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GSM Based Water Quality Monitoring and Notification System

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Abstract

Water is one of the major components of the environment and greatest gifts by nature to us. But we human beings have used it in such an uncontrolled manner that getting pure water has become a great challenge nowadays. Hence, it is high time to start monitoring of water qualities continuously so that necessary steps can be taken immediately. Water quality depicts chemical (pH, DO etc), biological (BOD, COD etc) and physical (turbidity, temperature etc) characteristics of water. The traditional water quality monitoring system where water quality parameters are checked manually by taking to laboratories is a tedious, inefficient and costly process which fails to meet the needs of today's fast paced life. In our project, three water quality parameters (pH, temperature, turbidity) are checked continuously and value can be shown in Blynk application. Moreover these values can be monitored by sending system specific character as message to a particular number. Whenever, any one (or all) of the water quality parameters crosses optimal range then user will be notified by an alert message as well as notification by the Blynk application.

Keywords: Water quality, pH, temperature, turbidity, sensors, GSM, Blynk.

Introduction

Water pollution is one of the biggest fears for the green globalization [3]. But due to rapid development of the society and numerous human activities, deterioration of the water resources are increasing continuously [1].Nowadays, 20% of the world's population does not have clean and safe water for drinking. The situation is even worse in some developing countries where contaminated water is used for drinking without being properly treated. The World Health Organization (WHO) has estimated that in India 77 million people are suffering due to not having safe water [10]. One of the reasons behind this situation is the lack of water

quality monitoring system [12]. In our system, we have used various sensors to measure the water parameters and if any undesirable change is found in the quality of water an alert message is sent immediately to the user and a warning message is displayed in the Blynk app which has been synchronized with this system. The main objective of this system is to check current water quality condition and identify any emerging issues so that necessary action can be taken before it can adversely affect the living beings.

Literature Survey

Water quality monitoring has been gaining interest among researchers in this 21st century. The main objective is to develop an efficient, cost effective and real time water quality monitoring system [2]. Gokulanathan, Manivasagam, Prabu and Venkatesh investigated about a water quality monitoring system using a wireless sensor network [1]. Vaishnavi V. Daigavane and Dr. Gaikwad made a system measuring various water parameters which are fed and then processed in the micro-controller and viewed on internet using Wifi system [3]. Yue and Ying presented a water quality monitoring system using wireless sensor network (WSN) technology which is powered by solar panel [12]. Hasan and Khan developed a system where the water quality is detected under the control of a microcontroller. After processing the data, it sends it to monitoring centre by GSM network and if the water quality is unusual, the data will be sent to the management's mobile [10]. In our project, we have developed a GSM based water quality monitoring and notification system which monitors pH, temperature and turbidity of water. The system checks the water parameters continuously and if any unwanted change is found, an alert message is sent to the user's registered number and a warning message is displayed in the Blynk application immediately. The user can also check the water parameters anytime by sending a request to the GSM module or can check it in the Blynk app.

