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Automated Water Billing System & Theft Detection System

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Abstract: ***The amount of water that can be drawn in urban areas are at pre-decided flow rate. There are incidents of water theft where the users tend to draw more water than the pre-decide of amount which may leads to certain disputes and conflicts. In this project it is proposed to develop a system where the users and the water suppliers are way far beneficial in using the water which is by fixing flow detecting sensors at both the ends.Implementation with respect to this project is based on a flow monitor system which is a embedded one consisting of flow sensor to record the flow of water, microcontrollers that monitors the flow rate fixed at the user end and from there the info regarding the water usage will be sent to the remote stations through transmitters that are wireless and the users can get the water through solenoid valve which is electrically operated. This valve can be controlled by the water supply boards to dispense the water and off it when flow exceeds the limit.We can use GSM MODEMs for wireless communication to transfer the messages to the officer cell phone regarding the theft identified.***
Keywords: Billing, internet, GSM MODEM, theft Detection.

I. INTRODUCTION

Water forms to be one of the most important things of living beings on the earth which forms to be the usage in daily life from the dawn to dusk. The survey done by the World Health Organization (WHO) declares that there is no improved sanitation facility to the world's 2.4 billion population and the safe drinking water does not reach to about 1.4 billion people. We can say that right now across the country or even the globe providing water has become a major challenging task not only due to the inefficiency of the water but also due to many instances like water theft or leakages. As we see in daily life the contamination of water leads to numerous health hazards. WHO says "control of Water supplies to ensure that they are pure and wholesome as one of the primary sanitation" in order to mean how important water is to man. Water was an important factor in the location of the earliest settled communities, and the advancement in growth of cities has been seen due to the public water supply system. Digging well turned about to be the earliest ways of extracting water beyond the natural resources like river, lake, etc.Technology and Communication always try to make peoples life easier. So the main purpose of this paper is based on developing water billing system that can make the people realize the importance of water and automation in the bill payments. The problems faced in rural areas by the people can be resolved is the main objective of the project. The problems faced can be well known to everyone like water thefts and leaks. These type of problems can be resolved by an embedded system consisting of smart devices like ARDUINO, FLOW SENSORS, etc.. So the vision of this paper is that to make sure that adequate amount of water is being supplied to all the houses and if there is wastage in between the supply channel it could be predicted and taken care respectively by all measures. And the avoiding of conflict in bill payments can be seen as the billing is done separately for the individual house.

II. LITERATURESURVEY

The problem in billing for an entire building and the water theft has been involving many researches from past many years just to develop an automated water supply.

A. Urban Drinking Water Supply Control.

The advancement in the globe in terms of all aspects has made urban life appeal for the need of all the basic amenities as that of rural areas in an automated way so is the water supply system. Along with this there have been few more instances that have been contributing into the scarcity of water like water thefts in which people use HP pump to suck illegally to their streets or houses. The automation can be carried out by using the PLC and PC including all network components that can improve the existing system. The flow sensors proposal can be used to check the flow variation in both the ends. The system includes The Power Stations across wide geographical area has been provided with Remote Terminal Units- RTU like actuators and specific transducers. In certain large water distributing systems the monitoring of the main technological parameters are assured by the reliable instrumentation

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connected to PLC or RTU. The data acquired of SCADA system (Supervisory Control and Data Acquisition) represent the support for optimization of the process and data-driven Decision Support System. For WAN data transfer remote control functions based on OPC technologies and wireless communication components are used and system uses HMI implemented on PC to ensure the process supervision. The users can draw many advantages from this SCADA system like daily monitoring of the water usage as well as the bill recorded for the used and water, it is also energy efficient which can save as much as energy as possible in all aspects.

