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Real time Water Quality Measurement System based on GSM

Introduction

Water is an essential component of our life. It has applications in almost each and every field. Need for rapid development is accompanied with serious problems of water pollution. Water pollution affects plants and organisms living in these bodies of water, individual species and populations as well as natural communities. Hence water quality measurement and improvement is the need of the hour. Water quality is determined by various parameters such as temperature, pH, turbidity, conductivity, dissolved oxygen (DO), Total Dissolved Solid(TDS).

The most common method to detect these parameters is to collect samples manually and then send them to laboratory for detecting and analyzing. This method wastes too much manpower and material resource, and has the limitations of the samples collecting, long-time analyzing, the aging of experiment equipment and other issues. Sensor is an ideal detecting device to solve these problems. It can convert non-power information into electrical signals. It can easily transfer, process, transform and control signals, and has many special advantages such as good selectivity, high sensitivity, fast response speed, etc. According to these characteristics and advantages of sensors, automatic measurement and reporting system of water quality is designed and developed. These sensors can be linked by GSM network to instantaneously transfer the collected data through SMS.

List of Components:

1. Microcontroller: Arduino
2. LCD display
3. pH sensor (SKU: SEN0161)
4. Temperature sensor (DS18B20)
5. Turbidity sensor (TSW-10)
6. For conductivity sensor: nichrome wire, copper wire,resistor: 470 ohms
7. GSM Module
8. Dissolved Oxygen sensor(based on availability)

Outcome:

The aim is to build a real-time, reliable, low cost water quality monitoring system which can send data obtained by it to a remote data analysis centre. We will try to cover all aspects which contribute to water quality and try to get fairly accurate quantitative data.

Applications:

From an engineering point-of-view, water quality monitoring is required in a variety of areas. Broadly the uses can be classified according to the domain namely industrial, civic and medical. Water purity is dependent on several parameters and hence every component of our project has a different application. For example,

- Desalination facilities use conductivity measurements to ensure that water samples have been sufficiently purified.
- The project can also be used to quickly identify the contaminants within wastewater streams and water supply systems.
- Another common application involves the use of conductivity probes to monitor the ionic content of water used within cooling towers since too highly concentrated ionic solutions prematurely corrode components and cause safety hazards.
- Modern industrial production often requires water used in industrial production to be at a specific temperature, be free of impurities and be at a specific pH. So, this circuit can be used to monitor water quality and send data for control systems to analyze. For instance: water used in pharmaceuticals needs to satisfy certain quality parameters.
- It might be of interest in certain applications to make sure that the water is of good quality in a 'biological' sense. For instance, an aquarium owner will be interested to monitor the temperature of water, the dissolved oxygen content to ensure that the fish stay healthy. The same holds for a pisciculture farm whose economic interests lie with the health of their produce.
- Such systems can also be used to improve civic water facilities. Systems which will provide real time data to authorities about the quality of water being supplied by the municipality can be implemented. Housing societies can use these low cost monitors which can automatically log a complaint with the authorities if the water parameters worsen. Such systems will greatly ease the task of checking up water quality in a society and significantly reduce the manpower required to collect it. This will enable the civic body to better gauge its facilities and take faster corrective action.

Limitations:

- The components used in the project may cannot give precise output as that obtained due to their compatibility with various factors like operating temperature,voltage or current. e.g. Turbidity sensor works over a specific range of temperature. If the circuit is used in the temperature beyond the operating range it may not give accurate output.
- The actual precision of the sensors that we use is less as compared to the sophisticated instruments which are used at industrial level.

Future scope and extensions :

1. High D.O level speeds up corrosion. For this reason, industries use water with as less possible D.O as possible.
2. Pathogens in water are a major factor which degrades water quality. Traditionally, the only way to find out pathogenic elements in water was to do a laboratory analysis. We tried to find an electronic sensor which is capable of doing this. Research is going on in this regard and such sensors are currently under development. This could be a major upgrade to the project.
3. This project can be combined with a major framework used in all the smart cities, i.e. IoT. Where such a miniature model can be be replicated to a massive model collecting the data from various samples (ponds / rivers) can be collected and even the efficiency and working can be regulated from a distant controller.

References:

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4. Conductiviy: https://www.teachengineering.org/view_activity.php?url=collection/nyu_/activities/nyu_probe/nyu_probe_activity1.xml

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