Testing and Validating of Water Quality Using Raspberry Pi2 Model B With the help of IOT.

C.Venkat Rao[1]and M.B.Kalpana[2]
[1] Emeritus Professor, CVR College of Engineering/ECE Department, Hyderabad, India
Email: vrao_chennam43@yahoo.com
[2]M. Tech, CVR College of Engineering/ECE Department, Hyderabad, India
Email: kalpanamb03@gmail.com

Abstract: **Water being hypothetical solvent, varies from region to region. Now a days water pollution becomes a universal concern for not acquiring green globalization, and also it should meet the Environmental Protection Agency (E.P.A) standards. The typical method of challenging fluoride, turbidity, and pH is done by collecting water samples manually, these samples are sent to the laboratory for quality check. It is time consuming process. The above method is unable to reach water quality testing standards. The run of the mill method comprises of fluoride sensor, turbidity sensor and pH sensor for water grade testing. The Raspberry Pi2 model B gets the data from these three sensors and it will be sent to the server through internet via the communication modules like GPRS/UMTS/CDMA. It can detect various testing parameters pertaining to the purity of water and it implements the required task. The existing system will be suitable for a particular area and it helps in avoiding health hazarding conditions. In the proposed method a simple system for testing and validating the water quality check is implemented using Raspberry Pi2 model B. It has been developed in order to cover more water storage areas with the help of IOT technique.**

Index Terms: **Raspberry Pi2 Model *B,* Fluoride sensor, Turbidity sensor, pH sensor, IOT and water quality.**

I. Introduction

Presently, contamination of water is a significant global problem, which requires continuous assessment and testing. It has been suggested that contamination of water is one of the leading world wide problems for causing deaths and diseases. About 80% of water in the cities of India is marked below the standard purity levels. Regular testing and validating of the water quality parameters are conductivity, pH, turbidity, fluoride,nitrate, nitrite,phosphate, various metal ions and so on. In the run-of-the-mill method most of the water samples are collected manually and sent to thelaboratory. It is a very tedious and time consuming process. Keeping in mind the end goal to wipe out such issues, another strategy for testing and approving of water quality check can be actualized by utilizing three sensors and Raspberry Pi2 model B.

II. Problem Definition

As an example, Hyderabad is taken into consideration, where the environmental regulations require the testing and approving of Manjira and Musi river water quality.The current system from the Manjira and Musi water basin travels to 28 locations on to the states of Maharashtra, Karnataka and Telangana. At each location a manual sensor sample for conductivity, pH, turbidity, fluoride content and bacteria are recorded by hand. Manual Testing occurs once a week during the months from May to October. The process of travelling and collecting data takes more than two hours to complete. The water collected for sampling is sent to the laboratory. There is a lot of time delay between these cycles and there is a chance of recording data incorrectly. After completion, the manually recorded data is given to the master as an input to the system. As a result of the manual process, there is no sufficient time to investigate water quality.

Disadvantages of an existing system:

1.High cost.
2.More Man power

III. Proposed Methodology

This method explains the complete structure of the proposed system where it presents the detailed explanation of each and every block. The overall diagram is shown in figure1. The following Block diagram consists of three sensors such as turbidity, fluoride, and pH. The collected data from the sensors is given as input to the Raspberry Pi2 Model B circuit board by using Python Programming. The outputs obtained from the Raspberry Pi 2 are stored in the cloud data base and it can be sent to the server with the help of IOT. By this way, we can eliminate certain issues such as time delay, and inaccuracy etc.

