Computational Algorithms and Numerical Dimensions

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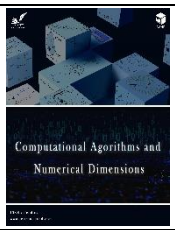
Com. Alg. Num. Dim Vol. 2, No. 4 (2023) 216–220.



Paper Type: Original Article

IoT-Based River Water Quality Monitoring

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Citation:

Fakheri, S., Komazec, N., & Saberi Najafi, H. (2023). IoT-based river water quality monitoring. *Computational algorithms and numerical dimensions, 2*(4), 216-220.

Received: 18/11/2022 Reviewed: 20/12/2022 Revised: 09/01/2023 Accepted: 01/02/2023

Abstract

This paper, named IoT-based river water quality monitoring, gives the outcome of quality river water with the advantage of various advanced techniques, the Internet of Things, and Wireless Sensor Networks (WSNs). As part of this, we have made the things to collect the data and transfer the data to the software that we have made. Then, the data we collect using various equipment will be analyzed using the software we have designed. Besides that, we automate the monitoring process with the system's hardware, data visualization, and software. This water quality monitoring system has been a significant issue and can be used digitally, intelligently, and effectively to improve river water quality.

Keywords: Water quality monitoring, Sensors, Data analysis, IoT.

1 | Introduction

The most critical environmental things are rivers (water), soil, environmental vegetation, farming lands, etc. The very important one is water, which saves all living creatures. Water is used for many purposes like domestic use, drinking, food preparation, and much more. So, we must protect the water resources from contamination [1]. If it doesn't happen automatically, the whole ecosystem will be damaged. It is hazardous not only for humans but also for all creatures [2]. Water contamination is a severe problem for the globe as well. We must stop this from global to local levels [3]. It is one of the main reasons for our current diseases [4]. In some areas, without proper water purification, the same polluted water is taken as their drinking water. There might be many reasons for this, which may finally lead to terrible health problems [5].

By knowing the disadvantages of water contamination, we have designed an IoT-based Wireless Sensor Network (WSN) that automates water quality monitoring with information provided by the sensors in the water [6]. By using the different sensors in the water, we will collect lots of information related to water, like the PH of the water and the extent to which the water is contaminated. All the related information is collected using the sensors [7].

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https://doi.org/10.22105/cand.2023.166518

With the WSN's fast growth, real-time data analysis will be taken and processed to get the valuable data [8]. This paper will provide all the river parameters using the IoT-based monitoring system.

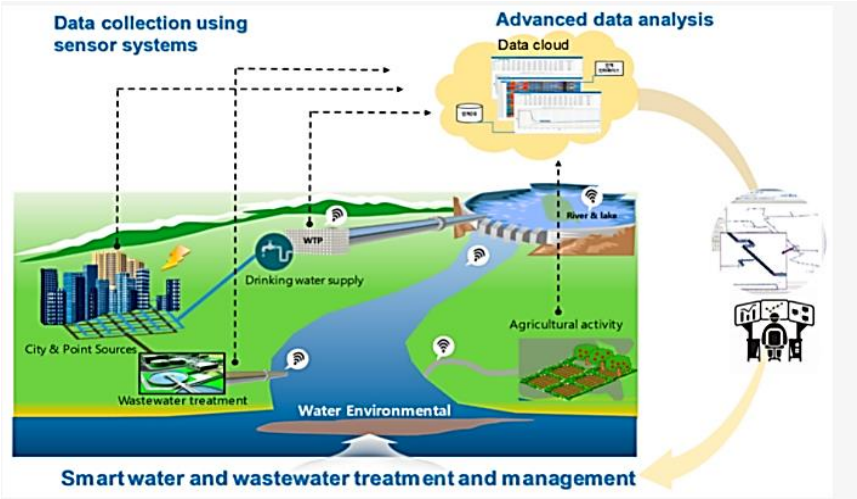

Fig. 1. Architecture sensor will be attached to every water level.

