**REVIEW OF RELATED LITERATURE**

**IoT based real-time water quality monitoring system in water treatment plants (WTPs)**

Water quality monitoring systems are developed to help humans overcome errors, and boost efficiency in workplace. This system leverages IoT-devices as the center of the water quality monitoring system. Through the use of IoT, the researchers developed an infrastructure capable of real-time monitoring of water quality and data visualization. The researchers want to study the approach and apply on the system.

In the study of (Forhad et al., 2024), real-time water quality monitoring system that leverages the use of IoT devices is developed. This device is mainly developed to remotely monitor the water quality of water treatment plants. The key parameters monitored by the device are pH, Dissolved Oxygen (DO), Total Dissolved Solids (TDS), and Temperature. The parameters are then transmitted to a centralized monitoring platform using wireless communication protocols such Wi-Fi, LoRa Wan, and Cellular Networks. The data transmitted are stored in a cloud server, SCADA, this system is capable of storing and visualizing data sent by the device. This enables early detection of any abnormalities in the water quality, which allows prompt corrective actions to prevent further damages. This study’s concept of water quality monitoring is relevant to our project, the use of IoT devices and use of Cloud Server are the main takeaways from this project. The researchers aim to make a new water quality monitoring system the revolves around the same approach used.

**Water quality monitoring system using IOT**

The use of MCUs and GPRS in water quality monitoring systems is an innovation that solved the problem in traditional water monitoring. This technology help solved problems with manual, costly, and labor-intensive water quality monitoring system. Leveraging IoT devices and a wireless communication protocol to process and transmit data gathered though the sensor nodes enable the device to monitor water quality in real-time.

The research by (Doni, 2018)utilized the power of IoT to develop a water quality monitoring system. This project revolves around the use of Microcontroller Units (MCU) and General Packet Radio Service (GPRS). Through the use of MCU, the data collected by the sensor nodes are processed and will be compared to a threshold. In an event where parameters went pass the threshold, there will be an indicator to indicate it. The data sent, through GPRS, are then stored in a cloud server for further use. This system focuses on measuring the pH, temperature and Turbidity (TDS) of a water body. The server module is responsible for storage and management of the data sent by the base station. This study utilized IoT devices and cloud server integration to allow real-time and remote monitoring of water quality parameters. This approach is relevant to the researcher’s study, the researcher wants to implement same approach to develop a system that utilizes IoT devices and cloud servers to store and manage data.

**IoT based smart water quality monitoring system**

Pollution is rampant in modern society, it does not only harm humans but also animals as pollution mainly affects their habitats. The study of (Lakshmikantha et al., 2021) developed a system to monitor water quality to enable early detection of irregularities in water qualities. Real-time monitoring of water qualities is made possible through using stacked technology to transmit and process data.

Lakshmikantha et al. (2021) utilized the power of lightweight sensors to and IoT devices to create a deployable device that will gather water quality data. The system is equipped with a lithium-ion batteries as a source of power for long distance deployment. The data gathered by the sensors are processed by a Microcontroller Unit which are then compared to predetermined threshold and will alert users through and LCD Monitor. Data gathered are uploaded to a cloud server for storage and safekeeping. This particular way of developing the system is relevant to the researcher’s project. The system enables real-time, cost-effective and efficient way of monitoring water bodies using sensors, IoT devices and cloud server.

**Enhancing Coastal Management through the Design and Development of an In Situ Water Quality Monitoring System**

The Philippines being an archipelago, consists of several coastlines that serves a lot of functions within a community. However, the rich coastal water is faced with water quality deterioration due to the heavy reliance of residents on coastal waters for livelihood and recreation. For that reason, the researchers developed a water quality monitoring device.

A device that’s capable of rapidly gather real-time data, through its multiparameter sensor that simultaneously measure temperature, PH, dissolved oxygen and electrical conductivity. Such device would aid the timely observation of parameters such as temperature, PH, dissolved oxygen, and electric conductivity. Data shows how implementing a water quality monitoring device help make informed decisions in resource management and pollution control (Carolina et al., 2024). Consistent with this evidence, our study extends the analysis to implement a sustainable water quality monitoring system that is portable and low-cost.

**IoT based real-time river water quality monitoring system**

Characteristic of manual system of water monitoring is often monotonous and time-consuming. As it is highly critical to maintain water quality as it affects the ecological balance among other species as well as human health. Hence, the introduction of sensor-based water quality monitoring system that integrates wireless sensor and internet of things for it to progress into an efficient, real-time and cost-effective monitoring system.

As Chowdury et al. (2019) explores the concept of a sensor-base water monitoring system, revealed how it could help residents in evaluating contaminated water and eventually prevent water pollution. The system mainly consists of components such as Wireless Sensor Networks (WSN), including a microcontroller for processing in the system. Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Displayed in a visual format on a server PC, as the data is collected. Similarly, the researchers aim to develop a sensor-base water monitoring system with cloud server integration to further enhance the real-time remote remoting of water quality.

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