IOT BASED WATER QUALITY MONITORING SYSTEM

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Abstract— Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT(internet of things).The system consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, flow sensor of the water can be measured. The measured values from the sensors can be processed by the core controller. The esp32 model can be used as a core controller. Finally, the sensor data can be viewed on internetusing WI-FI system.

Keywords—ph sensor, turbidity sensor, temperature sensor ,soil moisture sensor,esp32,power supply

I. INTRODUCTION

Water quality is defined as a measure of the physical, chemical, biological, and microbio-logical characteristics of water .Monitoring water quality provides empirical evidence to support decision making on health and environmental issues. One sampling site was established at the deepest part of the lake, near the centre. Discrete water samples were collected from three depths (0.5 m, 5 m, and 10 m deep).

Surface samples were collected by hand using plastic bottles provided by the lab conducting the analyses, and water column samples were collected using a Van Dorn bottle, then transferred to plastic bottles. All samples were shipped on ice to the laboratory for analysis. Samples were collected at the deep site on a quarterly basis, between February and November from 2006 to 2009. The drinking water intake is located on the west side of the lake at a depth of approximately 4 m; the BC MOE did not collect samples here, but the Kemp Lake Waterworks District samples raw water on a weekly basis for bacteriological parameters.

Monitoring water quality in the 21st century is a growing challenge because of the large number of chemicals used in our everyday lives and in commerce that can make their way into our waters. Methods of chemical analysis and knowledge of chemical toxicity are available for only a few thousand of the more than 80,000 chemical compounds estimated by EPA to be in commercial use in the United States

Results from 27,000 ground-water sites retrieved from NWIS show that more than half the sites in 25 states contain

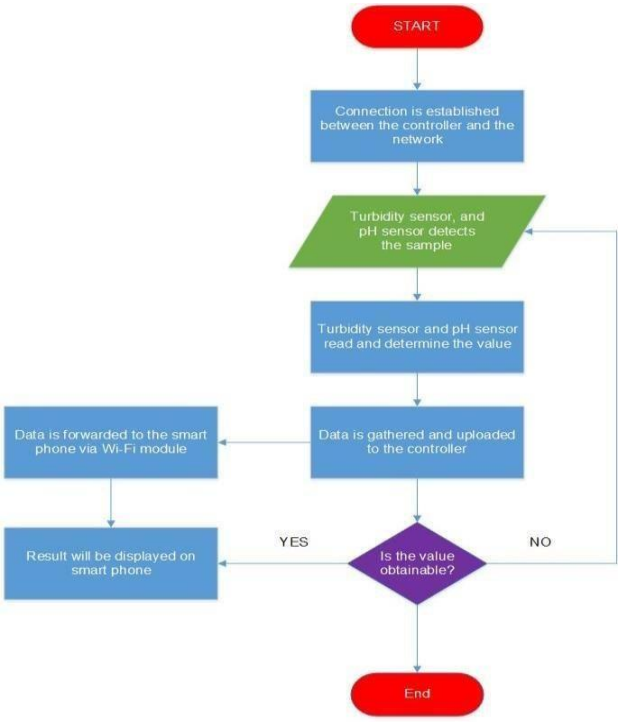
potentially corrosive water, as may occur in homes dependent on untreated water from private wells. Private wells are not regulated under the Safe Drinking Water Act and well owners are not required, except in some jurisdictions, to test their water. The study demonstrated that an index of corrosive water, calculated from a wealth of readily available and reliable monitoring data, can inform private well owners where further water testing and treatment might be needed to protect human health.

2. Literature Survey

Water pollution ensues when lethal materials move into water sources like ponds, rivers, lakes, seas and oceans, gets dissolved and suspends in water or gets deposited on the bed. Pollution will degrade the quality and purity of water. Ensuring pure and safer water is really challenging due to undue sources of chemicals and contaminants. Pollution of water can be instigated by numerous ways; one of the main reasons for pollution is industrial waste discharge and city sewage. Secondary sources of pollution are pollutants that enter the water from

soils or from atmosphere via rain or from groundwater systems. Usually, soils and groundwater comprises of residues of modern practices in agriculture and also indecorously disposed wastes from industries. The major pollutants of water include viruses, bacteria, fertilizers, parasites, pharmaceutical products, pesticides, nitrates, fecal waste, phosphates radioactive substances and plastics. These materials will not alter the color of the water always, but they might be indiscernible contaminants.

