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Smart Water Metering Technology for Water Management

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Abstract -Water is the most precious and essential natural resource present on our earth. Water wastage should be prevented so as to have sufficient water to all the creatures on the earth. Our system is designed so as to prevent water wastage by providing equal and specific amount of water to all the people in urban societies and apartments. If a certain flat member needs extra water than allotted for the day then he would be provided with it on request. Thus this would avoid overuse of water and keep a timely check on the amount of water being used. The system would be controlled using Microcontroller. The reception of the request from the user and the signal to send water to a particular flat would be managed by a graphical user interface (GUI) which would provide admin as well as user login. With this perspective we have planned to design such a system so as to avoid wastage of water. We are designing this system on a small scale. In our system we have designed graphical user interface with this one can control the overall system.

Usually this interface is placed in admin department. At the beginning of the day the administrator puts the system ON and then fixed amount of water is supplied. In GUI we are providing user name and password to admin as well as to each user. If anybody wants extra amount of water then by using his user name and password required amount of water is provided by the admin. At the end of the month bill is given to the user for the extra water he used. Water meters are used for urban water management, especially for billing purposes. The relatively recent Smart Water Metering (SWM) technology provides high resolution and frequent water consumption data which can be used to improve feedback to consumers and thus enhance water conservation and management. This study reviewed the SWM technology and used a smart water metering pilot project to analyse the water consumption trends, and demonstrate the potential water conservation benefits of the technology. Smart water metering, water conservation, consumption, demand management smart water metering, water conservation, consumption, demand management

***Key Words*:**Smart water metering, water conservation, water management.

1. INTRODUCTION

Water is the most precious and essential natural resource present on our earth. Water wastage should be prevented so as to have sufficient water to all the creatures on the earth. Our system is designed so as to prevent water wastage by providing equal and specific amount of water to all the people in urban societies and apartments. If a certain flat member needs extra water than allotted for the day then he would be provided with it on request. Thus this would avoid overuse of water and keep a timely check on the amount of water being used.

The system would be controlled using Microcontroller. The reception of the request from the user and the signal to send water to a particular flat would be managed by a graphical user interface (GUI) which would provide admin as well as user login. In the recent past, the demand for freshwater is worldwide increased largely due to the worlds growing population, as well as chaining lifestyles and eating habits that have been associated with higher water consumption. The increase is more pronounced in urban settings which normally have higher population densities in addition to production industries that typically consume large amounts of water. The supply of water to urban areas in Australia is mainly the responsibility of state government-owned water utility companies and local councils. These agencies own and maintain water supply infrastructure including water meters, and their business model is in many aspects a monopoly since there are no competitors in the market. In general, the supply of freshwater to urban areas for domestic and industrial use has become more challenging, and this has been exacerbated by the adverse effects of climate change. The typical response to the problem of scarcity of freshwater resources is to use a variety of methods to conserve water, which practically means using less water while avoiding or minimizing wastage. Water conservation in urban areas has increasingly taken an integrated management approach, and has gone beyond the use of measures such as flow-restricting taps and showers, optimization of toilet and urinal flushing, and now commonly includes the use of water-efficient appliances and technologies like waterless urinals, electronic taps, automatic leak detection, rainwater harvesting and effluent water reuse.

2. LITERATURE SURVEY

T A smart water meter is a standard or conventional water meter, and fundamentally performs the same function. However, to make it 'smart', the meter is attached to a device that allows continuous electronic reading, storage, display and transfer of water consumption data (Figure 1). In this paper, the combination of the standard water meter and the 'smart' is referred to as 'smart water metering (SWM) technology'. The amount or variety, and frequency of logging and transfer of data obtained depends on how the water meter has been configured (Cole and Stewart 2013). The typical time interval of data capture and storage for residential smart water meters is hourly. Conventionally, water meters have to be physically read at a set time interval, a process that can be both labor and time intensive. For most domestic residences in Australia, meter reading is undertaken on a quarterly basis. While this may be adequate for billing purposes, it provides limited information on actual water use behavior, leakage and seasonal variation (Aravinthan et al. 2012). Effective management of water resources requires accurate, timely and reliable measurement and monitoring of water consumption practices (Willis et al. 2010). Hence, in more recent times, a developing technology known as Smart Water Metering (SWM) is now being used in many countries including in Australia (Drubin, 2016). SWM technology allows water authorities to gain water meter readings remotely and at a higher frequency, and in a

format that can be utilized for various purposes including demand and consumption management, leakage detection and water conservation (Drubin 2016; Oren and Stroh 2013).

3. TECHNOLOGIES USED FOR WATER SAVING

3.1 A Smart Sensor to help farmers save water

To use the system, farmers can simply stick the Crop-X sensors in the soil. The sensors transmit data to the cloud, where Crop-X servers crunch the numbers on the topography, soil structure, and moisture of each part of the field. After the data is analyzed, farmers get recommendations via a smartphone app for how much water to devote to each part of the field. Crop-X claims the process can help farmers can use up to 25 percent less water.

