EFFICIENT RIVER WATER QUALITY MONITORING SYSTEM THROUGH IOT PLATFORM

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***Abstract*- Pollution of water is one of the main threats in recent times as drinking water is getting contaminated and polluted. The polluted water can cause various diseases to humans and animals, which in turn affects the life cycle of the ecosystem. If water pollution is detected in an early stage, suitable measures can be taken and critical situations can be avoided. To make certain the supply of pure water, the quality of the water should be examined in real-time. Smart solutions for monitoring of water pollution are getting more and more significant these days with innovation sensors, communication, and InternetofThings (IoT) technology. In this paper, a detailed review of the latest works that were implemented in the arena of smart water pollution monitoring systems is presented. The paper proposes a cost effective and efficient IoT based smart water quality monitoring system which monitors the quality parameters uninterruptedly.**

***Keywords*: Arduino, Cloud server, Conductivity, Controller, pH sensors, Turbidity, Water Quality**

1.INTRODUCTION:

FRESHWATER makes up only 0.01% of the global water but it supports at least 100 000 (almost 6%) of all recorded biological species. Since aquatic species spend at least part of their lifetimes in water bodies, water quality directly affects their living condition, composition, distribution, and diversity. Relationships between water quality and biodiversity are well recorded in a variety of studies, and the deterioration of water quality is believed to be one of the factors contributing to the rapid decline in global aquatic biodiversity. To conserve freshwater biodiversity, water quality should be continuously monitored and evaluated. Conventional laboratory water quality tests, however, can only provide sparse data due to financial and time limits. Over the last decade, the Internet of Things (IoT) has become a fresh and promising technique in water quality monitoring, especially for agriculture and waste management. The IoT technology is to connect traditional objects to the Internet to make things smart by utilizing technologies, such as sensors, wireless communications and networking, cloud computing, and so on. According to IoT-based services will contribute more than $2.7 trillion to global economics annually in 2025. Nevertheless, real-time water quality monitoring of diverse physical–chemical–biological (PCB) parameters still remains a great challenge, primarily due to the limited types of sensors available on the market. Consequently, a large number of chemical and biological parameters still rely on laboratory tests, which are time consuming and not cost effective. To address these problems, this research aims to achieve the following objectives.

1) Identify crucial water quality parameters that affect freshwater biodiversity.
2) Identify those water quality parameters that can be measured with available IoT sensors and develop an IoT system to measure these parameters simultaneously.
3) Develop artificial intelligence (AI) models to estimate parameters that cannot be measured by current IoT sensors using IoT-measurable parameters, based on a large historical water quality monitoring database.
4) Evaluate the AI models using a case study. The remainder of this article is organized as follows. In Section II, relationships between water quality parameters and biodiversity over the last two decades are reviewed and the top-10 crucial water quality parameters are identified. In Section III, a framework for unmeasurable water quality parameter estimation is proposed, a developed water

2. RELATED WORKS:

Pasika and Gandla [1] proposed a monitoring system which consists of a number of sensors used to measure several quality parameters like turbidity, pH value, water level in the tank, dampness of the adjoining environment and temperature of the water. The sensors are interfaced with the Microcontroller Unit (MCU) and additional processing is executed by the Personal Computer (PC). The acquired data will be directed to the cloud by means of Internet of Things (IoT) based ThinkSpeak application for monitoring the quality of the water under test. As a future directive, work should be extended for analyzing some other parameters such as nitrates, electrical conductivity, dissolved oxygen in the water and free residual chlorine. Mukta et al. [2] developed an IoT based Smart Water Quality Monitoring (SWQM) system which helps in incessant measurement of quality of water on the basis of four different parameters of water quality i.e., pH, temperature, turbidity and electric conductivity. Four different sensors are coupled to Arduino Uno in order to sense the quality parameters. The data collected from all the four sensors are communicated to a desktop application which is developed in .NET platform and the extracted data are matched with the standard values. On the basis of the collected data from sensors, the developed SWQM model will efficaciously examine the water quality parameters by employing fast forest binary classifier for classification of the sample of water under test is whether potable or not. Konde and

