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IoT BASED SMART QUALITY WATER MANAGEMENT SYSTEM

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Abstract: Water scarcity and water stress issues pose a serious threat to the global population. The traditional way of manual meter reading is furthermore inconvenient and time consuming, and it wastes resources. This method is also unable to manage the sustainable water resources effectively since it requires efficient, accurate and reliable monitoring techniques that enable the utilities sector and consumers to know the level of water consumption in real-time. Real-time smart water meters that can be monitored by the user are essential and constitute a key component of the water management system. A smart water-monitoring system based on internet of things will make users mindful of their water consumption and help them to reduce their water usage. At the same time, users will be alerted to abnormal water usage to reduce water loss.

Keywords: *Smart water meter, Internet of Things, Cloud storage, android application, storage, android application*

I INTRODUCTION

The earth has an abundance of water, but unfortunately only 0.3% of water is usable by humans. That's why, it is the need of mankind to save the water through proper management. Hence, there is a need for better water distribution technology. Water is commonly used for agriculture, industry, and domestic consumption. Therefore, efficient use and water monitoring are potential constraint for home or office water management system. This priceless resource usage need to be well monitored and for that a real-time monitoring system.is need right now [1].

Old and trendy water management systems have manual water flow meter whose reading is checked occasionally and there occurs lack of attention toward the usage and awareness. So there need a real time monitoring system which notice every usage and take necessary steps against extra wastage which were otherwise neglected [2][3].

By looking into present demand it motivates us to design a system which will regularly monitor the water flow. Despite of that there is immediate requirement of quality checking as well as acknowledgement of leakage (if any). It also guide us to get the user aware of the water level in tank, which user never knows.

For this purpose a wireless system need to be established to ensure user friendly system. And hence Internet of Things (IOT) appears as a boon to the system. The internet enabled system can let the user to fetch the data from any corner of the globe. The IOT based system is only responsible for real time monitoring and enables immediate action for any mishap [3][4].

In our proposed model, we have used raspberry Pi as a controller and different sensor which can upload data to the cloud. The system consists of different sensors like water flow sensor, ultrasonic sensor, pH sensor, water control valve and a raspberry Pi as a core controller. Our proposed model helps to indicate the level of water available in the tank, it checks the quality of water, identifies the water leakage in tank and prepares billing by keeping track of daily as well as monthly water usage. It displays all this information on android application in smartphones using Wi-Fi. Ultrasonic sensor is the basic component for the water level indicator. Our Project helps to indicate the flow of water and its corresponding bill is generated. The

objective of our work is to measure the water flow and correspondence bill generation. It also indicates the level of water available in the tank and to check the quality of water. Hall Effect Phenomenon (Water Flow Sensor YF-S201) is used to detect the leakage in pipeline. The information about billing, leakage and quality of water will be sent using Android Application to the municipality section which elaborates the results and discussion. Final section concludes the proposed work and suggests the open area for future advancement in the system.

II RELATED WORK

Many methods for water management and smart water billing have been proposed in the past. This section provides the literature on major research on water billing and management system.

Satish Palaniappan et al. [5] presented AMR (Automatic Meter Reading) technology that can be adopted for automatic collection of meter measurements as well as transfer it to the central database for billing. From this survey it is found that although the technology is very good but there requirement maintenance and there is need of automated system.

Further, Laxmi Jayannavar et. al [6] presented IOT based architecture for a water distribution system that can be constructed of in order to obtain real time data base system for water usage. It resulted in restricted water supply if instruction is not followed which is its major drawback. Again, Chalitha Kanchana et al. [7] proposed the SWG technology that can monitor water quality, distribution, usage of Potable water and Chemical leakage detection in rivers. Subsequently, many IoT based water management systems[8][9][10], water quality control systems [11][12] and remote water distribution systems [13][14] have been presented in those the systems volves are controlled through web interface based on water flow sensor's value to ensure equal and adequate water distribution to every connection.

From the extensive literature survey we have found that, a Smart water grid can be design in rural and urban areas incorporate with future water management platform. AMR (Automatic Meter Reading) technology can be adopted for automatic collection of meter measurements as well as transfer it to the central database for billing. On the basis of IOT architecture, a water distribution system can be constructed in order to obtain real time data base system for water usage. With the help of various sensors like pH meter, ultrasonic sensor water quality a as well as quantity in tank can be measure. This technology can be used in finding leakage as well. The valve can be controlled through web interface based on water flow sensor's value to ensure equal and adequate water distribution to every connection.

