International Research Journal of Computer Science (IRJCS) ISSN: 2393-9842
Issue 06, Volume 6 (June 2019) www.irjcs.com
SPECIAL ISSUE - 5th International Conference - "ACCE – 2019"

SMART WATER MANAGEMENT SYSTEM

S Ambareesh[1], B Tejaswini[2], Bhuvana Chandrika N[3], Manasa B[4], Megha M [5]
[1.]Associate Professor, Department of CSE, Vemana Institute of Technology, Bangalore.
[2, 3, 4, 5] UG student, Department of CSE, Vemana Institute of Technology, Bangalore.
ambareeshs@vemanait.edu.in ; tejaswinibasireddy98@gmail.com, bhuvanachandrika1998@gmail.com, bmanasa155@gmail.com, mmegha191@gmail.com

Manuscript History
Number: IRJCS/RS/Vol.06/Issue06/JNCS10087
Received: 29, May 2019
Final Correction: 30, May 2019
Final Accepted: 02, June 2019
Published: June 2019
doi://10.26562/IRJCS.2019.JNCS10087
Editor: Dr.A.Arul L.S, Chief Editor, IRJCS, AM Publications, India

ABSTRACT– In present world all of us are facing global warming crisis of water. Main causesfor these issues are growing population, improper management of water utilization. This problem is quietly related to poor allocation, inefficient use and lack of adequate water management system. Therefore, the efficient use of andmonitoring the same is essential for home, office etc. In this paper, anandroid application is developed that wouldmonitor the level of water in the cistern or any storage tank and automatically turns the motor on/off based on user requirement.This project can be implemented in any storage medium like well, cistern, etc.The purity of the water is measured using various sensors.Major advantage ofour system is that it detects any obstacles/solid particle present inside the storage tank. The obstacle or any object if found on the surface of water or even in sink, the image of the obstacle gets captured by the pi camera and image of the object will be sent to android application.By seeing these images user can take action. An alert message about water level as well as quality of water is sent to user. Thus, the system will be maintained systematically and the quality of the water gets notified.

KEYWORDS – IoT (Internet of Things), Android Application, Image Processing.

I. INTRODUCTION

Internet of Things is a network of computing devices which are able to collect and exchange the data. Sustainability of available water resourceproblem is related to poor water allocation, inefficient use, and lack of water management is a dominant issue. Water is used for agriculture, industry, and domestic consumption. Therefore, efficient use and water monitoring are potential constraint for home or office. Measuring water level is an essential task for government and residency. It is possible to track the implementation and usage of such initiatives with integration of various controlling activities. Therefore, water controlling system implementation makes potential significance in home applications. The main objective is to overcome water supply related problems and make system efficient. And there is need of proper monitoring and controlling system. In this project, we are focusing on continuous and real time monitoring of water supply in IOT platform. Water supply with continuous monitoring makes a proper distribution so that, we can have a record of available amount of water in tanks, flow rate, abnormality in distribution line. Monitoring can be done from anywhere.

II. LITERATURE SURVEY

Kaushik Gupta,MandarKulkarni,ManasMagdum, YashBaldawa and Prof. ShivprasadPatil [1] proposed Smart Water Management in Housing Societies using IoT to provide solution for water management for houses. But this system was fully automated by not providing userinteraction.

ShavarsidhaGunde, Dr. V. P.Baligar, Prof. A. K. Chikaraddi [2] proposed IoT Based Flow Control System using Raspberry PIto monitor water level in overhead tank. An web application was developed which did not provide user interaction.

Priyen P. Shah, Anjali A. Patil,Subodh S. Ingleshwar [3] proposedIoT based Smart Water Tank with Android application for monitoring and controlling the tank. System uses ultrasonic sensors which are less efficient.

Cristina Turcu, Cornel Turcu, VasileGaitan [4] proposed An Internet of Things Oriented Approach for Water Utility Monitoring and Control for measuring and displaying water content. The system is more time consuming and consumes more power.

ThinagaranPerumal, Md Nasir Sulaiman, Leong.C.Y [5] proposedInternet of Things (IoT) Enabled Water Monitoring System to monitor water level in tank. System uses ultrasonic sensors which may also provide inaccurate results.

