

Perspicuous Water Distribution Management System based on IoT and Raspberry Pi

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Abstract: Water is the most valuable and precious because it's a basic need of all the human beings but, now a day's water supply department are facing problem in real time operation. A smart water management system for water distribution support and losses prevention by automatic controlling of water connection networks using RASPBERRY PI [1] and IoT solution. The system operates through the smart monitoring of the water flow in pipes of the water distribution networks, aiming to ensure quality and quantity of the water supply, knowing that how much water quantity people consumed in every home. We are focusing on continuous and real time monitoring [4] of water supply in IoT platform. Supply of water with constant monitoring makes a proper distribution [4] so that, we can have a data of available amount of water in tanks, flow rate, abnormality in distribution [4] line. Monitoring can be done from anywhere as central office (As per Karnataka, BWSSB). Using thingspeak as free sever data continuously pushed on cloud so we can see data in real time operation. All data addressed by the central unit are available on-line by means of a supervisory platform using different sensors with controller and raspberry pi. And also the valve turns on/off to stop the water supply whenever the flow rate exceeds a predefined limit. This system which helps not only in monitoring consumption and also in-time payments with less manpower for water Suppliers.

Keywords: BWSSB, Cloud, IoT, Raspberry Pi, ThingSpeak, Water Management.

1. INTRODUCTION

According to recent survey, water has become a big issue because of less rain fall, increase in population in many cities are facing this problem. They don't have sufficient amount of water for their daily needs. Due to lack of monitoring water can't be supplied properly to all areas hence, there is a need of continuous monitoring, proper distribution, controlling and excessive consumption [1]. In order to implement the proposed water supply system, each consumer should be provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate

using a flow sensor and to transfer the same to a remote monitoring station using wireless transmitter and it is also provided with an electrically operated solenoid valve to supply water to the consumers [4]. By focusing on problems in conventional methods our system design and develop a low cost embedded system device for real time monitoring of water distribution system in Internet of things (IoT) platform [4]. IOT is a world where many of objects can sense, communicate and share information all interconnected over public or private Internet Protocol (IP) networks. These objects which are interconnected have data regularly collected, analyzed and used to begin action, providing a wealth of intelligence for planning, management and decision making. The automation in the water distribution and management with technical advances by sending a notification to the user end through GSM module which is a globally accepted standard for digital cellular communication. Depending upon the status of the payment there by admin controls the solenoid valve using cayenne module which is a solution for building IoT application. This paper deals about the web based controlled water distribution in different areas and distribution of water according to bill payment [1].

1.1 Objective of the paper

To measure the quantity and quality of water consumed by single user. To verify the pH level of corporation water. To pay a cost for consumed water intake and if payment is not done by declined date, water connection is blocked through web. To upload all the details onto the ThingSpeak cloud and finally to control solenoid valve by the cayenne module. To display the value of pH, water reading, day count & cost on LCD.

1.2 Scope of the paper

The important consideration was that it should benefit the day to day life of the people, it should meet the daily needs of every human (viz Water, an important thing for existence of human being), a project model which would be a beneficial to the society and reduce their problems.

To solve these problems the proposed work plans and builds up at a low cost model for continuous checking of water circulation in Internet of things platform. IoT is a scenario which can be used to detect billions of objects, impart and share data; all are organized in a manner over Internet Protocol (IP) systems. These will aggregate the information constantly and afterward exchange the information to the cloud [1]. This system solves problem of Overflow, consumption, Quality of water and makes a proper distribution. Continuous monitoring [1] and controlling from central server is possible using this system.

2. LITERATURE SURVEY

IoT based automated water distribution system with water theft control and water purchasing system [2018]-Objectives: The key idea of this paper is to plan a cost proficient framework to accomplish better water supply by regular supervising and furthermore controlling it from a central server to eliminate problems in the supply of water to the habitats.

Smart Water Management using IoT [2016]-Objectives: This paper is to present an IoT device which help to manage and plan the usage of water. This system can be easily installed in residential areas.

IoT technology for Smart Water System [2018]-Objective: There is a need to monitor and protect the water with a real time water quality monitoring system in order to make active measurements to reduce contamination. This paper focuses on discussing the architecture, applications and need of IoT in water distribution system.