III PROPOSED SYSTEM

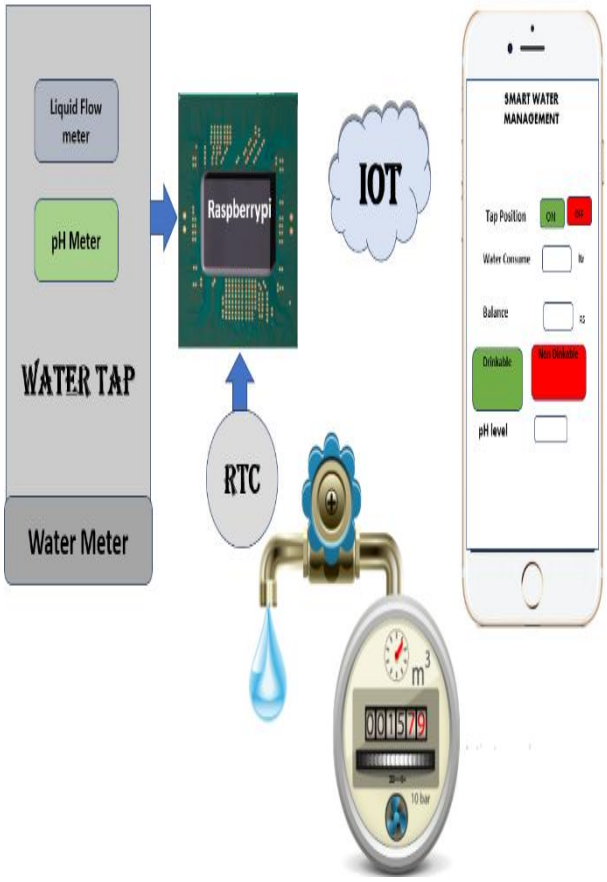

Figure 1. Flow diagram of proposed system

Fig 1 shows the flow diagram of smart water meter comprises of The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, used for interfacing the pH Sensor, hall effect water flow sensor and water level sensor. This Hall Effect sensor sits in accordance with your water line and contains a pinwheel sensor to gauge how much fluid has travelled through it. There's a coordinated attractive corridor impact sensor that yields an electrical heartbeat with each upset. The corridor impact sensor is fixed from the water pipe and permits the sensor to remain protected and dry. The pH meter is utilized for the

quality check if water is alright for drinking. A decent pH level is significant for human wellbeing; it ought to be around equivalent to 7.Water level sensor brick is designed for water detection, which can be widely used in sensing the rainfall, water level, even the liquate leakage. This item can judge the water level through with a series of exposed parallel wires stitch to measure the water droplet/water size. The output of all the used sensors is given to the cloud through IOT application for secure storage and display on app. Our mobile application display all the reading like water consume (reading per minute and total reading), pH value of water (drinkable/non drinkable), leakage detected. In this way the desired water consumption get updated on daily basis on the customer mobile.

In our proposed model raspberry Pi controller is used to control all the sensors. This controller is connected to the internet through Wi-Fi and displays all this stored information on an android application installed in smartphone through Wi-Fi. Raspberry Pi sends and receives the data or command to/from cloud or hosted database for performing the real-time operation. It also shows how much water is dispensed and at what time. It gives warning indicator if daily previously set limit is crossed. So that it helps to restrict the unnecessary usage of water. Additional water usage is displayed in android application.

IV EXPERIMENT SETUP AND RESULT DISCUSSUIN

This device is better than the existing systems and can be really helpful to individuals in water conservation because of the following reasons: With the assistance of corridor impact sensor, water stream is measure carefully. One can screen water quality with pH meter and use their utilization.

Real time information investigation is accomplished. It generated immediate bill against utilization. It has reliable framework with Android Application control and easy for establishment.

Fig 2 shows the desired mobile application with all the required information displayed on the screen. By this way customer comes to know all the details of its daily water consumption efficiently. The mobile application is developed by using MIT APP INVESTOR platform. It is a cost free app for students to make their applications students to make their applications

Figure 2 mobile application

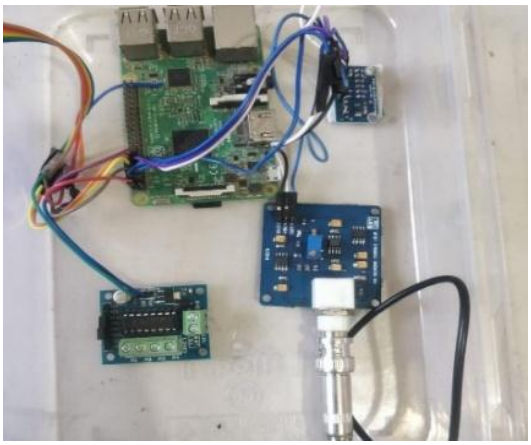

Figure 3. Interfacing of system components

Figure 4. Model for water management system

Fig 3 shows the interfacing of all the three sensors as level detector, pH, flow sensor to the raspberry pi board. Fig 4 shows the level detector, flow sensor and pH sensor attached to the tank for the device operation. In table I all the system related specifications are provided for proper selection of devices during its implementation.

Table I. System components and its specifications

Component	Specifications
LCD	16x2 Display Operating volt 5V 5x8 dots include cursor
Liquid Flow Sensor (YFS-201)	Model: YF-S201 Sensor Type: Hall effect Working Voltage: 5 to 18V DC Pulse frequency (Hz) / 7.5 = flow rate in L/min Pulses per Liter: 450
pH Sensor	Output: 4-20 mA. Range: 0-14 pH. Accuracy: 2% of full scale. Maximum Pressure: 40 psi Operating Voltage: 10-30 VDC.
Water Level Sensor	Working voltage: 5V/3.3V Working Current: <20ma Interface: Analog Width of detection: 40mm×16mm Working Temperature: 10℃~30℃
Raspberry pi	Processor:- Broadcom BCM2837B0, Cortex-A53 64-bit SoC @ 1.4GHz Memory:- 1GB LPDDR2 SDRAM Connectivity:- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE Gigabit Ethernet over USB 2.0 (maximum throughput 300Mbps) 4 × USB 2.0 ports Extended 40-pin GPIO header Video & Sound:- 1 × full sixed

V. CONCLUSION

In this paper, a model of smart water meter with water quality monitoring is presented. The proposed system is created with the use of different sensors, Raspberry Pi as controller and Cloud for storing the data from Raspberry Pi and sending the command to raspberry PI for measuring water quality and controlling water distribution. The generated data can be viewed using web interface all over the world. The advantage of the system is to provide the adequate water supply with pressure and good quality water to every house, industry, and others. The proposed model can be implemented as a part of the smart city.

On the basis of comparative of system used for Water Management System for Smart City Using IoT, our system is efficient in term of cost, accuracy, time and it require less man-power.

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