

Smart Water Quality Evaluation System

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ABSTRACT

In today's world, Internet of Things (IoT) and Remote Sensing (RS) techniques are vastly implemented in various sectors of research for analysis and monitoring of data from remote locations. As a result of the tremendous increase in global industrialisation and its output, rural to urban drift and the extended usage of land and water resources, the quality of water reaching people has been greatly decreased. In addition to this, the extended fertilizer usage, especially chemical fertilizers in farms and also in other chemical sectors such as mining and construction have led to the overall deterioration of the quality of water all around the world. Humans need water for their survival and therefore a high level water quality system which quality checks the water that is supplied to towns and cities is essential it should also be able to work the water in the rivers, ponds etc. All the water sources should be enabled with this facility. Quality water availability plays a paramount role in preventing major disease out breaks and improves the overall quality of life. In this paper we present a design and development of a low cost water management system for real time monitoring of the water quality using IOT(internet of things). Several sensors are implemented in this project for measuring various physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, flow of the water can be measured. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as the core micro controller. Finally, the sensor data is received and stored in the cloud and in case of any changes in the quality of the water, the system will intimate the organization via GSM module.

Keywords: *Internet of Things, Water quality.*

1. INTRODUCTION

The fact of eliminating pollution altogether might seem like an impossible notion but its effect when it does happen is certainly limitable. The primary objective of this project is to devise a method to monitor water quality in an effort to aid in water pollution control with the help of IoT and RS technology. The Smart Water Quality Monitoring System will measure the following water parameters for analysis; Potential Hydrogen (pH), Oxidation and Reduction Potential (ORP), Conductivity and Temperature using separate sensors. While monitoring these parameters, it is perceived that one should receive a stable and pre-set set of results. Therefore a continuous series of anomalous measurements would indicate the potential introduction of a water pollutant and the user will be notified of this activity with the aid of IoT technology. False positives, such as anomalous readings over a short period of time, will be recorded but not treated as an alert. Hence, with the successful implementation of this monitoring approach, a water pollution early warning system can be achieved with a fully realized system utilizing multiple monitoring

stations. Initiatives have been taken all over the globe to develop projects based on sampling water to aid in controlling water source pollution. Libeliums Smart Water device monitors the status of an aquarium’s health in Europe [2]. It specifically monitors parameters like pH, electro conductivity, oxidation/reduction potential (ORP) and temperature. A cloud based solution is developed to help in monitoring data in real time providing a fast and effective reaction in case of rising abnormalities. A similar example to that of this project can be seen in the coastal water pollution monitoring initiative in the Gulf of Kachch [3] with the only difference being in terms of it having a much larger scope and vastly more expensive protocols deployed to counter the effects of the industrial development. Furthermore, locally there have been projects based around the conservation of the coral reefs. The Mamanuca Environment society’s (MES) Biannual Sea Water Monitoring Program has been around for 4 years whereby tests are carried out on seawater for faecal coli form (FC) bacteria, salinity and nutrients which helps in ascertaining the health of the surrounding reefs [4]. Various parameters used to measure water quality are tabulated in Table 1.

Table 1. Parameters to measure water quality

Parameters	Standard Value	Permissible Value
pH	6.5 – 8.5	No relaxation
Turbidity (NTU)	5	25
Total hardness (mg/L)	300	600
Chloride(mg/L)	250	1000

Water Crisis in Tamilnadu in various water sources are shown in figure 1. The situation is critical as the current water level is lower than the average in last 10 years. Immediate action is essential in order to avoid future Hazards and proper monitoring is to be done effectively.

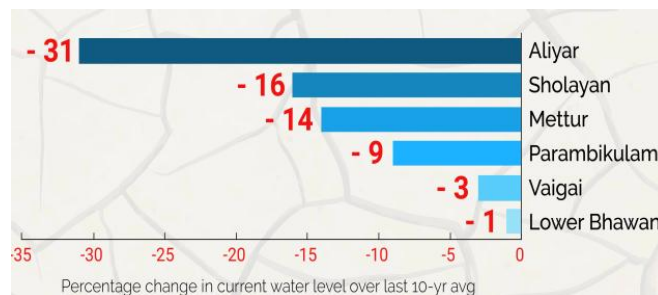


Fig1. Water Crisis in Tamil Nadu

EXISTING SYSTEM

In today’s world, most if not all of our water sources are polluted. In the current system, the equipment cost is high and the processing time is long and time consuming. Traditional methods as well impose the drawbacks such as long waiting time for results high cost, low measurement precision and complicated methodology [5]. So with the implementation of this technology, we use different methods and techniques to check the quality of water. Today’s systems also suffer from the fact that they all have a very low performance to complexity ratio. This method on the other hand is made with simple equipment and will ensure great performance to complexity ratio.

