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IOT Based Real-Time River Water Quality Monitoring System

Bhoomika R[1], Netra Jalagar[2], Pooja F B[3], Sangeetha Sontera[4], & Shanthveeresh N S(Asst., Professor)[5]
Department of Electrical and Electronics Engineering
PES Institute of Technology and Management, Shivamogga, Karnataka

Abstract—*Water pollution is one among the most important 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 coffee cost system for real time monitoring of the water quality in IOT(internet of things). The system contains several sensors is employed to measuring physical and chemical parameters of the water. The parameters like temperature, pH, turbidity, flow sensor of the water are often measured. The measured values from the sensors are often processed by the core controller. The Arduino model is core controller. Finally, the sensor data are often viewed on internet using WI-FI system.*

Index Terms—*IOT, Sensors, Arduino.*

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I. INTRODUCTION

There are numerous advances in the twenty-first century, but at the same time, pollutions, heating, and other forms of pollution are forming, and as a result, there is no safe beverage for the world's pollution. Water quality monitoring in real time is becoming more difficult as a result of increasing water scarcity, population growth, and other factors.As a result, better approaches for monitoring water quality metrics in real time are required[1]. The parameters of water quality the concentration of hydrogen ions is measured by pH. It indicates whether or not the water is acidic or alkaline. Pure water has a pH of 7, although it is acidic rather than alkaline. pH ranges from 0 to 14.It should be between 6.5 and 8.5 pH for drinking. Turbidity is a measurement of the unseen suspended particles in water. The greater the turbidity, the greater the risk of diarrhoea, cholera. If the turbidity is low, the water is safe to drink.The temperature sensor detects how hot or cold the water is. Flow sensor is a device that measures the flow of water. The traditional method of water quality monitoring entails manually collecting water samples from various sites. The use of wireless communication technologies is becoming more common to help people with their personal and daily duties. Many building control, automation, and data collecting applications have been created in recent years. There are numerous advantages,such as minimal cost, ease of installation, and maintenance. The remote device network can be used for a variety of tasks, including agriculture and traffic control, remote health care, forest management, security, and surveillance[1]. Connectivity, computation and signal processing, and dispersed device nodes for sensing are all part of the "Wireless sensor network"[2]. This framework allows the user to see the devices that are linked to the bottom station via completely different communication protocols such "Bluetooth, Zigbee, WIFI, RFID, and GPRS"[3]. IoT was developed concurrently with WSNs, in which a variety of devices are linked to networks from one to the next. Using a "PIC microcontroller" and GPRS, Jing[4] developed a remote wireless water supply monitoring system. The microcontroller architecture has a higher level of complexity, and the cost is higher. As a result, a lowcost, low-power, and predominantly system-on-chip based wireless device node is required to address these issues. Purohit and Gokhale[5] used GSM, Intel, sensors, ADC, and LCD to construct a real-time monitoring system. Because they are supported by advanced dedicated electronic boards [6], [7], [8,] these devices are limited.

II. OBJECTIVE

The major goal is to create a system that uses wireless sensor networks to continuously monitor river water quality at remote locations with low power consumption, low cost and high detection accuracy. pH, conductivity, turbidity level and other parameters are measured in order to enhance water quality. The remote sensing technology is the cornerstone of IoT-based water quality monitoring. This implements the approach by using the pH sensor, turbidity sensor to obtain analog readings for water contaminates. In addition, for the specific application, we can add extra sensor elements.

III. PROBLEM STATEMENT

Water is a finite resource that is necessary for agriculture, industry and the survival of all living things on the planet, including humans. Many people are unaware of the need of drinking adequate amounts of water on a daily basis. Many unregulated methods waste more water. Poor water allocation, inefficient consumption, lack of competent and integrated water management are all factors that contribute to this problem. Therefore, efficient use and water monitoring are potential constraint for home or office water management system.

IV. PROPOSED SYSTEM

The goals of concept implementation are as follows:

- Using accessible sensors at a distant location, monitor water parameters such as pH, dissolved oxygen, turbidity, conductivity, and so on.
- To collect data from various sensor nodes and transfer it through wireless channel to the base station.
- For quality control, to simulate and assess quality param- eters.
- When the water quality observed does not meet the established standards, send an SMS to an authorised person on a regular basis so that relevant steps can be performed.

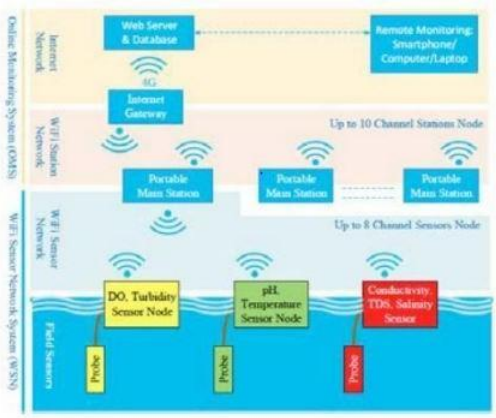

Fig. 1. Depicts a detailed diagram of a water quality monitoring system.

