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DESIGN AND IMPLEMENTATION OF IOT SYSTEM FOR WATER QUALITY MONITORING

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Abstract-**Water pollution is the major problem which is faced by the most of the countries today. The water quality monitoring plays an important role to identify the condition of the water. Thispaper aims to detect and display the real time physiochemical parameters of water in a place along with its location. It is a remote-controlled system which is specially designed for large water bodies where a single point measurement cannot determine the quality of the water in the large water bodies. This project includes a boat which moves from one corner to another of the water body and collects the values like pH and turbidity along with its location using GPS module. These results are displayed on LCD and through a web page, the data is stored in the server for future reference.**

Keywords-**Multipoint measurement; Arduino module; Water quality monitoring; GPS module; Physiochemical parameters.**

I. INTRODUCTION

Water is an essential resource for every living organism on the earth. It is an important element which is used for drinking, agriculture, aquaculture, industries and in other sectors. Water pollution will degrade the quality and purity of the water. Many people experience numerous fatal ailments every year as a result of water contamination.

According to research, the only reason 5 million people die each year is from drinking contaminated water. By giving children access to drinking water, the World Health Organisation's research indicates that about 1.4 million child deaths might be avoided. The polluted water does not consistof colour but changes the pH, turbidity values of the water.

Early detection of water contamination allows for appropriate action to be taken and the avoidance of dangerous circumstances. Real-time monitoring of the water's quality is necessary to ensure the supply of pure water. As sensors, connectivity, and Internet of Things (IoT) technology advance, smart solutions for water pollution monitoring are becoming more and more important.In this paper, an intelligent water quality monitoring system is proposed. It uses IoT platform which helps to monitor water quality without depending on the traditional or on the manual methods. The pH is the measure of hydrogen ions in the water. The water quality is measured by two separate sensors and also gives the location of the ship where the water is measured.

II. LITERATURE SURVEY

Turbidity, temperature, and pH sensors make up the framework, which is used to collect data and track the water quality throughout the day from various locations. The parameters are checked and assessed after the data has been uploaded[1]. This system uses sensors to measure the metrics related to water, such as temperature, pH, and dissolved oxygen content. For subsequent water quality investigation, all gathered data are kept in a database and computed stochastically[2]. Numerous sensor nodes make up the wireless sensor network application for water quality monitoring, which can be set up for a minimal cost with simple software installation, handling, and maintenance[3].

The above papers consist of various sensors which are used to sense and collect the quality of water from water bodies at a fixed point. The single point measurement is used to measure the parameters of water. In our proposed system, we used multi point measurement to check the parameters of water in large water body because the water will be pure at a point where there is a heavy flow and may be impure or polluted where the water is stagnant.

III. PROPOSED SYSTEM

This proposed work includes two types of sensors i.e., turbidity sensor and pH sensor which is used to collect the information from the water body while the ship is moving from one corner of the water body to another. These sensors are connected to the Arduino ATmega328P. The ship is operated through the mobile application called Bluetooth terminal HC-05 through Bluetooth module. The physiochemical parameters are sensed by the sensors for regular intervals of time which denotes the multipoint measurement. The information of the parameters is displayed on the web page through Wi-Fi module along with the location of the boat using GPS module. The information is collected by the sensors conclude the status

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of the water that is safe for drinking, aquaculture, agriculture etc. The Ultrasonic sensor is used to detect the obstacle in the path and alerts the user through the buzzer.