B. Embedded based System for Secure water Distribution.

1) *Increasing water scarcity:* One of the major challenges faced by the populated cities is the water scarcity. Problems like environmental issues, pollution and revenue has added up along with the scarcity. We can also see that there are no perennial sources and no proper distribution system in cities like Chennai. To overcome these problems there are numerous steps taken like bore wells, or public water taps and even water supply through trucks and Lorries. But as discussed in many papers water theft can be seen in trucks which are increasing gradually. In this paper we would propose an automated model through which the Lorries can be monitored and thus controlling the theft. The need for water increases forever until the population increases. Not just the water usage is seen in the public places but also at food outlets, factories and many industrial areas has made the raise in this problem.. As per the approximate estimation by 2050 there will be a great raise in the need of food and water for the population settled at that time. So, there are many steps taken in order to reduce the present facing challenges like produce more food with less water, improving the irrigation technologies and along with it water monitoring.

2) Water supply and distribution Food, water, shelter are the main basic needs of a human .The global coverage says that from 2002 of every 10 people

a) Approximate of 5 people have water supply pipeline at home.

b) 3 make use of some other sort of improves water supply like a protected or public standpipe.

c) 2 are unsaved.

d) In addition; 4 out of every 10 people live.

C. Water Supply Infrastructure by Wireless Sensor Network based Control System Development.

For water utilities water theft detection and leaks in water pipelines are the economically important issue. However, when being researched the controlling and monitoring of underground infrastructure has become a challenging task.. In recent years, for Advanced Metering Infrastructure (AMI) and Automated Meters Reading (AMR) wireless sensor networks are applied. In this paper, for water distribution network monitoring system solution for the found problem is wireless sensor networks as proposed by the authors. The case study by the authors regarding the solution thought has made this idea a successful one.

Due to fast growing demand for Automated Meters Reading (AMR) and Advanced Metering Infrastructure (AMI) systems development and maintenance emerging of new technologies opens great opportunities for internet services providers, telecommunication infrastructure, smart metering, and software. There has been creation of new synergies between software systems and embedded devices by the Service Oriented Architecture (SOA) and it is why it is becoming important in the field of devices integration-services for water supply client's community is given by the SOA in order to implement it among the people, but certain problems like applying SOA to devices like sensors is still faced, for example use of excessive XML scheme for low memory sensors.. The difficulty in replenishment in power resources has made the scenario more complex. The sensor lifetime is estimated only by its battery usage. Majority of research efforts have been mentioning about using middleware software running on more capable devices to resolve mentioned constrains. To make sure that sensor node does not undergo through resource intensive operations, the communication between middleware software deployed on gateway devices and the nodes in an ad-hoc manner and then translates their functionality as web services to external systems. The performance of AMR is characterized at least by two measures: metering data reading and transmitting rate, which could be considered as reliability of sending data, operating lifetime of the system without replacing batteries.

D. Low Cost Flow Sensors: Making Smart

1) *Water Monitoring Technology Affordable:* For water resources planning high quality water data are fundamental, scientific research, water and sanitation infrastructure design. However, to minimize problems like water theft and pipeline damage high profile automated water meters can be way costlier to implement. Consequently, the usage of these automated instruments can be a tough one for the under and developing countries. Thus, we shall see water data will be fragmented, inaccurate and based

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on the isolated measurements. This article describes a remote monitoring flow sensor which is cost effective for the developing countries. The sensor uses low cost sonar devices to gauge the river level like a proxy flow rates based on Global System for Mobile communications (GSM) via Internet of Things (IoT). The logging data is transmitted from sensor to a centralized server to provide real-time data analytics. The sensor performance in the informal settlement says how important is smart sensors and continuous flow data to inform the design of drainage and wastewater treatment systems. The pair of water-quality data with rainfall and flow data provides vision into the discharge patterns of gray domestic wastewater, not adding up the wastewater from the toilets for this sake. For collecting data smart IoT sensors that monitor SDG-related metrics and disseminate real-time data are the novel technologies that should become especially important. In realizing sustainable development as society comes closer to meeting the SDGs the important role can be played by the so-called data revolution. However, the accessibility of information together with an interpret, improved capacity to analyze, and communicate findings will be the reason for the success of the SDGs in the context of a data revolution. Water monitoring has been changing gradually along with the roles of sensors and other implementations through IoT. Many devices in the field of IoT has been improvising according to the change in the technologies as per the automation the IoT devices and networks has vastly improved in convenience and spatial temporal resolution which gives high quality data that can be accessed easily. However, the developing countries may still find the automated IoT devices too costly to implement so the problems may further continue without the automated world in such countries. The country government budget may not be sufficient to implement such devices by stretching the budget. So, in developing countries researchers feel that they often lack reliable, accurate, and precise water data. In addition, in certain countries whatever the situation is there are certain drawbacks for every automation that will be implemented. Even the theft monitoring devices may be faced at such countries if the monitoring system is implemented at certain public places.

