

Water Quality Monitoring System Using IoT

Abhinandhan E ¹, Thrilok A ², Akshay R ³, Sheeraz Ahmed Khan ⁴

Associate Professor, Department of Computer Engineering, NDRK Institute of Technology, Hassan, Karnataka, India¹

UG Student, Department of Computer Engineering, NDRK Institute of Technology, Hassan, Karnataka, India²

UG Student, Department of Computer Engineering, NDRK Institute of Technology, Hassan, Karnataka, India³

UG Student, Department of Computer Engineering, NDRK Institute of Technology, Hassan, Karnataka, India⁴

ABSTRACT: World Economic Forum ranked drinking water crisis as one of the global risk, due to which around 200 children are dying per day. Drinking unsafe water alone causes around 3.4 million deaths per year. Even in the presence of advancements in technology, sufficient and good quality measures are not present to measure the quality of drinking water. By focusing on the above issue, this project proposes a low cost water quality monitoring system using emerging technologies such as IoT and Cloud Computing which can replace traditional way of quality monitoring. This helps in saving people of rural areas from various dangerous diseases such as fluorosis, bone deformities etc. The project also has a capacity to control temperature of water and adjusts it so as to suit environment temperature using cooler and heater.

KEYWORDS: Water quality monitoring, Internet of Things, Cloud Computing, MQTT, Rural Development.

I. INTRODUCTION

Due to limited water resources and increasing population nowadays, water has become a vital resource for mankind. Clean and safe drinking water is the most important resource for mankind. As most of the diseases these days spread through water there is a need for online real time water quality monitoring system.

The methods used for water quality assessment at present involve collection of random samples of water at various locations weekly or monthly and analyzing them in the laboratories. This approach is not much efficient because they have various drawbacks such as long time consumption, only water samples from few areas can be determined simultaneously. This method also involves manual work to monitor the quality of water regularly. These methods are also costly and are not capable enough in large populated countries like India, China. In order to overcome these drawbacks we need a real time system which monitors water quality through sensors such as pH, turbidity and temperature and updates those values in Cloud service. This project consists of sensors which measure the chemical composition of water. These sensor values are then passed to NodeMCU micro controller which has inbuilt WiFi module, using which the data is passed over to the Adafruit cloud and the data will be visible at the Adafruit dashboard.

This project also uses MQTT client broker architecture to transmit data from micro controller to external MQTT broker service. Turbidity measures the large number of suspended particles in water that is invisible. Higher the turbidity higher the risk of diarrhea, cholera. Lower the turbidity then the water is clean. Besides turbidity, pH is also an important measure which measures the acidic level of drinking water. Temperature sensor measures how the water is, hot or cold. Other part of this project is to sense the external temperature near the water storage and control heater and cooler respectively depending on the external temperature.

II. RELATED WORK

Water quality monitoring system is to solve the problem of drinking water especially in rural areas. This system is developed in such a way that people can know that the water is efficient for drinking purposes or not [1]. As the number of diseases are increasing day by day drinking water problems are bound to exist. Problems that arise due to inefficient drinking water are various dangerous diseases such as fluorosis, bone deformities etc. The cost of the previous water quality monitoring systems are extremely expensive, complex, time consuming and are not capable enough in large populated countries like India and China. So that in order to overcome these drawbacks we need a real time system which monitors water quality through sensors such as pH, turbidity and temperature and updates those values in Cloud service [2][5]. Water Quality Monitoring System that is designed to make it easier to people for drinking pure efficient water. Our online real-time water quality monitoring system using the contemporary

technologies such as IoT and cloud computing will be able to solve one of the basic and emerging problem of human survival to certain extent [3]. All the previous water quality detecting models were built by using heavy computing devices such as Raspberry Pie, whereas this paper uses NodeMCU which is light weight and also cost effective. This project also focuses on usability besides water quality monitoring. For usability we are controlling water temperature by using Heater and Cooler so as the users get water suitable to the climatic conditions. This project also includes Real time access to data visualization for authorized users[4][6].

III.METHODOLOGY

In this proposed work, the main aim of this work is to detect the turbidity of the water and check whether the water is suitable for drinking or not. This project consists of all the sensors such as Turbidity sensor, Temperature sensor and actuators such as heater or cooler. The quality of the water is detected using the turbidity sensors. Turbidity measures the large number of suspended particles in water that is invisible. To ensure reliable communication between devices and cloud we choose WiFi as connecting technology such that there is reliable delivery of messages across the network. The sensor values are then passed to NodeMCU micro controller which has inbuilt WiFi module. For data accumulation we are using Adafruit cloud to store the data on cloud servers which ensures reliability and cost effective. This makes data accessible to other devices outside Adafruit who have access to data and then the data will be visible at the Adafruit dashboard for data analysis and visualization part of data. By using these features, our model also helps in keeping the water at a constant temperature with respect to the outer environmental temperature using Heater and Cooler. The algorithm used for controlling the temperature is Adjusting temperature algorithm.

