Enhanced IOT Based Smart Water Monitoring and Controlling System

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Abstract- **Internet of Things (IoT) based smart water distribution system is a revolutionary solution for efficient and intelligent water management. It is a network of interconnected devices that enable real-time monitoring and control of water distribution systems. The system uses sensors, data analytics, and machine learning algorithms to collect and analyze data on water quality, usage, and distribution patterns. The information is then used to optimize the distribution of water resources, reduce wastage, and improve the efficiency of the entire water supply chain. 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.**

Index Terms- **Water flow sensor, Solenoid valve, Relay, ESP8266**

I. INTRODUCTION

The Internet of Things has revolutionized the way we interact with the world around us. One of the areas where IoT has made a significant impact is in the domain of smart cities. Smart water distribution is a key aspect of smart cities that can help ensure efficient and sustainable use of water resources. In this project, we present an IoT-based smart water distribution system that leverages the power of connected devices and data analytics to optimize water usage and improve water distribution. The proposed system consists of a network of sensors, controllers, and actuators that are deployed across the water distribution network. These devices collect data on water quality, quantity, and distribution in real-time, which is then analyzed using advanced data analytics techniques. The system uses this data to optimize water usage, detect leaks, and ensure timely maintenance and repairs. The system also includes a user interface that enables users to monitor and control water usage in their homes and businesses.

The IoT-based smart water distribution system offers several benefits over traditional water distribution systems. It reduces water wastage, improves water quality, and ensures equitable distribution of water resources. The system can also help reduce water bills for consumers and improve the overall sustainability of water usage. We believe that the proposed system has the potential to transform the way we manage water resources in smart cities and pave the way for a more sustainable future.
In this system, IoT devices such as sensors and actuators are used to collect and monitor data on water distribution, flow rates, pressure, and water quality. This data is then transmitted to Firebase Cloud, where it is stored and processed. The system can also be configured to send alerts and notifications to concerned parties in case of any anomalies or irregularities in the water distribution system.
Firebase Cloud provides an easy-to-use interface for developers to build and manage the system, and it also offers a range of features such as user authentication, data security, and real-time updates. The data collected and analyzed can also be used to improve the efficiency of the water distribution system, reduce wastage, and ensure equitable distribution of water resources.

II. LITERATURE SURVEY:

The purpose of water distribution networks is to provide water to city residents. Even with climate change and decreasing precipitation, water distribution systems should be built to accommodate consumer demand. A Water Distribution Network (WDN) consists of pipes, valves, pumps, tanks, etc., to transfer potable water from reservoirs to consumer nodes. Internet of things (IoT) and information and communication technologies (ICT) are applied to water management systems (WMS) to make them smarter and more efficient. The physical devices of the water system are equipped with smart sensors and controllers so that real-time measurement of remote data such as smart meter reading, water tank level, valve condition, and pipe pressure rate can be gathered using smart sensors and broadcasted to the cloud via communication protocols. The data can then be examined, processed, and computed for the water authority board to make an ideal decision regarding the water supply scheduling in the WDN system to minimize the pump's operation cost and decrease water loss [1].
As per literature survey water management systems [2] had been already implemented and invented by various researches. In the implemented system various features has been working together like uniform water distribution, monitoring of water level available in a tank, supply on demand, and online billing and payment of the water utilized. Using existing IoT (mobile network) these data could be sent to the remote server for billing from each flat and accepting request, monitoring and getting notifications are also done in this project. In this paper author has implemented a system which is monitoring the water utilization and preparing a bill as per utilization of water also water monitoring has been done remotely. Control and real time monitoring has been focused in this paper, by electronic flow rate sensors [3]. When the system is turned on the amount of water utilized by each user is monitored and controlled by using micro controller by counting the pulses from all channels continuously. Water level indicating sensors were used to

