

A Survey on Safe Drinking Water in Remote Locations using IoT Based Water Quality and Quantity Monitoring System

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ABSTRACT:Water quality measurement is an important task nowadays to avoid different types of diseases. Water may be composed of following aspects such as biological, physical or chemical. For human survival water is important natural source. Main aim of this project is to prepare an automatic model which finds water quality with the help of IOT (Internet of Things). For finding temperature, pH, ultrasonic and turbidity, system is designed and implemented with the help of sensors and *WeMos D1*. For sending information over internet Wi-Fi is mounted on Arduino board called *WeMos D1*. Complete experiment from selection of water data to its validation is done online using four important tasks as one is data transfer, second is its monitoring, third is recording and forth is its analysis.It has been noted that the system updates its settings in less than a minute. This low-cost solution is ideal for residents as well as businesses looking to check water quality.

Keywords: IoT (Internet of Things), waterquality monitoring, WeMos D1, Remote Location.

1.INTRODUCTION

In some locations the deterioration of drinking water quality is a challenging task. In recent years, it has gotten progressively worse [1]. Furthermore, a scarcity of technology exacerbates the situation. Two causes have contributed to the increase of

water contamination: industrialization and population exploitation. Sewage discharge into water streams from different residences is a serious problem.

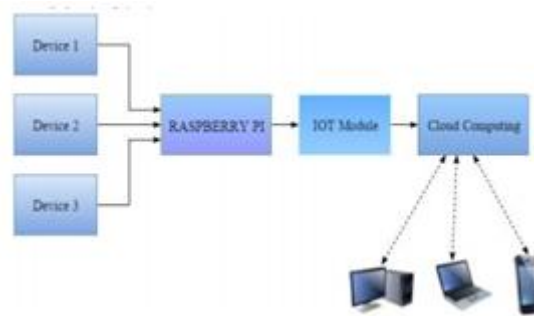


Fig.1: Example figure

If the fertilizers and chemicals from different agricultural and manufacturing industries are mixed with water the water become more toxic. From earths total population [2], maximum 20% of the people has access for drinking water with high quality and others don't have pure water access. This contributes to the spread of water-borne infections.

Water-borne sickness is thought to be responsible for 33% of all deaths in the country [3]. These germs are lethal and induce life-threatening illnesses.

They are not only harmful to humans, but also to animals and plants. They devastate the ecology and aquatic life in one way or another. Pathogens and virus germs contaminate even groundwater, resulting in over 2.5 million fatalities per year. To make water aesthetically pleasing, it must be free of color, turbidity, odour, and germs.

The priority of the water and sanitation agency must move from quantity to quality. It has been focused with finding ways to increase water quantity, but it has not prioritized water quality in practice. Treatment technology currently available is insufficient. In many cases, it does not meet international standards.

II.RELATED WORKS

Drinking Water Quality and Contamination [2]:

Drinking water quality is deteriorating day by day as a result of the country's alarming population growth and rapid development. The findings of multiple research inquiries into the drinking water quality condition in various locations of Pakistan are summarized in this report, which takes into account both the physicochemical characteristics of drinking water and the presence of harmful microorganisms. Only about 20% of population has access to clean drinking water. The remaining 80% of the population is forced to consume contaminated water due to a shortage of clean and nutritious drinking water sources.

Internet of Things (IoT) for water surface platform sensor data measurement and monitoring [4]:

Environmental monitoring is an intriguing procedure that has become increasingly important in modern society. Due to numerous obstacles in getting data from a given location, this study provides a platform that uses the Internet to monitor the environment at rivers or lakes. Flood alerts are also issued based on water levels.

Before being transferred to the cloud through the Internet, every sensor data is kept in a data logger. To obtain precise statistics, the data was collected three times a day using a time-based sampling strategy. Customers can also use the Internet cloud to access data in real time on their mobile phone or on their own PC.

System for Monitoring Water Quality Using IoT and Machine Learning[5]:

The World Economic Forum has identified the drinking water problem as a worldwide concern, with an estimated 200 children dying every day as a result. Each year, 3.4 million people die as a result of drinking contaminated water. Despite technological developments, there are insufficient quality measures to assess the quality of drinking water.

