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AN OVERVIEW OF WIRELESS SENSOR NETWORK SYSTEM DESIGN USING RASPBERRY-PI FOR REAL TIME ENVIRONMENTAL WATER QUALITY MONITORING AND TREATMENT APPLICATION

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ABSTRACT:

Drinking water is one of the most important & basic need of human beings. The drinking water is not available in sufficient amount even though 79% of earth's surface is covered with water. One the other hand, the water which is available for the drinking purpose is not of good quality. The need of the time is to develop the monitoring system for the water quality as the water if important for human beings survival. The developing countries like India are continuously supporting the industrial growth. The industrial are growth leads to extra use of water and the waste generated from the water is most of the times disposed in natural water resources. Authors have presented an overview of the water quality monitoring system using Raspberry-pi environment and wireless networks.

KEYWORDS: Wireless Networks, Raspberry-pi, water quality monitoring, water treatment, etc.

INTRODUCTION:

The growth of industries leads to the excessive use of water. The waste generated from the industries is harmful to the resources of water. The challenge is to keep the water resources ready for use by means of quality enhancement of the water sources and monitoring the quality continuously. Currently the authorities are facing the problem that, the monitoring is impossible due to required cost and manpower. This leads to the requirement of the cheap, accurate and automatic monitoring system. The automation of this system reduces its cost and improves the accuracy of the system. The water security is one of the important factors for sustainable development of the world. The demand of the water is rapidly growing with development and increase in the population. Saving the water and using it efficiently is the only way for human survival. As we know even though 79% of earth's area is covered by water. Out of total water present around 97% is salted water, out of remaining 3 percent, 2 percent is present in the form of ice and hence only 1percent water is present for use of human beings.

Water treatment is necessary to reuse the water and the automation in treatment plants is the need of time. Authors have proposed the system with the help of Raspberry pi and wireless network to monitor the water quality and treatment of the water.

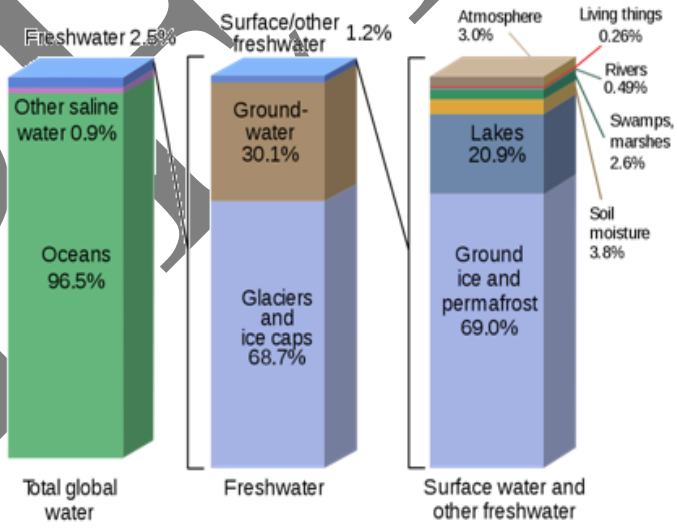

Fig. No.1: Details of the water resources on earth

LITERATURE REVIEW:

Sheikh Ferdoush, XinrongLi(2014) has discussed theenvironment monitoring system using Raspberry pi. The wireless sensor networks have found many applications. The system is Arduino and Raspberry Pi. The cost of the system is found less and it is sensitive to small changes in the environment. The system developed with detailed architecture is discussed in the paper.

ZulhaniRasin and Mohd Rizal Abdullah (2009)describe a quality monitoring system of water by using the Zigbee technology. The continuous monitoring and data storage is done with the help of the wireless sensor network. The water parameters like pH level, turbidity are observed by sensors and monitored by the person seating in the control room.This system is found

very suitable and has reduced the labor cost. It provides more flexibility and accuracy.

Nirav M. Parmar, Rahul S. Goradia (2015) discusses about identification of impurities present in the water.In deciding the quality of the water, the pH value and dissolved oxygen levels are the important parameters. Authors have proposed the use of wireless network for identification of dissolved oxygen for the fish form.Combination of Zig-Bee and wireless network is found useful for the purpose of the water quality checking. Real time analysis of the water quality is done with the help of the sensors and the various software exposures available. Hardware and software combinations are useful for the quality monitoring purpose of the water.

Sanjana Prasad, P.Mahalakshmi, A.John Clement Sunder, R.Swathi (2014), have proposed the applications of the Raspberry pi and PI/PIR sensor for the monitoring and surveillance of the water. The proposed system is found smart.The use of mobile phone has made it very easy to control the home applications very easily. Authors have also proposed the home security system.The Raspberry pi is used to control the devices with the help of motion detector devices and smart phones.