Hence small quantity of water from such



water resources and marine organisms are examined for determining the water quality.

Declining quality of water is detrimental to the health, environment and economy. David Malpass, President of the World Bank cautions about the influence on economy: "Deteriorating water quality is stalling economic growth and exacerbating poverty in many countries". It means that, if the biological oxygen demand, the pointer used for measurement of organic pollution in water, surpasses the threshold, the Gross Domestic Product (GDP) growth of the constituencies surrounded by the allied water basins will decrease by a third.

A. Methodology

In this proposed system we are using Arduino uno asmicrocontroller and sensors. By using ESP32microcontroller, we can eliminate ADC module which decreases complexity. we are using pH, Turbidity sensor, Turbidity is mainly used for the detecting dust particles inthe water.pH Sensor is to know whether water is acidic, basic or neutral in nature.TDS Sensor is to measure anyharmful solutions present in water. The values areuploaded to cloud server and message will be sent if anysensor crosses the threshold value.The system is completely self-sufficient, no need for charging, thebatteries at the nodes are charged using water propelleddynamo. The system is completely wireless without the hassle of wires being laid underground. The systemaddresses all water needs and water problems to both watersupply board and end citizens. Because of the node setupand highly modular design the system has high repairability and serviceability.

B. System Design

- **ESP32:** The ESP32 Wi-Fi module is a SOC microchip mainly used for the development of end-point IOT(Internet of things) applications. It is referred to as a standalone wireless transceiver. It is used to enable the internet connection to various applications of embedded system

2. IMPLEMENTATION

The whole design of the system is based mainly on IOT which is newly introduced

concept in the world of development. There is basically two parts included, the first one is hardware & second one is software. The hardware part has sensors which help to measure the real time values, another one is ESP32 converts the analog

values to digital one, & smartphone shows the displays output from sensors, Wi-Fi module gives the connection between hardware and software. In software we developed a program based on embedded c language. The PCB is design at first level of construction and component and sensors mounted on it. BLYNK app is installed in the android version to see the output. When the system get started dc current given to the kit and and WIFI gets on. The parameters of water is tested one but one and their result is given to display. The app went provided with hotspot gives the exact value as on display shows on kit. Thus like this when the kit is located on any specific water body and WIFI is provided we can observe its real time value on our android phone anywhere at any time.

The main components used in this project

- ESP32 Microcontroller
- pH Sensor
- Turbidity Sensor
- Soil Moisture Sensor
- Temperature Sensor
- Power Supply
- battery
- LCD

2.1 ESP32 MICROCONTROLLER

ESP32 In this tutorial, we will learn about ESP32, a dual core MCU from Espressif Systems with integrated Wi-Fi and Bluetooth. If you worked with ESP8266, then ESP32 is a significant upgrade with a lot more features. This Getting Started with ESP32 guide is for complete beginners, with or without prior experience in IoT or ESP8266.

2.2 pH Sensor

This pH sensor is commonly used to test the pH of a liquid as it measures the hydrogen-ion activity in water-based solutions. Wherever acidity and alkalinity testing is required, it is frequently employed in the chemical businesses, pharmaceutical industry, dye industry, and scientific research. This kit's drive board works with both 9V systems. It's also very easy to work with Arduino and Raspberry Pi thanks to the standard BNC probe interface and Grove connection. A Power Indicator LED, a BNC connector, and a PH2.0 sensor interface is all included.

