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IOT based Smart Water Quality Monitoring System

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ABSTRACT: This major project presents a Iot Based Smart Water Quality Monitoring. The polluted water is basic cause 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, by suitable measures can be taken and critical situations may be avoided. The quality of the water should be properly examined in real-time condition. The project proposes a less cost effective and efficient IoT based smart water quality monitoring system which monitors the quality parameters uninterruptedly. The main developed of this model is test with three water samples and the parameters of sensors are transmitted to the cloud server for further action can be taken.

KEYWORDS: Wifi Module, pH Sensor, Turbidity Sensor, Temperature Sensor, Conductivity Sensor, Oled Display, Cloud DB Server, Blynk Application and Quality Monitoring

I. INTRODUCTION

In the beginning of the 21st century able to providing apure drinking water is becoming the major challenge in the recent times The United Nations and World Health Organization as well as the recognized human right to sufficient works, continuous, safe, secure and acceptable, physically accessible, and affordable, portable water for personal and for domestic use. The future alarmingly estimates that every year diarrhea alone is causing around death of people. The physiochemical parameters that include in the electrical view of conductivity, pH, turbidity, temperature with normal hot or cool, chlorine content and flow. These parameters can be analyzed quickly and at less cost than the bacterial parameters. This with the monitoring helps sensor technology to move still not very effective, as they do not require always meet the practical needs in the table shown about the data of specific utility although cheaper than traditional equipment, cost, reliability and maintenance issues still exist; and data handling and management can also be improved. In this projectwere the development of a lowcost, wireless connectivity of sensors, multi-sensor network for measuring the physicochemical methods water parameters; enabling real-time monitoring, is presented. The tables below describes about the sensor data visibility of the devices of the system.

The cost related with machine communication over to the mobile networks are usually cheaper than fixed networks. Now people can have connectivity from anywhere and anytime for anything. The Internet of Things is being used in number of sectors, from automation, transportation, energy, healthcare, financial services, wearable devices, security, agriculture to nanotechnology.

The pH sensor is used to show the acidity or alkalinity of water. It has a range of 0 to 14, with 7 being neutral. A pH value less than 7 indicates acidity, while a pH value greater than 7 indicates alkalinity. The turbidity sensor is used to show the amount of suspended solids particles in the water. It has a range of some 0 to 1000 NTU, with 0 being the clear water and 1000 being very cloudy water. The temperature sensor is used to show the temperature of thewater. It has a range of -50 to 150 degrees Celsius values. The Tds sensor also able give us the proper real time values.

Table-1 : Threshold values of pH and Turbidity Sensors

The sensor	Safe water	Unsafe water
pH	6.5-8.5	<6.49 and >8.5
Turbidity	<5	>5

Table-2 : Threshold values of temperature sensor

Sensor	Normal	Hot	Cold
Temperature	$10 <= T <= 29$	$T >= 29$	$10 < T$

Table-3 : Conductivity Values of the Sensor

Types	Electrode constant	Measure range
Stainless steel electrode	K=1	1-2000 μ S/cm
Stainless steel electrode	K=1	10-2000 μ S/cm
Plastic electrode	K=1	1-2000 μ S/cm
Plastic electrode	K=1	10-2000 μ S/cm

II. RELATED WORK

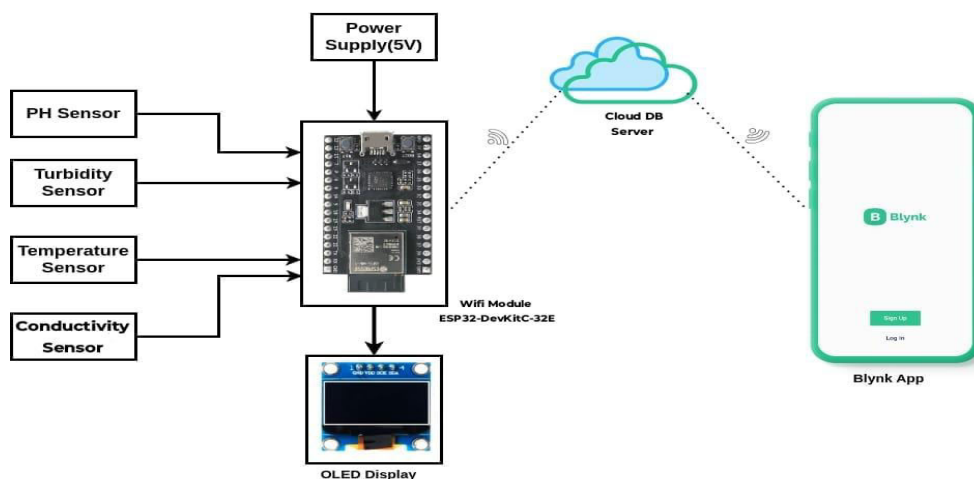
The concept of water quality was introduced by Avinash Kumar in his title in the research of “IoT Based Water Quality Monitoring System” in 2018. By integrating sensors and internet connectivity, the system can collect data on various water quality parameters and transmit it for analysis. This enables us to monitor water quality remotely and make informed decisions about water management and treatment.