SayaliWadekar, VinayakVakare, VinayakVakare, Shivam Yadav, Vijaypal Yadav [6] proposed Smart Water Management Using IOT to manage and plan water usage. System notifies current water level in tank but user has to manual operate the motor.

Amrit Kumar Panigrahi1, Chandan Kumar Singh, Diwesh Kumar, NemishaHota [7] proposed Tank Water Level Indicator & Controller Using Arduino for displaying water level. But a seven-segment decoder is used to display level of water. It is more time consuming.

III. ANALYSIS

In Existing System,water level monitoring andautomatic water control through sensor technology.Previously people were notified by message throughGSM module about water flow status but people were not able to know the status of inner view of the storage tankand to check the quality of water, it only notifies the on andoff status of the tank. The disadvantages here are: noreal time data monitoring, no waterflow control enabled from outside of home and water quality checking is neglected. In present system the web application developed does not support the user interactions. Few systems were not applicable for tank with depth more than 10m. More energy consuming and time consuming is the major problem faced here. Only water level was monitored but quality of water was not monitored. Design and implementation are complicated and more expensive. In Proposed System, water monitoringsystem with sensors. A sensor is a hardware device that produces ameasurable response with respect to a change in physicalconditions. The continual analog signal sensed by thesensors is digitized by an analog-to-digital converter andsent to the embedded processor for further processing. Themodel is consisting of different sensors like Water levelsensor, Pi sensor and PH sensor. Initially the Node MCUconnects to the internet through Wi-Fi, which helps insending the notification to the user. When the connectionis established it starts reading the parameters of sensors. The threshold levels for the required sensors areset previously as per the user requirement. The sensed data is sent to the webserver and stored in the server.

IV. DESIGN

The designed system is used for water monitoring and checking the quality of water. Initially, sensor in the base tank checks for the presence of water. In the presence of water, pump starts automatically and it starts pumping water to overhead tank. Over head tank is monitored for different water levels. Once the water reaches the threshold specified, it notifies the user. If the water level reaches the maximum threshold, pump stops automatically. If water is flowing continuously than the expected time then it will be detected by water flow sensor and data will go to IOT server.

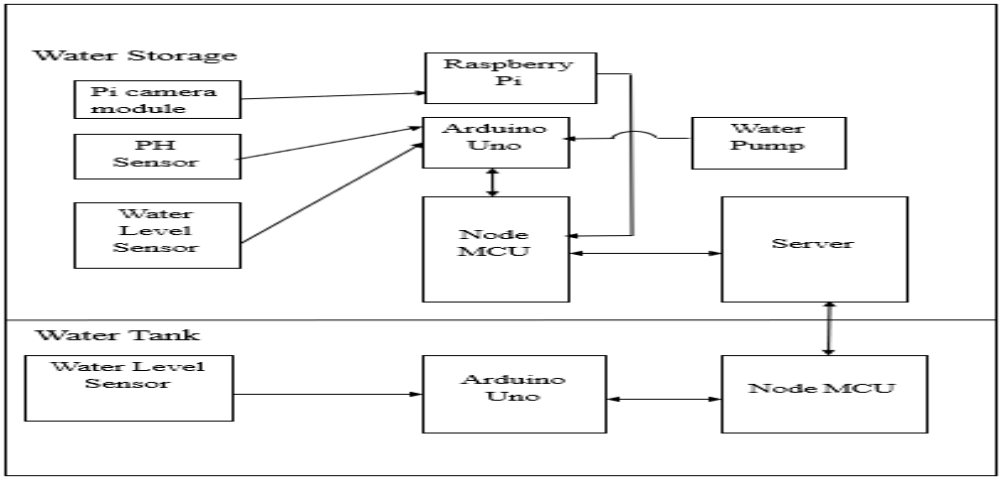

Fig 1. System Architecture

User can see the real time data in IOT server and in this condition one notification will be sent to mobile App from IOT server. If the water PH level or dirt level is not good then the water will not be pumped into the tank. User can control water flow through mobile app by interacting with the server.

