A Real Time Water Quality Monitoring System Using IoT

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Abstract- *Water pollution is one of the main threats nowadays since drinking water is getting more and more contaminated and polluted. The diseases that could be transmitted to humans and animals by the contaminated water influence the ecosystem's life cycle. Early detection of water contamination enables effective response and avoidance of hazardous situations. To guarantee the provision of pure water, real-time water quality monitoring is required. Smart solutions for monitoring water pollution are becoming more and more crucial as sensors, connectivity, and Internet of Things (IoT) technologies develop. The most recent projects in the field of intelligent water pollution monitoring systems are in-deathly analyzed in this paper. The concept provides a low-cost, high-performance, Internet of Things-based smart water quality monitoring system that continuously tracks the quality indicators. The built model is tested using three water samples, and the parameters are then forwarded to the mail for further processing.*

Keywords- Pollution monitoring systems, Temperature sensor, Water Samples.

I. INTRODUCTION

Due to the increase in environmental contamination and the amount of pollution, the field of water monitoring systems has attracted a number of researchers in the last ten years. Water sources such as ponds, rivers, lakes, seas, and oceans become contaminated when dangerous elements enter them, dissolve in the water, and then either suspend there or deposit on the bottom. Due to unnecessary sources of chemicals and pollutants, ensuring pure and safer water is extremely difficult. Water monitoring was traditionally done physically, solely with chemicals. Due to pollution from human activity and many environmental changes, water quality is declining.

Design algorithms to materialize the detections and sensors in accordance with our desired detections. Water management is becoming more of a concern as the world's population is growing quickly, particularly in the industrial, agricultural, and other sectors. Most people worldwide lack access to drinkable water. Several people experience numerous fatal ailments every year because of water contamination. By creating a water quality monitoring (WQM) device that is integrated into an IoT platform and can recognize four distinct physical parameters in water—temperatures, pH, turbidity, and conductivity—and analyses the extracted value of these parameters using the right machine learning approach, it is possible to improve the quality of water samples. the creation and use of a low-cost monitoring system for drinking water quality based on the Arduino Uno open-source hardware platform. The Automatic Water Quality Device uses both passive and active sensors for system monitoring. System will show you any probable effects, such as extinction of species, compromised habitat, The usage of several parameters measured via system, including as turbidity, dissolved oxygen, pH, dissolved organic carbon, will be utilized to communicate the threat to public health, damaged habitat, diminished biodiversity, fish kills, algal blooms, and excess nutrients.

1.1 BACKGROUND HISTORY:

Lethal substances that enter water sources including ponds, rivers, lakes, seas, and oceans, dissolve and suspend in the water, or are dumped on the bed, cause water pollution. Water's quality and purity will decline because of pollution. Due to unnecessary sources of chemicals and pollutants, ensuring pure and safer water is extremely difficult.

Several factors can contribute to water contamination; among these are sewage from cities and the discharge of industrial waste.

Pollutants that enter the water via soils, the atmosphere through rain, or groundwater systems are known as secondary causes of contamination. Typically, modern agricultural techniques left behind as well as improperly disposed of industrial wastes can be found in soils and groundwater. Viruses, bacteria, fertilizers, parasites, pharmaceuticals, pesticides, nitrates, fecal waste, phosphates, radioactive materials, and plastics are among the main contaminants of water. These substances might be undetectable contaminants, but they won't always change the color of the water. In order to assess the water quality, a little amount of water from these resources and marine organisms are analyzed.

1.2 PROBLEM STATEMENT:

Nowadays, tourists often use glamping as an alternate kind of lodging. This "glamping" (glamorous camping) idea offers an alternative to traditional camping while maintaining a feeling of safety and luxury while taking in the scenery. Traditional campers encounter challenges in their living spaces due to uncertainties, bug and pest bites, unfavorable weather, loss of sleep, etc. They need camping equipment, which is too expensive and not available at an affordable price, if they want to create and enjoy private and independent camps. As Glamping emerges to lend a helping hand, it will be simpler for tourists to live and enjoy the peace if camping is easily accessible.

1.3 SCOPEOF THEPROJECT:

Water pollution causes a decline in aquatic ecosystems and starts an unchecked growth of phytoplankton in water supplies. Contamination of the food chain: Fishing in contaminated water sources and using wastewater for agricultural and cattle husbandry may add poisons that are harmful to health when consumed. There won't be clean water for drinking, public health, or sanitization in rural or urban regions if water pollution rises or drinking water quality is not maintained. Almost 2 billion people worldwide do not have access to clean water resources, therefore they must instead drink water that has been tainted by feces, putting them at risk for a variety of illnesses. According to the WHO, diarrheal disorders brought on by poor hygiene cause over 1000 children to pass away every day worldwide.