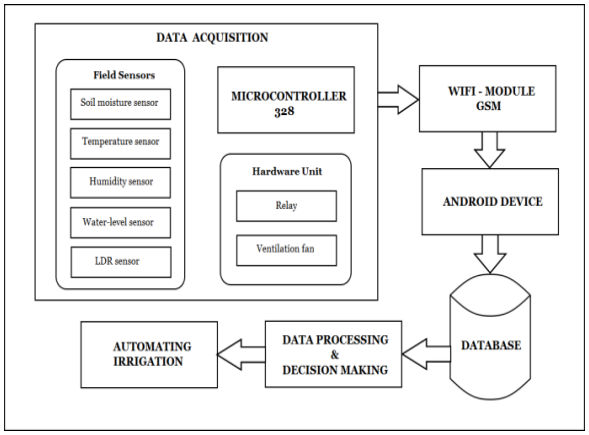

Fig.1 Architecture for Automatic Irrigation System

3.2 IoT based water saving technique for Green Farming

There are many ways to refer to modern agriculture. For example, AgriTech refers to the general application of technology to agriculture. Smart agriculture, on the other hand, is mostly used to denote the application of IoT solutions in agriculture. Although smart agriculture IoT, as well as industrial IoT, aren't as popular as consumer connected devices, the market is still very dynamic. The adoption of IoT solutions for agriculture is constantly growing. Namely, BI Intelligence predicts that the number of agriculture IoT device installations will hit 75 million by 2020, growing 20% annually. Because the market is still developing, there are still ample opportunities for businesses willing to join in. Building IoT products for agriculture within the coming years can set you apart as an early adopter and, as such, help you pave the way to success.

3.3 Time your water usage

Put a timer on your sprinkler and outdoor faucets/taps. Look for inexpensive, automatic timers that screw between the hose and the hose bib, or install a programmable timer on your sprinkler or drip system. An automatic timer can also help you water at times of day when the water can be absorbed the best.If you water something manually, set a kitchen timer before you turn the water on, or stay with the hose the whole time.Know how to adjust your sprinkler and irrigation timer settings for the seasons. Waterless or not at all during wetter, cooler weather.Don't over-water, and don't water any faster than the soil can absorb the water. If water is running off the lawn onto the sidewalk, cut the watering time or divide it into two smaller segments to allow time for the water to absorb.

Fig.2 Timer based water saving system

3.4 urban and rural water usages managements

Public water supply monitoring to avoid tampering and water man fraud is used in many ways. In this system, micro controller and LCD are arranged to display the quantity of water present in pipelines. As logic level converters and water pipelines are connected by RS 232 serial communication to detect the presence of water flow in one or more pipelines by using leds. Water should be released as per the instructions by officials' i.e. for example alternate days of supply are provided and only during specific period of time but not daily. All the details will be shown in the web server using IOT [9] [13] module connected to controller. So that authorities can take necessary action in case of misuse. This is an advanced, trouble-free, and fit and forgets system for water board. By using all these malfunctioning can be avoided. The flow rate is sensed by the signal conditioning unit when the water is passed through the pipeline. The sensor operates under certain predefined value. When there is a variation in the water flow due to any pumping of water through motor, it will be detected by the water flow sensor. The signal conditioning unit is used to give the desired input signal of the ADC. The analog signals generated due to variation in the flow of water sensed by the water flow sensor are converted into digital signals using Analog to Digital Convertor (ADC) and this digital signal is given to Microcontroller. This microcontroller enables the transmitter signal for intimate to water supply board. At the same time they enable the driver unit to closes the solenoid valve. Public Water Supply Monitoring to Avoid Tampering and Waterman Fraud using Smart Water Meter System. The microcontroller is doing have the capability for driving the solenoid valve. So here it was designed the driving Circuit using Traic to operate the solenoid valve for ON/OFF control. The flow rate conditions are displayed by the PC. Then here we proposed GSM Modem for wireless communication so that the information can be passed to many responsible officers cell phone for immediate action.

4. CONCEPT OF SMART WATER METERING.

A water meter is a device used to measure the amount of water consumed in a building. A "smart" water meter is a measuring device that has the ability to store and transmit consumption data frequently. Sometimes "smart" meters are referred to as "time-of-use" meters because in addition to measuring the volume consumed, they also record the date and time the consumption occurs. Traditional water meters are read monthly or bi-monthly by a person and a water bill is generated from this manual reading of the meter. "Smart" meters can be read remotely and more frequently, providing instant access to water consumption information for both customers and water utilities. "Smart" water meters are one component of an automated meter infrastructure (AMI) system that water utilities may choose to deploy. The simple graphic below shows how an AMI system transmits information and data in two directions - both to and from the customer and the water utility.

