PREPAID WATER METER AND WATER QUALITY CHECKING USING IOT

Rutik Rajesh Patil[1], Nishant Shriram Shrivastav[2], Tejas Sunil Patil3, Rushikesh Prakash Shirke[4]

[1]*Students, E & TC Engineering,Shatabdi Institute of Engineering & Research*
[2]*Students, E & TC Engineering,Shatabdi Institute of Engineering & Research*
[3]*Students, E & TC Engineering,Shatabdi Institute of Engineering & Research*
[4]*Students, E & TC Engineering,Shatabdi Institute of Engineering & Research*

ABSTRACT

Water Efficiency is considered as a major aspect for every country in the world, many studies such as integrated water management were developed to enhance the way water resources are managed. Consequently, smart water systems were developed to reach equity for water usage, economic benefits for both the consumer and the utility, improve system management and achieve maximum water efficiency.Prepaid water meter is a device that measures the amount of water consumed by householders who have the device fitted within their premises. Water conservation is a big issue in many apartments. A common meter is fitted and cumulative consumption amount is shared among households where they are being charged more than what is to be paid. There are several idea to overcome this issue. In this paper we have proposed a solution to this issue in which a device is used to calculate the flow rate and quantity of water consumed by the householders and send it to the cloud to monitor the consumption of water.Current Municipal Corporation Water Distribution has manual process need additional personnel and has no system to monitor the flow, utilization and quality of water. According to study, there has a case where one family gets water supply for 1 hr per day and another family gets 24 hours water supply. Each individual has their own usage of water and everyone have to pay amount of water consumption as per their meter reading. And if any person fails to pay water bill then there has no automated system which can restrict the water supply to their houses. To overcome this problem the system has been developed to monitor the flow, utilization and quality of water. The water resources information will benefit to the water resources management department and the public. The "Prepaid water meter" override the problems prevailing in the existing manual process.Wasteful usage of water, climatic changes and Urbanization has further depleted the resource. Conservation and management of the resource must be given utmost importance. In this paper, we present an IoT design for water monitoring and control approach which supports internet based data collection on real time bases. The system addresses new challenges in the water sector -flow rate measuring and the need for a study of the supply of water in order to curb water wastage and encourage its conservation. We also measure the quality of water distributed to every household by deploying by Solenoid Valve and Turbidity sensors. Java was used for the development of web applications which is an open-source scripting language having Object-Oriented features. MySQL database uses to keep a record of customer information, water consumption, and charges.

Keyword : - *Arduino Sensors, cloud storage, real time monitoring, microcontroller, Internet of Things (IOT), Solenoid Valve ,Turbidity sensors*

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1. INTRODUCTION.

Water is one of the most important resources .No one including human beings, animals, plants and insects can live without water.The bad quality, overflowing from tanks , leakage in pipes and inefficient usage of water are the main cause which leads to the wastage of water. So it is important to have control on water wastage and usage as well by introducing or building a system which will overcome the water wastage related issue using Internet of

