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Design of Low Cost System for Real Time Monitoring of Water Quality Parameters in IOT Environment

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Abstract: Water is a fuel of life and no lives exist without water on this earth planet. The water has to be monitored regularly using smart technologies. There are various purification technologies proposed for monitoring of drinking water; but the hazards of different category are mixed with the drinking water which comes through industrialization, globalization, urbanization, agriculture etc. Hence, the water quality is needed to be monitored at different places in one stretch to avoid pollution in IoT environment. The ‘Internet of Things (IoT)’ has the potential to revolutionize the water industry, as more of its technology is connected to the web. Sensor based smart water meters are a form of IoT, a network of technologies which can monitor the position of physical objects, capture meaningful data and communicate that data over a wireless network to a software application for analysis on a computer in the cloud. Technologies are capable of monitoring objects such as smart water meters and other electronic devices, organisms or a natural part of the environment such as an area of ground to be measured for moisture or chemical content. This paper tells about low cost system that checks the water quality using different sensors, Raspberry pi-module. In the experiment, the output of the sensor will be uploaded to the cloud. Further, from the cloud the data will be examined by ‘Water Monitoring Board (WMB)’ to know about the contamination and also to send the report. Finally, the uploaded data will be put into public domain; if it is not managed properly by the concerned authorities. In conclusion, the implementation of the proposed sensor based smart meter and other IoT networks can facilitate the data on water quality which can provide actionable information to regulatory authorities for determining compliance by residential, agricultural and other business water users as well as by parties in the water infrastructure. The data can be the basis for enforcement actions so it must be reliable for real time monitoring of water quality parameters in IoT environment through the proposed Low Cost System.

Keywords: *Raspberry pi B+; IoT; Sensors; Water Parameters, Cloud.*

I. INTRODUCTION

Currently, drinking water faces many challenges in the present situation. The drinking water is essential for all human beings. Due to the growing population, ageing infrastructure, inadequate water resources many challenges occurred. so water quality methodologies required. Water is a fuel of life and no lives exist without water on this earth planet. The water has to be monitored regularly using smart technologies. There is various purification technologies proposed for monitoring of drinking water; but the hazards of different category are mixed with the drinking water which comes through industries, urbanization, agriculture resources etc. Hence, the water quality is needed to be monitored at different places in one stretch to avoid pollution in IoT environment. The ‘Internet of Things (IoT)’ has the potential to modernize the water production, as more and more of its technology is connected to the web. Sensor based smart water meter are a form of Internet of Things, a network of technologies which can monitor the status of physical objects, capture important data and communicate that data over a wireless network to a software application for analysis on a computer in the cloud. Conventionally, the water samples are collected from different places, and then tested by the scientist at their laboratory using many techniques to determine the water quality. Even though

water quality test includes physical, chemical, biological parameters, it has so many disadvantages they are: 1. Reduced spatiotemporal exposure. 2. High cost and requires high human resource. 3. Difficult to take critical decisions in real time. So, it is necessary to monitor the water quality in online. And move to the water quality monitoring through the online. In this process it is done only for the water plants. To check the water quality through online requires number of sensors, and other equipments, those instruments are high cost difficult to afford and this techniques are not suitable for all the area. By considering the issues in this paper design a low cost system for water quality parameters in IoT. Here Raspberry Pi B+ is used as important module and that take the input from the sensors, internet of thing means it connects the remote objects. The beauty of this paper is monitoring the water quality in the real time and gives the alert to the company owner using gmail. Raspberry pi B+ module plays major role in processing and storing data in the cloud. Additionally the IoT module also provides the public to view the water data about the contamination if they are not taken any action within the particular period.

II. PROBLEM DEFINITION

The low cost System for real time monitoring of water quality by measuring Temperature, Turbidity, Ph , Conductivity in water using Raspberry Pi B+ and different sensors in IoT Environment and notifying respective authorities about their water quality.

- To conduct base lined survey for collection of water sample at different location.
- To conduct extensive literature survey to identify both scientific and technical gap in the current scenario.
- To analyze the physico chemical parameters of the water samples using background data.
- To develop suitable sensors system in order to measure the physico chemical parameters such as pH, temperature, turbidity, conductivity, dissolved oxygen and total hardness.
- To analyze the data obtain from the study using core controller system i.e. Raspberry Pi B+ model.
- To transfer the data to cloud computing system through sensor and core controller system.
- To establish secured data in cloud computing using attribute based encryption by excluding the abstract of the study which has to be displayed to concerned authority followed by public domain.