The author Anantha Naik G. Dhis in the research of “IoT based Real-Time Water Quality Monitoring System using smart Sensors” in 2020. This system likely employs smart sensors to measure various water quality parameters and transmits the data continuously via the internet. This allows for constant monitoring and quick identification of any changes in water quality, potentially leading to improved water management and the safety concerns.

The author Salem Garfan in his title in the research of “IoT-Based Water Monitoring Systems: A Systematic Review” in 2022. Conducted a comprehensive review of IoT-based water monitoring systems, covering a wide range of topics, including system architectures, sensor technologies, data transmission methods, and data analysis techniques, while highlighting challenges and future directions in the field.

In the present conditions of the methods for the monitoring water quality parameters are the manual, time consuming, and labor intensive and also riskier in the data handling. This can lead to delays in the detecting of the water quality problems, related which that can result in the health risks, environmental damage, and economic loss also. An IoT based smart of water quality monitoring of the system could that address these several challenges by providing real time value data on water quality parameters, such as pH, temperature, turbidity, and conductivity. This data could be used to detect water quality problems early on, allowing for timely corrective action. Additionally, the system could be used to track recent water quality trends over the time, which could help to identify potential sources of contamination and inform long terms water management strategies.

III. METHODOLOGY



(a)

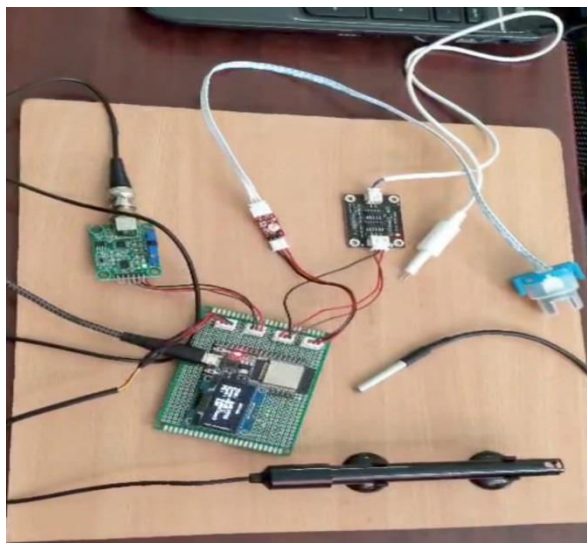
The methodology encompasses Sensors measure water quality parameters are placed in the water to measure various parameters like pH, turbidity, temperature, chlorine level, and conductivity. The microcontroller collects to the sensor data and sends to the microcontroller is connected to the sensors and collects the data they measure. Data is processed and prepared for transmission and the microcontroller processes the data to ensure its accuracy and prepares it for sending to a cloud platform. The figure (a) is the Methodology diagram

The data is transmitted to the cloud and the processed data is securely transmitted to a cloud platform like Blynk. The system is continuously monitored and improved and the system is regularly reviewed and updated to ensure it is operating effectively.

Data is visualized and analyzed and by the cloud platform provides tools to visualize the data in graphs and analyze trends and anomalies. These are embedded devices that measure specific water quality parameters. Different types of sensors are used depending on the desired parameters to be monitored. This is a small-scale computer that collects and processes data from the sensors.

It also controls the communication between the sensors and the cloud platform. This module transmits data from the microcontroller to a cloud platform via wireless networks like Wi-Fi network. This is a remote server that stores and analyzes the collected data. It can also provide visualizations of the data and generate alerts for potential water quality issues. This is an interface through which users can access the data and visualizations provided by the cloud platform. This can be a web interface, a mobile app, or a dedicated dashboard.