Overall design i.e .System architecture is represented in Figure 1, which provides information of about how the components are interconnected and how components interact with each other. Sensors are placed in storage tank and overhead tank. In overhead tank three sensors are placed indicating levels of water along with thesesensorspH sensor is also placed for checking purity. Any impurities present in storage tank are detected by using image processing concept. Pi camera module will capture the images and sends to server. Server willprocess the image and determines the status as either pure water or dirty water and then sends to the user android/mobile application. It also notifies the same to the user. The water from the water tank and in sump is monitored through android application via server connection.Presence of impuritiesin storage tank is detected by using image processing concept with Pi camera module. The workflow of the system is shown in Figure 2.

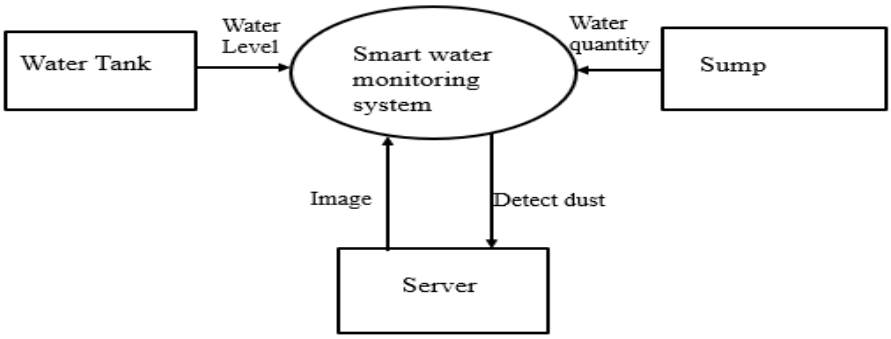

Fig 2 System Workflow

V. METHODOLOGY & IMPLEMENTATION

Majority of the water wastage takes place because of overflowing water tanks. In most of thecases, water tanks are manually controlled by an operator. In absence of the person, waterkeeps on overflowing until the motor is switched off. Therefore, smart water tank system is used forwater monitoring and checking the quality of water. In storage tank and overhead tank, water level sensors are placed. Sensor in overheadtank is used to detect presence of water. If there is no water present in storage tank the motorautomatically stops. If water is detected, water is sent to overhead tank based on userrequirement. pH sensor is also inserted to check the quality of water. In overhead tank, three sensors are placed indicating three levels in the tank. If waterreaches the top of tank, motor turns off automatically. If water presence is detected in any ofthe sensors, motor turns on/off based on user requirement. An android application is developed for user interface. In storage tank image processing is done by using raspberry pi. On top of storage tankpi camera is placed. If any object found inside the storage tank pi camera is used to takeimages. pi camera is also been interfaced with the raspberry pi kit. All the automation is programmed such that the system will run automatically as programmed.Image processing is done using python. All the sensors are interfaced with Arduinoboard and programming is done in Arduino software. The Node MCU board connects to theinternet through Wi-Fi. When connection is established it will start reading the parameters of sensors. The threshold levels for the required sensors are set to some values. The sensor data are sent to the web server and stored in the server. If water is flowing continuously than theexpected time then it will be detected by water flow sensor and data will go to IOT server.

A. Motor Control

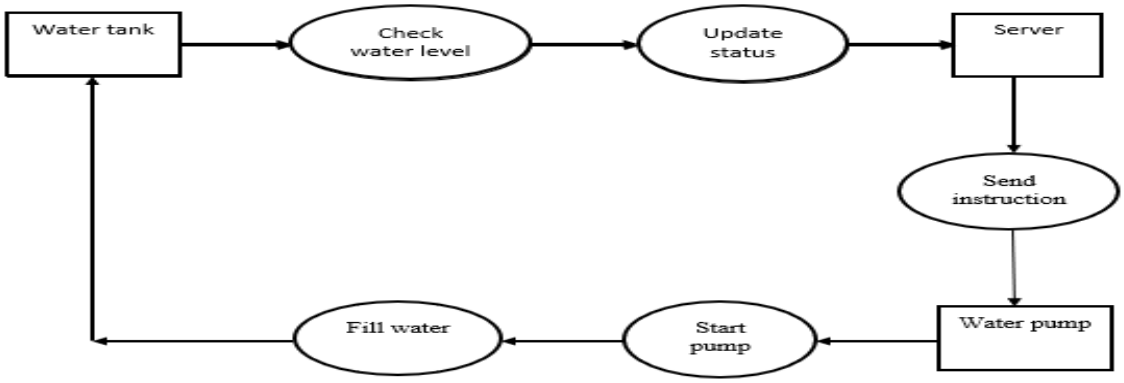

Fig 3 Control System of motor

Checks water level in overhead tank. If there is not enough water in overhead tank, water starts filling in the tank from the sump through switching on the motor. As well as when tank is full, motor is switched off. Motor turns on/off automatically through android app. Figure 3, represents how information passed between storage tank and overhead tank.

