SMART WATER QUALITY MONITORING SYSTEM

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ABSTRACT

Water quality system is a concept where issue of globally polluted water can be solved with the help of IoT by monitoring the quality of water. The internet of Thing (IoT) is used in different areas of research for monitoring, collecting and analyzing data from remote sites. This paper presents is based on reconfigurable interface device for water quality monitoring (WQM) in an IoT environment. In the proposed work, Arduino uno is used as a core controller. The system mainly focuses on IoT which is new scenario to make the city smart with different applications. Proposed system consists of Arduino used as minicomputer, different sensors such as water level sensor, pH sensor, temperature sensor, CO_2 sensor, turbidity sensor are used. Sensors collect the data and send it to Arduino uno. This system will estimate quality of water by continuous monitoring and controlling it with the help of central server, which is possible by using this system.

INTRODUCTION

As the Internet of Things (IoT) involves every aspect of human daily chores nowadays, the applications of IoT bring the potential resolutions in healthcare services, education, smart building, environmental monitoring and additional chapters of modern living. Recently, the environmental monitoring technology has been

increasingly important due to the climate change, natural disasters and natural hazards [1-3]. The environmental monitoring application consists of multiple sensors that detect and monitor sensor data in IoT environments [4]. Therefore, low power consumption and low-cost sensors are important criteria in the implementation of network in IoT. For environmental monitoring applications, the number of sensors deployed in IoT is the primary factor of high cost for better replacement and servicing. Therefore, the selection of hardware components such as sensors, microprocessor and wireless communication protocol is the priority issue for the implementation of energy-constraint sensor nodes in a remote environment. The system needs to be user friendly, flexible and affordable. Hence, the selection of software is also important.

In order to ensure the safe supply of the drinking water the quality needs to be monitored. The proposed work presents a design and development assistance for monitoring of the water quality in IoT, the system consists of several sensors which is used for measuring physical and chemical parameters of the water parameter such as temperature pH, turbidity, CO2 of the water. The measured value from the sensor can be processed by the microcontroller. The Arduino uno can be used as a core controller. In this work main focus is on continuous and real-time monitoring of water in IoT platform. Internet of things is nothing but the network of physical objects embedded with electronic sensor software and network connectivity. Monitoring can be done from anywhere as central office. Using free server data continuously pushed on cloud so we can see data in real-time operation using different sensors with Microcontroller Arduino as minicomputer can monitor data and also control operation from server with efficient client server communication. IOT-based smart water quality monitoring system presents smart sensor interface device for water quality monitoring system in an IoT environment. This system detects and display various parameters of water level continuously. Thus, for making drinking water fit for human consumption, it has to free from sediments, minerals, bacteria's etc. which affects the human health of human being.

Traditional method of water quality involves the manual collection of water sample at different locations, followed by laboratory analytical techniques in order to characterize the water quality. Such approach takes longer time and no longer to be considered efficient. Although the current methodology analyzes the physical, chemical and biological agents, it has several drawbacks. Therefore, there is a need for continuous water quality monitoring in real time. In the present work the proposed approach design and develop a robust system for monitoring of the water quality using IOT environment. Where IOT describes the network of physical

objects things that are embedded with sensors software and other technologies for the purpose of connecting and exchanging data with the other devices and systems over the internet [5].

LITERATURE REVIEW

Cho Zin Myint [6] et. al. Propose smart WQM system of single chip solution to interface transducers to sensor network using FPGA is presented with wireless method by using a wireless XBee module. The results of the five parameters of water quality are verified that the system achieved the reliability and feasibility of using it for the actual monitoring purposes. The proposed system will assist in protecting the ecological environment of water resources. The smart WQM system minimizes the time and costs in detecting water quality of a reservoir as part of the environmental management. The WSN network will be developed in the future comprising of more number of nodes to extend the coverage range.

M Cho Zin [7] et. al. Wireless real-time WQM system in IoT has been designed and implemented to measure five water parameters. The system achieves high execution speed as the water data is detected within 1 or 2 minutes after the switched is on and the system executes parallel processing. The proposed system exceeds the performance of the existing microcontrollers-based WSN design by utilising the FPGA SoC board. The experimental results of the proposed design offer reliable outcomes which are lowcost, low power consumption, strong communication ability, and reliable real-time measurement. The current system can be additionally upgraded by integrating additional sensors for a broader measuring area.