IV. IMPLEMENTATION



(b)

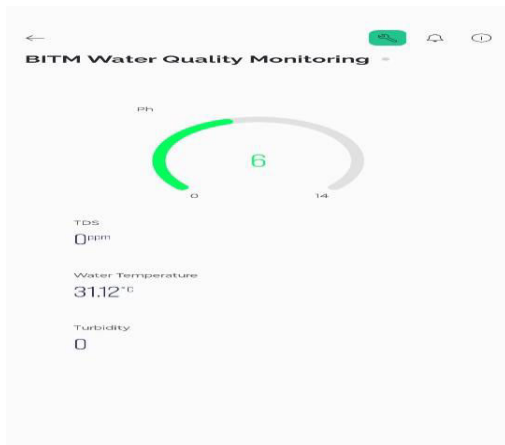
Working:The whole design of the system is generally related to IOT which is newly introduced concept in the world of development and technology. There is basically two parts included, the first one is hardware & second one is software.

The hardware part consists of sensors which help to measure the real time values of sensors, OLED shows the displays by the output from the sensors, The wi-fi module gives the connection between hardware and software section. In software we developed a program based on the embedded c language structure. Classification based decision tree algorithm is used to predict the water quality classes using software. The figure (b) is the parts of hardware and software components of the project.

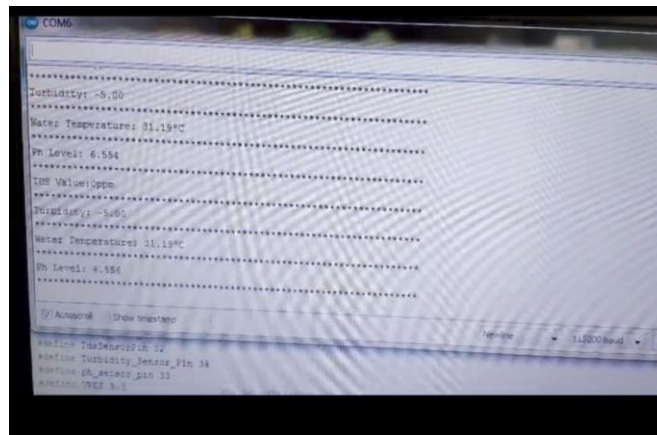
Once the all hardware is interfaced to the core we need to program for sensor and communication devices. power the module to measure water parameters from sensor, each sensor value is measured at different interval time and displayed on the OLED alternatively accumulate the measured value and send to cloud using ESP32 Wi-fi module. Here Blynk is used as a cloud server. User can view the real time measured value by login the account, where we can monitor the real time water parameters.

V. EXPERIMENTAL RESULTS

The water quality monitoring is important for the many applications such as the figures shows the drinking water distribution and measurement and environment monitoring of pond, lank and ecosystem etc. The realtime water monitoring system having four different in sensors which are connected to a core system of the project. The sensors are which senses or read the real values of time water parameter by using microcontroller and send to the cloud using wi-fi module, here we can monitor the water quality parameter on the internet server by using cloud computing. We use Blynk or Thingspeak as a cloud server to store the water parameters these parameters can be obtained in numerical values display on the screen.



(c)



(d)

While turning on the system initialization takes place and display the system name on Oled display as we code. Alternatively once the data is initially, then wi-fi module is get connect to the network using ip address and connecting progress display on serial monitor window and also on lcd display like as connecting to wi-fi, both serial monitor window and lcd display. If the wi-fi get connected to network shows wi-fi connected message on both serial and lcd window or else shows wi-fi connected. The pH of the water is visible to show. We took three different samples for demo purpose. One is pure water, second one is salt water and third one is added acidic water each samples parameters are measured continuously and obtained result is real time on both Oled display and on web. The figure (c) and figure (d) where the expected result can be viewed in the website and the monitor.

VI. CONCLUSION

The conclusion tells that of the Iot based smart water quality monitoring system is more and more suitable for real time value monitoring and analysis of water quality parameters compared to the existing systems. It is automatic and does not require human intervention, reducing errors. The system utilizes temperature, pH, conductivity and turbidity sensors, along with a Wi-Fi module for wireless data transmission. The last process is that microcontroller processes system sensor data and transmits it to the cloud with Wi-Fi module. The data is stored and analyzed in the cloud using Blynk web service provided. The system can predict future water quality parameters and provide real-time notifications to users through a mobile application.

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