International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

Water Quality Monitoring

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ABSTRACT: *Water is an essential natural component that is very important for the existence of life. In today's scenario, due to increasing industrialization and environmental imbalance, water quality and fresh water quantity are decreasing day by day. In the presented paper, we are emphasizing on understanding the Arduino based electronic modules that are being used to monitor the water related parameters for basically three types of applications related to water quality, river water parameters and agricultural fields. Arduino is being used for controlling and data processing applications because it provides a flexible and easily reconfigurable hardware platform. The observations for different parameters according to different applications are also reviewed.*

Keywords: Arduino, Water quality, Turbidity sensor.

1. INTRODUCTION

Earth is called as Blue Planet and is the only planet known up to the present time having the capability to support life. This capability of our planet to support life is only due to the presence of water on earth. If the balance of water gets disturbed in our ecological system, then this may lead to extinction of species and creatures leading life on our planet. We can say that it's high time for us to think seriously about our environment and its perfect balance as it has been already disturbed to a great extent by our changing life styles and increasing facilities. There are many factors that describe the ecological system balance, but in our study we are concentrating on water imbalance and its real time monitoring to decrease this imbalance. Fresh water present on earth is constantly decreasing and is being replaced by polluted water; example is increasing amount of acid rains, river water pollution, increasing floods, sea water pollution and bad impact on aquatic life. Fresh water resources are being degraded day by day, many living creatures are surviving on contaminated water and it is leading to many diseases. All these effects are not natural but they are occurred due to our carelessness and over use of facilities available to us by the virtue of increasing technological development.

Case study from latest scenario (Ganga river project) – Ganga is a religiously important river of our country but it also supports the existence of civilization in our country to a great extent. Almost 40 percent of the population of our country is surviving on Ganga water and agriculture supported by this water. Not only this but the Ganga is pride of our country because it is the only river of the world that has 25 percent oxygen content in it's water. But we did not care for this virtue given to us by nature and nowadays Ganga is on the verge of extinction because it's water is contaminating day by day and it's source the Gangotri glacier is also contracting. Hence, we see that there is an immense need of efficient river water monitoring system. These real time monitoring systems are river water monitoring, agricultural field monitoring and water quality monitoring.

Environment around us consists of five key elements. These are soil, water, climate, natural vegetation and land forms. Among these water the most essential element for human to live. It is also important for the survival of other living habitants. Whether it is used for drinking, domestic use, and food production or recreational purposes, safe and readily available water is must for public health. So it is highly imperative for us to maintain water quality balance. Otherwise it would severely damage the health of the humans and at the same time affect the ecological balance among other species.

Now a day's Internet of things is a revolutionary technological phenomenon. It is shaping today's world and is used in different fields for collecting, monitoring and analysis of data from remote locations. Internet of things integrated network is everywhere starting from smart cities, smart power grids, and smart supply chain to smart wearable. Though internet of things is still under applied in the field of environment it has huge potential. It can be applied to detect forest fire and early earthquake, reduce air population, monitor snow level, prevent landslide and avalanche etc. Moreover it can be implemented in the field of water quality monitoring and controlling system.

1.1 PROBLEM STATMENT

There were lots of inventions, but at the same time were pollutions, global warming and so on are being formed, because of this there is no safe drinking water for the world‟s pollution. Nowadays, water quality monitoring in real time faces challenges because of global warming limited water resources, growing population, etc. Hence there is need of developing better methodologies to monitor the water quality parameters in real time.

1.2 Objective of research

- To monitor soil quality (turbidity), temperature of surrounding, colour as well as PH of soil.
- To display soil condition on LCD.

2. LITERATURE REVIEW

1. Cho Zin Myint and et al states that since the effective and efficient system of water quality monitoring (WQM) are critical implementation for the issue of polluted water globally, with increasing in the development of Wireless Sensor Network (WSN) technology in the Internet of Things (IoT) environment, real time water quality monitoring is remotely monitored by means of real-time data acquisition, transmission and processing. This paper presents a reconfigurable smart sensor interface device for water quality monitoring system in an IoT environment. The smart WQM system consists of Field Programmable Gate Array (FPGA) design board, sensors, Zigbee based wireless communication module and personal computer (PC). The FPGA board is the core component of the proposed system and it is programmed in very high speed integrated circuit hardware description language (VHDL) and C programming language using Quartus II software and Qsys tool. The proposed WQM system collects the five parameters of water data such as water pH, water level, turbidity, carbon dioxide (CO 2) on the surface of water and water temperature in parallel and in real time basis with high speed from multiple different sensor nodes.