Deosarkar [3] proposed a method for developing a Smart Water Quality Monitoring (SWQM) system with reconfigurable sensor interface device using IoT environment. Sensors, Field Programmable Gate Array (FPGA) board, Zigbee based wireless communication module were used in the proposed model. Six different water quality parameters like turbidity, pH, humidity, water level, water temperature and carbon dioxide (CO2) on the surface of water were considered in real-time. The proposed method will provide assistance in guarding the safer and balanced environment of water bodies. The SWQM system reduces the cost and time in determining the quality of water in water resources as part of managing environmental and ecological balance. In the suggested future work, WSN network will be developed involving of additional number of nodes to encompass the coverage area. Deployment at different locations Amruta and Satish [4] proposed a Solar Powered Water Quality Monitoring system by employing wireless Sensor Network. Underwater Wireless Sensor Network (UWSN) is the elementary component in the water quality monitoring using wireless sensor network (WSN) technology which is powered by photovoltaic panels or solar panel. For monitoring quality of water in real-time over various locations, exceptional system architecture is proposed that consists of a base station and distributed sensor nodes. All the nodes and base station are linked with the use of Zigbee WSN technology. Designing and implementing a prototype model by using a node which is power- driven by solar panel and WSN technology is a perplexing task. The collected data at each node such as turbidity, oxygen level and pH values from different sensors will be sent to the base station through WSN. The collected data from the different locations can be shown in some readable form and analysis can be done at base station using various simulation tools. This developed novel water quality monitoring system has various advantages like consumption of less power, no carbon emission and higher limberness for Sughapriya et al. [5] developed a method for determining the quality of water using IoT and different sensor modules. This system uses different sensors for monitoring the water quality by determining pH, turbidity, conductivity and temperature. The Arduino controller used will access the sensor data. With the use of IoT, the collected data is analyzed and the pollution of water can be investigated by a stringent mechanism. Additionally, the developed system sends alerts and notifications to the people and apprehensive authorities about the quality of water. The task of water quality monitoring could be achieved by with people having less training also. Installation of the water quality monitoring system could be achieved effortlessly adjacent to the water resources (target area). The proposed developed model comprises of different sensors that computes quality parameters of water in real- time for immediate plan of action. Also the developed model is accurate, economical and requires less manpower. Unnikrishna Menon et al.**3**

3.EXISTING SYSTEM:

Water pollution is a significant threat to public health and the environment, and early detection and mitigation of water pollution is crucial to ensuring access to clean and safe drinking water. In recent years, smart water pollution monitoring systems have become increasingly important due to advancements in sensor technology, communication networks, and Internet of Things (IoT) technology. These systems use sensors to monitor water quality parameters in real-time and transmit the data to a central server for analysis and action. This paper presents a detailed review of the latest works that have been implemented in the field of smart water pollution monitoring systems. The authors propose a cost-effective and efficient IoT-based smart water quality monitoring system that continuously monitors water quality parameters. The system is designed to detect changes in water quality in real-time and transmit the data to a cloud-based server for further analysis. The proposed system uses a combination of sensors to monitor water quality parameters such as pH, temperature, dissolved oxygen, turbidity, and conductivity. The sensors are placed in the water source and connected to a microcontroller, which collects and processes the data. The microcontroller is connected to an IoT device that transmits the data to a cloud-based server for further analysis. The authors tested the developed model with three water samples and found that it accurately monitored the water quality parameters in real-time. The data was transmitted to the cloud server, where it was analyzed and compared with the standard values for safe drinking water. The system was able to detect changes in water quality parameters and alert the relevant authorities in case of any deviation from the standard values. the proposed IoT-based smart water quality monitoring system is a cost-effective and efficient solution for monitoring water pollution. The system can continuously monitor water quality parameters in real-time and transmit the data to a central server for further analysis and action. The system can help detect changes in water quality early and prevent critical situations that can arise due to water pollution.

4.PROPOSED SYSTEM:

A NPK sensor is a device that measures the nitrogen, phosphorus, and potassium (NPK) nutrients of soil. In addition to measuring the NPK of soil, it can also convert into analog. The NPK sensor has an inbuilt circuit to measure the changes in the soil. The NPK sensor is connected with a board to get a analog voltage as output.

General Description:

The DS18S20 digital thermometer provides 9-bit Celsius temperature measurements and has an alarm function with non-volatile user-programmable upper and lower trigger points. The DS18S20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor. In addition, the DS18S20 can derive power directly from the data line (“parasite power”), eliminating the need for an external power supply.

Each DS18S20 has a unique 64-bit serial code, which allows multiple DS18S20s to function on the same 1-Wire bus. Thus, it is simple to use one microprocessor to control many DS18S20s distributed over a large area. Applications that can benefit from this feature include HVAC environmental controls, temperature monitoring systems inside buildings, equipment, or machinery, and process monitoring and control systems.

