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Smart Water Consumption Monitoring and Controlling System

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ABSTRACT

Due to the drastic changes in technology in the last decade, so many advancements were introduced in the Water board. In this system the user has to purchase a mobile Bluetooth based recharge card and it should be inserted in the slot provided on prepaid flow meter kit. To use the system again the user has to reload the units by recharging the system. The user has to recharge and after successful recharge, the water supply automatically gets ON. This project provides a best solution for the users to know how much the amount of water is consumed in their day-to-day life and also the amount consumed is under the user's control. The system ensures a steady, safe and sufficient water supply required by the user without wasting the water along with a flexible billing cycle. Since excess water usage is prevented,the water as well as money is saved by saving on unnecessary distribution. Thus, the system eliminates human efforts and is easy touse.

KEYWORDS: Prepaid water, Raspberry-pi, Bluetooth, EEPROM, Level Sensor, etc.

1. INTRODUCTION

In our day to day life water is an essential resource for every living organism on the earth. Drinking Water Distribution Systems facilitate the carrying of potable water from water resources such as reservoirs, river, and water tanks to industrial, commercial and residential consumers through complex buried pipe networks.

Providing sufficient water of appropriate quality and quantity has been one of the most important issues in human history. Cost recovery is a key element for sustainable water supply. Currently most water service providers are experiencing problems with cost recovery from community water supply schemes. Many are considering introducing prepayment systems or other innovative ways of cost recovery.

Prepayment water metering systems are already available in South Africa although historic and practical performance reports in a 'real' environment are in many cases still lacking. Although this reports by no means the final word on this subject, it predicts that both water service providers and their customers are likely to welcome these systems as cost effective and user-friendly.

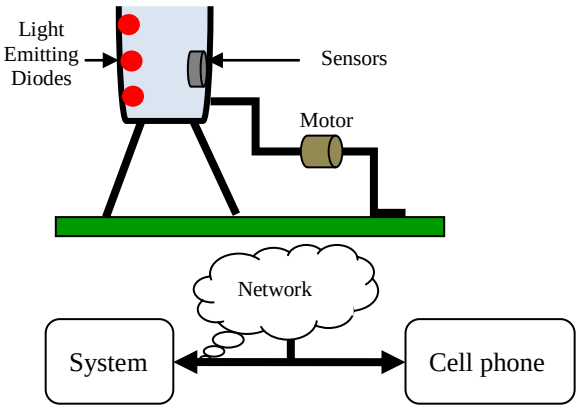

Fig. 1. Water Monitoring System [5]

2. LITERATURE REVIEW

The authors in [1] proposed that the water flow sensor is used for determining the flow rate. The flow sensors thus used will keep the track of the amount of water flowing through each pipeline which is requested by the user and will automatically shut off the valve whenever the threshold is reached.

During distribution of water flow rate is determined so that, water is equally distributed. This whole data is sent to webpage via Wi-Fi so that the

system can be accessed remotely from a computer. Both, the distribution and amount of water will be monitored from the webpage which can be displayed anywhere using the internet. Thus, the proposed system successfully helps in handling water supply effectively.

The authors in [2] proposed that although valves are turned on/off according to the user need. Some users do not receive the water or receive it at low pressure. To overcome this issue, an embedded device which has control valve can be used. With the help of proposed system, the user can receive the amount of water required withpressure. In real time to distribute water with pressure,flow sensor data can be monitored and control valves can be turned on/off.

The authors in [3] proposed that a relay can be used in a water distribution system. It is used to driveAC/DCloadandalsousedforauto-switching purposes. A magnetic field is generated due to the current flowing through the coil of relay, which changes the switch contact. Since the coil current can be turned on/off relayshave twopositions. Due to relay two circuits can switch between each other.

For example, a low voltage battery circuit can be used as a relay to switch a 230V AC main circuit. Relay does not require any electrical connection still has magnetic and mechanical linkage between two circuits.

3. EXISTING SYSTEM

In the existing system [1] water is distributed to the residential areas manually. The opening of valve will be looked after by human labor. So in this process the particular person has to wait for desirable time period for closing of the valve. However the amount of time consumed is very high in the system as it needs manpower. Also if the operator fails to perform the task accordingly, he will not get desirable output. By making use of water motor, people can take an excessive amount of water for their personal use which may lead to scarcity and unavailability of water. The existing system is a standalone system and does not have any management over proper consumption of water. Thus, it works as an open loop system and is relatively inefficient.

There are several limitations in the existing system which is as:

- Monitoring is not up to the mark
- Excessive wastage of water by the user which thus leads to scarcity of water and difficulty in managing it.
- The amount of water required by any user cannot be predicted. No standard limits are set.
- The user has to pay the entire bill even though water is not consumed by him sometimes.
- The existing system requires a periodic human effort in order to maintain proper water supplying cycle, which thus makes the system inconvenient and less effective.

