International Conference on Advancements in Computing Technologies - ICACT 2018 ISSN: 2454-4248
Volume: 4 Issue: 2 114 – 116

iNeer: An IoT Based Efficient Water Management System

N.Yazhini[1], Faustina Joan S P[2]

P.G. Student, Department of Computer Science,StellaMaris College, Chennai, Tamilnadu, India[1]

Assistant Professor, Department of Computer Science,Stella Maris College, Chennai, Tamilnadu, India[2]

Abstract:Water is a crucial resource and in the present era, it has become a scarce resource, as it is wasted without efficient water management systems. In this paper, an IoT based efficient water management system 'iNeer' is proposed which manages the storage tanks and monitors the water levels and water quality using Raspberry Pi and various sensors. The water levels are measured using ultrasonic sensor whereas the quality of water is measured using PH, turbidity and conductivity sensors. An alert system is incorporated when there is abnormality in water quality and when water level goes below the threshold value. The location of each storage tank is tracked for the distribution of water during emergency. The sensed values are processed by Raspberry Pi and are displayed in a web based dashboard providing real time monitoring of the storage tank water.

Keywords: Internet of Things, Raspberry Pi, Sensors, Water Management, Water Distribution.

*****

I. INTRODUCTION

In today's world, with the increase in urbanization, water scarcity has become a trendy issue. Along with it, comes the need for water management to monitor and distribute the water resource from distant locations. Also, water management avoids the overuse and wastage of water.

Internet of Things (IoT) is a happening technology which connects all objects in world to internet so that they can sense, communicate and share information interconnected over public or private network [1]. This work aims to use IoT to develop an efficient water management system, iNeer.

The proposed system attempts to manage all the storage tanks and provide real time monitoring of water levels and water quality through a web application. It also integrates an alert system along with water distribution. It has sensors to sense the data, microcontroller to process the sensed data and some platform tools to store and display them.

This paper describes the prototype system design, implementation and description of the tools and technologies of the IoT based efficient water management system. The next section gives a review of the existing literature.

II. RELATED WORK

Pranita Vijaykumar Kulkarni and M.S.Joshi [1] proposed an IoT based water supply monitoring and controlling system with theft identification providing real time monitoring of water reducing the manual work to go and monitor the fields. They used Arduino, Raspberry Pi and various other sensors. The key advantage of this work was the message notifications that were triggered in case of abnormality such as absence of water and theft.

Pavana N R, M.C. Padma [2] proposed a low cost system for real time monitoring of water quality parameters in IoT environment. The water quality was checked using Raspberry Pi and sensors. The system allowed the Water Monitoring Board be aware of the contamination by generating reports. If the water parameter was not in the range, the report was sent to the owner to take necessary actions.

Joy Shah [3] proposed an IoT based model for smart water distribution that provided adequate water supply with pressure and good water quality to every house and industry. Adequate water supply was achieved using Raspberry Pi that helped to control the water control valve based on the value sensed by the sensor. Also, water quality was checked using several sensors. The valve was automatically turned off and a message was generated when water quality decreases.

Divya C,Nikhil Gowda, Suhas Shashtry, Yashwanth J, Achyutha Preksha A [4] proposed an IoT based water supply monitoring and soil moisture detection system that monitored the flow of water for the daily usage of residents and examined the soil moisture in agricultural fields. It was done using Raspberry Pi and several sensors. There was an automatic supply turn off when water decreased below the threshold value and an alert was also sent to the user regarding the water moisture in soil.

Patawala Amatulla.H, Bansode Navnath.P, Bhong Yogesh.P, Zambuck Ashwini.S [5] proposed an IoT based smart water management system for water monitoring and control. Water quality was examined and equal distribution of water was done only when there was water quality assurance. The flow of distribution and quality of water was also monitored in a webpage.

Timothy Malche, Priti Maheshwary [6] proposed an IoT based water level monitoring system for smart village. They described the tools and technologies that allowed to track the source water levels from remote locations. It was done using Arduino and a liquid level sensor. Carriots was used to store and analyse the data whereas Freeboard visualized them.

The system methodology is explained in the next section.

 ISSN: 2454-4248
114 – 116

III. METHODOLOGY

The architecture of the proposed system consists of four layers. They are physical layer, network layer, administration layer and application layer as shown in the Fig. 1.

Physical layer: It consists of sensors to measure the water levels and water quality. At this layer, data is collected from sensors and sent to the control unit.

Network layer: It gets the sensor information and processes it using Raspberry Pi.

Administration layer: Data processed by the microcontroller is published to the cloud for storage and analysis.

Application layer: It is the client application that integrates with the cloud and helps to visually manage the system through an user interface.

