IOT Based Water Quality Monitoring System

Dr. B. Bhaskar Reddy[1], K. Tarun[2], D. Kishore[3], S. Nandu Yadav[4]

[1]Professor and Head of IQAC ,Department of Electronics and Communication Engineering, St .Peter's Engineering College. Hyderabad 50100

[2,3,4]Undergraduate Student , Department of Electronics and Communication Engineering, St .Peter's Engineering College. Hyderabad 50100

1. ABSTRACT

The most reliable method of implementing water quality monitoring system is the low cost and efficient system of water quality observation. As water utilities confront growing difficulties, drinking water may become increasingly valuable for all people. These issues are brought on by the large population, scarcity of water supplies, etc. As a result, a variety of procedures are done to regularly monitor the different parameters of the water. A new approach in the technology has been planned to use IOT to check water quality, however this must be done securely and in real time. With an increase in mobile phone connections for the Internet of Things, data collection, method, and transmission are investigated in real-time water quality monitoring.The water characteristics are uploaded by the Arduino microcontroller through WI-FI after being received from the sensors. WQM chooses several device nodes to determine water characteristics such temperature, pH level, turbidity, and EC sensor. These processes transmit data to Thingspeak's Web Cloud and show sensor data on LCDs. Anywhere in the world can retrieve or access the data that is periodically updated on the server.

KEY WORDS: Power supply,Arduino UNO, pH sensor, Temperature sensor,LED indicators,ESP8266 WiFi module,LCD display

2. INTRODUCTION

In this context, "water quality" refers to the water's ability to support particular uses or processes. Each specialised application of water will have specific requirements regarding its chemical, physical, or biological features, such as constraints on temperature ranges and ranges of pH for water sustaining invertebrates communities. As a result, the quality of the water can be determined by a number of variables that control water usage. Attempts to improve or maintain a specific water quality sometimes mean compromising the quantity and quality requirements of different consumers. The idea that ecological systems should be considered when making decisions about how to manage water quality is becoming more widely accepted.

This is because of both their inherent value and the fact because they are small changes in the general parameters of the water, adding important details about chemical, physical, and other data. In order to move data from one location to another in the air, Wi-Fi uses radio frequency as its method of connection. A between one and two Mbps range characterises Wi-Fi speeds. The 2.4 GHz frequency used by Wi-Fi is used to transport

data. It makes use of technology called frequency division multiplexing. Between 40 and 300 feet is the Wi-Fi technology's range.

In this project, a LM35 sensor is used to determine the temperature sensor. The hydrogen ions concentration i.e impurities and ph value of the water is measured by a pH sensor, and the amount of suspended particulates in the water is measured by a turbidity sensor. The Arduino UNO microcontroller is constantly provided the values of all these parameters as input. With the addition of the date and time through WiFi, these parameter values are updated continuously, and an LCD display is used to show the sensor data.

3. LITERACY SURVEY

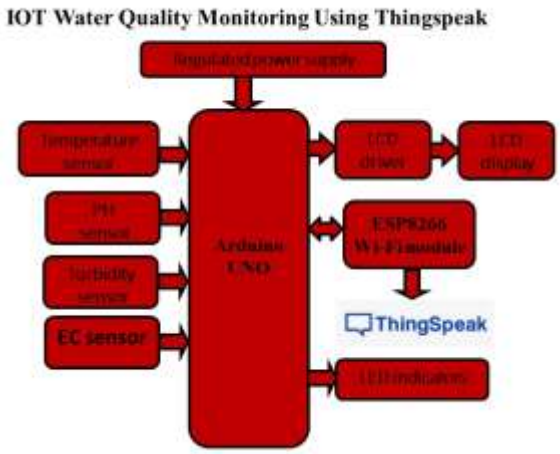
A monitoring system that comprises of several sensors used to assess different quality elements including turbidity, pH and water temperature was proposed by Sathish Pasika and Sai Teja Gandla. The Microcontroller Unit (MCU) and the sensors are connected, and the Personal Computer (PC) does additional processing. For the purpose of tracking the water under test, the data will be sent to the cloud namely ThinkSpeak application.

An IoT-based Smart Water Quality Monitoring system was created by Monira Mukta to continuously measure the water quality based on pH, temperature, turbidity, and electric conductivity, among other four other water quality indicators. Four different sensors are linked to an Arduino Uno to detect the quality attributes. The .NET platform-based desktop application receives the data from all four sensors., where the retrieved data is compared to reference values. utilising the sensor data that has been collected, the SWQM model that has been developed will accurately assess if the water sample under test is drinkable by utilising a fast forest binary classifier.