IV.EXPERIMENTAL RESULTS

Figure.1 shows the Hardware Components of Water Quality Detection Module. It consists of Arduino uno, Turbidity sensor, DS18B20 External and Internal temperature sensors, Heater and Cooler.

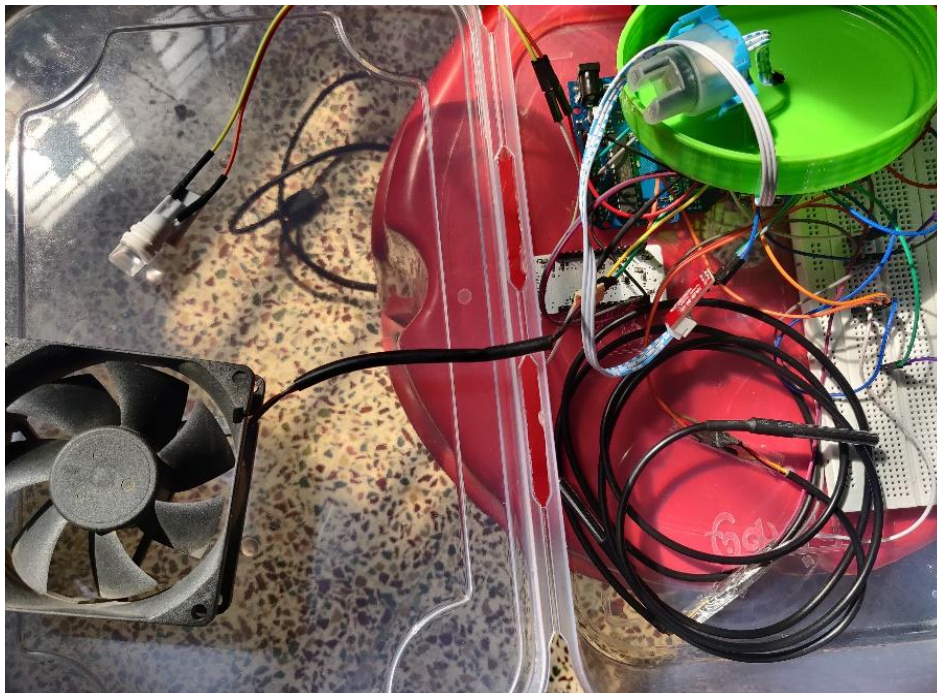


Figure.1 Hardware Components of Water Quality Detection Module

Figure.2 shows the working Model of Water Quality Monitoring System using IoT.

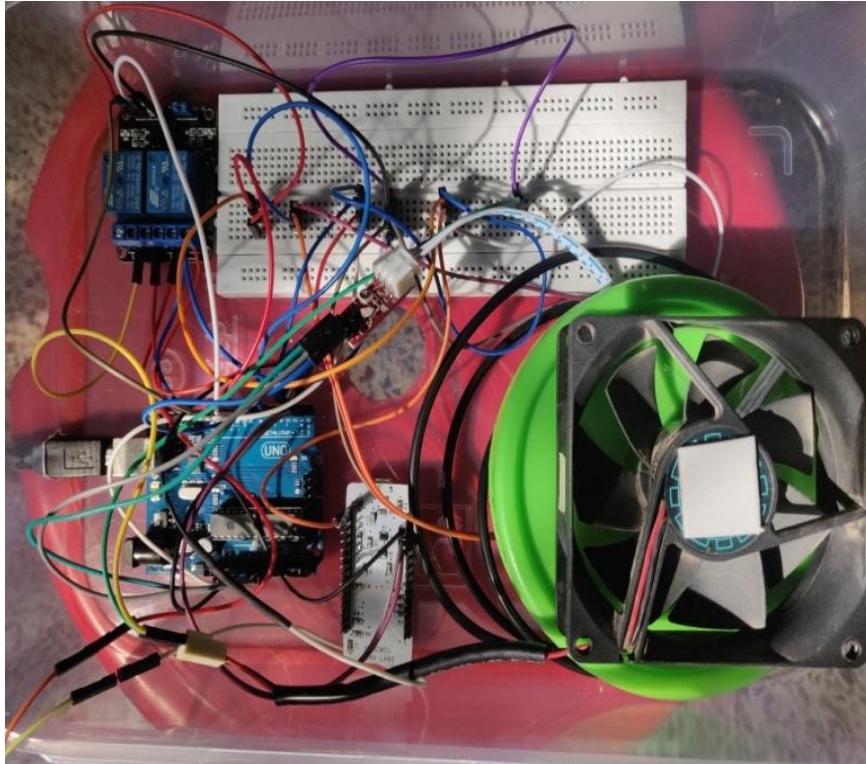


Figure.2: working Model of Water Quality Monitoring System using IoT

Figure.3 shows the Data visualization and data displayed on Adafruit dashboard using WiFi through Cloud Computing.