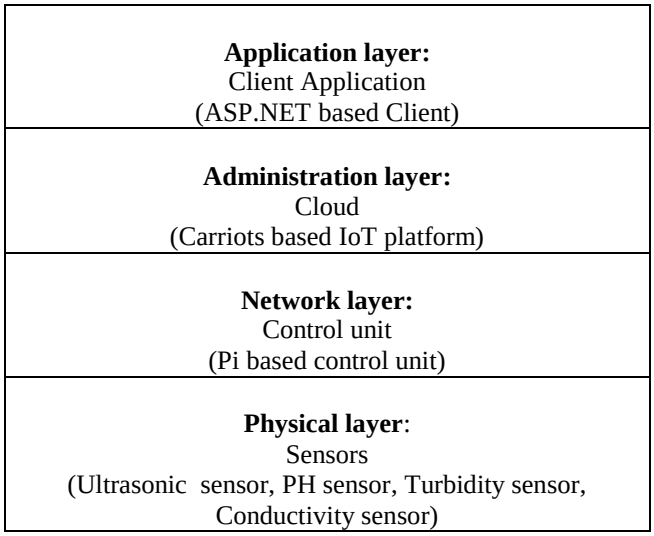

Fig. 1 Layers of the Proposed System

The sensors are placed in all storage tanks of the city. The ultrasonic sensor measures the water levels whereas the PH sensor, turbidity sensor and conductivity sensor measure the water quality. Once the data is sensed by the sensors, it is processed and sent to the cloud. Carriots, an IoT platform streams the data from the control unit in JavaScript Object Notation (JSON) format which stores and analyses the data stream .It also allows to perform events, triggers, alarms and so on, as a response to the received data stream.

All the water management activities are done through the client web application with the help of Freeboard. It is a dashboard that acts as a data visualization tool. It receives the data stream from Carriots in JSON format by the data source configuration and visualizes according to its widget configuration. These widgets are automatically updated as data is streamed at Carriots using Rest API. Thus the client application allows real time monitoring and water management.

Water management using the client application involves monitoring the water levels and water quality along with water dispensation. It also includes an alert system to alert the authoritative person when the water level goes beyond a certain threshold value and when there is abnormality in the water quality. Water dispensation is implemented by finding the nearest tank with available water. When there is no sufficient amount of water in the tank, the nearest tank is determined and suggestions are given to the authoritative person notifying him/her. Thereby, the system serves as an advisor during the water crisis.

The system is also capable of generating various reports based on the available sensed data. They include,

A. Amount of water in each tank, thereby calculating the total amount of water in city.
B. Amount of water consumption per area per month.

The components that are required for the proposed system are summarized in Table 1.

This water level monitoring, water quality monitoring, water dispensation, generation of reports together forms the IoT based efficient water management system, iNeer.

The performance of the proposed system is explained in the next section.

IV. PERFORMANCE ANALYSIS

The proposed iNeer water management system proves its efficiency by the use of selected sensors, microprocessor, IoT platform and web application.

The accuracy of the system is achieved using sensors. Ultrasonic sensor provides the water level measurement with millimetre precision. It also allows the water level to be updated for every millisecond. The water quality is determined accurately as a combination of PH, conductivity and turbidity sensors are used. Raspberry Pi is used as a microprocessor

 ISSN: 2454-4248
114 – 116

considering the following parameters: RAM, clock speed, input voltage required and processor. So the chosen sensors and microprocessor gives high performance to the system.

.

Table I
Components of the System

Hardware Specification	Software and service specification
1. Raspberry pi 2. Ultrasonic sensor 3. PH sensor 4. Turbidity sensor 5. Conductivity Sensor 6. Jumper wires 7. Water source	1. IDE 2. An account on carriots 3.An account on Freeboard

Carriots, an IoT platform is known for its device provisioning, MQTT support, telecom integration, security audit and event processing. The usage of Carriots provides security, reduced development time, low cost of development and operation, scalability for the system. A data stream from sensor node received by Carriots is shown in Fig. 2.

Fig. 2 Data stream received at Carriots from sensor node

The ASP.NET web application shown in Fig.3 provides the user interface for the system that ensures ease and fast accessibility with minimum response time.

Fig. 3 User Interface of the web application

Hence, the system provides greater performance and work efficiency.

V. CONCLUSION

In this work, iNeer, an IoT based efficient water management system, measures the water levels and water quality in storage tanks. It also manages water dispensation and report generation through an user interface. The system also allows the water source at a particular location to be managed and monitored remotely avoiding water wastage and in turn, the water crisis. The whole system is tried out in a closed setup at present. The system will be implemented on a real scenario to test its whole effectiveness for the smart city setup.

REFERENCES

[1] Pranita Vijaykumar Kulkarni, M. S. Joshi (2016) 'An IOT based Water Supply Monitoring and Controlling System with Theft Identification', International Journal of Innovative Research in Science, Engineering and Technology , 5(9)
[2] Pavana N R, Dr. M. C. Padma (2016) 'Design of Low Cost System for Real Time Monitoring of Water Quality Parameters in IOT Environment'', *International Journal of* Advance Research in Computer Science and Management Studies, 4(5)
[3] Joy Shah (2017) 'An Internet of Things Based Model for Smart Water Distribution with Quality Monitoring', International Journal of Innovative Research in Science, Engineering and Technology, 6(3)
[4] Divya C, Nikhil Gowda, Suhas Shastry, Yashwanth J, Achyutha Preksha A (2017) 'IoT based Water Supply Monitoring and Soil Moisture Detection System', International Journal of Computer & Mathematical Sciences, 6(5)
[5] Patawala Amatulla .H, Bansode Navnath .P, Bhong Yogesh.P, Prof. Zadbuke Ashwini .S (2017) 'IOT Based Water Management System for Smart City', International Journal of Advance Research, Ideas and Innovations in Technology, 3(2)
[6] Timothy Malche, Priti Maheshwary (2017) 'Internet of Things (IoT) Based Water Level Monitoring System for Smart Village', Springer Nature Singapore Pte Ltd.2017
[7] https://cpanel.carriots.com/
[8] https://freeboard.io/
[9] http://electrofriends.com/featured/water-level-indicator-pump-controller-using-raspberrypi/