Internet of Thing (IoT) Enable Water Monitoring System [2018]-Objective: In this paper we proposed an IoT based water monitoring system that measures water level in real time. Our prototype is based on the idea that the level of water can be very important parameter.

3. TECHNOLOGY AND METHODOLOGY

In this proposed system, RASPBERRY PI [1] processor based controlling and automation is handled by use of flow sensor [1] and pH sensor. For web upload data application is done by using ESP8266 module and cayenne. Initially raspberry pi [1] based system was developed for the water distribution [4] or supply system management. The user need to know how much power consumed during water supply, which is measured by using a water flow sensor [1], it will measure the quantity by water force applying on the sensor module which is placed in the inlet pipeline. The water quality is check by pH sensor. The two analog

values are cannot directly given to the raspberry pi [1] processor. So before that output of the sensor given to the PIC microcontroller [3] and the value is uploading on cloud. The corporation admin and user has their ID to monitor the data. The cost is calculated based on consumption (per liter). If the payment is not done by the due date the water supply is blocked by remote connection which is done by IoT cayenne module. For this setup in our project solenoid valve is used based on hardware controlled by driver circuit. All the data are displayed in LCD and webpage. The total system uses 5-12v voltage provided by the power supply unit.

3.1 BLOCK DIAGRAM

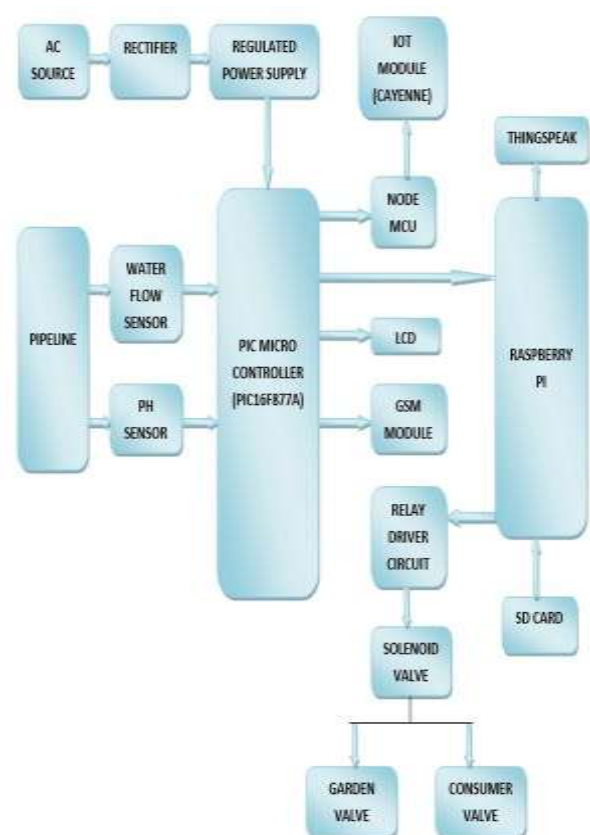


Figure 1: Block Diagram

3.2 FLOW CHART

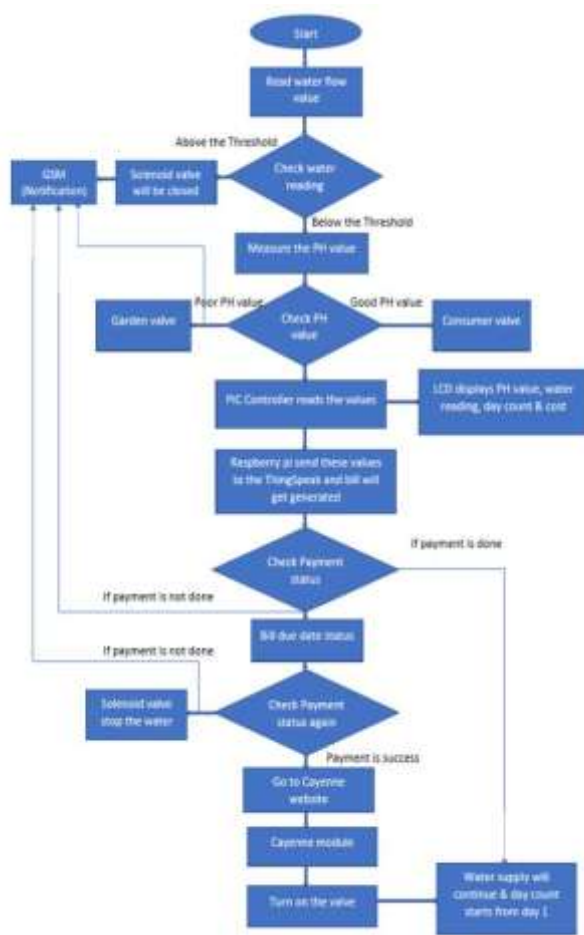


Figure 2: Flow Chart

4. RESULT AND DISCUSSION

Accurate data monitoring of sensor information, Cost details based water pipeline connection controlling system by IoT module and whenever and wherever check with the data online.

4.1 Water Distribution and Management Prototype Model

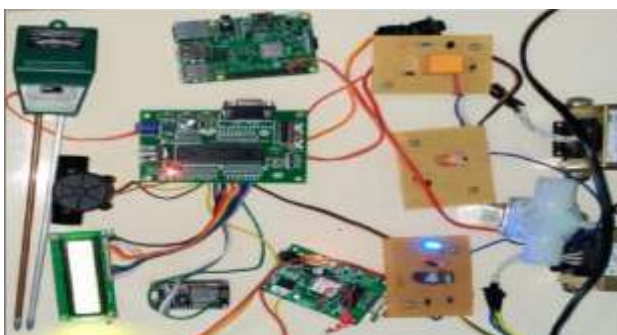


Figure 3: Final Model

The figure 3 shows the Water Distribution and Management Prototype Model where all the components are interconnected according to the requirement.