Santosh Konde and Shankar Deosarkar, they suggested model included sensors, a FPGA board, and a Zigbee-based wireless communication module. Real-time consideration was given to six different water quality parameters, including turbidity, pH, humidity, water level, water temperature, and carbon dioxide (CO2) on the water's surface. As part of regulating environmental and ecological balance, the SWQM system decreases the cost and time associated with determining the quality of water in water resources. In the suggested next work, a WSN network made up of more nodes will be constructed.

Tha.Sughapriya created a system for assessing the water quality through the implementation of the Internet of Things (IoT) and a range of sensor modules, this system gauges the pH level, turbidity, conductivity, and temperature of the water utilizing a diverse array of sensors.The sensor data will be accessed by the Arduino controller. The acquired data is analysed with the help of IoT, and a rigorous procedure may be used to look into water pollution. The created system also notifies concerned authorities and the public of the water quality through warnings and notifications. Monitoring the quality of the water could potentially be done by those with less training. The target area's proximity to the water resources made it simple to install the water quality monitoring equipment.

4. IMPLEMENTATION

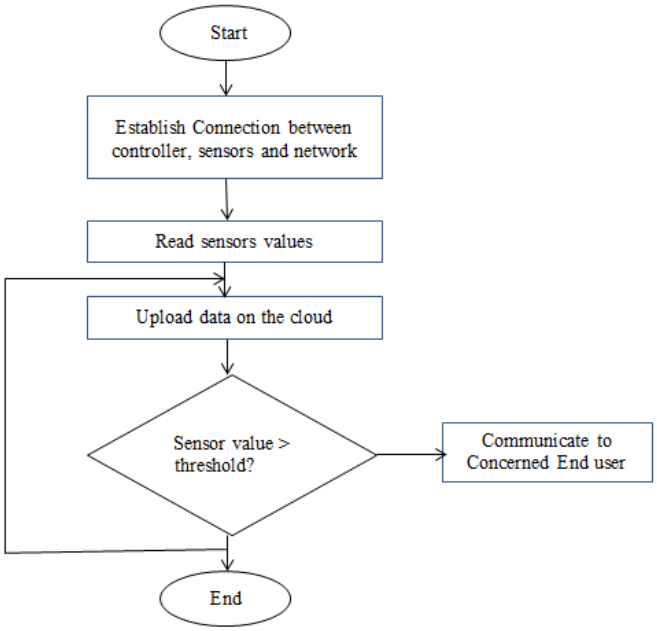


Arduino UNO is a device that can used to implement the design. The pH sensor, temperature sensor, turbidity sensor, and electron conductivity sensor are the devices that are interfaced to the Arduino UNO. In this, we will take the readings of all parameters of thne water by using the different sensors and the data will be displayed on the LCD and the values can be accessed by the user in the ThingSpeak platform.The values will automatically be uploaded to the cloud platform if the water's parameters change. The cloud platform is accessible to the user from any location in the world. The project's primary control device is an Arduino UNO that is pre-loaded with a clever programming created in embedded C.

With the development of IoT technology, the system for monitoring water quality is growing smarter, using less electricity, and being easier to use. The process diagram for the sophisticated system for tracking water quality is depicted in the above figure.

Numerous sensors, including pH, conductivity, temperature, turbidity, and many others, are integrated into the main controller. For testing, the sensor leads are submerged in water. The ADC will process the sensor values before reading them from the core controller and continuously uploading to the ThingSpeqak platform. The water parameters will be continuously uploaded to the cloud by determining if the system checks whether the parameter value surpasses the predefined limit or not. In case the parameter value exceeds the threshold, it will be transmitted to the cloud platform for additional measures to be taken. The parameters undergo reevaluation for a water source if the sensor reading falls below the established threshold.

5. FLOW CHART



Both the equipment and the software are broken down into separate portions for the work. The hardware consists of sensors that help measure values in real time, an Arduino ATMEGA328 which transforms analogue values into digital values, an LCD that shows device results, with a Wi-Fi module that links the physical components and software.The core-controller has different pins and we can connect different components.The LCD panel displays the values of each water quality parameter as they are analysed, updated on the cloud server, and shown one at a time.