A. Block Diagram

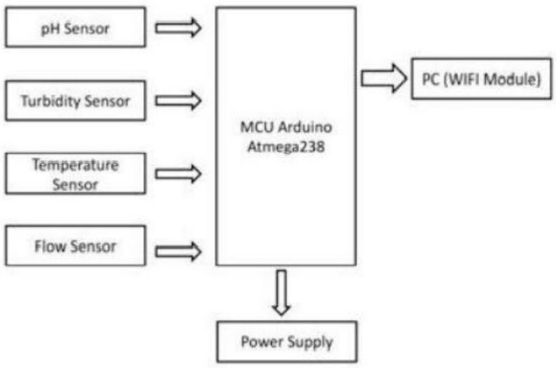

Fig. 2. Block diagram of a water quality monitoring system

B. Methodology

The proposed block diagram shown in fig.1 consists of three modules:

1) Data sensing module 2)Server Module 3)User Module.

1) **sensing module:** Microcontroller, pH sensor, Turbidity sensor, and Temperature sensor are all part of the data sensing module. The sensor's data will be routed through an amplifier circuit (signal Conditioning circuit) to alter the analogue signal such that it fits the requirements of the following stage for further processing. The data that has been altered will then be sent to the microcontroller unit. The analogue signal will be converted to a digital signal for further processing by the controller's inbuilt ADC module. The GPRS module is used to send the converted data to the server. The pH sensor in this study uses the CA3140 operational amplifier, which is an integrated circuit operational amplifier that combines the benefits of high

voltage PMOS and high voltage bipolar transistors on a single monolithic chip. The gate protected MOSFET (PMOS) transistors in the input circuit of the CA3140 BiMOS operational amplifiers provide very high input impedance, very low input current, and high-speed performance. The gravity arduino turbidity sensor measures turbidity levels to detect water quality. It measures light transmittance and scattering rate, which fluctuates with the amount of total suspended solids (TSS) in water, to identify suspended particles in water. The level of liquid turbidity rises as the TTS rises. Water quality in rivers and streams, wastewater and effluent measurements, control instruments for settling ponds, sediment transport research, and laboratory measurements all use turbidity sensors. This liquid sensor can output both analogue and digital signals. When in digital signal mode, the threshold can be adjusted. In this paper, a DS18S20 temperature sensor is employed. The DS18S20 digital thermometer measures temperatures in 9-bit Celsius and offers a nonvolatile alarm function with user-programmable upper and lower trigger points. The DS18S20 communicates with a central CPU through a 1-Wire bus, which requires only one data line (and ground) by definition. Furthermore, the DS18S20 may draw power directly from the data line (”parasitic power”), obviating the requirement for an external power supply. Each DS18S20 has its own 64-bit serial code, allowing many DS18S20s to share a single 1-Wire bus. As a result, controlling several DS18S20s across a vast region with a single CPU is simple. The temperature readings are in degrees Celsius, but they are translated to binary and then to hexadecimal. The following are some examples of readings.

2) **Server Module:** The server module consists of a PC connected to the internet, on which an application has been designed to store the data received in the cloud.

3) **User Module:** The user module includes a GPRS communication module that will receive data from the base station. The data from the server module can be accessed through PC, Mobile, or Tablet. The server module provides a service that allows data to be kept, monitored, and backed up remotely. It lets the user to save data online and access it from any computer with an internet connection. When a suitable connection is established, the server delivers data to the web page. We will be able to monitor and control the system through the web page. We may get the matching web page by providing the IP address of the server that is being monitored. The web website provides data on the pH level, turbidity level, and temperature fluctuations in the area where the embedded monitoring device is installed.

C. Hardware Requirements

1) Arduino UNO – Atmega328 2)PH Sensor
3)Turbidity Sensor 4)Temperature Sensor 5)LCD Display 6)Flow Sensor

D. Software Requirements

1) Arduino IDE 2)Proteus Design Tool

V. EXPECTED OUTPUT

Real-time monitoring of water quality using IoT-integrated Big Data Analytics would greatly assist individuals in becoming aware of the dangers of drinking contaminated water and in not damaging the environment. The research is focused on real-time monitoring of river water quality. Since a result, IoT-integrated big data analytics appears to be a better solution, as it can provide dependability, scalability, speed, and permanence. An intensive comparative examination of real-time analytics technologies such as Spark streaming analysis through Spark MLlib, Deep learning neural network models, and Belief Rule Based (BRB) system will be undertaken during the project development period [20-27]. This study suggests that the offered technologies be tested in a systematic manner in Bangladeshi river water of various characteristics. Due to budget constraints, we are just measuring the quality of river water parameters. This concept could be expanded into a local area’s effective water management system. Other factors such as total dissolved solids, chemical oxygen demand, and dissolved oxygen can also be quantified, which were not included in the scope of this investigation. As a result, the additional budget is required to improve the overall system.

VI. CONCLUSION

Water turbidity, PH, and temperature are monitored using a water detection sensor that has a unique advantage and is already connected to a GSM network. The technology can automatically monitor water quality, is low-cost, and does not require personnel to be on duty. As a result, water quality testing will most likely be more cost-effective, convenient, and quick. The method is very adaptable. This system may be used to monitor different water quality metrics by simply replacing the matching sensors and modifying the required software packages. The procedure is straightforward. The system can be expanded to track hydrologic, air pollution, industrial, and agricultural output, among other things. It is widely used and has a large number of applications. Keeping embedded devices in the environment for monitoring allows the environment to protect itself (i.e., smart environment). This will necessitate the deployment of sensor devices in the environment for data collection and processing. We can bring the environment to life by placing sensor devices in it, allowing it to communicate with other things over the network. The end user will then have access to the collected data and analysis results via Wi-Fi.

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