N Vijayakumar and R Ramya (2015)has implemented the monitoring system with the help of an IoT.The real time monitoring is needed for the water as being very important to commercial uses. Authors have proposed and implemented the low cost system for the said application. The physical and chemical parameters of the water are monitored and the recorded.

PROPOSED WORK:

The project takes an attempt to develop a real time water quality monitoring and analyzing system for predicting the quality of water and thus reducing the cost of treatment of water. This project deals about one of the efficient methods to know the water quality parameters before the treatment and defining the optimum dosage for the process. The fundamental process in our system is viewing sensor values of sensors installed at different locations near source of water for dataprocessing and information analysis and to takeappropriate decision. The real time data is periodicallysentto the central server through the Raspberry Pi and Zig-Bee module. The server automatically updatesthe databasewith latest parameter values.

Thereceiver of the unit is capable ofidentifying the values by receiving informationfrom the sensor nodes. We have chosen Zig-Bee as the wireless sensor network as communication medium between sensor node and thecentral server to improve availability of our system. The central server system handles and process all theinformation received from sensor node through wireless sensor network.

Our main objective is to reduce the cost of treatment of water by using wireless sensor system and Raspberry Pi.

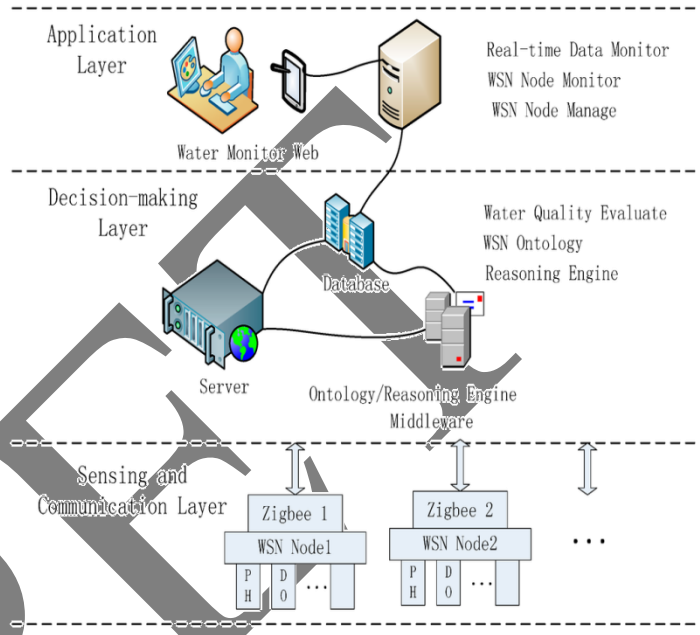

Fig No.2: System overview

Proposed block diagram for the system is shown in above figure. Diagram contains high performance Raspberry Pi controller, sensors, ZigBee module. A monitoring system will provide effective real time reporting. The system will inform us different water quality parameters at specific interval of time with required dosage of treatment to water which may reduce the cost.

In this proposed system consist of sensors like temperature, pH, turbidity, dissolved oxygen are connected to Raspberry Pi which act as the core controller. The core controller is accessing the sensor values and processing them to transfer the data through ZigBee module to central server. The temperature sensor, turbidity sensor, dissolved oxygen sensor, pH sensor can be read directly from the command line. However, this requires us to input a command every time we want to know the sensors reading. In ordered to access all the terminals of the sensors, python program is used, which will read the sensors value automatically at set time intervals. The Raspberry Pi comes equipped with a range of drivers for interfacing. However, it's not feasible to load every driver when the system boots, as it willincrease the boot time significantly and use aconsiderable amount of system resources forredundant processes. These drivers are therefore stored as loadable modules.The controlleris responsible for data analysis and suggesting proper dosage of treatment.

OBJECTIVES:

1. To obtain various quality parameters of water.
2. The obtained data is transmitted via Zig-Bee module to central control unit.
3. Using available data central control unit take appropriate decision.

This system finds its application in real time water quality monitoring and suggests the proper time for lifting of water and optimum dosage of treatment to water which will reduce the cost. It could be used as a valuable tool for real time monitoring, and system evaluation.

CONCLUSION:

This paper deals with the extensive literature survey and the overview of the monitoring system for the water. Water is one of the important aspects of the human life. The water present on the earth's surface is present in the various forms. Out of the total water, very small amount is ready for the commercial use. The monitoring of the water is really needed as the lower quality of the water may direct affect the human health and other commercial aspects. The industrialization is one of the key reasons for the water quality degradation but still it is necessary for the development of any country.

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