III. OVERALL BLOCK DIAGRAM

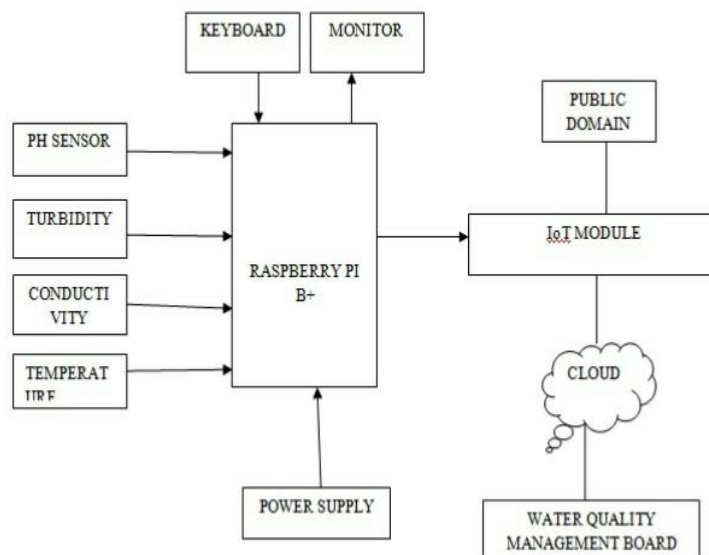


Fig1: block diagram

In this diagram consist of several sensors that are Ph, turbidity, conductivity, temperature, these are connected to the

Raspberry pi B+ model. This module is used to access the sensor data and processed it, after processing the data will be uploaded to the cloud using internet. At the water department the uploaded data can be viewed using their user name and the password.

IV. PROPOSED SYSTEM

In our proposed method, Raspberry pi B+ will be run on the LINUX kernel by the use of I/O devices, the DEBIAN JESSY OS is boot on the Raspberry pi. The four sensors value that are Temperature, pH, Turbidity and Conductivity can be read by the command line. No need to input a command every time to know the sensor readings. In order to access the terminals of the sensors, Java program is used. Raspberry pi B+ have the installed device driver software no need to load them for interfacing. Whenever it requires then it increase the boot time to process the use of required amount of the system resources. These drivers are stored in the modprobe. This modprobe work is to boot drivers into the Linux kernel. The Raspberry pi B+ sends the data to the cloud. From the cloud the water department takes the reading and based on the reading is plot the graph. The monitored parameters of the water from the sensors are stored in the cloud in the form of tags, using XML parsing we parse the data and create xml document, those data will be taken as the latest readings. The Raspberry Pi as only serial in and serial out pin so we used here different sensor we need all the values at a time, so java program help to do this. If the water parameter not in range means it will generate a report automatically and send to the owner of the industry. If the owner is not taken any action then the details will be uploaded to the public cloud or else mark it as resolved.

V. EXPERIMENT AND RESULTS

The Water quality monitoring is important not only for the water department, it is low cost system this system can be used by the common people who care about the water, and it is useful to know whether the water is good for drinking etc. Such application need separate methods for water quality management. In this proposed system, we monitor the different parameters using cloud server. We use separate cloud space to store the result of the monitoring. Here security is major because we are using a cloud so at the water department they have user name and password.

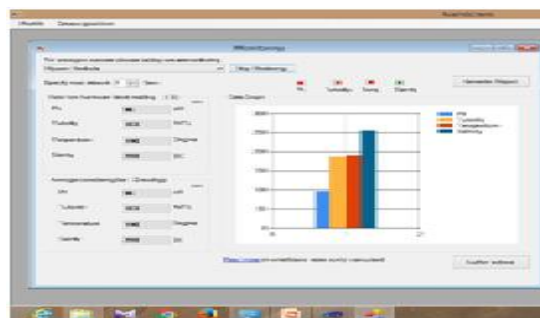


Fig2:Output results from the cloud

VI. CONCLUSION

The above presented paper was successful in what it had to achieve. Our main objective was to reduce the time required for testing of water in laboratories, and we have been able to achieve it but with lesser accuracy. It reduces the laboratory equipments that would be required for the traditional way of testing the water for its quality. The major point is we have been able to record all the details obtained in our testing in cloud. The results can be viewed and fetched whenever required. The monitoring of water can be done online easily using this system. Hence, we have tried to achieve all our objectives.

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