This study presents a low-cost water quality monitoring system that can replace existing quality monitoring methods using modern technologies such as Cloud Computing, IoT, and Machine Learning. This helps to prevent various dangerous diseases in rural areas, including bone abnormalities and fluorosis. The proposed approach may additionally control and alter the water temperature to match the ambient temperature. We have an R-squared score of 0.933 based on our model.

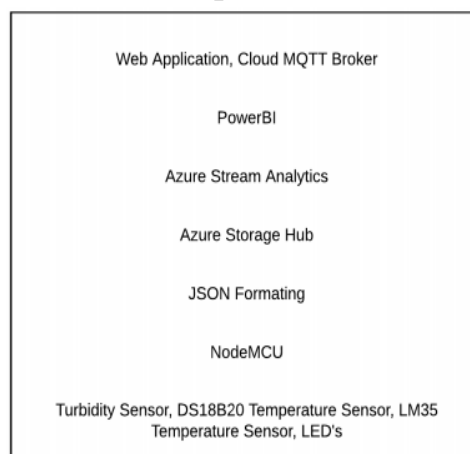


Fig.2: IOT architecture

This study provided a practical and cost-effective way for monitoring water quality without necessitating human involvement, especially in remote places.

INTERNET OF THING

Everything in human life has changed in the last decade as a result of the internet. The internet of things has been one of the most significant advancements in the internet portfolio of technologies. The Internet of Things (IOT) is concerned with the interconnection of communication devices in multiple locations, some of which are remote. The Internet of Things is a concept in which network devices receive and process data from the outside world before sending it over the internet to be used and processed for a number of reasons.

The internet of things is a concept in which items connect to the internet, each with its own identity and network access. In addition, the Internet of Things (IoT) provides accurate real-time data on physical object access. For real-time sensor data monitoring, the Internet of Things idea is particularly valuable. The Internet of Things (IOT) is a network system that uses information sensing equipment such as laser scanners, RFID, gas sensors, infrared sensors, GPS, and other similar devices. It enables anything to connect to the Internet and exchange data via a protocol that allows for intelligent identification, tracking the location, and management & monitoring.

IOT ARCHITECTURE

- **Layer 1:**All of the sensors, such as turbidity sensors and temperature sensors, as well as actuators such as heater or cooler LEDs, are found in Layer 1.
- **Layer 2:**In architecture Wi-Fi as the connection technology to enable reliable connection between devices and the cloud, ensuring that messages are sent reliably across the network.
- **Layer 3:**Data in structured format is the only format that Azure Event Hub accepts. As a result, the data is formatted into a JSON packet before being delivered to Azure Event Hub.
- **Layer 4:**The architecture storing the data on cloud servers using Azure storage hub, which provides dependability and cost effectiveness. Several copies of data are also created, ensuring backup capability in the event that the main server is physically damaged.
- **Layer 5:**The Storage Hub sends data to Azure Stream Analytics, which makes it available to devices outside of Azure.
- **Layer 6:**For research and reporting, Architecture employed PowerBI, a Microsoft application for data analysis and visualization.

- **Layer 7:**In architecture, we created a web application that allows users to log in with their credentials and access all of the visual charts that represent water quality. We used a MQTT broker to send data from the client, which is our gateway, to the broker, which is cloud MQTT, in addition to a web page to demonstrate how MQTT works.

III.CONCLUSION

This project includes complete study of water quality monitoring using Internet of Things (IoT) based system. The advantages of water quality monitoring using IoT is, it works with real time data, cost effective system and monitoring responses are quick. This proposed system can be installed at any place or at any given time, such as in Hospitals, water filters-based plants, industries or at homes.

Proposed hardware model includes four sensors as temperature sensor, ultrasonic sensor, pH sensor and turbidity sensor as well as it has internet connection with Arduino board *WeMos D1*. This project is designed successfully and the water quality monitoring correct information which is obtained from four sensors is sent over matlab IoT 'ThingSpeak' cloud.

ThingSpeak cloud data has updating rate of 15 sec with given four sensor, for further modifications and update someone can prepare their own cloud and update data accordingly. Existing systems has drawbacks of higher cost and more time complexity. Proposed work overcomes the drawback and designed time-saving cost effective water quality monitoring system.

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