Benefits and Features

●Unique 1-Wire® Interface Requires Only One Port Pin for Communication

●Maximize System Accuracy in Broad Range of Thermal Management Applications

•Measures Temperatures from -55°C to +125°C (-67°F to +257°F)

•±0.5°C Accuracy from -10°C to +85°C

•9-Bit Resolution
•No External Components Required
●Parasite Power Mode Requires Only 2 Pins for Operation (DQ and GND)
●Simplifies Distributed Temperature-Sensing Applications with Multidrop Capability
•Each Device Has a Unique 64-Bit Serial Code Stored in On-Board ROM
●Flexible User-Definable Nonvolatile (NV) Alarm Settings with Alarm Search Command Identifies Devices with Temperatures Outside Programmed Limits
●Available in 8-Pin SO (150 mils) and 3-Pin TO-92 Packages

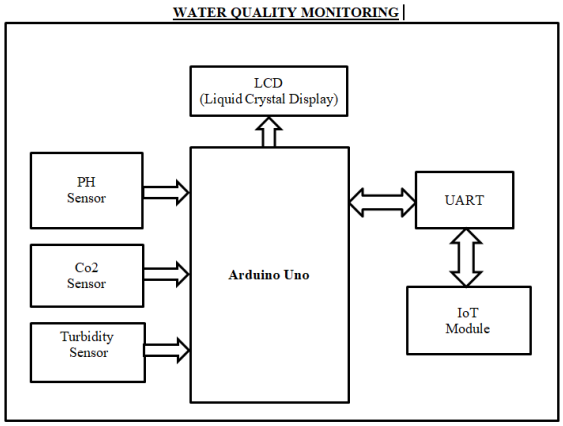


Fig.No.4.1 Block Diagram of IOT based River Water Quality Monitoring and Control System

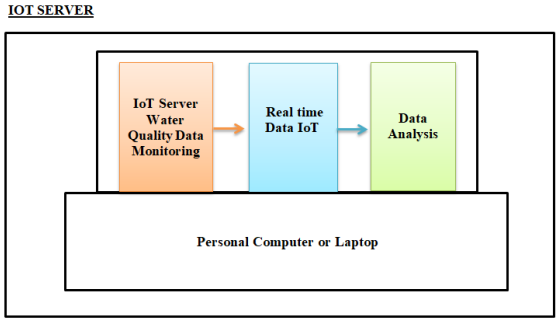


Fig.No.4.2 Block Diagram of IOT Server

5. OUTPUT AND RESULTS:
Initially, there were no indication of chemicals, turbidity, PH

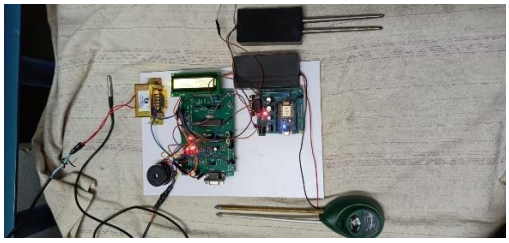
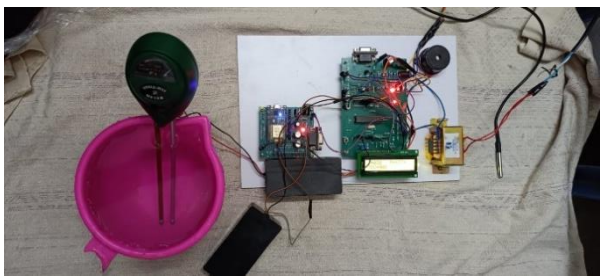


Fig No:5.1



FigNo:5.2

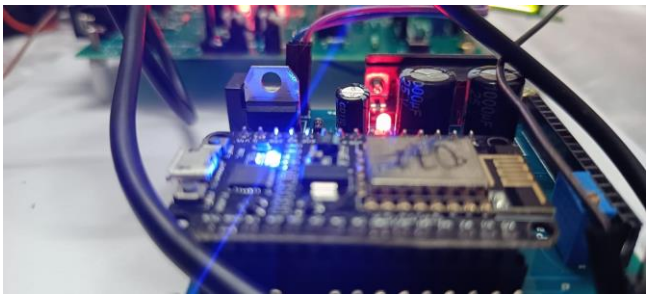


Fig No:5.3 Arduino Uno

Fig.No.5.4

The output of this module would be a water that is limited to normal PH sensor. The module would continuously monitor the water quality and show the water turbidity and the chemicals in the water

6.CONCLUSION:

Water Pollution is a major threat to any country, as it affects health, economy and spoils bio- diversity. In this work, causes and effects of water pollution is presented, as well as a comprehensive review of different methods of water quality monitoring and an efficient IoT based method for water quality monitoring has been discussed. Although there have been many excellent smart water quality monitoring systems, still the research area remains challenging. This work presents a review of the recent works carried out by the researchers in order to make water quality monitoring systems smart, low powered and highly efficient such that monitoring will be continuous and alerts/notifications will be sent to the concerned authorities for further processing. The developed model is cost effective and simple to use (flexible). Three water samples are tested and based on the results, the water can be classified whether it is drinkable or not.

As a future directive, the suggestion is to use latest sensors for detecting various other parameters of quality, use wireless communication standards for better communication and IoT to make a better system for water quality monitoring and the water resources can be made safe by immediate response.

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