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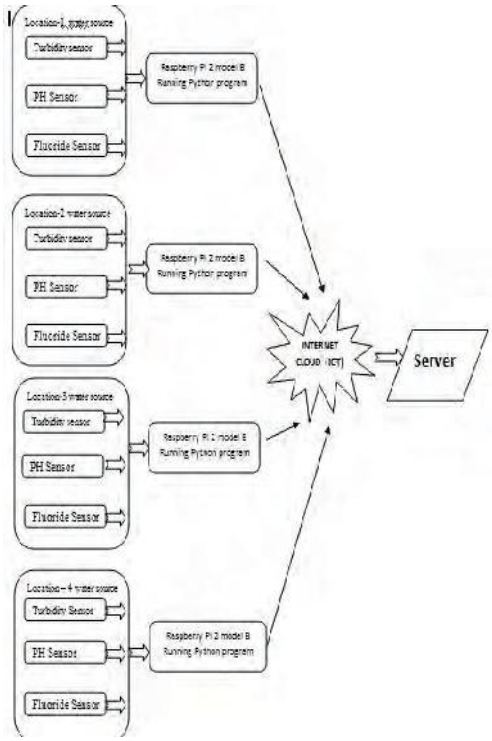

Figure.1. Block Diagram Of Water Quality Monitoring at Different locations

IV. HARDWARE DESCRIPTION

The following are the major components used in the proposed system. Brief explanation of each component is given as follows.

A.Raspberry Pi2 Model B:

Raspberry Pi2 Model B is shown in figure2. It is the second era Raspberry Pi. It has supplanted the first Raspberry Pi1 Model B+ and it has the accompanying progressed features such as 900MHz quad center ARM Cortex_A7 CPU and 1GB RAM. It supports Microsoft Windows10.

Figure.2. Raspberry pi 2 Model B

B.GPIO Pins:

One of the robust features of Raspberry Pi families is the row of GPIO pins which are located at the top brim of the board. These pins are programmed to interact Raspberry Pi2 to the external world. Inputs should be given from a sensor or a signal from another computer or device.

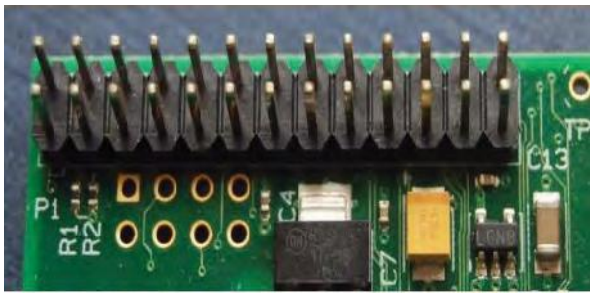

Figure.3. GPIO PINS

C. Turbidity Sensor:

The Turbidity Sensor measures the turbidity of crisp water or seawater in terms of NTU (Nephelometric Turbidity Units). The DTS-12 is a turbidity and temperature sensor which provides accurate measurement. Due to Nephelometry's, accuracy and appropriateness over a wide particle size and turbidity range, it's the favored technique for measuring turbidity by the EPA. The DTS-12 is easy to arrange and utilize. It offers a standard (Serial Digital Interface) SDI-12 output for communicating with data measuring instruments.

Figure.4. Turbidity Sensor

D. pH Sensor:

Being one of the water quality measures 'pH' indicates how much water is acidic or alkaline. It is controlled by the measure of free hydrogen and hydroxyl particles in the water. Water, that has free hydrogen ions is acidic, and alternately water that has more free hydroxyl ions is alkaline. Measuring pH is in the scope of 0 – 14: the scale is logarithmic. pH below 7 is acidic and pH above 7 is alkaline. It is essential to screen the pH of a water body since it influences aquatic animals. A modification in normal pH in a water body can be an indication of expanded contamination or other environmental pollution factors. This

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is because of the way that pH can be influenced by chemicals in the water.