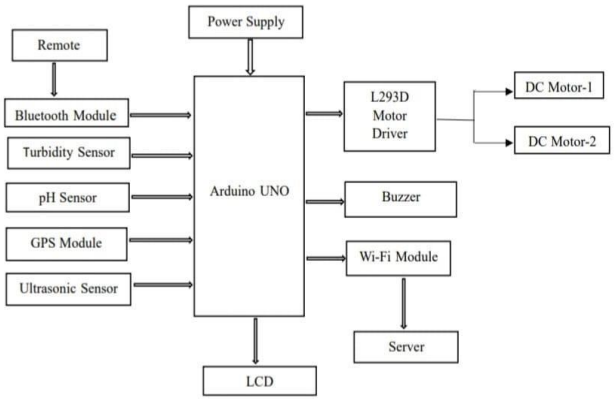

Fig 1 Block diagram of Water Quality Monitoring System

The Fig 1 represents the block diagram of water quality monitoring system where the turbidity sensor, pH sensor, Bluetooth module, GPS module, ultrasonic sensor, L293D motor driver, wi-fi module are interfaced with Arduino UNO. This is placed in a water body where the pH sensor and turbidity sensor collect the data and location is known with the help of GPS module, the ship is operated using a mobile application called Bluetooth terminal HC-05. This application acts as the remote to the boat. The boat is operated by the user. The data is collected for every certain interval of time.The information is displayed on the LCD, web page, updated and stored in the server.

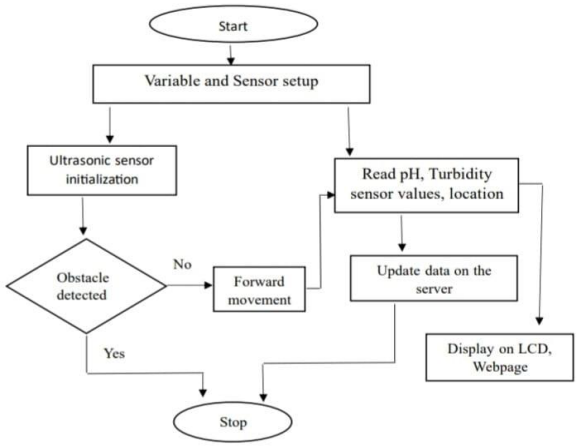

Fig 2 Flow chart of the System

The Fig 2 depicts the step-by-step operation of the proposed system. The process starts with start operation where the internal code will activate at this step. At variable and sensor setup, the sensors and all other hardware components will be activated and gets ready to collect the information. In the next step, the Ultrasonic sensor initialization begins, if it detects the obstacle then the process will stop. If there is no obstacle detected, the ship will move forward and the sensors will begin to collect the data and location. This information will be displayed on the LCD, Webpage and data will be updated on the Server.

A. Components

(i) Arduino:All the parts are integrated using the ATmega328P. In this project, the instructions are written using embedded C and C++ programming languages. It comprises a collection of general-purpose input and output pins used to communicate with the motor driver and control the movement of the motors in accordance with the user's specified direction. It has six analogue inputs and fourteen digital input and output pins that connect to various boards and circuits. To link the computer and the board, a USB connection is required. Writing programmes for Arduino can be done using the cross-platform Arduino software IDE (Integrated Development Environment).

(ii) Regulated power supply: It provides the system with 12 volts of DC power. A transformer, rectifier, filter, IC regulator, and load make up this device. The transformer steps down the main supply 230V AC input to 12V, which is then delivered to a rectifier. A pulsing DC voltage is produced by the rectifier as its output. The output voltage from the rectifier is passed to a filter to eliminate AC components in order to produce a clean DC voltage. This voltage is fed through a voltage regulator, which creates a pure, constant DC voltage that is then fed to the output load.

(iii) LCD:LCD stands for Liquid Crystal Display. It displays the results and other information on its 16x2 screen.

(iv)Wi-Fimodule (ESP8266):All other components can connect to the internet through it. It is connected to the Arduino using a variety of pins. A microcontroller board called the ESP8266, which supports Wi-Fi, is used to link devices to the internet. This module may be integrated with sensors and other particular devices with strong processing and storage capabilities.

(v) pH Sensor:This sensor depends on the quantity of hydroxyl ions in the water to function. When it comes to water quality and water treatment, a pH sensor is crucial. Water can be dangerous when the pH level of a water treatment facility goes too high or too low. Drinking water should have a pH between 6.5 and 8.5.