4. PROPOSED SYSTEM

Water is the most valuable resource on our planet. That's why efficiency and quality are top priorities for the water industry. These goals are becoming increasingly difficult to achieve as the expense of providing clean water grows in many regions, while at the same time operations have to be as efficient and economical as possible. The consistent, end-to-end digitalization of plants and processes helps the water and the water industry meet these challenges. In the proposed system, the water from the level tank, which is built according to the daily water needs of the user, is being supplied to the user. The level tank consists of level sensors, which gives signal to the raspberry Pi, indicating the water level in the tank. After receiving the signal from the level sensors, the raspberry Pi will give command to the solenoid valve accordingly to open or shut down the valves and so to stop or start water supply. Thus, as per the water requirement of the user, the relay of each apartment will be turned on and the essential water supply will be provided to theuser.

Whereas, for an excess amount of water, required by the user, he will then have to opt for a recharge scheme, in which the level tank will supply a required additional amount of water to the user by turning on the relay again and thus the pump. All the water related calculations will be displayed on the LCD. When the water in the tank gets decreased, the authorized person will get a notification via buzzer. Whereas for the real time systems and in order to further expand this system, a recharge scheme having an option for prepaid/postpaid schemes using IOT is being used.

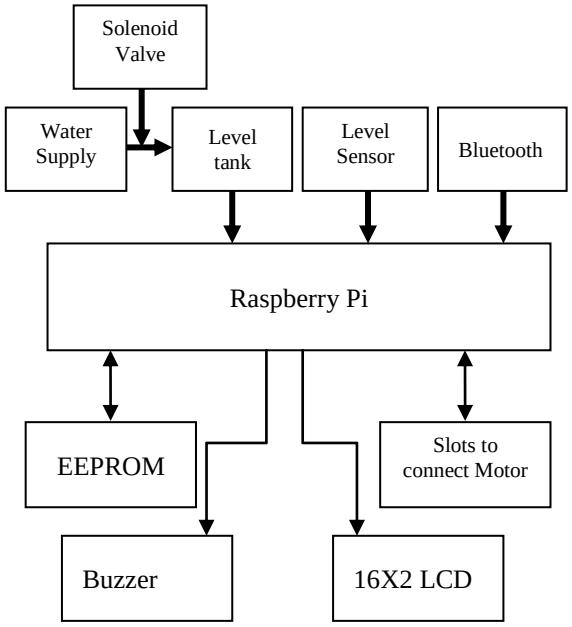

Fig. 2. Block Diagram of Proposed System

5. IMPLEMENTAION

Water level sensors are generally used for measuring the level of water in the reservoir or any overhead tank. They are normally used for sensing the water level, water leakages etc. The water level sensor primarily consists of three parts as: 1MΩ resistor, an electronic brick connector and anumber of bare conducting wires. It functions by having a series connection of "exposed traces" which are analogues to ground. A 1MΩ weak pull-up resistor is required which pulls up the sensor value till a drop of water shorts the sensor trace to the grounded trace. The water droplets or water size can thus be measured due to this by making use of a series of exposed parallel wire.High sensitivity along with low power consumption are the two major characteristics of the water level sensor. The features of water level sensor and DC pump are below:

- Water level Sensors
  a) Operating voltage: -3 to 5 VDC
  b) Operating temperature: -10°c to30°c
  c) Measuring range: 0 to 15feet
- DC PUMP
  a) Input Voltage: 4.5-12V DC Power: 3W
  b) Hmax: 0.4-2.0M
  c) Qmax: 200L/H
  d) Size: 38 * 34 * 27mm Wire Length: 40cm

6. RESULTS AND DISCUSSION

For the proposed system to work in real time, an IOT based system shall be implemented in which, the system will be designed by keeping the key parameters like the daily water requirements of the user, the previous amount of water supplied to the user along with the postpaid/prepaid recharge schemes for an additional amount of water so required, on the top. The bill payment for the consumed amount of water can be done by online bill payment process such as net banking or any other application. With the recharge schemes also the system should be fully battery operated, so that the system does not fail to work efficiently even in the times of power cuts or any other malfunctions. Also the system should be adjustable according to every user's tank. Thus, the proposed system can be successfully usedor handling water in an efficient way.

7. CONCLUSION

The proposed system is successful for ensuring a safe and steady water supply, without wasting it. Also a flexible billing cycle is obtained by saving on unnecessary distribution. Hence, the user can make use of a minimal amount of water thus, preserving it for the water. The system is successful in preventing wastage of water by making use of different prepaid /postpaid recharge schemes, for an additional amount of water so feedback required by the user.

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