4.2 LCD OUTPUTS



Figure 4: LCD Outputs

The figure 4 shows the LCD Outputs which initially displays welcome message and then it starts showing the total water reading, pH values and the day count from 1 to 31. After completion of 1 month, it displays the total water reading consumed by the user along with the cost and allows 5 due dates. When the due date exceeds it displays as pay your bill valve closed. If the water pressure is low below or above the threshold valve, LCD shows as water flow problem detected.

4.3 ThingSpeak Output



Figure 5: ThingSpeak Output

Figure 5 shows the ThingSpeak output in a graphical manner indicating two fields. Those 2 fields are:

1. Water Flow Problem
2. PH problem.

4.4 Cayenne Website



Figure 6: Admin Page

Figure 6 shows the admin page, when the user fails to pay the bill within the due date the solenoid valve gets blocked automatically. Once the payment is done, the admin permits the water to flow by unblocking the valve through the cayenne website.

4.5 Message Notifications

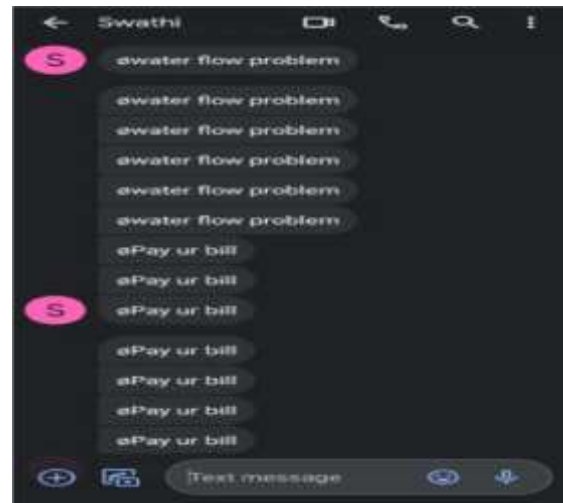


Figure 7: Messages received by the User

In order to alert the user regarding payment and water flow problem, the notifications are sent to the user end through the GSM module and the above figure 7 shows the message received by the user.

5. CONCLUSION AND FUTURESCOPE

Automated distribution of water and its monitoring system focuses on various entities such as proper supply, over consumption alert and water quality assurance. Those factors can be effectively monitored by employing flow sensor and pH sensor along with communication support provided by Raspberry Pi and Node MCU. The future scope is that the work can be conducted for different zone of the city so deficit/problem in portable water system or pocket of abnormality can be found at micro level. The work can be conducted on pressure management or 24*7 hours water supply which reduces water losses. The asserts management can be conducted in focus of cost benefit analysis.

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