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System Design

Flow Chart

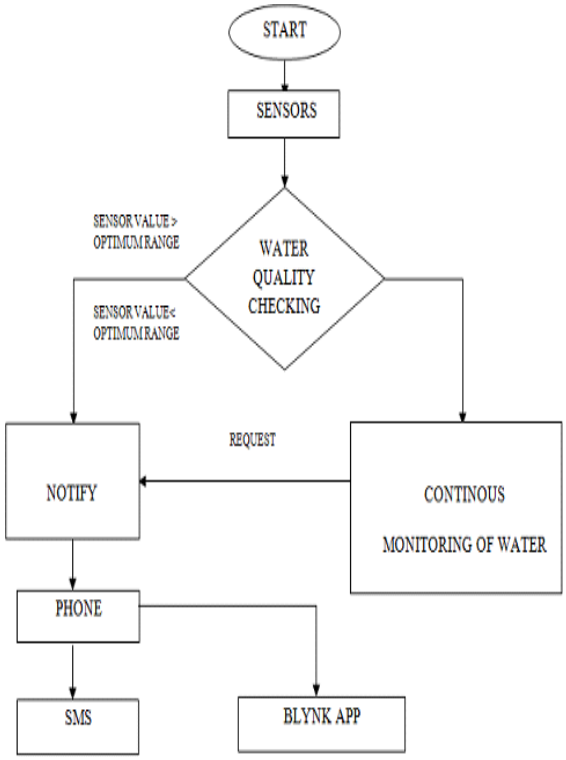

Figure 1.Flow Chart of the System

Block diagram

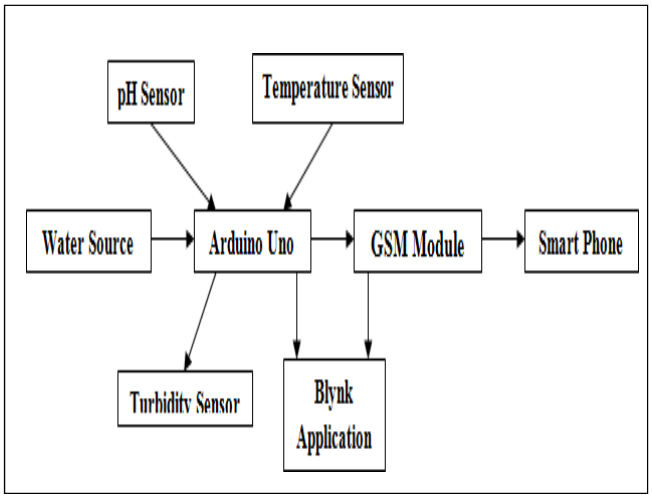

Figure 2.Block Diagram of the System

Arduino Uno: The Arduino Uno is a micro- controller board which is based on the ATmega328. It has 14 digital pins, 6 analog pins, 16 MHz crystal oscillator, a power jack, an ICSP header and a rest button.

pH Sensor: pH is a measure of how acidic or basic the solution is. The pH scale is logarithmic and ranges from 0 to 14, 7 being neutral. pH less than 7 is acidic whereas pH more than 7 is basic.

Temperature Sensor: Temperature sensor checks temperature of a water source. Here, waterproof dsb18b20 temperature sensor is used. The range for operating temperature is from -55°C to 150°C.

Turbidity Sensor: Turbidity sensor checks how turbid water is. It basically checks opaqueness of the water sources

GSM Module: A GSM modem is special type of modem. It accepts a SIM card and it operates over a subscription to a mobile operator. Here SIM900A GSM module is used.

Blynk Application: Blynk is a platform with IOS and Android apps with which Arduino, Raspberry Pi can be controlled over the Internet. It's a digital dashboard where we can build a graphic interface for a project.

Implementation

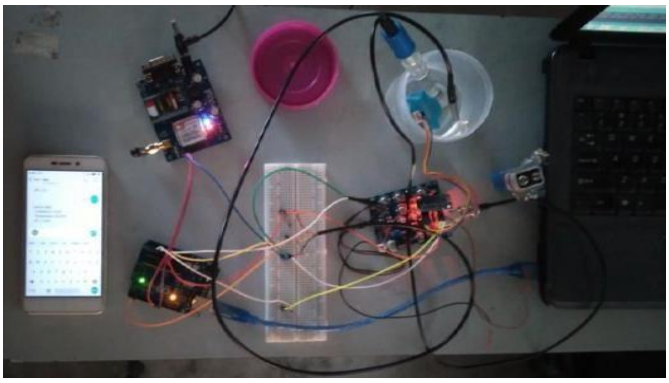

Figure 3.Overall System Implementation

At first, the three sensors used in this project i.e. the pH, temperature and turbidity sensors measure the respective water parameters. All the three sensors have been programmed accordingly to give accurate and fast results. The sensors are then interfaced with the Arduino uno board. The Arduino board accepts the sensor data continously and processes it further into an acceptable and convenient form. It has been programmed in such a way that it constantly accepts the data from the three sensors and compares them with a threshold range which has been predefined in the program defining purity. The GSM module is interfaced with the Arduino. The system is then synchronized with the Blynk application using the Blynk server. Three different gauge meters has been used to display the water parameters continuously. The coding of the Arduino has been done in the Arduino Integrated Development Environment (IDE). It has been programmed in a way that if any one of the water parameters crosses the threshold range, an alert message is sent to the user through the

GSM module and a warning message is displayed in the app. The sensor values can also be obtained at anytime by sending a system specific character as a request to the GSM module. The sensor values can also be checked anytime by downloading and installing the Blynk app in a smart phone.

