Smart Water Usage Monitor

Bhagya VD, Hemalatha NM, Nethra K, P Vaishnavi, Shyamala G

Computer Science Department, BMS College of Engineering, Bangalore, Karnataka, India

Abstract- **Sustaining available resources is the most important issue faced globally. Increase in the population, urbanization and shortage of water due to less rainfall makes it difficult to provide fair distribution of water resource in real time. To solve this problem, we need an efficient system that provides better monitoring and controlling the consumption of water. Idea of IoT is used for uninterrupted monitoring and tracking of water consumption using Wi-Fi/LAN. Server collects readings of sensors showing the usage of water at every outlet through Wi-Fi/LAN. Users can continuously track the water usage in mobile application. The application can retrieve data stored in cloud and display it to users in a better format. Same application can be used to notify users if their water consumption exceeds a predefined range. This automation can help users to efficiently monitor the usage and keep track of the bills. Unknown leakage in distribution pipe is a major issue that adds up to wastage of water. Wireless Sensor Network Consisting of Water flow sensors can be used for leakage detection in pipes. Proposed system aims at notifying respective authorities whenever the leakage is detected so that immediate actions can be taken.**

Keywords – **Wireless Sensor Networks, Water Flow sensors, Arduino Uno, Android, Cloud, Wi-Fi/LAN Module.**

I. INTRODUCTION

Water is a scarce resource and it is the responsibility of every person to utilize without wastage. Houses and industries are prone to unknown water leaks that is highly undesirable and costly. Unfair distribution of water, overflow of tanks, leakage in pipelines, excess consumption, these are some of the problems that arise due to lack of proper water monitoring. It is important to maintain a proper balance over supply and usage. Also to come up with better solutions to avoid water loss. The objective of this proposal is to build a complete system that provides an uninterrupted water usage monitoring, controlling, and leakage detection pipes. This idea has been implemented using IoT where many interconnected objects collect useful information and communicate with each other using existing technology to come up with intelligent solutions to discovered problems. For achieving this, a flow meter is placed on every outlet pipe of each home for measuring the flow of water. Project employs cloud for real data storage. Mobile applications are developed such that they can retrieve the data stored in cloud and view the same in terms of readable graphs. Also showing estimated bill for usage. Leakage of water is determined by comparing the readings of flow meters installed at different nodes of the distribution pipe. Leakage detection is immediately notified to the respective authorities and further actions can be taken.

II. LITERATURE SURVEY

A. IoT using Wireless Sensor Networks

An IoT based Water Supply Monitoring and Controlling System with Theft Identification [1] is aimed at building a low cost efficient controlling system that can effectively monitor the water quality and usage. It makes use of water level sensor, flow sensor, Raspberry Pi, Arduino, Turbidity sensor all together solving identified problems like over-usage, quality check and proper distribution of water.

Automated Water Usage Monitoring System-7754501 [2] consists of 2 modules – Wireless Sensor and Server module. Wireless Sensor module collects real time readings at respective homes. This data is sent to Labview via Wi-Fi/LAN. The Labview can be accessed with any remote device with an Internet connection. Sensor module senses flow of water and sends to circuitry. RF module is used as a transceiver to transmit sensed data and receive control signals.

A case study of Internet of Things [3]- A Wireless Household water consumption monitoring System uses temperature / flow sensor, Wi-Fi router, wireless gateway that can receive data from wireless data collectors and passes it to Wi-Fi router after converting it to a Wi-Fi signal. Remote Sensor Software that is developed using visual basic that is capable of receiving household water usage data. Every component is networked using Wi-Fi and is allowed to communicate results and data collected.

Smart Water Management using IoT [4] includes a Wi-Fi module, water level sensor, transistors and resistors. A software is used to load the code onto the Wi-Fi module, which helps to upload data collected by the sensor to the cloud. It is a simple implementation for achieving water management in the small scale. This project can be implemented in a large scale for better understanding about usage and helps to find better solutions.

B. Using Android Technology

Wireless Water Flow Monitoring based on Android smartphone [5]- In this study, a wireless data acquisition system was developed for wireless water flow monitoring using android phone with NFC reader, NFC card, water flow sensor. Application Inventor for Android (AIA) a mobile application was developed. The whole idea is about creating a simple water flow rate monitor.

IoT based Smart Water Tank with Android application-8058250 [6]- This project makes use of Ultrasonic sensor to find the water level in the tank. A Wi-Fi module that can connect to wireless network using ssid and password and upload data to the cloud data storage. Firebase is used as the cloud storage platform to store data collected by the ultrasonic sensor. MIT application inventor for creating mobile application that can serve this purpose. All together to implement a smart water tank.