2 | Proposed System

The primary thing here is to give an automated specific thing for observing water quality at particular locations utilizing local sensors with low consumption of energy or power, low money, high discovery, etc. [9]. There are some areas where the water standard is to be increased effectively. The following points of thought execution: 1) to calculate or collect the data from the river, we want some sensors to collect data related to the water pH to determine to what extent the water is polluted, 2) the collected information pertaining to water must be sent to hubs and base stations [10], 3) after sending the data, it has to be calculated based on the parameters we discussed earlier [11], and 4) if any area is detected with contamination, an SMS needs to be generated so that actions can be done accordingly [12]. All the flow that was discussed in the points are illustrated in *Fig. 1*.

3 | IoT Platform

The various information we get from the sensors can give information like to what extent the water is contaminated with the help of Neural Networks [13]. *Fig. 2.a* describes the sensors that will be used in the monitoring system and the other parameters in the block diagram [14]. *Fig. 2.b* illustrates the various IoT layers of the platform that will run on the Hadoop cluster.

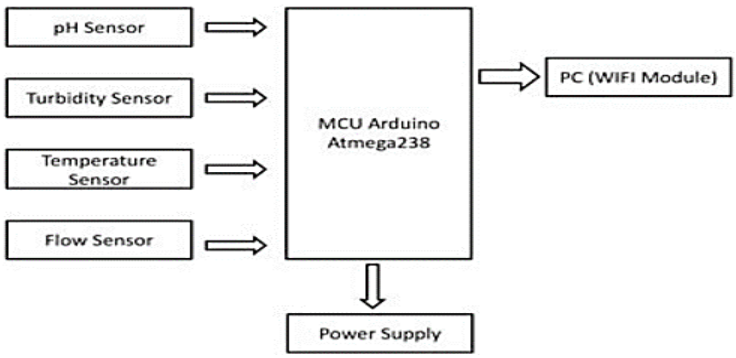

Fig. 2.a. Sensors and basic structures.

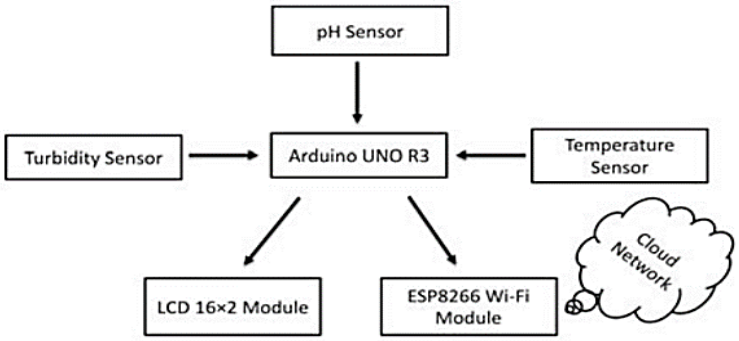

Fig. 2.b. Layers of IoT platform.

Disadvantages

In the Normal method, water samples are collected manually from different parts of a water body. The collected water samples have analyzed various parameters like PH, dissolved oxygen, and conductivity chloride content [15]. It is challenging to gather the water tests from all the regions of the water body [16]. The expense of investigation is exceptionally high. The lab testing and investigation take a few times, and consequently, the lab results don't reflect continuous water quality estimation because of deferral [17]. The interaction is tedious because of the slow course of manual information assortment from various water body areas. The technique is inclined to human blunders of different structures [18]. Thus, the disadvantages of the normal method are more when compared to the automated real-time water quality monitoring system [19].

Advantages

The standard of water is polluting year by year due to various changes that are happening in the environment changes and by humankind. So, it has become more important to calculate the water quality in different areas of water bodies. This may help in reducing water pollution and consecutively in saving aquatic life. As the boat is mobile, more samples are collected from different locations in much less time [20]. The IoT-based water quality monitoring system is straightforward to maintain as we can carry all the electronic boards. The budget is meager, and the software does not cost much [21]. We have various machine learning algorithms to plot data points that can be formatted for proper analysis. Different cloud storage platforms help in storing the data immediately.