E. Smart Water for Leakage Detection: Feedback

1) *About the use of Automated Meter Reading Technology:* The water distribution for various cities has been developed has improved due to advancement in the technologies in water meter system as per the automations. Smart meters using Automated Meter Reading (AMR) technology allowed water utilities to: i) detect the leakages in the pipelines that cause scarcity at places and (.ii) Help users to track the amount of water they consume or use at their house and know the amount of bill received as per the usage. This paper mainly speaks about the AMR which is helpful in certain populated cities to know about the leakages that may cause the water scarcity, which is conducted at the Scientific Campus of the University of Lille, which is representative to a small town. This paper presents the demonstration site as well as how the detection of leakages can be seen using the AMR whose role is the same as that of leakage detection. Urban people face the scarcity of water problems not only by humans but also many natural instances like climatic change or the temperature raise which may cause the metal pipes expand which may cause a defect in it. In this context, water providers have gone through certain aspects like metering, pricing and supply to ensure it's better than the previous research in developing the water metering system. The water supply board fixes a meter at the user end to know their usage and to monitor the water supply so that the user can pay bill for the amount of water he used. Meters are usually read by Manual Meter Reading (MMR) or Automated Meter Reading (AMR). The readings taken from that manually can have drawbacks like being tedious, expensive and involving intensive labor's interaction. The advancement in IoT field has made the work easier for the user as the usage can be tracked from the user place itself by wireless connections by implementation of GSM and AMR. These smart meters can be handled in a better way by an operator with a radio-equipped handheld computer. The vehicle equipped with communication devices number of meter read scan reach about 20000 meters per day. But still these processes which can be implemented through AMR can still be costlier. The meter reading can be made available through this at any frequency intervals and at any time of the day for tracking the meter or the water usage. Water utilities make use of Radio Frequency (RF), commercially available wireless and mobile networks like GSM-GPRS, Wi-Fi, Zigbee-3G and 4G Long Term Evolution (LTE) for concerning the communications networks,. The advancement in the water metering system has improved the accuracy in recording and taking down and even the usage tracking more accurate. Leak detection capabilities are being developed. The consumption profile on the user side helps in detecting the leakage of water; alerts could be sent by email or SMS message. AMR helps the water utilities in knowing the loss of water in District Metered Areas (DMA). Water balance can be done by comparing the water consumption and the water supplied to the DMA. Evaluation of leakage can be done by Minimum Night Flow (MNF) which is a service given by the AMR systems. This paper presents a feedback leakage detection using AMR on large scale water supply system.

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III. EXISTING SYSTEM

The present water supply has a completely no so responsible enough supply to the marked locations. The population growth has made the water supply even more miserable than ever thought. Eventually even if the water is being sufficiently supplied instances like water thefts or leakages have made the supply miserable.

Other expert reports on water management are consistent with the notion that "free water is wasted water," and yet refrain from using terms such as water theft and instead use the milder wording of an overuse of water. Graphs can be utilized to get the info regarding the water supply and the inadequacy faced in getting the water and handle information. Subsequently, the water scarcity has risen since the population increase has occurred gradually.

Innovation has gotten to be progressed in keeping water supply field as well; consequently the rate at which supplies' being utilized has heightened. Water meters measure the volume of water used by residential and commercial building units that are supplied with water by a public water supply system. The billing which has been measured is irrespective use of individual house which means that even if the house in a building has used less amount of water, there is a need for them to pay excess for which they have not used.

The water pipes channels are considered as weak as with respect to that of the climatic changes they rust and finally one day they break out as a result the water being supplied may not reach the consumers and they need to pay for the bill that is being generated. So these drawbacks which are being observed like water theft or wastage and the unautomated billing system can be solved in our proposed system.