Table 1 Proposed working of motor

No	Condition of water level	Motor status
1	If water level in storage tank is minimum	Automatic off
2	If water level in overhead tank is maximum	Automatic off
3	If water reaches any of the level in overhead tank	Motor can be controlled by user
4	If water in overhead is tank empty	Motor is switch on still level 1
5	If any objects present in storage tank	Images sent to user by android app.

Conditions of the water levels and what actions are taken are given in Table 1.

B. Water quality

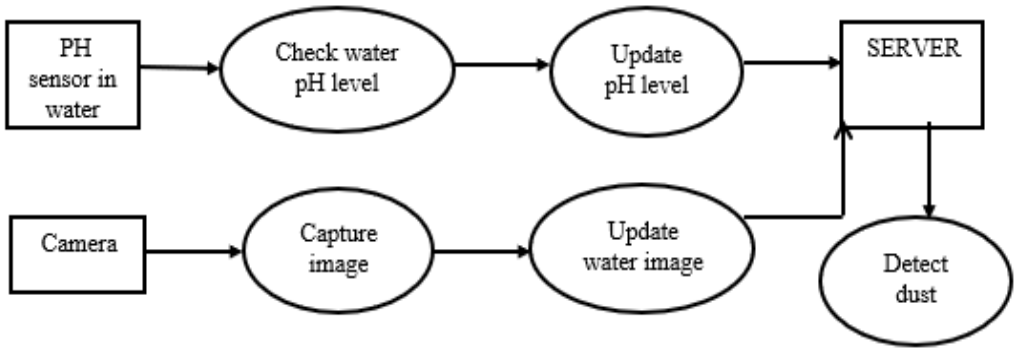

Fig 4 Checking Water Quality

pH sensor is placed in tank to check the purity of water. pH values are updated in server which is in turn updated in the android application. Image processing is also done in sump by using Raspberry Pi. Any solid particle present in water is detected through capturing images. The pH values whether it is pure or impure and the image that is been processed is sent to user android application. Figure 4, represents how quality of water is maintained.

C. Image processing

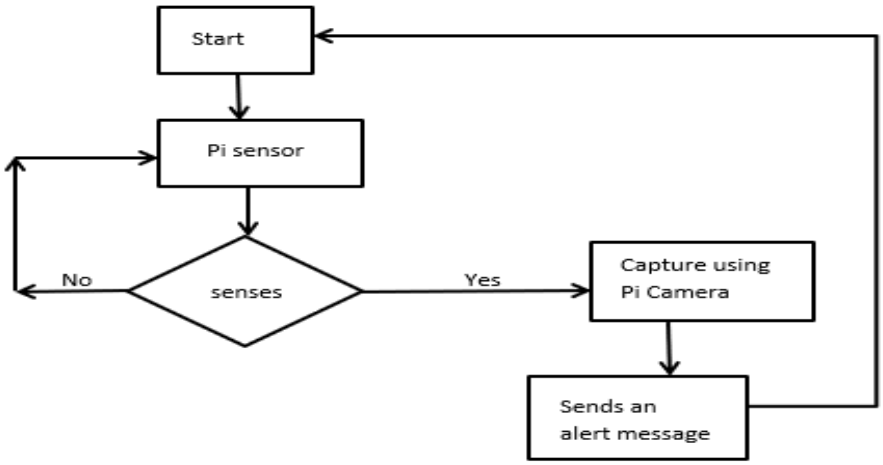

Fig 5 Image Processing

Pi sensor senses the solid particle if it is found inside the storage tank and sends signal to Pi camera. Pi camera is connected to raspberry Pi board. Pi camera captures the images and sends to the raspberry pi server to process the image. For processing the image through three steps first it resizes the image, trains the image and finally it tests the image to notify whether solid particles present.

