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Water Quality Monitoring System

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Abstract: The availability of good quality water plays an important role in developing countries such as India where a steady rise in industrialization and urbanisation has led to deterioration in drinking water quality. Since, water is vital to human survival there's a need to ensure the availability of safe drinking water through proper monitoring of its quality. In this paper, we present an integrated system to monitor the same through measurement of parameters like pH, conductivity and turbidity. While monitoring these parameters, it is perceived that one should receive a stable set of results. Therefore, a continuous series of measurements would indicate the quality and subsequently alert the user with the aid of Wi-fi module.

Keywords: pH sensor, Turbidity sensor, conductivity sensor, Arduino model, Wi-fi module.

I. INTRODUCTION

Water quality is a measure of the condition of water relative to the requirements of one or more biotic species, or to any human need or purpose. The traditional method for monitoring of the water quality is such that the water sample is taken and sent to the laboratory to be tested manually by analytical methods. Although by this method the chemical, physical, and biological agents of the water can be analysed, it has several drawbacks. Firstly, it is time consuming and labour intensive. Secondly, the cost for this technique is very high due to the operation cost, labour cost and equipment cost, and it is difficult to make critical decisions in the real time.

In this project, a variety of monitoring sensors have been deployed for measuring water pH, turbidity and conductivity to determine the quality of the water sample in real-time. The idea of the project is to provide a system which can be attached at rural water tanks to monitor various key parameters of water which defines its purity.

II. WORKING AND METHODOLOGY

The various sensors play a central role in this project. The electrode is placed inside the beaker filled with water sample whose pH is to be measured. The glass bulb welded at the end of measurement consists of lithium ions doped to it which makes it act as an ion selective barrier and allows the hydrogen. The measurement electrode potential thus changes with the hydrogen ion concentration. The detected pH of the system is first pre-amplified to strengthen it and then given to the voltmeter. As for the conductivity sensor, it consists of two steel electrodes that are immersed in the water sample. When no hardness is present it provides maximum voltage, as the hardness increase the voltage decreases. Hardness is represented by mg/L. To measure turbidity, a pair of IR transmitter and receiver is used. If the water is clear, all light transmitted by the transmitter is received. So, the resistance becomes minimum. When the sampled water is made muddy, turbidity increases and lesser amount of light reaches the receiver which causes increase in resistance of receiver. It is represented into % of opacity here air have 0% opacity and drinking water have nearly 20% capacity. If water opacity is higher than 30% it can be considered as turbid. After all sensors have carried their operation successfully, the sensors' data is sent to the Arduino UNO board to which a 16x2 LCD is connected that is used to display the value output of sensors in a simultaneous fashion.

This data is eventually analysed through IoT platform called "ThingSpeak". It enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates. It can be utilized to send real time updates on the user's mobile phone too as an option.

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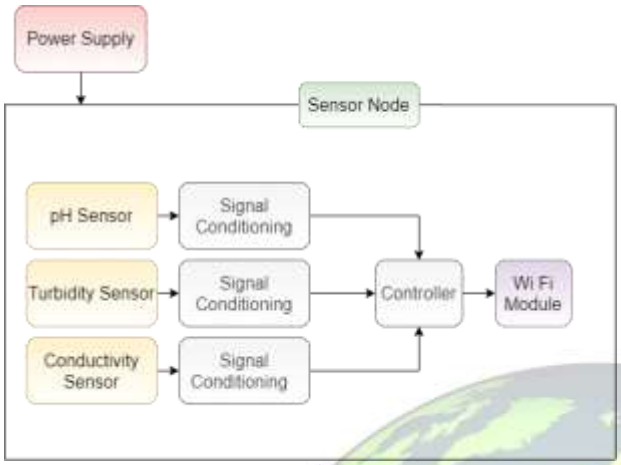

Figure 1: The schematic of the proposed system

III. FUTURE SCOPE

In future we use IOT concept in this project, and we can also infer to increase the parameters by addition of multiple sensors by detecting the more parameters for most secure purpose, this project can be extended into an efficient water management system of a local area. It provides an apparent designing of webpage and upload data on webpage, it presents us with useful features such as large monitoring ranges, flexible configuration, low power consumption, small damage to the natural environment and low cost.

A wireless sensor network was developed in the hope of tackling with the problem of the lack of a practical environment monitoring system, this monitoring system consists of three part: data monitoring nodes, data base station and remote monitoring system.

We can also work on making a mobile application for remote water monitoring which user can download and install in his or her device and can get real time notification. Due to limitation of time and budget we focus on measuring quality of a water parameters, and also by using the monitoring system we can easily prevent the wastage of water and the water will be save to our next generation.

The Wifi-module is deployed here which can be used to domestic level or for monitoring large water bodies.

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IV. HARDWARE DESCRIPTION

1) ARDUINO UNO

The Arduino UNO R3 is a Micro-controller board based on a removable, dual-inline-package (DIP) ATmega328 AVR Micro-controller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino IDE.

2) Turbidity Sensor

Turbidity sensors is the use of optics, through the liquid solution and scattering rate of transmittance integrated to determine the turbidity case. Since the amount of haze value is gradual, usually detected in a dynamic environment, the turbidity sensor acquisition value, the need for external control for AD conversion, the conversion to obtain the corresponding environment turbidity situation, so that the

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sensor can also need to produce a peripheral circuit detected in the system

3) Conductivity Sensor

When Contacting Sensors are used, the conductivity is measured by applying an alternating electrical current to the sensor electrodes (that together make up the cell constant) immersed in a solution and measuring the resulting voltage. The solution acts as the electrical conductor between the sensor electrodes.

4) pH Sensor

A simple and speedy device to measure the acidity and alkalinity of a fluid. A pH meter acts as a volt meter that measures the electrical potential difference between a pH electrode and a reference electrode and displays the result in terms of the pH value of the solution in which they are immersed.

5) Signal Conditioning module

A signal conditioner is a device that converts one type of electronic signal into another type of signal. Its primary use is to convert a signal that may be difficult to read by conventional instrumentation into a more easily readable format. The main function of the module is amplification of sensor output in this project.

V. HARDWARE OUTPUT

Figure 2 Turbidity analysis

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Figure 3 pH value analysis

Figure 4 Conductivity analysis

VI. CONCLUSION

With the current system an ease of water purity monitoring and analysis can be achieved with significant accuracy. As it is already specified that the built system is capable of providing real time data, immediate action and analysis is very much possible and the acquired data can be shared among different government and non-government agencies. Although costly, when the system is subject to mass production the cost can be significantly reduced.

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