Things(IOT).Water "Water is a Life" of the living being. When it comes to its proper usage then it will reach us up to the crest but its wastage is very Costly for economically as well as by Humanity point of view. Municipal Corporation spends money every year on Filtering and purification of water for the commercial and residential use. In addition, they also spend money on the maintenance and repairing of those traditional analog water meters.The IoT based digital water quality and quantity management system are made to track the usage of water, automatic valve control and flow of water for each and every user by processing the real time utilization of water and billing to the respective user according to its usage. With this system user needs to pay for its usage only, not like a traditional fixed rate Tax. Water distribution and its control over billing cycle is most challenging task for authorized providers. Municipal corporation water distribution is manual process and become difficult to monitor the utilization of water at a consumer level. Existing system limits to monitor the quality and quantity of water. Unpaid bill recovery costing is more than actual bill which waste man hours cost. Water is an important resource for all the livings on the earth. In that, some people are not getting sufficient amount of water because of uneven distribution. We can use this approach so that everyone gets the equal amount of water. It is also used to avoid the wastage of water during the issuance period. In the last method, the employee will go to that place and open the valve for a particular duration, then again the employee will go to the same place and close the valve, it is waste of time. To ensure the safe supply of drinking water the quality should be monitored in real time for that purpose IOT (Internet of Things) based water quality monitoring has been proposed. To ensure the safe supply of drinking water the quality should be monitored in real time for that purpose IOT (Internet of Things) based water quality monitoring has been proposed.The real-time monitoring of water resources information will benefit the water resources management department and the public. The primary concept of real-time IOT based water resources information system is to provide comprehensive and accurate information. The system is developed through defining some explicit water resource parameters then, Water level and flow parameter are defined for water measure & management, followed by a sensor network for water resources information monitoring is constructed based on IOT.The traditional water metering systems require periodic human intervention for maintenance making it inconvenient and often least effective.In this project, a smart two-way communication water meter that operates in prepaid payment method was simulated using Prepaid water meter software on PC. We will install this Prepaid water meter system to each and every consumer And these water meters are connected to Internet which will takes the data from those meter and send it to the server.The water meter communicates with the water utility company and transfer data containing the daily water usage of the user through technology.The proposed system consists of Prepaid Water Meter (Developed using The Arduino Uno - microcontroller board, Flow Sensor, Solenoid Valve and Turbidity Sensor), Web application.It also consists of Flow Sensor, Solenoid Valve, Turbidity Sensor.The proposed system is fully automated. Here human work and time are saved. Rapidly meter reading has been saved to memory in the control board and periodical time interval data will be uploading to the cloud system. users can be logging into the cloud system and able to upload their meter reading, download the bill, and upload the evidence of payment during the given period.With this system, it is expected to facilitate consumers to make better service and save the water as a resource.

1.1 PROBLEM STATEMENT

To develop a application Prepaid Water Meter.we developed the System for water utilization using water flow sensor and interface with Microcntroller which embedded with Arduino code. Arduino software is used for Arduino coding to find flow rate of water, display the output in serial monitor and send the sensed data to the cloud which can be monitored by customers and measuring water quality on a real-time basis

2. LITERATURE SURVEY

This part of the project describes the theoretical background of this project,Following researchers previously worked on modeling of organizations which is discussed below:

1) Gurung Ram proposed a paper that demonstrated how smart metering and provide better handling the demand complexities of contemporary water supply methodology developed by smart meter. It focused on optimal planning of water infrastructure network. [1]
2) G Hauber-Davidson proposed a paper that discussed role of smart water meter and working of smart meter and shown the water consumption in real time. He proposed an idea to took the action when increasingly expensive water. [2]

3) Sarah Darby proposed an idea of affordance and using this theory of affordances, qualitative research is examined to understand how householders had used consumption feedback, with and without smart meters. Advanced Metering Infrastructure (AMI) relied in the transition to lower-impact energy systems. AMI offered possibilities for household energy management and customer–utility relations. [3]

4) Tracy C. Brittonshared his idea about water utilities to improve water distribution System and reduced the amount water lost in the network. It estimated the customer post meter leakage for up to 10% of total water consumption and concluded that reduced the water loss by finding post meter leakage.[4]

5) E.Idris proposed a paper about Intelligent Water Metering(IM) which offered the potential to transform the urban water management. This paper was to provide an overview of prospect and pitfalls based on review of IM deployment. [5]

6) Cara D.Beal proposed a paper that had shown that householders' perceptions of their water use were often not well matched with their actual water use. This paper examined the contributions of end users to total water use for each group that self-identified as "low", "medium" or "high" water users. The consumers received level of information based on their water bill. [6]

7) Current water tank systems are not able to monitor the level of water in a tank. Author introduced a IoT (Internet of Things) based automatic On/Off system to control the level of tank and usage of water. System is turning ON when the water level is lies between low level and high level. Motor is turning Off when it is in between low level and above the high level. User are able to access the data on website [7].

