internet of Things (IoT)"-based water quality has been forecast, but it has to be monitored in real time to ensure that water distribution is done safely. An expansion in the wireless device network approach used in the Internet of Things is explored for real-time water quality observation. The measured values from the sensors are interfaced using a microcontroller, and the remotely processed data is sent to the core controller ARM via a WI-FI protocol. A microcontroller interfaces with the sensor measurements, and the remotely processed data is transferred to the core controller ARM over the WI-FI protocol. When WQM selects water parameters such as temperature, pH level, water level, and CO2 by employing a range of device nodes, This method is used to transmit the data to the web server. Anyone in the world can receive or view the server's often updated data. A buzzer will sound if the sensors fail or come into unusual situations.

[10] In order to examine the possible synergistic benefits of multi-energy consumption, there has been significant research effort on the combined analysis, planning, and operation of integrated electricity, natural gas, and heating networks. Because these two networks are inextricably linked by elements such as electric-motor powered pumps, current research rarely considers the integration of electricity and water networks (E-pumps). The combined power-water flow analysis of integrated electricity and water networks is consequently proposed to be studied in this research (IEWN). The power-water flow issue is framed with E-pumps acting as the coupling component, with a focus on the regional IEWN, which is made up of an imbalanced power distribution system and a municipal water network. The problem is then addressed using the Newton-Raphson

[11] technique and the Hardy-Cross method. The combined power-water flow analysis is validated using numerical data from a testing setup composed of a 33-bus distribution system and a 9-node water system.

## IV. PROPOSED SYSTEM

This initiative contributes to ensuring that water is supplied effectively without causing leaks or unnecessary loss. It is an intelligent system that calculates the amount of water provided, the flow rate, and the amount of water used by the user by using flow sensors to create a sequence of electric pulses. The suggested method automatically turns on and off the motors based on the water level while continually controlling the water level in the main tank.

A control valve and a flow sensor work together to control the water flow through the pipe. ThinkSpeak is an IoT platform that may be used to carry out this procedure. The administrator can access the data at various time intervals and use it for automatic billing, resource analysis, and approximations for later consumption. The monitor will display the invoices and tank water level for the administrator to see.

## V. SYSTEM ARCHITECTURE

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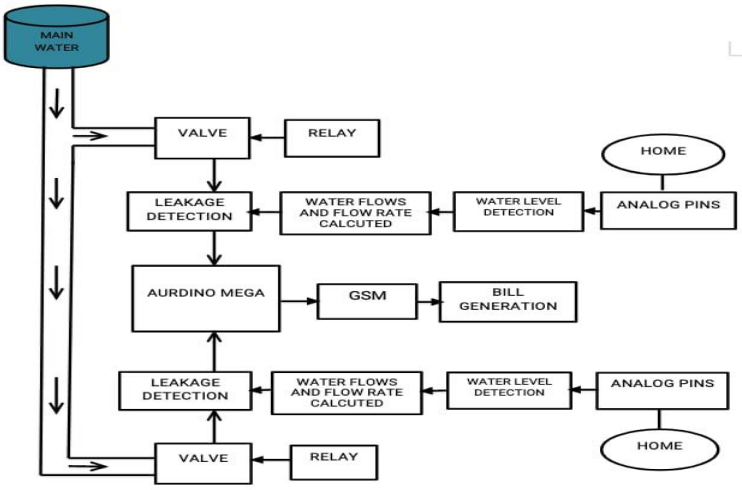


## VI. COMPARISON TABLE

| AUTHORS | YEAR | METHODOLOGY | LIMITATIONS |
|---|---|---|---|
| Salem Garfan,Mohammed Talal, A. H. Alamood, Amneh Alamleh, | 2022 | Analysing and monitoring the water's quality models using sensors that collect data on the parameters of the water during actual experiments | Research done at a specific time on a subject this important don't usually properly represent the significance or implementation. The data, however, merely represents how the scholarly community has responded to the topic. |
| Senoj Joseph, Anjana Menon, Akash.P, Bharath.P | 2021 | The suggested approach continuously monitors the water flow, and if leaks are found, alarms are given to the administrator. With the IoT platform ThinkSpeak, the administrator may oversee the complete setup. Automated invoices are created and sent to each home, saving labor. This initiative uses embedded technology to some extent to help alleviate the water issue. | This system does not employ falldetection to avoid accidents. |
| Prachi Dalvi,Dr. Aarti Karande, Suyash Santosh Ojha , Omkar Ravindra Wadekar, | 2021 | The strategy uses the divide and conquer method and divides the system into one or two tank-sized subsystems. The source's subsystem controls the flow of controls (mains). Predictions are made at the source using the data from other subsystems, which serve as the node points for data collection. This strategy is workable since a significant task phase occurs at the source, especially when taking into account the cost of valve operations. | To ensure that market standards arefulfilled,including maintaining appropriate upper and lower boundaries to prevent pressure fractures and restricting tank levels to reduce maximum flow pressure. |