Jinfeng and Shun [8] designed an aquaculture water quality monitoring system using MSP Microcontroller and zigbee wireless module. The system collects, transmits, displays and queries the water quality parameters such as temperature, dissolved oxygen concentration, pH value and water level.

Vijayakumar and Ramya [9] designed a real time water quality monitoring system in IoT environment. The system consists of multiple sensors to monitor water parameters and raspberry pi B+ model as the main controller.

Akila et al. [10] proposed the water quality monitoring system that detects the pH and temperature of the river water using sensors and Arduino board.

Libeliums [11] Initiatives have been taken all over the globe to develop projects based on sampling water to aid in controlling marine environments. Libeliums Smart water device monitors the status of an aquarium's health in Europe. It specifically monitor parameters like pH, electro conductivity, oxidation / reduction potential and temperature. A cloud-based solution developed to help in monitoring data in real time providing a fast and effective reaction in case of risiamo abnormalities.

Postolache et al. [12] developed embedded software to monitor water quality using PIC Microcontroller, MPLAB and C compiler. In the proposed system, the software for data communication, data logging and graphical representation of the water quality data was developed in LabVIEW software. A similar example to that of this project can be seen in the coastal water pollution monitoring initiatives in the Gulf of Kachchh with the only difference being in terms of it having a much larger scope and vastly more expensive protocols deployed to counter the effects of the industrial development. Furthermore, locally there have been projects based around the conservation of the coral reefs. The mamanuca environment society's Biannual sea water monitoring program has been around for 4 years whereby tests are carried out on seawater for fecal coliform bacteria, salinity and nutrients which helps in ascertaining the health of the surrounding reefs. Research indicates that projects of this nature are developed on a large scale with generous funding from reputable organizations. There is little indication of small scale and inexpensive projects that have a similar role in places like marine jetties, cities and industrial rivers to preserve aquaculture and public health. By applying a strategic, cheap and methodical technique this project hopes to achieve this in an effort to sanitize our oceans.

Nikhil khedia [13] entitled water quality monitoring for rural area A sensor cloud based economical project. This paper highlights monitoring method, sensors, embedded design for measure water quality is not feasible at this point, efficient use of technology and economic practices can help improve water quality and awareness among people.

Prasad et. al [14] propose a smart water quality monitoring device for Fiji using IoT and remote sensing technologies is shown in this article. The Pacific Islands of Fiji requires regular collection and analysis of collected data for the water quality monitoring system and uploading this data into the server. In order to monitor water quality, the author have used IoT and remote sensing technologies. The current measurements can be enhanced by remote sensing. During the entire test period, the system has been proved worth by

delivering accurate and consistent data using IoT for water monitoring in real time. The system proposed by these authors also used GSM module to forward the data to the mobile user via SMS.

M.NAGANAIK [15] et. al. The proposed smart WQM system of single chip solution to interface transducers to sensor network using FPGA is presented with wireless method by using a wireless XBee module. The proposed system will assist in protecting the ecological environment of water resources. The smart WQM system minimizes the time and costs in detecting water quality of a reservoir as part of the environmental management. The WSN network will be developed in the future comprising of more number of nodes to extend the coverage range.

Omar Faruq et. al. [16] propose a water quality monitoring system based on Microcontrollers for people living in Bangladesh outskirts, where safe drinking water is not available, is provided in this paper. The device has been designed with a high degree of accuracy and is sensitive to several water parameters such as temperature, turbidity and hydrogen potential displayed on the LCD monitor. Finally, in this paper, each of the parameter values is compared with the predefined equipment, and sensor values and error are calculated.

The studied literature presents various water quality monitoring mechanism. However most of them are based on micro controllers that requires additional hardware for interfacing the sensors, certain literature provide FPGA Best reconfigurable mechanism which are costly. The literature studied hardly reports any mechanism for measuring salinity and contamination of water. This I propose to develop and design a low-cost solution for continuous monitoring of water. The develop system will be remotely controlled using IoT platform. It will be capable of measuring not only basic parameters such as pH, temperature, turbidity, CO_2 etc. but will also be capable of monitoring salinity and automation.