8) To supply safe of the drinking and useful water for different purposes like agricultural, commercial, industrial etc. so the water should be monitored quality and quantity level. Author developed a low cost system that collected data from the all sensors are used for analysis purpose and for better solution of water problems [9].

3. MOTIVATION

A Prepaid water meter provides an interface between the utility and the customer. Successfully implemented, this meter will benefit the customer as well as the water in the following ways:

1. The device will show the remaining balance so that the consumer knows how much he has consumed and when he needs to refill the account.
2. The Municipal Corporation will have a better idea of water demand. This will help them to plan ahead.
3. The Municipal Corporation would be able to collect the expenses from customers in advance, so they will no longer have to deal with late payments.
4. Since the meter will send daily consumption data to the Municipal Corporation; it will help reduce water bypass and determine water leakage.

4. PROPOSED SYSTEM

In this system, Project is divided in three modules, Hardware Module consists of hardware parts like Flow Sensor, Solenoid Valve, Turbidity Sensor and Arduino for controlling the flow of water. Web Server Module consists of server parts like web server, database, web app to fetch and store the reading of meter.Website/Application: It consists of application part like website or mobile application to monitor usage of water. A solenoid valve is used as a water controlling valve, it is a simple electromagnetic device that converts electrical energy directly into linear mechanical motion. A solenoid valve is the combination of a mechanical valve and basic solenoid. So a solenoid valve has two parts namely-Electrical solenoid and a mechanical valve. Solenoid converts electrical energy to mechanical energy which operates a mechanical valve that is to open, close or to adjust in a position. The system will be an internet-based approach to measuring water quality and usage of water to provide comprehensive and accurate information about water resources on a real-time basis. In the previous method, the employee will go to that place and open the valve for a particular duration, then again the employee will go to the same place and close the valve, it is waste of time. The proposed system is fully automated. Here human work and time are saved. We use this approach so that everyone gets the equal amount of water. It is also used to avoid the wastage of water during the distribution period. Municipal Corporation Water Distribution System will be automated system and become easy and efficient to monitor the consumption of water centrally. Also people will get the information about their water consumption.Prepaid Water Meter will monitor the flow and consumption of water by each family. The system will get planted on the water supply pipes of every house. It will monitor and control the flow of water. We get real time data of consumption and can control the valve to avoid flow of water. User can see their usage anytime

through dashboard or web application. Proposed methodology is to develop a meter which calculate amount of consumption of water which is wirelessly directed to server which store records.The web portal or mobile application access information from server and display it to customer. Users can interact with web-based portal or with mobile application to monitor the usage and for payment of bills or to stop or start the service.