This process is done using two algorithms they are random Forest and SVM (Support Vector Machine) which is written in python programming language. The processed image is sent to theuser as a notification message through the android application. Figure 5, represents image processing which is done by raspberry pi.

VI. RESULTS

An android application is developed for user visualization. A user gets notified with alert messages about water presence in storage tank and overhead tank. User is also notified with quality of water as well as images of storage tank can be viewed. Based on these images user can take any action. User has full control of toggling motor on/off. Motor is automated when tank is empty or overflow. Some of the snapshots of android application of our proposed system are shown in the following figures

Fig 6 Android application (Status ON)

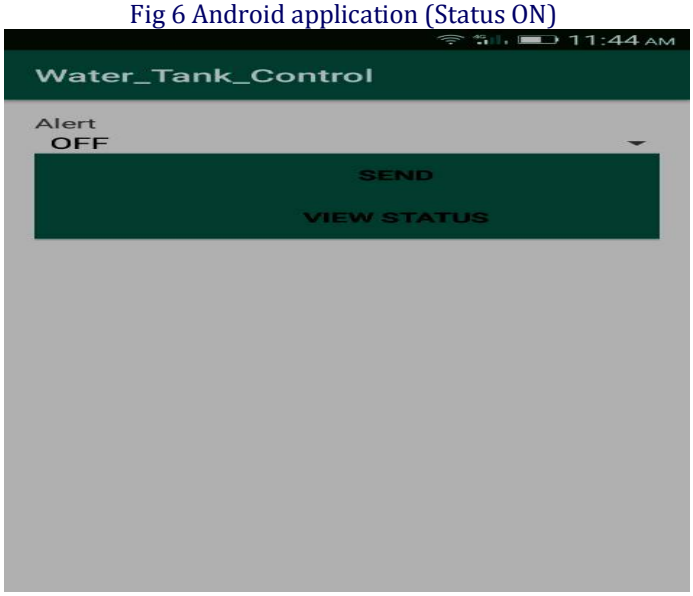

Fig 7 Android application (Status OFF)

Figure 6,7 represents the motor on/off status of android application.

VII. CONCLUSION

Water is one of the most important basic needs for living being. Our proposed system helps to monitor water level, check the quality of water and control them using Android Application. User controls motor through this application from anyplace and at any time. In present world, motor was automatically turning on/off, but quality of water was not tested. Thus, our system detects any objects present in the storage tank to maintain purity of water. It will be useful when decomposable objects are found in water. This helps in preventing accidents. Future improvement for the system is to find frequently detected objects in storage tank and intimating the user about it. Cloud can be utilized for large database.

REFERENCES

1. Kaushik Gupta,MandarKulkarni, ManasMagdum, YashBaldawa and Prof. Shivprasad Patil, "Smart Water Management in Housing Societies using IoT", published in ICICCT 2018,pp 1609-1613.
2. Shavarsidha Gunde, Dr. V. P.Baligar, Prof. A. K. Chikaraddi,"IoT Based Flow Control System using Raspberry Pi", publishedin ICECDS-2017, pp 1386-1390.
3. Priyen P. Shah, Anjali A. Patil,Subodh S. Ingleshwar,"IoT based Smart Water Tank with Android application", published in I-SMAC 2017, pp 600-603.
4. Cristina Turcu, Cornel Turcu, VasileGaitan,"An Internet of Things Oriented Approach for Water Utility Monitoring and Control", published in advance computer science, pp 175-180.
5. Thinagaran Perumal, Md Nasir Sulaiman, Leong.C.Y,"Internet of Things (IoT) Enabled Water Monitoring System", published in GCCE, pp 86-87.
6. SayaliWadekar, Vinayak Vakare, Vinayak Vakare, Shivam Yadav, Vijaypal Yadav, "Smart Water Management Using IOT", published in IEEE 2016.
7. Amrit Kumar Panigrahi1, Chandan Kumar Singh, Diwesh Kumar, NemishaHota,"Tank Water Level Indicator & Controller Using Arduino", published in IJAREEIE 2017,vol- 6,pp 1348-1354.

