

Monitoring the Quality of Water Using IOT

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Abstract: Water is important resource in our life. It plays vital role in our human life, animals and eco system. But, Now-a-days water had polluted due to human activities. For that purpose, it is important to measure and monitor the quality of water. The usual method of measuring the quality of water is to get the samples manually and send it to laboratory for examination. This system is time consuming and costly. In addition to that it is difficult to send the water sample to the laboratory, subsequent to every hour for measuring its quality. Wireless sensor network (WSN) is the uncomplicated and fundamental way to assess the quality of water using wireless sensor network technology. So as to make routine the course of action, a water quality monitoring system is proposed. The system consists of pH sensor, Temperature Sensor, Turbidity Sensor and Conductivity Sensor, Rasperry pi 3, Wireless module Bluetooth Low Energy (BLE) and server consists of BLE device and PC or Mobile Phone. This system will measure and monitor the water quality with low cost and it is easy to set up and the system is having low maintenance.

Keywords— Rasperry Pi 3, water, sensors, pH, Temperature, Turbidity, Conductivity, Wireless Sensor Network (WSN).

I. INTRODUCTION

Water is being generated by our mother nature in the form of rain which is getting moved to other areas by means of river and getting drained in sea or ocean in between the Water is being stored in the form of dams, lakes, and ponds etc... which are being used by humans for their consumption purposes. All the natural resources are getting polluted in the recent years due to reasons like population explosion, deforestation, improper waste management, sewage disposal into natural water sources. Water quality Monitoring is an important part of environmental monitoring. When water quality is poor, it affects not only aquatic life but the surrounding ecosystem as well. In the developing and under developed countries there is no simple technologies being used for measuring and monitoring the water quality and since the absence of suitable water treatments and technologies the impure & contaminated water is used for drinking purpose. The absence of water quality measuring systems causes lots of health issues and also damages the entire ecosystem of the area this leads to ecological imbalance which will be more adversely on a longer run in a larger extent it will affect the current and future generations of living organisms. Recently, wireless sensor networks (WSNs) plays vital role in environmental and industrial monitoring. Wireless Sensor Network (WSN) [3] works with combination of number of sensor [2] node and it uses the radio signal for communication. A typical WSN is a combination of number of sensors which are connected together for identifying and balancing factors of the environment. In general the WSN can be used to measure or monitor the properties of the environment and in our paper we are using WSN for measuring and monitoring the

properties of water which includes pH Level, Water Temperature Level, Level of Water Turbidity, Conductivity in the water sample. This paper deals with a Water Monitoring system which consist of a Rasperry Pi-3 Controller Board, Sensors for measuring the properties such as pH[1], Temperature[1], Turbidity[5], Conductivity[5].

II. EXISTING SYSTEM

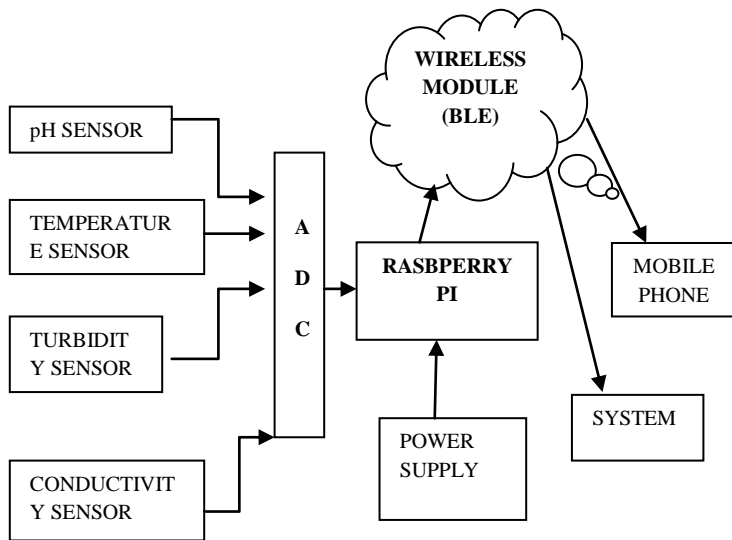
There are some existing systems [4] which are being used for measuring the water quality and they are not much cost effective and the results are not immediate. Most of the systems can be used in a laboratory environment. This is a major issue as samples where needed to be checked frequently in remote areas when the time moves the quality of water changes and it is difficult to get a proper results. if the results are not proper then it is difficult to measure and monitor the quality of water. This is the reason why we are proposing a system which gives a result in real time so that we can able to measure and monitor the quality of water properly and we can give proper solution to eliminate the imbalance in the ecosystem