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| | | | |
|---|---|---|---|
| Andrzej Urbaniak | 2020 | The EPANET environment's primary purpose is to mimic how a water supply network might operate while accounting for varying beginning circumstances. | Google Maps system integration is not being considered. The algorithm will be able to estimate an arrival time based on GPS data. |
| Varsha Radhakrishnan, Wenyan Wu | 2020 | A structure and methodology were designed to assure the security of the devices, the integrity of client information, and the data transferred across the network. | Few of the current problems with choosing the specifications for the smart water system. |
| Navin Rapelli Ashish Myakal, Vyankatesh Kota, Prachi R Rajarapollu | 2019 | Using an ultrasonic sensor, the first step in installing a monitoring system is to gauge the water level in the main tank, which will give the precise amount of storage that is available. | Demand does not have a mobile application built. |
| J G Natividad and T D Palaoag | 2019 | The monitoring and controlling system employing a microcontroller and a web server for water distribution are the two circuit designs that make up the IoT-based model employing a system-on-a-chip microcomputer for monitoring water using an IoT-based strategy . | Lastly, this study will have the wonderful possibility of further expanding the concepts and ideas for usage in the future thanks to the continued growth in technology, particularly IoT devices. |
| Mr. M. M. Srihari | 2018 | Ethernet Shield is the IoT module in use, and MQTT is the cloud computing protocol. The solenoid valve, which serves as the control valve, is activated and deactivated by the Arduino microcontroller. The flow of water through the pipe is sensed by the water flow sensor, which then transmits a pulse to the Arduino microcontroller. The pH sensor is used to evaluate the pH range and water quality. | The amount of water is not measured and is given to the users in an infinite amount. |
| Xinyi Li, Xia Zhao, Lun Yang | 2018 | Water and electricity networks are different systems that are planned and run independently. Due to the widespread usage of electric-motor-driven pumps (E-pumps) in water networks and the major influence cooling water systems have on the operation of thermal or nuclear power plants, these two networks are really inherently interconnected | This research will look at the integrated electricity-water network, and the combined power-water flow will be analysed using the Newton-Raphson and Hardy-Cross methods. Both Newton's technique and Hardy's approach may be used to analyse water flow. |

## VII. CONCLUSION

The suggested approach continuously monitors the water flow, and if leaks are found, alarms are given to the administrator. With the IoT platform ThinkSpeak, the administrator may oversee the complete setup. Automated invoices are created and sent to each home, saving labor. Using embedded technology, this initiative helps to

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alleviate the water shortage to some extent.This paper presents survey of water distribution system and associated problems in water distribution system. This paper gives review of intelligent metering systems and leakage detection systems. As water is one of the most precious and limited natural resource, it is need of time to have new cost effective and efficient system to overcome problems in water distribution system. We proposed smart water distribution system using DSP processor to speed up the operations.