So the global scarcity of water that has been observed right now may be because of the un-updated version o the water supply design and billing system.

IV. PROPOSED SYSTEM DESIGN

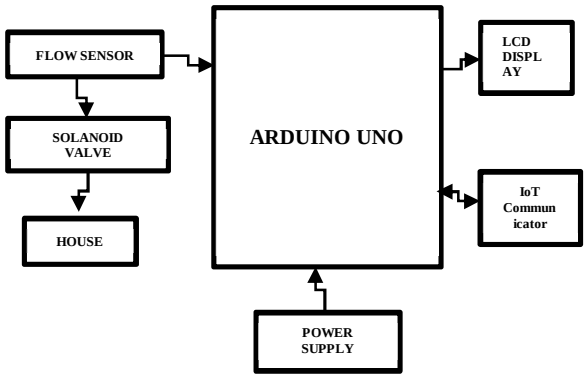


Fig: Automated water billing system Design

As seen in the existing system we incur many of the problems faced in the present scenarios like water theft and inadequate water supply and channel outbreaks etc….So, the proposed design makes sure that these problems are overcome by automated version of the existing system.

Analyzing the problems faced this system may provide solutions by taking appropriate measures like, i)To put in sensors at the user end to check the flow rate (.ii)To provide an effective system to analyse the water billing system for individual house.iii)To minimize the theft being seen which is leading to insufficient water supply(.iv)To make sure that scarcity of water is being minimized.

So, overall the inclusion of extra devices into the design can be helpful in reducing the scarcity of water by taking measures like, Flow sensors to make the flow rate appropriate so that they get to know their usage which means if theft is being noticed then it can be noticed in the billing by seeing the water used and the water bill.

The automated billing which gives the usage per house can be inferred and usage can be controlled which reduces the scarcity of water.

The water board which supplies water records the water which is being supplied to the building and the flow sensors fixed at the users individual house records the water flows through it. So, finally if there is a difference theft or leakage can be detected.

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V. IMPLEMENTATION

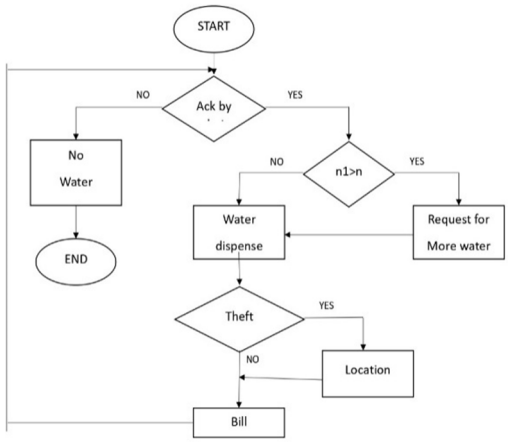


Fig: Flow Chart of how the existing system works

When the flow of water is initiated by the acknowledgement of the user the logic i.e. n1>n has to be satisfied to request for more water else normal amount of water will be dispensed and the amount of water that has been flowing through user and sender end will be checked if there's any theft and its location by knowing if there's difference in water used and dispensed and respectively bill will be generated and if the water is not required by the user no acknowledgement will be given by him.

VI. RESULT

A. The automated system gives raise to the refurbished system to the water supply which will be well automated.

B. Urban people will also be educated about this automation technique so that their major problems regarding water can be resolved.

C. Flow sensors to make the flow rate accurate and also to minimize the theft by looking into the bill showing water used and water dispensed.

VII. CONCLUSION

The scarcity in water and food has been causing extinction of many living species. A step towards minimizing the scarcity of one of these two can bring an enormous change in the present world and which is why we propose this project for the minimizing of scarcity of water in an automated way. So the basic amenities has to be saved so taking that in to consideration a water preserving project can be made using the flow sensors, ARDUINO UNO, Solenoid Valve which is also cost friendly. The project can be implemented in present generation with the proposed model in this project. The billing system helps people conclude their usage with respect to every month noting down the usage of the water so that they can track their over sufficient usage and control the Water usage accordingly. The over payment for the water, people uses have also been a major issue in the present generation so the project also helps in payment of the bill respectively to the water used by each house.