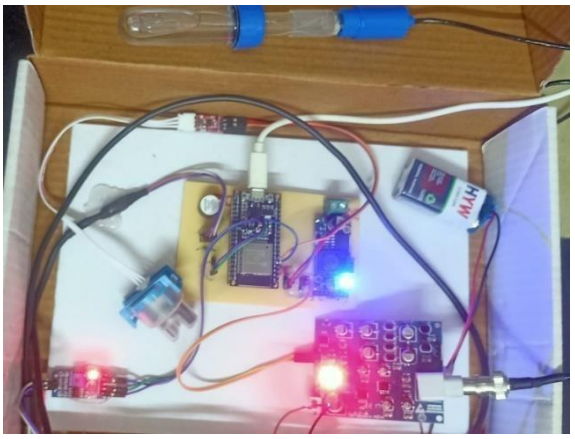
2.3 Turbidity Sensor

Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in the air. The measurement of turbidity is a key test of water quality. Turbidity is caused by particles suspended or dissolved in

water that scatter light making the water appear cloudy or murky. Particulate matter can include sediment, especially clay and silt, fine organic and inorganic matter, soluble colored organic compounds, algae, and other microscopic organisms.

2.4 Soil Moisture Sensor

The working of the soil moisture sensor is pretty straightforward. The fork-shaped probe with two exposed conductors, acts as a variable resistor (just like a potentiometer) whose resistance varies



according to the water content in the soil. This resistance is inversely proportional to the soil moisture.

A typical soil moisture sensor has two components.

The Probe: The sensor contains a fork-shaped probe with two exposed conductors that goes into the soil or anywhere else where the water content is to be measured. Like said before, it acts as a variable resistor whose resistance varies according to the soil moisture.

The Module: The sensor also contains an electronic module that connects the probe to the Arduino. The module produces an output voltage according to the resistance of the probe and is made available at an Analog Output (AO) pin. The same signal is fed to a LM393 High Precision Comparator to digitize it and is made available at a Digital Output (DO) pin.

2.5 Temperature Sensor

The DS18B20 digital thermometer provides 9-bit to 12- bit Celsius temperature measurements and has an alarm function with nonvolatile user-programmable upper and lower trigger points. The DS18B20 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 DS18B20 can derive power directly from the data line ("parasite power"), eliminating the need for an external power supply. Each DS18B20 has a unique 64-bit serial code, which allows multiple DS18B20s to function on the same 1-Wire bus. Thus, it is simple to use one microprocessor to control many DS18B20s 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.

FIG: IMPLEMENTATION OF WATER QUALITY MONITORING SYSTEM

3. Software Implementation

- Arduino IDE
- Blynk App

3.1 Arduino IDE

Arduino IDE stands for "Integrated Development Environment", the Arduino IDE is incredibly minimalistic, yet it provides a near-complete environment for most Arduino-based projects. The top menu bar has the standard options, including "File" (new, load save, etc.), "Edit" (font, copy, paste, etc.), "Sketch" (for compiling and programming), "Tools" (useful options for testing projects), and "Help". The middle section of the IDE is a simple text editor where you can enter the

program code.

3.3 Blynk App

This guide will help you understand how to get started using Blynk and give a comprehensive overview of all the features. If you want to jump straight into playing with Blynk, check out Getting Started.

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.

4. Advantages

- It will reduce the time to measure the parameters.
- This is economically affordable for common people.
- Water quality monitoring system is used to alert us tocurrent, ongoing and emerging problems.

5. Applications

- Agriculture
- Water Utilities
- Aquaculture
- Research Facilities and Laboratories
- Wastewater Treatment
- Manufacturing Units

6.Acknowledgements

The authors would like to express sincere thanks to Management and Principal of Vidyavardhaka College of Engineering, Mysuru, India, Head of the Department of Electronics and Communication Engineering, Vidyavardhaka College of Engineering, Mysuru, India, and all those who supported us directly and indirectly during the project.

7. Conclusion

Water quality monitoring has become necessary work in environmental protection. Automating monitoring and telemetry is a trend for improving the ability of water quality monitoring system. With the help of sensors, we can check the water quality by use of Wi-Fi module. Since the system is automatic therefore it is low in cost and does not

require manpower so time and powers both are save. It has widespread application and extension value. 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.

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