III. PROPOSED SYSTEM

The proposed system is a cost effective one and it is suitable to use in the real time environment. The results are displayed in same time of testing the sample. Proposed system, in this paper the system uses a wireless sensor network and Sensors which is very much needed for water resource management and the main reason for using wsn [11] is to identify the quality of water for drinking for the urban population, which receives water mainly from the reservoir. Our proposed

system consists of four main components such as sensor nodes Gateway node application software BLE devices. The proposed system consists of different types of sensors to measure the properties of the water sample such as pH that is potential of hydrogen EC electrical conductivity, turbidity and temperature. Gateway node is the connectivity between the remote network and the host network gateway is the service point for both entry and exit of the network .it is a point where all the inward and outward data must pass through to reach its proper destination.

IV. SYSTEM ARCHITECTURE



As we are using multiple sensors to collect data from the sample and should be routed to proper destination. The Gateway is equipped with Raspberry Pi board [12], power supply and BLE transceiver. The recent Raspberry Pi is equipped with BLE support. The BLE Block is used to send the data to the BLE devices as the proposed system is using BLE. Hence there is no need for any sim or data connectivity or even a GPS is not needed. Hence the device can be used in any remote location to measure and monitor the quality of water very low energy requirements this will be the biggest advantage. Power supply [6]module is important module which search the power for the system and it is important to have a good power supply unit for giving the system a long life power supply can be everyday through alternating current or direct current .DC current can be generated by batteries when the system is required to be used in a remote location or even it is possible to use system that harvest solar energy when there is no other chances of energy is available at a remote location for the purpose of implementation we are using a normal power supply in this module.

pH Sensor: It measures and monitors the pH levels .If the pH levels low then it can have dangerous effects on human health. The pH of water can vary from 0 to14 [13].

Temperature Sensor: Temperature Sensor [8] measures the temperature of the water and the measured voltage is proportional to the temperature with negative or positive coefficient.

Turbidity Sensor: Turbidity Sensor [7] used to measure the clearness of water or muddiness visible in the water. The output voltage varies represents turbidity value varying from 0 to 4000NTU (Nephelometric Turbidity Unit).

Conductivity Sensor: The conductivity [10]of water indicates the amount of ions and /or free flowing electrons which are present for the conduction of electricity. It is measured in Siemens per meter(s/m) or micro Siemens per centimeter.

Measurement Level:

Why BLE

For wide range of covering the area ,Wi-Fi is used with sensor but while using the protocol like UDP and HTTP there may be chance for packet losing and the Wi-Fi consumes more power consumption therefore it increases the cost also. For more accuracy, low cost [9] and low power consumption the BLE device is implemented. **Bluetooth Low Energy (BLE,** marketed as **Bluetooth Smart**) is technology designed for wireless personal area network and provides reduced power consumption and cost while maintaining a similar communication range. BLE low power requirements, operating for "months or years" on a button cell. BLE is small size and low cost, compatibility with a large installed base of mobile phones, tablets and computers. Spectrum range of Bluetooth Smart Technology is the of about 2.400–2.4835 GHz ISM band.

Measurement parameter	WHO standard (Drinking Water)
Ph	7-8.5(<=8)
Turbidity	1-5NTU
Dissolved Oxygen	5-6mg/l
Conductivity/Salinity	25C
Temperature	15C
TDS	600-1000mg/l

BLE Specification:

Technical specification	Bluetooth Smart technology
Distance/range (theoretical max.)	>100 m (>330 ft)
Over the air data rate	125 kbit/s – 1 Mbit/s – 2 Mbit/s
Application throughput	0.27 Mbit/s
Active slaves	Not defined; implementation dependent
Latency (from a non-connected state)	6 ms
Minimum total time to send data (det. battery life)	3 ms
Power consumption	0.01–0.50 W (depending on use case)

V. RESULTS

In this paper python language, MY SQL database are used .The sensors are dipped into the water and the combination of sensor predict the values, raspberry process the values, and BLE transmit the data to server. Here the data is updated into database for monitoring purpose in time and low cost.