PROPOSED SYSTEM

The proposed system shown in Figure 2 reduces the complexity while increasing the performance by collecting the data of the water parameters like temperature, water level, co2, pH, salinity, turbidity. The data collected is updated onto the web server that can be retrieved from all over the world.

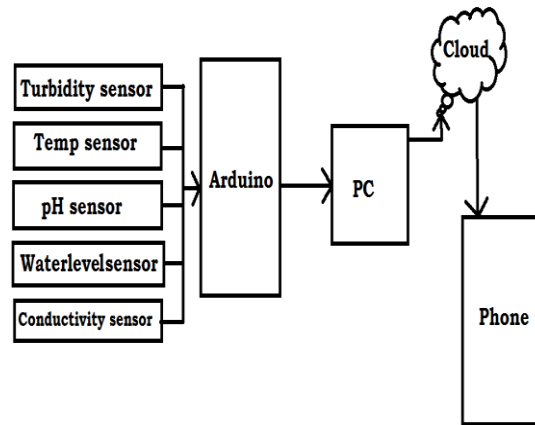


Fig 2. Circuit Diagram

SYSTEM DESCRIPTION

The system as presented allows the water monitoring in any water sources through a network of sensors where every single one of the sensor is connected to a microcontroller capable of interpreting and motorizing its measurements. In case of water flow in the rotor of the flow sensor, the turbine blades will be rotated and each time one passes through the Hall effects sensor, there is an interaction between the magnetic fields. Upon every single interaction, the Hall effects sensor will generate a pulse (i.e) the more the water flows through the rotor the greater the frequency of pulses generated to measure the flow of water. Ideally the normal range of pH is 6 to 8.5 for common water. Special probes in the pH meter will calculate the pH of the given solution and send it to the microcontroller. The water level sensor mainly consists of three parts which are $1M\Omega$ resistor, an electronic brick connector and enormous number lines of conducting wires. The general working is done by a series of “exposed traces” which are associated to the ground. An interface between grounded traces and the sunstrokes is also present. A weak $1M\Omega$ pull-up resistor is present. The work of the $1M\Omega$ resistor is to pull up the sensor value until a drop of water shorts the sensor trace to the grounded trace. The measure of the cloudiness of water is called Turbidity. Turbidity indicates the degree where the water loses its transparency. The usage of “LM35 sensor” for calibrating the temperature in this project relieves the user the work of converting Kelvin to centigrade temperature. The GSM Shield compatible with Arduino allows an Arduino board to be connected to the internet, make/receive voice calls as well as SMS messages. This shield uses a radio modem M10 by Quectel. The communication between the module and our board is done using AT commands.

The M10 is a Quad-band GSM/GPRS modem that works at frequencies GSM 850MHz, GSM 900MHz, DCS1800MHz and PCS1900MHz. As the process of sensing the parameters is done by the sensors, the process of storing this data and sending it further wirelessly is carried out. The Data is stored in a cloud base system, and when any of the parameters changes from the ideal measurements, the user is intimated through his mobile phone using a GSM module

CONCLUSION

This Monitoring system can monitor water quality automatically, and the cost is very low and mainly it avoids the need for manpower. And hence this approach will be very economical, convenient as well as fast. This system also has good flexibility as the parameters can be changed or added at any time for any required testing medium and just by replacing the corresponding sensors and changing the relevant software programs. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. Implementation of technologies can seriously improve the quality of life and pave our way towards a smart world.

FUTURE SCOPE

- In future we could use new IOT concepts in this project to enrich it.
- Detecting the more parameters for most secure purpose.
- Increase the parameters by addition of multiple sensors
- By interfacing relay we controls the supply of water
- Can be implemented for not only water but air soil and many more.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.

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