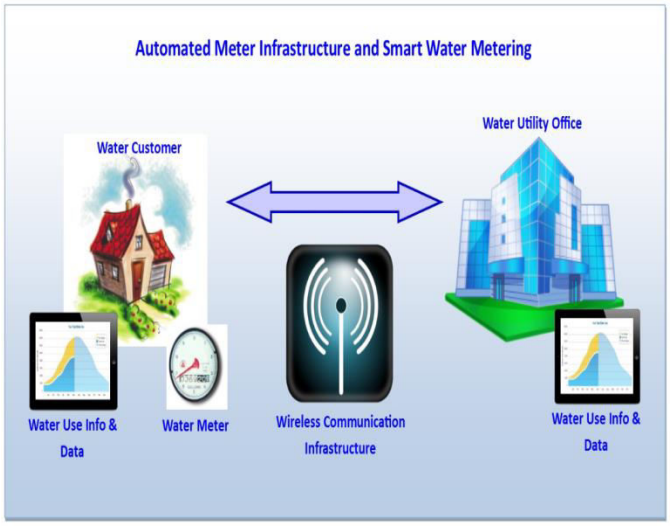

Fig.5 Smart Water Management

AMI systems using "smart" water meters are capable of measuring, collecting, and analyzing water use information and then communicating this information back to the customer via the internet either on request or on a fixed schedule. AMI systems include hardware, software, communications, consumer water use portals and controllers, customer associated systems, Meter Data Management (MDM) software, and supplier business systems. Water utilities are implementing advanced metering infrastructure (AMI) systems as part of larger “Smart Grid” initiatives that may also including electricity and natural gas services. AMI extends current advanced meter reading (AMR) technology by providing two-way meter communications, allowing information and commands to be sent toward end users for multiple purposes including: Real-time usage and pricing information, leak and abnormal usage detection, targeted water efficiency messaging, measuring changes in water use, and even remote service disconnects. The network between "smart" meters, utility business systems, and information portals allows both customers and utilities to take advantage of the usage data and information created through the AMI system. AMI differs from automatic meter reading (AMR) in that it enables two-way communications with the meter and the customer. Systems only capable of remote meter readings without two-way communication do not qualify as AMI systems.

Fig.4 Smart Water Metering

From the utility vendor`s internal approach, smart water metering means an infrastructure upgrade, new workflow protocols and less people involved. Cloud based application that manages data end to end is an enabler for waste preventive activities, that today cannot be performed with the current technology: real-time pipeline leak location, automatic signal for overrun debit, steam metrics regarding hot water production, final consumer improper or damaged water installation and indicate other preventive maintenance measures.

5. WIRELESS SENSOR NETWORK USED FOR WATER SAVING

Through trials of various Smart Water Grid technologies, WSN has identified a few key challenges. Firstly, there is a lack of interoperability technical standards for the three primary components of the Smart Water Grid, namely sensors, wireless communications and data analytics tools. This impedes the integration of multiple components of the Smart Water Grid system. Secondly, real-time sensor and meter readings generate massive amounts of data which require good organization and powerful analytics in order to extract useful information. Thirdly, job-redesign for existing staff must be considered as new roles are created and old roles made redundant with the implementation of Smart Water Grid. Fourth, public communications must address concerns adequately to ensure that society is accepting of the technology. Finally, as Smart Water Grid technologies have yet to mature, further research and testing will be needed to realize the full benefits of a Smart Water Grid.

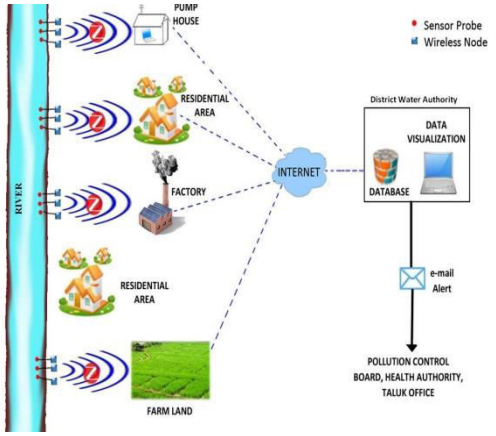

Fig.4 Iot based Smart Water Managements

6. CONCLUSION

This paper presents techniques for water –saving on all domains like urban as well as rural areas. The system which fulfill the user requirements as well as save the water. By this we conclude water supply monitoring and fraud system was built. Using proposed system, we can make centralized water control and fraud detection system. We can ensure fair water supply to all users by preventing water fraud and ensuring by taking necessary action. This real-time automation implemented in the system avoids wastage of water and man power.

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