C. Water Leakage Detection

Smart Water Leakage Detection and Metering Device [7]- various subsystems implemented in this project are water flow meter, microcontroller, GSM module, LCD display, LED indicators, database, websites. EEPROM. Results are analyzed by plotting different like flow rate vs time, water consumption vs average flow rate, flow rate vs total water consumption to find leakage, etc.

Smart Wireless Sensor Networks for Leak Detection in water pipelines [8] uses flow sensor in between two points of the pipe, to monitor the flow of water. If there is a leakage, the flow rate drops at the second sensor. Thus the microcontroller intimates about the leakage. Here two modules are used these are transmitter and receiver. These modules built using ATMega8 microcontroller. These modules communicate using ZigBee wireless communication. The flow sensor at the transmitter measures the flow rate and these values are compared to the flow rate at the receiver side. If a change is identified in the flow rate values, it sends an alarm signal, indicating the leakage.

III. EXISTING SYSTEM

Presently, water usage is recorded by the water flow meter that is installed at every home. The readings recorded by the meter is manually collected every month and a bill is generated. Customer pays the bill amount in the water supply board. The current system is simple but can be recreated so that the water usage monitoring can take care of unknown leaks and wastage of water. In case of pipe breakdown or leakages, water is wasted until the respective authorities get to know that the leak has occurred. Also customers can not keep track of their usage or get notifications when their metered range is crossed. Also users can not find out if there is a unknown leak in the distribution pipe that has been contributing to the increased water bills. As and how the requirements increase, the overall system should be changed to meet all the requirements.

IV. PROPOSED SYSTEM

The aim of the project is to create a water usage monitoring system that provides uninterrupted water flow monitoring, controlling and leakage detection in pipes. For this flow meters are installed at different nodes to record the readings of

water usage. These readings will be sent to microcontroller. A Wi-Fi/LAN module is used to store these readings on Firebase cloud. Mobile app communicates with cloud and can provide users an access to their usage data in a graphical form. User of each apartment is given login credentials to view their monthly/weekly/daily usage, estimated cost, etc. Users can be notified when usage exceeds each range. Also leakage can be detected by comparing the readings of flow meters on the same line of pipe connection. Also immediate actions can be taken whenever leakage occurs by notifying it to the respective authorities.

Proposed system can improve the existing system by implementing most of the useful requirements so that wastage of water is reduced. Moreover, users can track their water usage with user friendly applications.
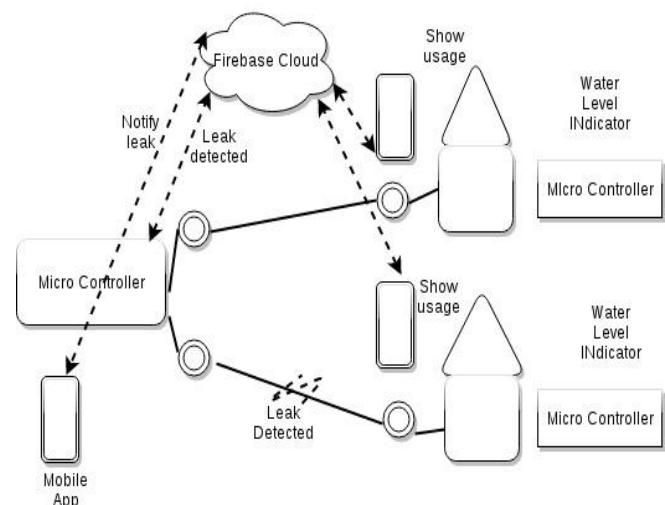

Fig.1 Example of the workflow in Smart water usage monitor

V. CONCLUSION

Water equals life. It is a non renewable resource therefore it is our duty to conserve it for future use. Conservation of water not only saving it for coming generations but also to make efficient use of existing resource. Advancement in IoT and communication technologies has improved the traditional techniques used for conservation of resource in every aspect of life. Water usage monitoring system aims at creating a complete module that can track usage by every user, generate bills, notify users if they exceed each metered range. Leakage detection should be notified to the intended user so that further actions can be taken to avoid wastage. Automatic Tank filling takes care of Water underflow and overflow conditions avoiding manual control of it. Proposed system can automate the overall water usage making it easy to maintain. User friendly applications makes it easy for a user to keep track of usage and billing. Implementation of the proposed system in large scale can help in efficient water monitoring and leakage detection.

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