4 | Results

In *Fig. 2.a*, we display the content detected about various parameters. It consistently gets the information related to the various things shown in *Fig. 2.a*. If the gained value exceeds the threshold value, remarks will be shown with some red color [22]. If the gained value is lower than the limit, esteem remarks will be green. A bar chart will likewise be shown for wonderful agreement. The time series portrayal of sensor information with choice is displayed in *Fig. 2.b*.

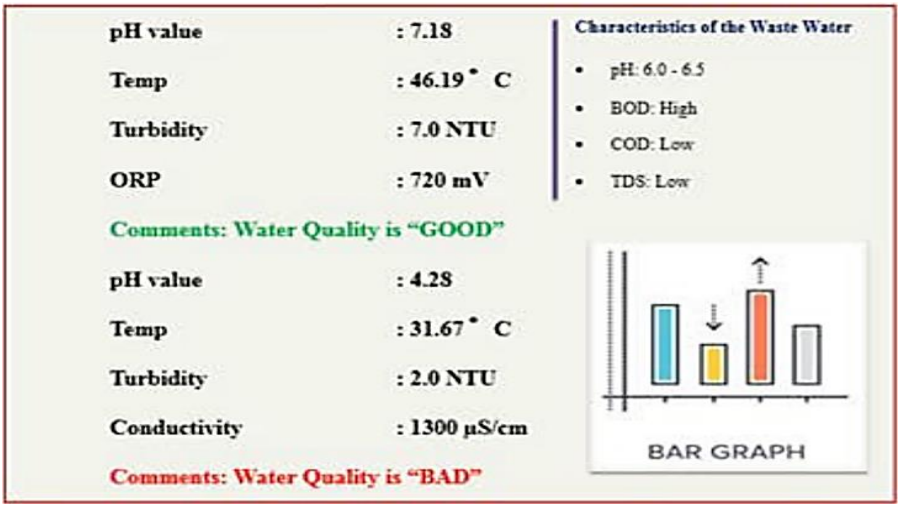

Fig. 4. Results of various sensors.

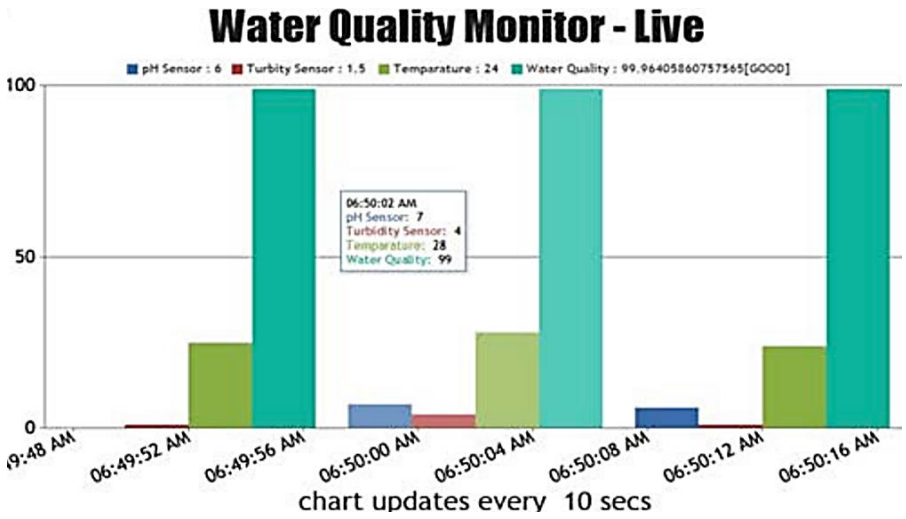

Fig. 5. Bar graph representation of sensor data.

5 | Conclusion

This paper discusses the disadvantages of the manual method, how it works less than the automated real-time monitoring system, and the advantages of the real-time river water monitoring system. And how the data is collected from the sensor placed below the water and processed after getting the data. Detailed data points will be analyzed, and helpful information will be taken. Monitoring river water quality, a real-time Neural Network by IoT and Big Data Analytics will help human life effectively by sending the data through sensors placed inside water. The IoT Neural Network gives a better solution for water contamination. Through the water monitoring project process, we analyzed all the parameters in detail, and data visualization was also used to visualize the data from the sensors.

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