PROPOSED METHODOLOGY

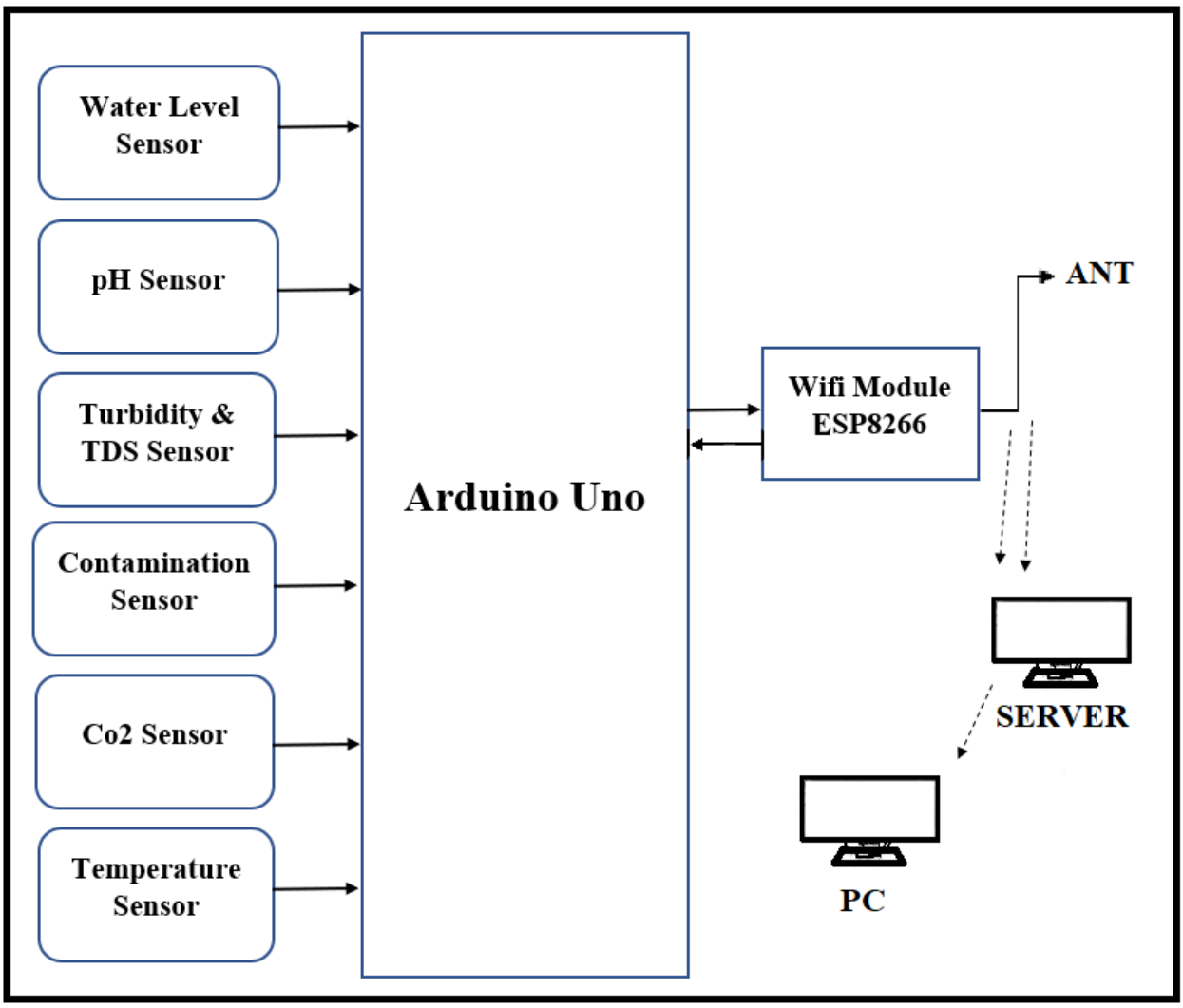

Figure 1: Block diagram of Proposed System

In the proposed work, Arduino uno is used as a core controller. The system mainly focuses on IoT which is new scenario to make the city smart with different applications. Proposed system consists of Arduino used as minicomputer, different sensors such as water level sensor, pH sensor, temperature sensor, CO_2 sensor, turbidity sensor are used. Sensors collect the data and send it to Arduino uno. This system will estimate

quality of water by continuous monitoring and controlling it, with the help of central server, which is possible by using this system.

CONCLUSION

Due to the impact of polluted water globally tremendous changes are taking place towards development of a smart sensor interface device for water quality monitoring system in an IoT environment. IOT-based smart water quality monitoring system is designed and developed a reliable and efficient technique to monitor quality of water by continuous monitoring and also controlling it from a central server. The system minimizes the time and cost in detecting water quality of reservoir as part of the environmental management. This system detects and display various parameters of water level continuously for making drinking water fit for human consumption. The develop system will provide low-cost and low operating time as a solution to continuous water monitoring.

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