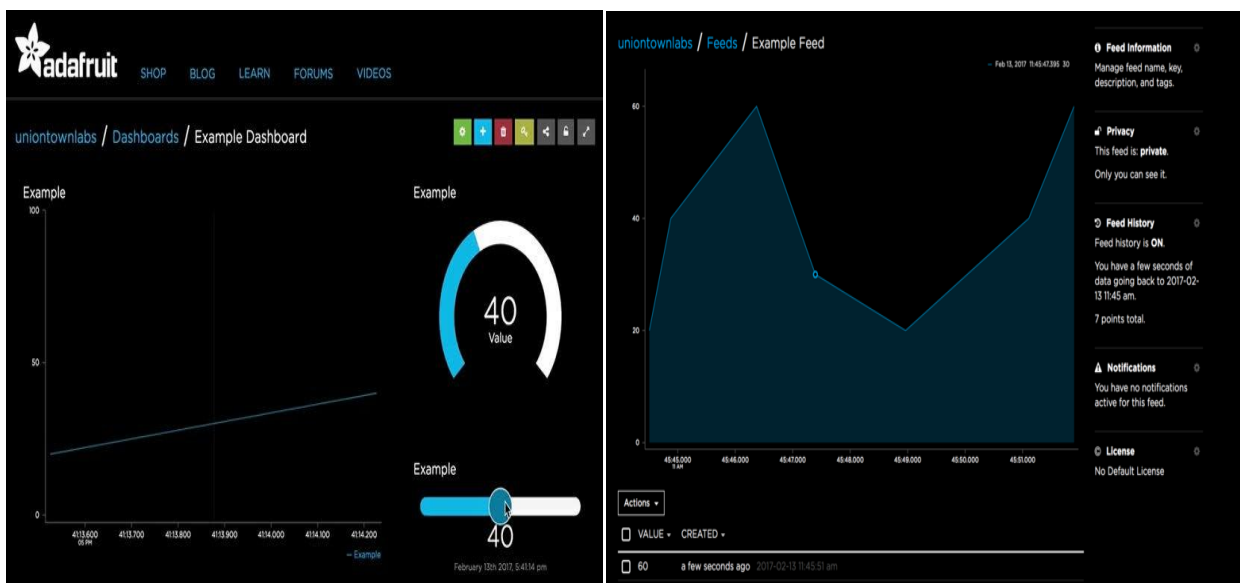


Figure.3: Data visualization and data



VI. CONCLUSION

This paper presents a practical and economical solution to monitor the quality of water especially in rural areas without any human intervention. To solve this problem this proposed work uses IoT and cloud computing. On combining these two technologies we are able to solve one of the basic and emerging problem of human survival to certain extent.

REFERENCES

- [1] Pradeep kumar M, Monisha J. "The Real Time Monitoring of Water Quality in IoT Environment" 2016 International Journal of Innovative Research in Science, Engineering and Technology, 2015 ISSN(Online) : 2319-8753.
- [2] Vaishnavi V. Daigavane, Dr. M.A Gaikwad. "Water Quality Monitoring System Based on IoT" 2017 Advances in Wireless and Mobile Communications, Nov 2017 ISSN 0973-6972.
- [3] Jayti bhatt, Jignesh patoliya. "IoT Based Water Quality Monitoring System" 2016 International Journal of Industrial Electronics and Electrical Engineering, ISSN: 2347-6982.
- [4] Vijayakumar, N, and R Ramya. "The Real Time Monitoring of Water Quality in IoT Environment" 2015 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2015],2015, doi: 10.1109/iccpct.2015.7159459.
- [5] Atif Alamri, Wasai Shadab Ansari, Mohammad Mehedi Hassan, M. Shamim Hossain, Abdulhameed Alelaiwi, and M.Anwar Hossain, "A Survey on Sensor-Cloud: Architecture, Applications, and Approaches", International Journal of Distributed Sensor Networks, Volume 2013.
- [6] Kedia, Nikhil. "Water Quality Monitoring for Rural Areas- a Sensor Cloud Based Economical Project" 2015 1st International Conference on Next Generation Computing Technologies (NGCT), 2015, doi:10.1109/ngct.2015.7375081.
- [7] R.Karthik Kumar, M.Chandra Mohan, S.Vengatesha pandiyan, M.Mathan Kumar, R.Eswaran. "Solar based advanced water quality monitoring system using wireless sensor network" 2014, International Journal of Science, Engineering and Technology Research, 2014.
- [8] "Average Monthly Temperatures across the World." DataMarket, datamarket.com/data/set/1loo/average-monthly-temperatures-acrossthe-world!ds=1loo!1n6s=1nq.3jsdisplay=line.