1.4 EXISTING SYSTEM:

Pollutants in water can poison people or spread disease. Poorly handled sewage may contain bacteria and parasites that can enter drinking water supplies and cause diarrhea and cholera. The widespread usage of PH sensors in the current system necessitates routine cleaning in order to prevent sample contamination. Since the glass tip on the probes used in most pH meters is highly fragile, they are quickly fractured or damaged when exposed to corrosive substances. The processes can be halted by deposits on the electrode membrane. A pH meter must frequently be calibrated. To calibrate it, a unique buffer solution is necessary. Temperature and carbon dioxide absorption may have an impact on pH calibration.

1.5 PROPOSED SYSTEM:

We are replacing the outdated and conventional PH sensors with TDS and DHT11 sensors. TDS is the number of residues of inorganic and organic soluble solids in the water. It and salinity have a strong relationship, and as it rises, so does the salinity of the water. Turbidity, chlorides, electrical conductivity, total hardness, total suspended solids, and chemical oxygen demand are all closely related to it. It is measured in mg/l using the gravimetric method (dried at the specified temperature after filtration. The DHT11 is frequently used to measure the humidity and temperature of the surrounding air. The sensor has an 8-bit microscope output and a Negative Temperature Coefficient (NTC) for temperature measurement, allowing the temperature and humidity values to be communicated to the serial data are used in microcontrollers. With an accuracy of between 1 °C and 1%, the sensor can calculate temperatures ranging from 0 °C to 50 °C and humidity levels ranging from 20% to 90%. In order for the pH and turbidity sensors to function properly over an extended period of time, the sensor is utilized to measure the temperature of the atmosphere. The types of marine organisms that can live in the sea can also be determined by temperature measurements.

II. REQUIREMENT SPECIFICATION

2.1 SOFTWARE REQUIREMENTS:

- IDE: Arduino IDE
- Operating System: Windows & Linux
- Programming Language: C++

2.2 HARDWARE REQUIREMENTS:

- Development Board: Intel Galileo Gen 2
- TDS: Gravity TDS Meter
- Turbidity sensor
- Alarm: 5 v Buzzer
- Temperature Probe: DS18B20 Temperature sensor probe
- LCD
- Jump Wires.

2.1.1. ARDUINO IDE:

Write, compile, and upload code to practically all Arduino Modules using the Arduino IDE, an open-source programme created by Arduino.cc. is a legitimate Arduino programme that makes code compilation so simple that even the average person with no prior technical expertise can start learning. It operates on the Java Platform, which has built-in functions and commands that are essential for debugging, modifying, and compiling the code, and is compatible with all operating systems, including MAC, Windows, and Linux. Many Arduino modules are available, including the Uno, Mega, Leonardo, Micro, and many others. There are three basic divisions of the IDE environment. The primary code, often referred to as a sketch, written on the IDE platform will eventually produce a Hex File, which is transported to and uploaded into the controller on the board. The Editor and Compiler are the two primary components of the IDE environment. The Editor is used to write the necessary code, while the Compiler is used to compile and upload the code into the designated Arduino Module.

Fig 2.1Arduino IDE

2.1.2 C++:

As an extension of the C language that incorporates the object-oriented paradigm, C++ is a general-purpose programming language. It is a compiled language that is imperative. The name C++ denotes the evolutionary nature of the modifications made to C. The increment operator in C is "++". One of the most popular languages for creating all types of technical and commercial software is C++.

2.2.1 TDS:

The quantity of ionized solids that have been dissolved in a solution is known as total dissolved solids (TDS). When table salt is added to water, the salt granules eventually dissolve, making it challenging to determine how much salt is there. The number of solids (in this case, salt) dissolved in the water can be measured using a TDS tester without having to evaporate the liquid or use the gravimetric method to return the salt to its solid state. A TDS meter is a tiny, portable instrument used to measure the amount of total dissolved solids (TDS) in a solution, often water. A TDS meter measures the conductivity of a solution because dissolved ionized solids, such as salts and minerals, raise the conductivity of a solution and infers the TDS from that reading. of the answer. TDS meters may also be referred to as PPM (parts per million) testers or TDS testers. The Water Quality Association defines hard water as having 120 mg/L (or ppm) or more, with 180 mg/L being considered extremely hard. Ideal water is between 80 and 100 mg/L, which is not too hard and has the perfect concentration of dissolved minerals for the best flavor. It becomes "soft," has a lower pH, and is more acidic as the TDS level drops below 17 mg/L (as the minerals are eliminated).