6. DISCUSSION

The quality of the drinking water has been decreased over the years due to many reasons such as globalization and industrialization as a result of this declining the availability of potable water sources, the expanding population, the urbanization of rural regions, and the excessive utilization of seawater for salt extraction pose significant challenges. A crucial instrument for ongoing assessment of water quality is a intelligent system for monitoring the quality of water resources. The designed model of the smart water quality monitoring system is shown in Figure 6

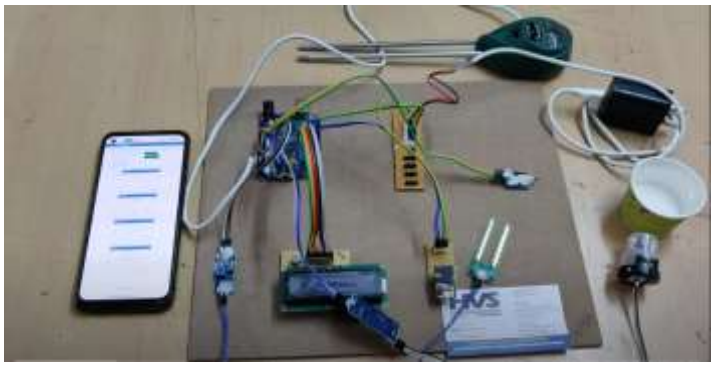


Fig 6 : Developed Model of IoT Based Water Quality Monitoring System

According to the regulations, the acceptable range of various quality parameters for ensuring the safety of drinking water is provided as follows :

pH should vary between 6.5 to 8.5

Turbidity should be less than 5 NTU

Conductivity should be between 200 to 800 µS/cm

Temperature should be between 6°C to 20°C

If the water follows the above parameters then the specified water is best suitable for drinking if they fail to follow any of the above parameter range then the water is not fit for drinking.

The graphical representation of the different parameters of the water when tested by the developed model are as follows :

7. CONCLUSION

Since it threatens the health of its citizens, financial stability, and biological diversity, contamination of water is a severe problem for any country. This paper provides an in-depth analysis of the various methods for monitoring water quality as well as the causes and impacts of water pollution, along with a practical internet of things approach to water quality monitoring. The research subject is still challenging despite the abundance of excellent smart devices for tracking water quality.

This paper provides an a description of current research projects aimed at creating energy-saving, and efficient drinking water monitoring systems that will enable continuous monitoring and the sending of alerts and uploading the parameters values to the cloud platform for further action.The developed model is user-friendly and cost-effective. Water samples are analyzed, and by assessing the findings, it becomes feasible to ascertain the suitability of the water for consumption. In the forthcoming times, it is recommended to deploy state-of-the-art sensors capable of detecting diverse levels of quality parameters. Wireless communication standards to To improve communication and harness the potential of the Internet of Things (IoT), there is an opportunity to

enhance the existing system for monitoring water quality.By implementing these advancements, we can establish a more robust framework that promptly responds to any issues, guaranteeing the safety of water resources through swift measures.

8. REFERENCES

1. K. A. U. Menon, D. P and M. V. Ramesh (2012), "Wireless sensor network for river water quality monitoring in India," 2012 Third International Conference on Computing, Communication and Networking Technologies (ICCCNT'12), pp. 1-7, doi:10.1109/ICCCNT.2012.6512437.
2. Konde, Santosh and Deosarkar, Shankar, (2020, June) . IOT Based Water Quality Monitoring System). 2nd International Conference on Communication & Information Processing (ICCIP) 2020, doi: http://dx.doi.org/10.2139/ssrn.3645467
3. L. Perelman, J. Arad, M. Housh and A. Ostfeld, "Event detection in water distribution systems from multivariate water quality time series", Environmental Science & Technology
4. S Geetha and S Gouthami, "Internet of Things Enabled Real Time water Quality Monitoring System", Smart Water International Journal for aqua – Smart ICT for Water, vol. 2, no. 1, pp. 3-11, 2017.
5. 8. Y. L. Xiong, "Application research of biological monitoring technology in environmental monitoring"Resource : Economization protection , vol 12, no 6
6. A. N. Prasad, K. A. Mamun, F. R. Islam and H. Haqva, (2015) Smart water quality monitoring system, 2nd Asia-Pacific World Congress on Computer Science and Engineering (APWC on CSE), pp. 16,doi:10.1109/APWCCSE.2015.7476234.
7. A. Jerom B., R. Manimegalai and R. Manimegalai, (2020), An IoT Based Smart Water Quality Monitoring System using Cloud,International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE), 2020, pp. 1-7, doi: 10.1109/icETITE47903.2020.450.
8. Geetha, S., Gouthami, S.(2016) Internet of things enabled real time water quality monitoring system. Smart Water 2, 1. https://doi.org/10.1186/s40713-017-0005-y
9. Sengupta B, Sawant S, Dhanawade M, and Bhosale S (2019), Water Quality Monitoring using IoT, Int.(2011).