3.1 BLOCK DIAGRAM
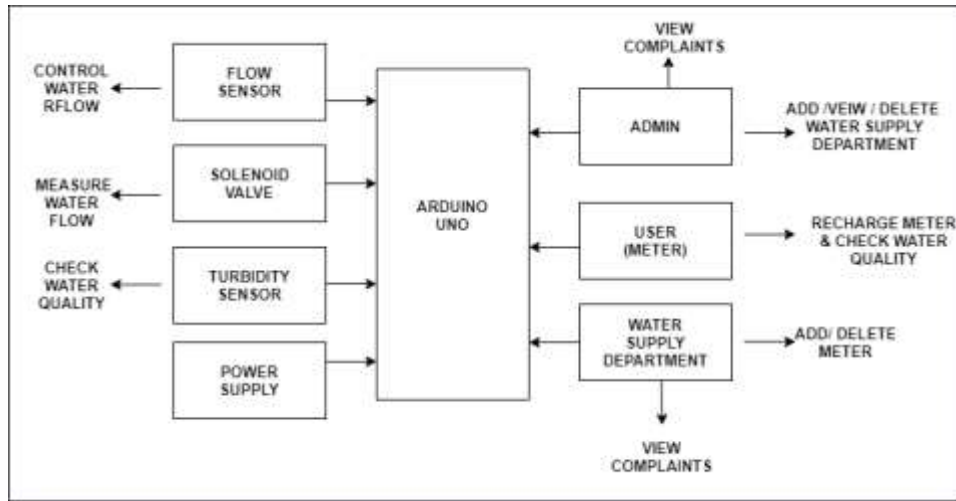
Fig -2: Block Diagram

3.2 System Architecure
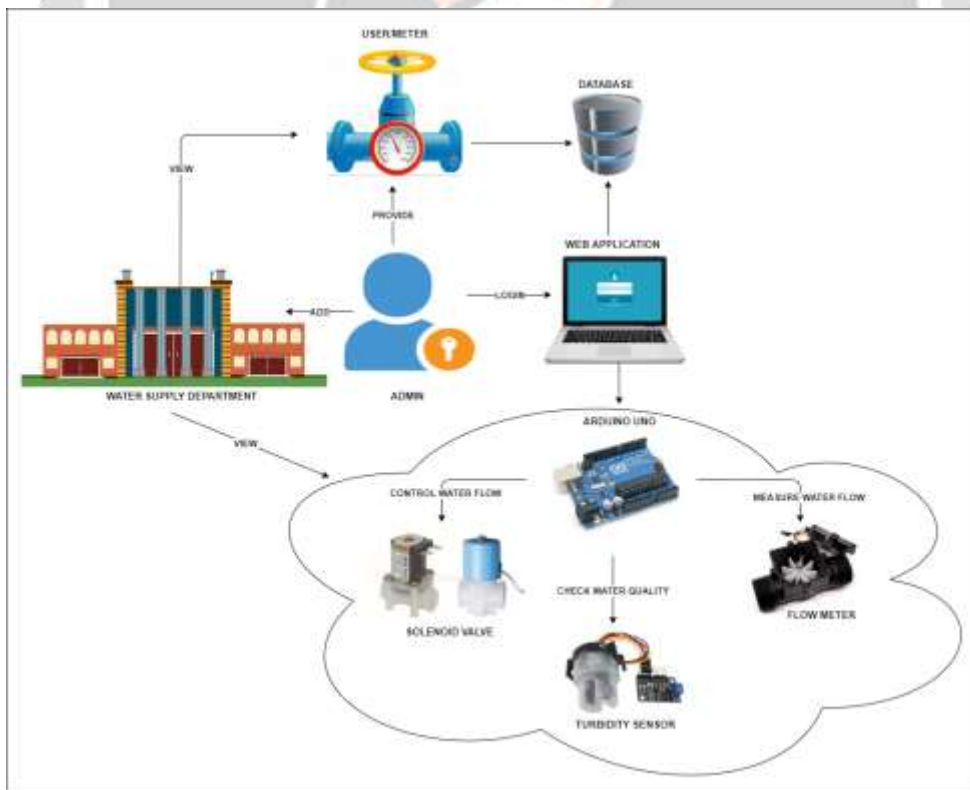
Fig -3:System Architecture

5. CONCLUSIONS

This paper will demonstrate the successful implementation of an internet-based approach to Prepaid Water Meter & measuring water quality and usage on a real-time basis. A flow sensor for measuring of quantity supplied, eliminating the drawbacks of traditional water metering systems. Future enhancements can include prepaid billing and automatic treatment of water based on the nature of contamination. Water metering system will be used for automated billing, eliminating the drawbacks of traditional water metering systems. This novel idea can be further extended to other areas like oil and natural gas monitoring systems.

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BIOGRAPHIES (Not Essential)

	Rutik Rajesh Patil, *Student,* *E & TC Engineering,* *Shatabdi Institute of Engineering & Research*
	Nishant Shriram Shrivastav, *Student,* *E & TC Engineering,* *Shatabdi Institute of Engineering & Research*

	Tejas Sunil Patil *Student,* *E & TC Engineering,* *Shatabdi Institute of Engineering & Research*
	Rushikesh Prakash Shirke *Student,* *E & TC Engineering,* *Shatabdi Institute of Engineering & Research*