2. Mariana Jurian, and Cristian Panait, Visan Daniel, Cioc Bogdan conclude that Having as departure point the necessity to guarantee drinking water quality in compliance with the rules and regulations in force, this paper aims at presenting the collection, monitoring and transmission system of parameters needed in order to monitor the drinking water quality. First of all parameters that determine the quality of drinking water are analysed and parameters are selected for which the system using cutting-edge technology in the collection and data transmission field shall be implemented. The system concerned, the type of sensors used and the wireless parameter transmission system are presented. The electric diagrams and the advantages of using this real-time monitoring system are presented.

3. R. Meza and et al presented their paper entitled as “An Intelligent System for Rivers Water Quality Assessment, based on Pollutants Propagation Modelling and Simulation”, in which they states that rapid environmental changes as well as potential risks for the human health call for water quality continuous surveillance and on-line decision making. Information and communication technologies can be valuable in these areas. In this paper they present an intelligent system for water quality assessment. Some models used for pollutants propagation, the system architecture, the functional description, the distributed acquisition subsystems are presented. The main concepts are the integration of distributed and diverse information resources through wide area net- working methods, but with an easy-to-use interface that makes the technical complexity completely hidden for the user. Menu driven, graphical and supported by an embedded expert system, the interface makes interaction with complex models easy. The system provides a powerful, but simple tool for river water quality management, and decision making, according to European environmental policy, guidelines, and regulations.

4. Han Xiao-gang and Huang Ting-lin states that the real-time water quality monitoring network has been operational for water resource protection and water quality detection. It is useful for management plans of water utility and local authorities to realize change characteristic of water quality. In the paper, the principle of wavelet analysis widely used in dynamic data processing was introduced. In addition, the time series of three days’ continuous monitoring for some node residual chlorine was analyzed with the Daubechies wavelet. With the mother wavelet function 'db3', the subjects were decomposed into 5 levels, and the original time series was reconstructed into the combination of high-frequency and low-frequency on various time scales. The results show that the day change of residual chlorine has a significant characteristic of two periods. The wavelet analysis can provide a very good representation of the change trend of residual chlorine time series and also put forward a new approach to the studies on the stage change of residual chlorine and the mid long term prediction for time series. Meanwhile, it also has a good application effect in the noise elimination and the determination of discontinuous point and abnormal value.

3. PROPOSED SYSTEM

Water pollution is one of the biggest 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. Nowadays, water quality monitoring in real time faces challenges because of global warming limited water resources, growing population, etc. Hence there is need of developing better methodologies to monitor the water quality parameters in real time. The water quality parameters pH measures the concentration of hydrogen ions. It shows the water is acidic or alkaline.

Pure water has 7pH value, less than 7pH has acidic, more than 7pH has alkaline. The range of pH is 0-14 pH. For drinking purpose it should be 6.5-8.5pH. Turbidity measures the large number of suspended particles in water that is invisible. Higher the turbidity higher the risk of diarrhoea, collera. Lower the turbidity then the water is clean. Temperature sensor measures how the water is, hot or cold. Flow sensor measures the flow of water through flow sensor. The traditional methods of water quality monitor involve the manual collection of water samples from different locations.

Fig shows the block diagram of the proposed system. It consists of sensing unit such as Turbidity Sensor, temperature sensor, colour sensor and PH sensor to measure water quality of water, the atmosphere temperature, colour of water and PH respectively and LCD interfaced with Node Arduino displays all this values.

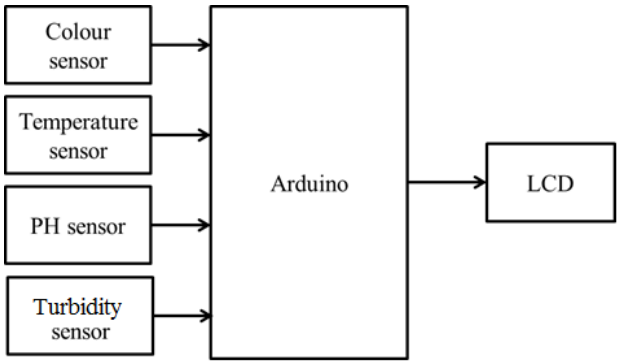

Fig block diagram of proposed system

4. CONCLUSION

Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage. The system can monitor water quality automatically, and it is low in cost and does not require people on duty. So the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value.

By keeping the embedded devices in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available on LCD.

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