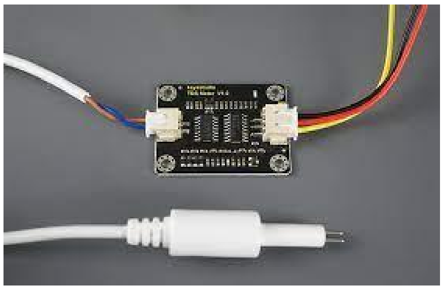

Fig 2.2TDS

2.2.2 TEMPERATURE SENSOR:

To record, monitor, or communicate temperature changes, a temperature sensor is an electronic device that monitors the temperature of its surroundings and turns the input data into electronic data. Temperature sensors function by sending electrical signals that contain readings. Temperature is a unit used to represent hotness or coolness using any of a number of scales, including Fahrenheit and Celsius. There are several distinct kinds of temperature sensors; some (contact temperature sensors) measure an object's temperature by making direct physical contact with it, while others do it indirectly. (Temperature sensors without touch). Automobiles, medical equipment, computers, kitchen appliances, and other sorts of technology all use temperature sensors. The water temperature sensor has a resolution of 0.1 degree and can measure temperatures in the range of -5 degrees Celsius to +50 degrees Celsius (or 23 degrees Fahrenheit to 122 degrees Fahrenheit).

Fig 2.3Temperature Sensor

2.2.3BUZZER:

A beeper or buzzer, for example, may be electromechanical, piezoelectric, or mechanical in design. The signal is converted from audio to sound as its primary function. It is often powered by DC voltage and used in timers, alarm clocks, printers, computers, and other electronic devices. It can produce a variety of sounds, including alarm, music, bell, and siren, according on the varied designs. It has two pins: a positive pin and a negative pin. The "+" sign or a longer terminal is used to indicate this's positive terminal. This terminal is supplied by 6 volts, while the negative terminal is denoted by the short "-" symbol. It is linked to the GND terminal through a terminal. A DC power supply with a 4V to 9V range is used by this buzzer. This is powered by a 9V battery, albeit it is advised to use a controlled +5V/+6V DC supply. A buzzer is a useful tool for incorporating sound characteristics into our project or system. It is a very compact and sturdy two-pin gadget, making it easy to use on a breadboard or PCB. Asa result, this component is frequently employed in most applications.

Fig 2.4Buzzer

2.2.4 LCD:

The term "Liquid Crystal Display," or LCD, refers to a flat display technology that is typically seen in computer displays, instrument panels, smartphones, digital cameras, TVs, laptops,tablets, and calculators. It is a thin monitor that supports high resolutions and provides superior image quality.

Fig 2.5LCD

2.2.5JUMP WIRES:

An electrical wire, or collection of electrical wires in a cable, with a connector or pin at each end is called a jump wire and is typically used to connect the parts of a breadboard or other prototype or test circuit internally or with other machinery or parts without soldering.

Fig 2.6Jump Wires

2.2.6BLOCK DIAGRAM:

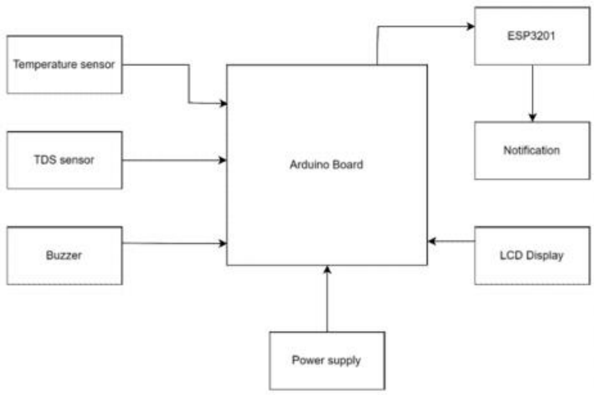

Fig 2.7Block Diagram

2.2.7FLOWCHART:

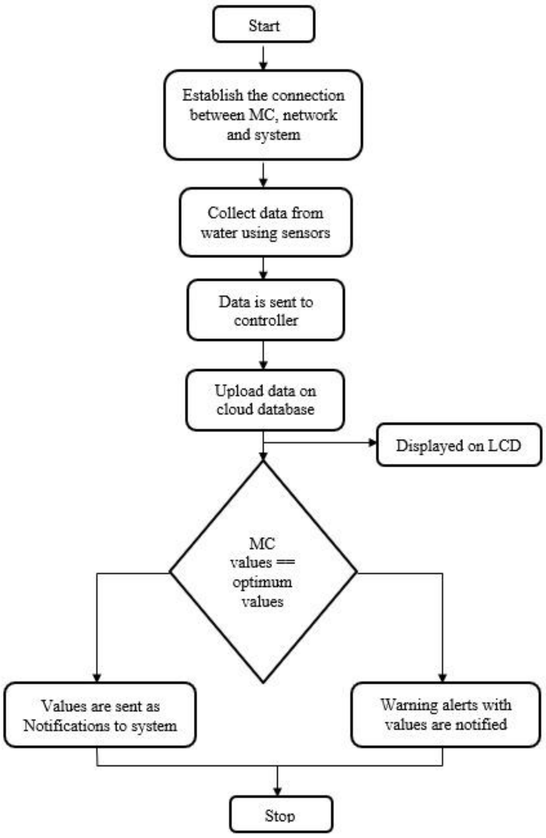

Fig 2.8Flowchart

2.3 INTERFACING:

2.3.1 TDS SENSORWITH MICROCONTROLLER

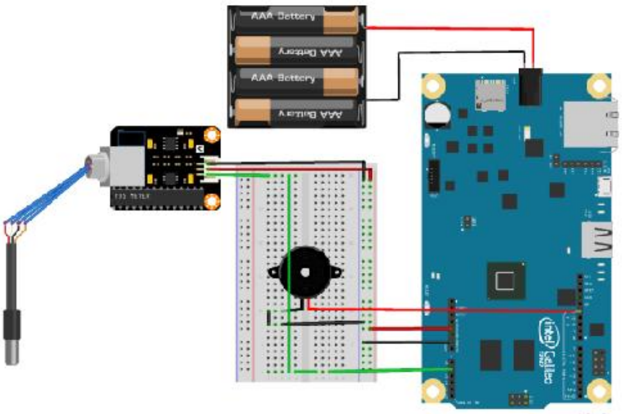

Fig 2.9TDS Sensor with Microcontroller

2.3.2 TEMPERATURESENSORWITH

MICROCONTROLLER

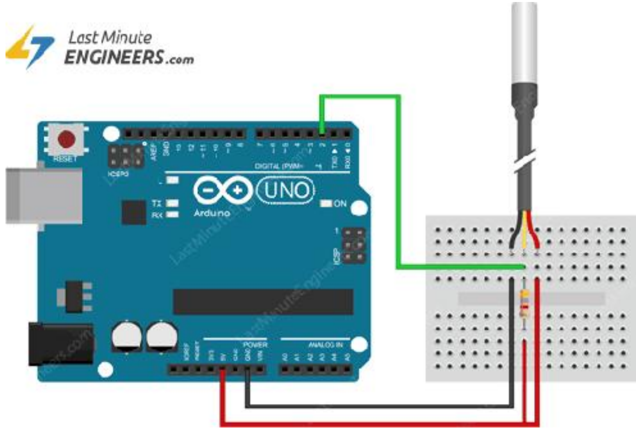

Fig 2.10Temperature sensor with microcontroller

2.3.4 LCD WITH MICROCONTROLLER

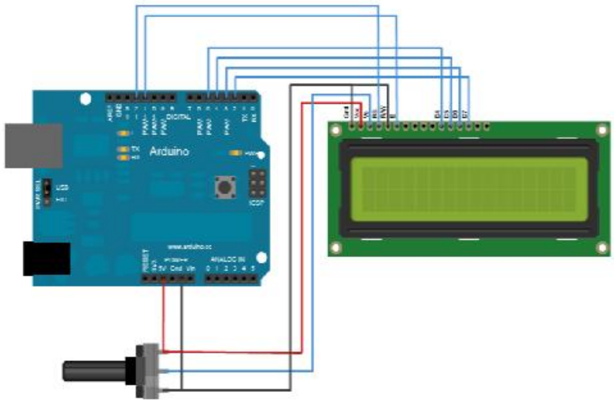

Fig 2.11LCD with Microcontroller

III. CONCLUSION

3.1 SUMMARY:

Water pollution is a serious challenge to any nation since it harms people's health, the economy, and biological variety. An effective IoT-based strategy for water quality monitoring has been detailed in this study, along with a thorough assessment of the various ways of monitoring water quality and the causes and effects of water pollution. This study of recent research reviews efforts to develop intelligent, energy-efficient, and highly effective water quality monitoring systems that will enable continuous monitoring and alarms or notifications to be delivered to the appropriate authorities, for further processing. The created model is inexpensive and easy to use (flexible). Three water samples are examined, and based on the findings, it is possible to determine if the water is fit for consumption or not.

3.2 FUTURE WORK:

The recommendation for the future is to use cutting-edge sensors to detect various other quality metrics, wireless communication standards to improve communication, and IoT to create a better system for monitoring water quality and making water resources safe through quick action.

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