(vi) Turbidity Sensor:Turbidity is measured with a turbidity sensor. Turbidity meters employ LED light sources to calculate the amount of particle matter present in water or other fluids. The phenomenon where a portion of a light beam flowing through a liquid medium is reflected by undissolved particles is dealt with turbidity sensors. The turbidity level of the water will rise as the total suspended solids in the water rise. It is a crucial marker that shows the presence of toxins in water that are dangerous to human health.

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(vii) GPS:The Global Positioning System, or GPS, allows the user to find their where abouts in any country on the planet. An Arduino can be directly connected to a GPS device. GPS shield specifically made for the Arduino can be used to connect devices. The Arduino can receive and process data, including longitude, latitudeand other coordinates, after the connection is established.
(viii) Bluetooth Module: It is a popular wireless communication module that is used to send and receive information. It allows the interchange of data, audio, and other sorts of information over short distances. This Bluetooth module uses a 2.4 GHz frequency to function. It is used to steer the ship by providing instructions via a mobile device.
(ix) Ultrasonic sensor: It is used to calculate how far the ship is from the obstruction. If an obstruction is found, the Arduino receives signals that tell it to stop the motors. High-frequency sound waves are produced by ultrasonic sensors, which then analyse the echo they hear back. Sensors calculate the elapsed time between transmitting a signal and getting an echo to estimate the object's distance.
(x) Buzzer: It is an electronic device which is used to alert the user that a certain situation has occurred. Here, it is used to indicate the user about the obstacle and to stop or change the direction of ship. Here, the buzzer uses DC voltage to buzz. It can make a loud buzz sound without using much power. It includes two pins namely positive and negative. The frequency range is 3,300Hz and operating voltage ranges from 3V to 24V DC.
(xi) DC Motor**:**An electrical device known as a DC motor transforms electrical energy into mechanical energy in the form of spin. The DC motor is made up of various components. They include brushes, commutators, and actuators. Two DC motors with 12 volts each are used in this project. The user uses it to steer the ship in a specific direction. The motor driverL293D, operates it.
(xii) Motor driver:An Arduino and the motors are connected by a motor driverL293D. It is employed to steer the ship. Two H-bridges make up L293D. The simplest circuit for managing a motor with a low current rating is an H-bridge. These H-bridges supply high current and voltage from an external source while receiving and controlling an Arduino signal. Two DC motors can be driven by a single L293D motor driver.

IV. IMPLEMENTATION

A. Software implementation

The proposed system's code is written in embedded C and C++ in the cross-platform Arduino Integrated Development Environment (IDE). Real-time data monitoring is accomplished via the IoT (Internet of Things). The suggested solution uses cloud computing methods to keep track of sensor values online. We created an application that makes it simple to create mobile interfaces for managing and controlling the hardware prototype.

The parameters like pH and Turbidity values of water body along with its location and date is obtained in the webpage. The fig 3 shows water quality parameters like turbidity value, pH value and pH status (acidic, basic and neutral) of different water samples at different locations along with date and time of measured parameters, the data will be updated for every regular interval of time through wi-fi module and stored in the cloud server. These values can be viewed by the authorities and the users anytime. With the help of these monitored values we can know the quality of water and further we can decide whether the water is suitable for drinking purpose.

Fig 3 Water quality parameters at different locations from webpage

Table 1 Monitored water quality parameters of different samples

Sample	**Parameter**	**Measured Value**
Water Sample 1	Turbidity pH	2394 5.42
Water Sample 2	Turbidity pH	2019 6.65
Water Sample 3	Turbidity pH	2680 7.17

Table1 represents the monitored water quality parameters of different samples. These readings could be used later for the comparison between other water samples.
All the 3 water samples have the turbidity value less than 5 NTU.
Water Sample 1 is not suitable for drinking because the pH value of the water is 5.42 which is not within the range of pH of drinking water.

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Water Sample 2 and Water Sample 3 are suitable for the drinking water as pH range is between 6.5 and 8.5, turbidity value is less than 5 NTU.