Result

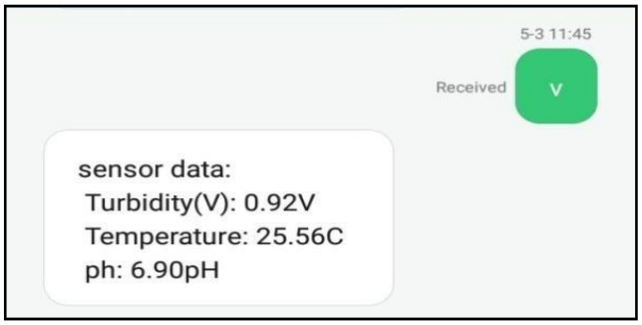

Figure 4.Getting of Sensor Values on Request

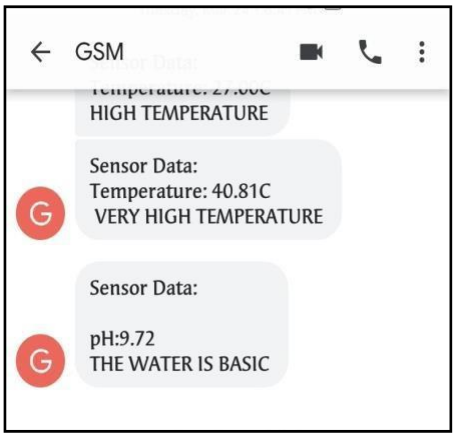

Figure 5.Alert Message Whenever Any Problem Occurs

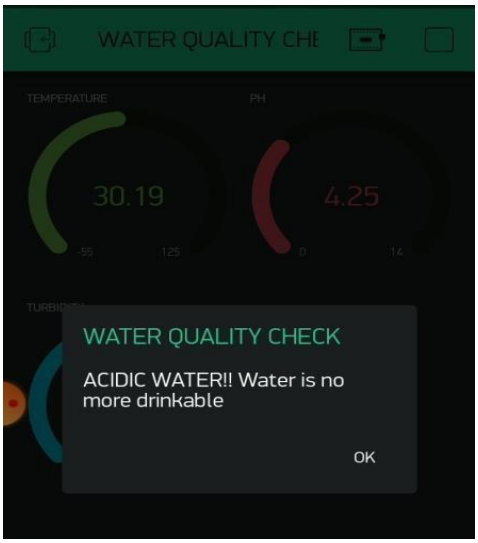

Figure 6.Alert Notification by Blynk Application Whenever Any Problem Occurs

Applications

1. This system can be used to monitor the quality of water which is to be used for drinking purposes.
2. Animals sometimes drink polluted water from various water sources which a threat to life. Hence this system can also be used to monitor the quality of any water source and the lives of the animals too can be safeguarded and protected.
3. The system can be used to monitor the quality of water given to the plants.
4. It can be an extremely useful tool for managing irrigation water and help farmers to maximize crop production.
5. This system can be installed in the industries so that when they release their liquid waste, they can monitor the quality of the waste water.
6. This system can also be useful for aquaculture and livestock production.

Future Scope

1. In future, to make this system more efficient other sensors can be used in order to measure different parameters.
2. Wireless sensors can be incorporated to make the system more efficient.
3. Solar cells can be used to power up Arduino and GSM module.
4. A relay can further be interfaced to control the supply of water.
5. The system can be expanded to monitor air pollution, industrial and agricultural production and so on.

Conclusion

There's nothing more essential to life on Earth than water. Yet, there is global water crisis everywhere. Whether it be Cape Town or Flint or Michigan or may it be rural, sub-Saharan Africa or Asia's various mega cities, the picture is quite same everywhere. Hence it is high time to start monitoring the quality of the left water resources continuously and need to take immediate step when required. This system will simplify the work of monitoring. This model is easy to handle and possess a lot of future scopes. Though this model faces some drawbacks but with proper techniques and methodologies these can be easily overcome. Lastly, we human beings need to be more serious and aware of this matter and be more responsible to keep the water resources clean and maintain its quality. We should try to curb down the possible ways which can pollute the water sources posing harm to all the life forms dwelling on this planet and the environment as much as possible. It is the responsibility of the human beings to try their fullest to protect our water resources.

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