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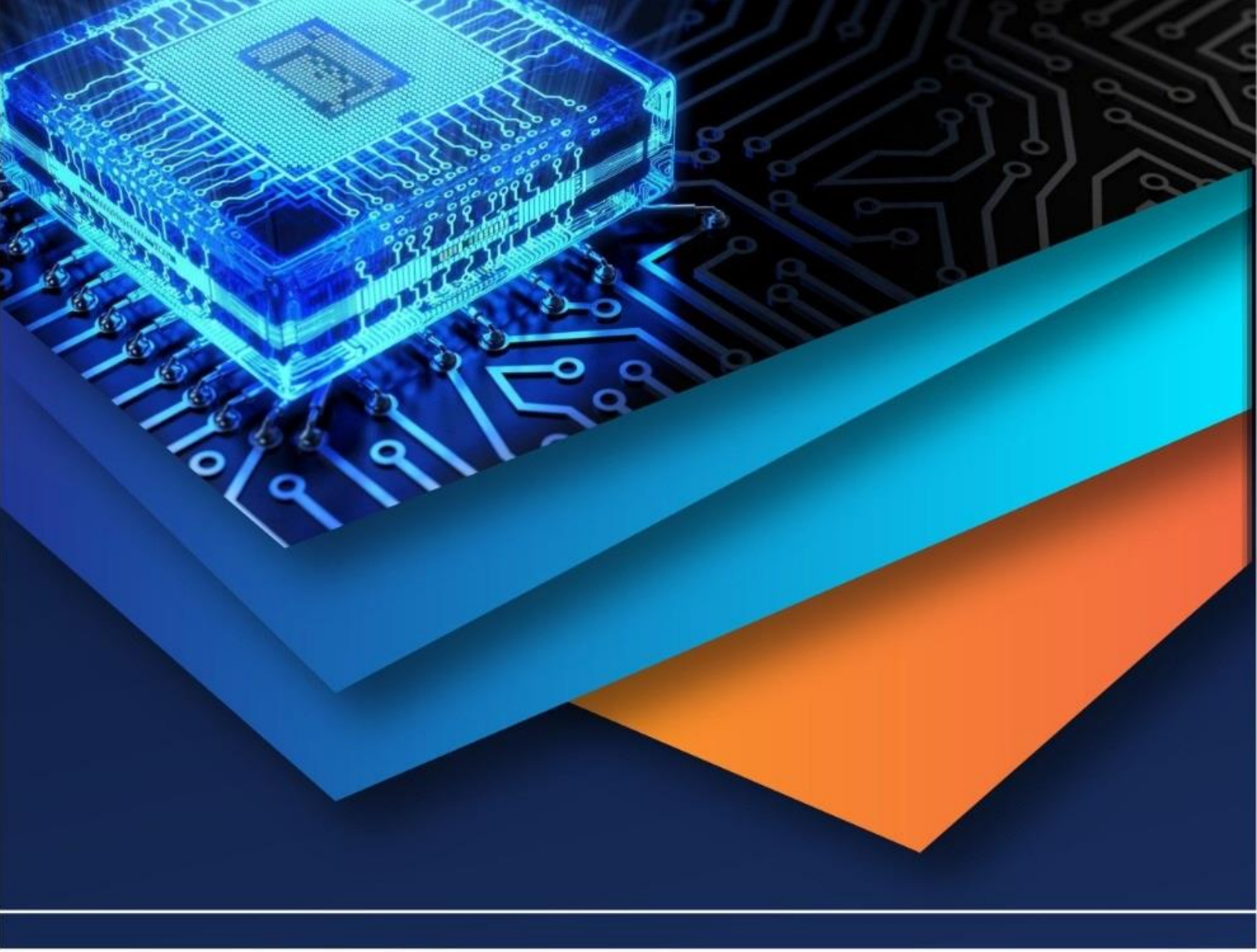
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