B. Hardware Implementation

We have designed the application for this proposed system so that the ship can move left, right, forward, and backward. We connected many sensors to the Arduino. They are employed to gather information, transmit it to a server, and store it for later use. The turbidity sensor gives information on the water's clarity. The pH sensor on the scale of 0 to 14 provides values in accordance with the nature of the water, indicating basic water if the pH is over 8, acidic water if the pH is below 8, and neutral water if the pH is 7. Drinking water has a pH range of 6.5 to 8.5 and a turbidity level of <5 NTU.

The fig 4 represents the hardware model of the proposed system. The data collected by this prototype is shown on the LCD and on the webpage.

Fig 4 Hardware prototype of the proposed system

Fig 5 Output on the LCD

The Fig 5 represents the output which is displayed on the LCD consists of pH, turbidity values along with its pH status. Here, it is shown that pH value and the turbidity value of the water sample is 6.65 and 2019 units respectively. The pH and turbidity values are within the range of drinking water. Hence, it is shown normal which indicates the water is suitable for drinking.

V. CONCLUSION

This paper details the process of monitoring water quality with a ship, which is a less complicated and more cost-effective system. This results in less manual labour and is a procedure that saves time. With the help of the remote included in the mobile device, anyone can effortlessly operate it. The data can be easily gathered at various locations across the water body. It provides reliable readings. A water filtration system can be added to it. Multiple sensors can be added to water to measure additional physiochemical properties. The system is therefore quite flexible. The process is fairly straightforward, and it has numerous uses.

VI. REFERENCES

[1]. Ramakala, R., Thayammal, S., Ramprakash, A., & Muneeswaran, V. (2017, December). Impact of ICT and IOT strategies for water sustainability: a case study in Rajapalayam-India. In 2017 IEEE international conference on computational intelligence and computing research (ICCIC) (pp. 1-4). IEEE.

[2]. Pranata, A. A., Lee, J. M., & Kim, D. S. (2017, June). Towards an IoT-based water quality monitoring system with brokerless pub/sub architecture. In 2017 IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN) (pp. 1-6). IEEE.

[3]. Sridharan, S. (2014). Water quality monitoring system using wireless sensor network. International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), 3(4), 399- 402.

[4]. Kedia, N. (2015, September). Water quality monitoring for rural areas-a sensor cloud based economical project. In 2015 1st International Conference on Next Generation Computing Technologies (NGCT) (pp. 50-54). IEEE.

[5]. Swathi, K. Iot BASED WATER QUALITY MONITORING SYSTEM. Archers & Elevators Publishing House.

[6]. Encinas, C., Ruiz, E., Cortez, J., & Espinoza, A. (2017, April). Design and implementation of a distributed IoT system for the monitoring of water quality in aquaculture. In 2017 Wireless telecommunications symposium (WTS) (pp. 1-7). IEEE.

[7]. Skarga-Bandurova, I., Krytska, Y., Velykzhanin, A., Barbaruk, L., Suvorin, O., & Shorokhov, M. (2020). Emerging tools for design and implementation of water quality monitoring based

on IoT. Complex Systems Informatics and Modeling Quarterly, (24), 1-14.

[8]. Jabbar, W. A., Ting, T. M., Hamidun, M. F. I., Kamarudin, A. H. C., Wu, W., Sultan, J., ... & Ali, M. A. (2024). Development of LoRaWAN-based IoT system for water quality monitoring in rural areas. Expert systems with applications, 242, 122862.

[9]. AlMetwally, S. A. H., Hassan, M. K., & Mourad, M. H. (2020). Real time internet of things (IoT) based water quality management system. Procedia CIRP, 91, 478-485.

[10]. Correa, C., Dujovne, D., & Bolaño, F. (2022). Design and implementation of an embedded edge processing water quality monitoring system for underground waters. IEEE Embedded Systems Letters, 15(2), 81-84.

[11]. Chowdury, M. S. U., Emran, T. B., Ghosh, S., Pathak, A., Alam, M. M., Absar, N., ... & Hossain, M. S. (2019). IoT based real-time river water quality monitoring system. Procedia computer science, 155, 161-168.

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