determine the level of the water in the master tank, based on the level pumping motor has been controlled. This paper presents an IoT device which helps to manage/monitor and plan the usage of water by observing the level of water in the tank [4].
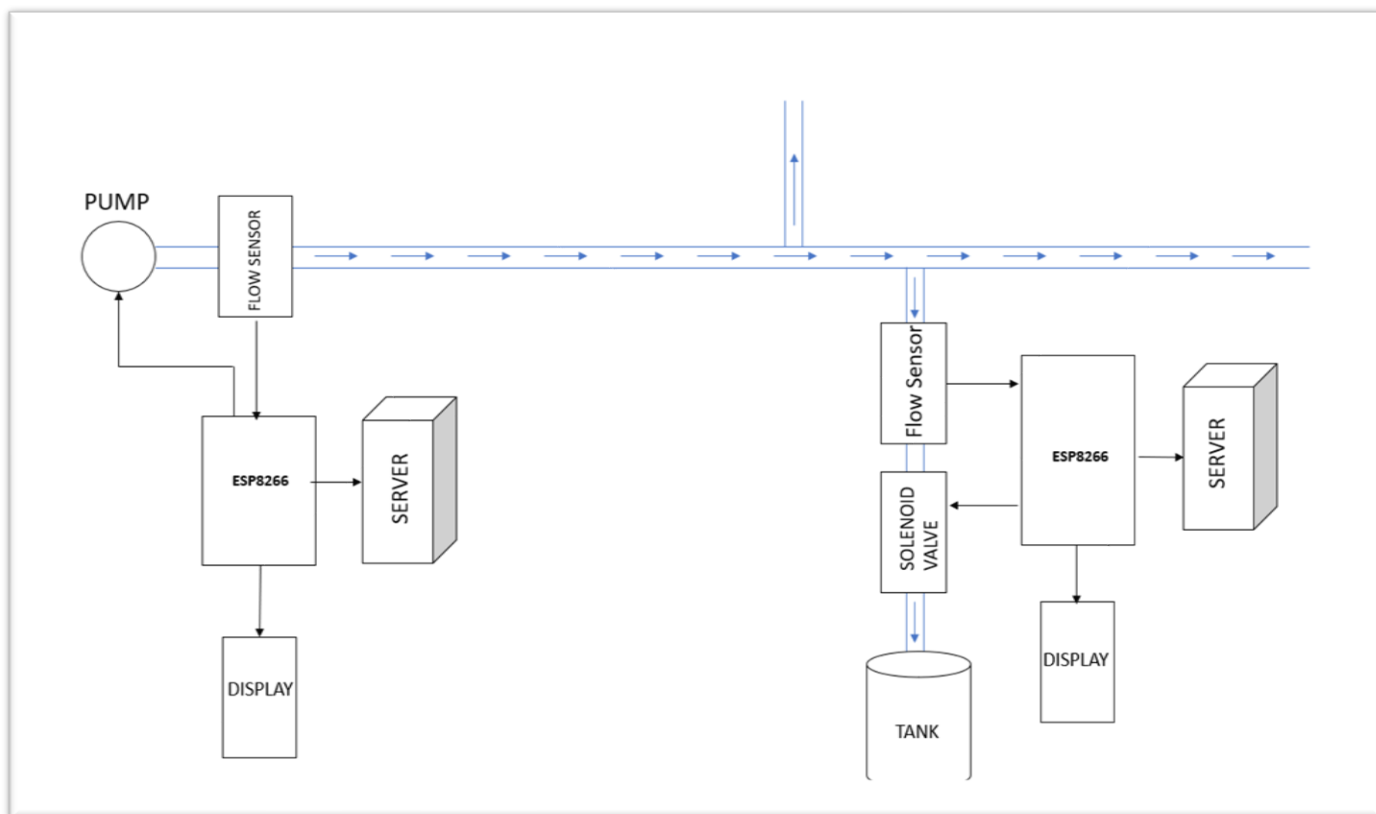
III. METHODOLOGY:

Fig 1: Block Diagram of Water Distribution System

Materials and Methods

a)   ESP8266 Microcontroller: ESP8266 is the microcontroller used in this project. In built WIFI module is used for transmitting the water flow sensor data to server and to receive the data from the server. Initially Controller is connected to the WIFI by providing user ID and password in the program. Once the controller is connected, data is transferred to the firebase. We are making use of fire base to store real time data.

b)   Water Flow Sensor: Water flow sensor is used to measure the water flow rate and volume of water delivered in litters. Inside the meter there i turbines structure available, when water is entered into the pipe the turbines are rotated and flow meter provide the pulses accordingly. Volume of water passed through it is calculated and sent to the firebase. Water flow will stop when maximum threshold is reached.

c)   Liquid Crystal Display (LCD): LCD is used indicate the flow rate and the volume. LCD is used at each consumer. Consumer can see total volume of water delivered. LCD is used because of low power consumption.

d)   Relay Circuit: The relay circuit is used to switch off and on the electronic valve because it works on the 12volt, we didn't provide the 12 volts from the ESP8266 so to give this supply we use relay circuit which switches the supply to the electronic valve.

IV. EXECUTION RESULT:

The Node MCU was connected to the sensors and the internet. The data was sent to the Firebase database, which was monitored using a smart phone. The system was able to accurately measure the water flow rate, total water distributed, and leakage alert. The data was displayed in real-time on the smart phone as shown in the figure 2, and alerts were sent to the user in case of any abnormalities. The system was able to provide an efficient and reliable way to monitor the water quality and level in the tank.
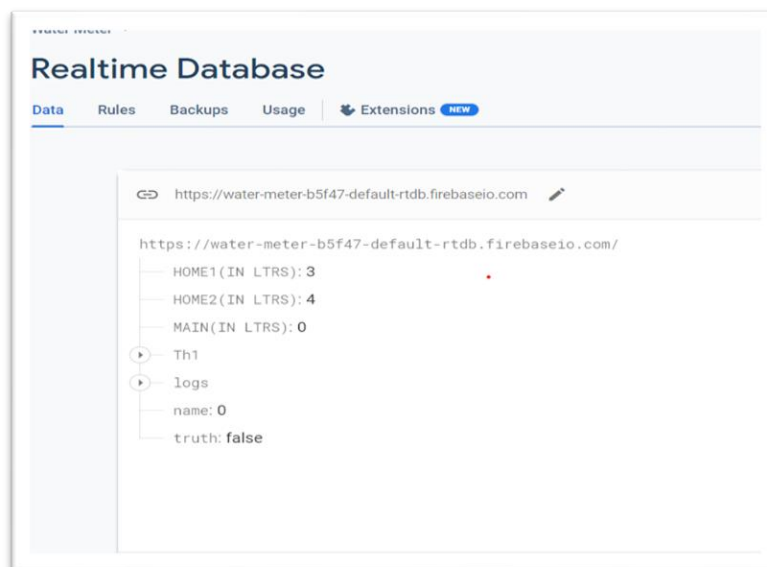
Fig2: Real Time Database Output

V. CONCLUSION:

IoT-based smart water distribution system using Firebase Cloud provides a reliable and efficient way to monitor and manage water distribution networks. By leveraging the power of IoT devices, data can be collected in real-time, providing insights that can help optimize water usage and reduce wastage. The collected data is then analyzed and used to control water flow and pressure, detect leaks, and optimize water usage. The integration with Firebase Cloud enables secure and scalable storage of the data, making it easily accessible and manageable from anywhere. It is also a cost-effective system, where the user can also save water and money. Time to time alert has been given on the water utilization. This project will satisfy the significant need of this generation to save our future generations from water scarcity.

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