## VIII. EXPERIMENTAL RESULTS

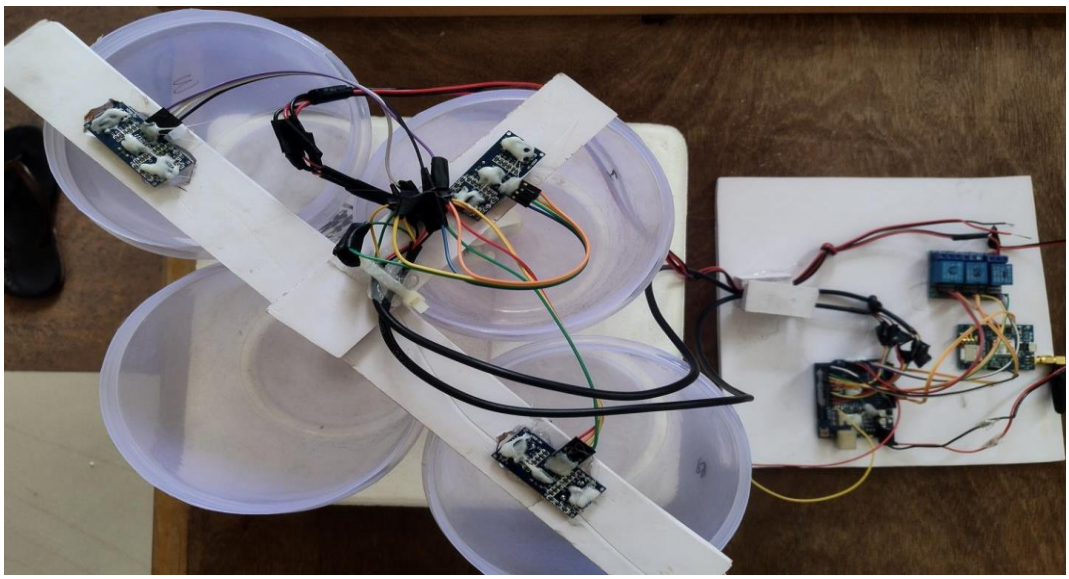

Figure 1: Hardware Implementation of the System

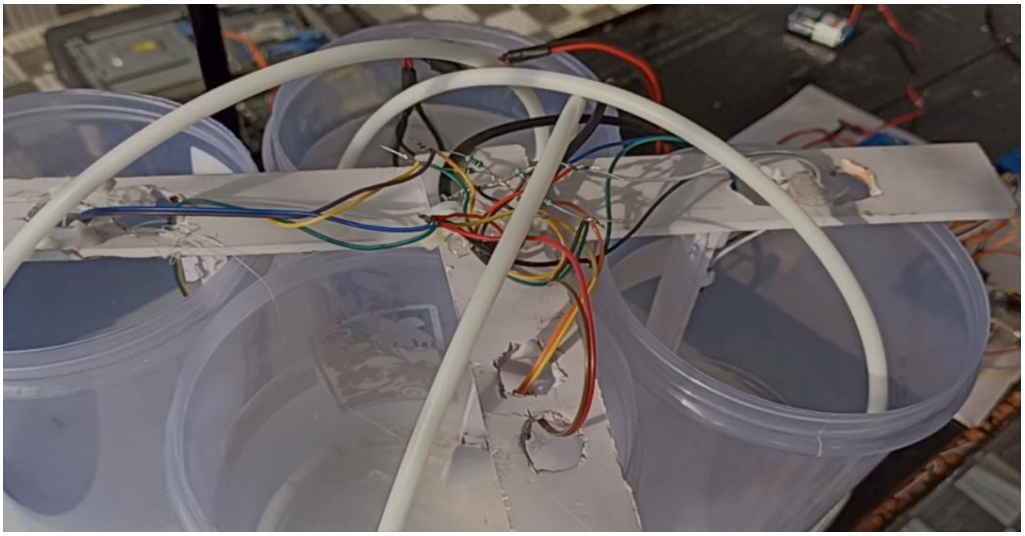

Figure 2: Even distribution of water

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Figure 3: GSM module

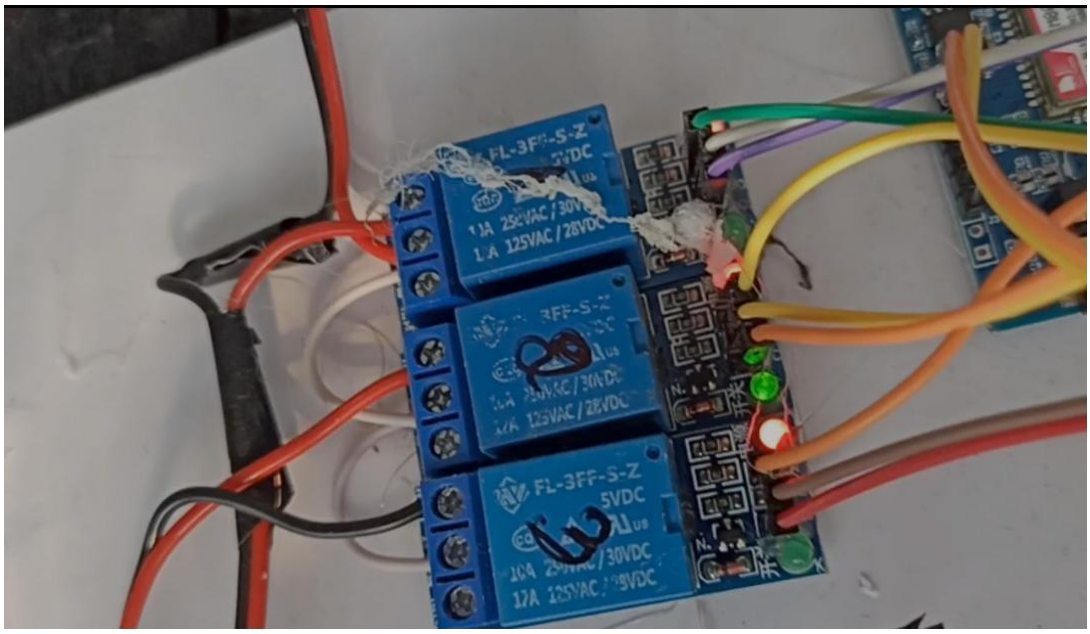


Figure 4: Relay

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