VI. CONCLUSION AND FUTURE SCOPE

Measuring and monitoring the quality of water is very important for human health, eco system and animals. The previous methods are cost effective and time consuming. For that purpose the automated Wireless Sensor Network technique is implemented with help sensor, raspberry and BLE. It is time efficient, low cost, accuracy, low power consumption. In future this technique can be implemented with the help of mesh network, beacon and better protocol.

REFERENCES

[1]. www.fondriest.com.
 [2]. www.engineersgarage.com.
 [3]. www.ni.com.
 [4]. Shruti Sridharan, “Water quality monitoring using wireless sensor networks” JEST-M, Vol 3, Issue 2, July-2014.
 [5]. Dr.Seema Tiwari “Water Quality Parameters-A Review”,International Journal of Engineering Science Invention Research & Development; Vol. I Issue IX March 2015 www.ijesird.com e-ISSN: 2349-618.
 [6]. Dr.K.Karuppusamy M.E, Ph.D, B.Abinaya, R Sudha, J P ArunPrasath,”Water Quality Monitoring and Control Using Wireless Sensor Networks”, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 03 | Mar-2016 www.irjet.net p-ISSN: 2395-0072 .
 [7]. Chandrappa S and Dharmanna L,Shyama Srivatsa Bhata U V,Sudeeksha Chiploonkar M,Suraksha M N and Thrupthi S”Design and Development of IoT Device to Measure Quality of Water”, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 03 | Mar-2016 www.irjet.net p-ISSN: 2395-0072 .
 [8]. Mr. Vikas Mane, Mr. Pranav Medsinghe, Mr. Akash Chavan, Mr. Sudhakar Patil ,“Water Quality Measuring System Using Wireless Sensor Network” INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING AND TECHNOLOGY (IRJET) E-ISSN: 2395 -0056 VOLUME: 04 ISSUE: 02 | FEB -2017 WWW.IRJET.NET P-ISSN: 2395-0072
 [9]. Hemanth Kumar CH, Sowmya I,” Low-Cost Sensor Network for Contamination Detection in Drinking Water” Hemanth Kumar CH Int. Journal of Engineering Research and Applications www.ijera.com ISSN : 2248-9622, Vol. 5, Issue 4, (Part -4) April 2015, pp.71-74 .
 [10]. Pedro M. Ramos, J. M. Dias Pereira, Helena M. Geirinhas Ramos, and A. Lopes Ribeiro,” A Four-Terminal Water-Quality-Monitoring Conductivity Sensor”, IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, VOL. 57, NO. 3, MARCH 2008.
 [11]. Anthony Faustine, Aloys N. Mvuma, Hector J. Mongi1, Maria C. Gabriel, Albino J. Tenge, Samuel B. Kucel,”Wireless Sensor Networks for Water Quality Monitoring and Control within Lake Victoria Basin: Prototype Development”, Wireless Sensor Network, 2014, 6, 281-290 Published Online December 2014 in SciRes. http://www.scirp.org/journal/wsnhttp://dx.doi.org/10.4236/wsn.2014.612027
 [12]. S.Kayalvizhi, Koushik Reddy G, Vivek Kumar P, VenkataPrasanth N,” Cyber Aqua Culture Monitoring System Using Arduinio And Raspberry Pi”, International

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interests are Wireless Sensor Networking, Network Security, IoT (Internet of Things).

[13]. Cesar Eduardo Hernandez Curiel, Victor Hugo Benitez Baltazar, Jesus Horacio Pacheco Ramirez, "Wireless Sensor Network for Water Quality Monitoring: Prototype Design", International Science Index Environmental And Ecological Engineering Vol:10, No:2, 2016 waset.org/Publication/10003655.

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