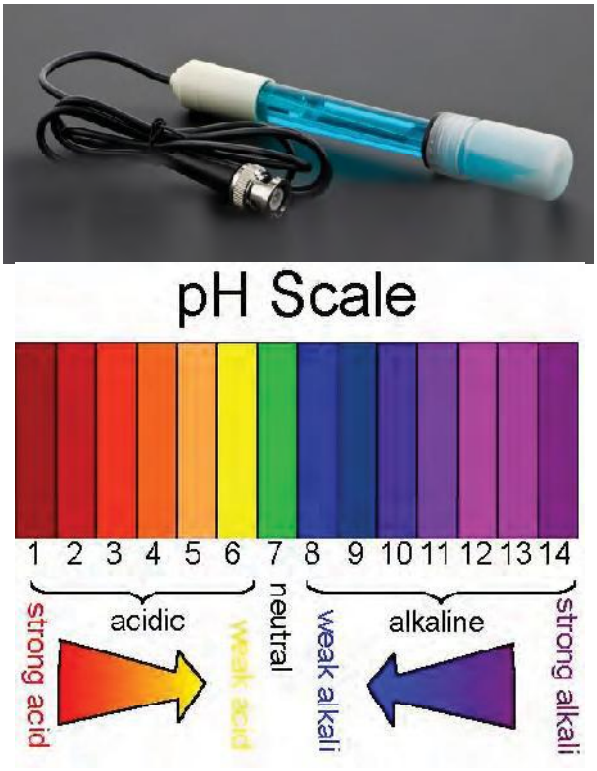

Figure.5. pH sensor

E. Fluoride Sensor:

The Fluoride Sensor is a potentiometric sensor, working with ion selective electrodes (ISE) and a reference electrode supplying the measurement signal (mV).The following are the main features of fluoride sensor:

- Measurement is instantaneous.
- Sensor provides stable measurement.
- For simple and quick installation, Fluoride sensors are available for quick operation and mounted on PE-boards, i.e. plug and play within adjustable segments.

Figure.6. Fluoride sensor

V. Software Description

1.GUI Platform:

GUI platform has been successfully developed by using html and java programming. Here, the real time values of fluoride, pH and water turbidity are displayed on the monitor. The user can get the real time status of every sensor on the web page.

2.Pycharm Software:

Pycharm software is used in this system. The source code for Raspberry Pi2 Model B is written in a language called *Python* programming. The program will be coded and dumped to the Raspberry pi2 model B processor so that the data is read from the sensor. It will be sent to the server with the help of IOT environment. Finally the result is viewed in the web server.

3.Internet Of Things:

The Internet of things (stylized as IOT) is comprised of sensors and actuators, the innovation turns into an occasion of broad class of digital physical frameworks. Web of Things is concerned with an idea in which, gadgets can gather and percept information from the world, share the information over the web which can be used and handled for different purposes. The idea of Internet of Things is especially useful to accomplish constant checking of sensor data.In proposed framework, Cloud computing procedure is utilized for storing and watching sensor outputs such as fluoride,turbidity and pH values on the web.Cloud computing unit processes in run time and it is less expensive to implement using IP.

VI. Results

The following are the results which are obtained from this work,

- Waste Level detection inside the water resources.
- Transmission of data to web.
- The data can be accessed on demand to assess the water quality .
- Data transmission and access will be in real time.

The Online Monitoring of Water Quality using Raspberry Pi2 Model B is very useful for water works department in smart cities. For example in cities such as Hyderabad ,there are different water sources located in the different areas and water gets polluted many times and the people do not get information about this. The system is designed to solve this issue and will provide pollution details of the water source located in the different areas throughout the city. The concerned authority can access the required information on demand. The following figures show the results obtained at fourdifferent locations.

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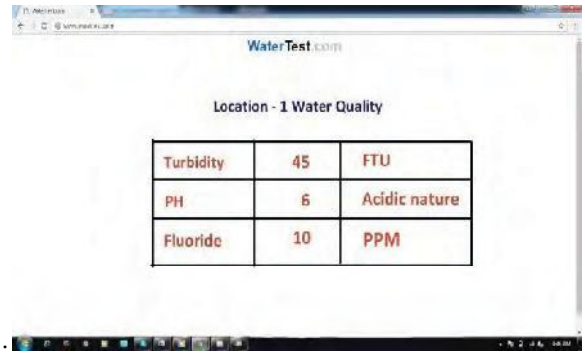

Figure.7. Location-1 Output

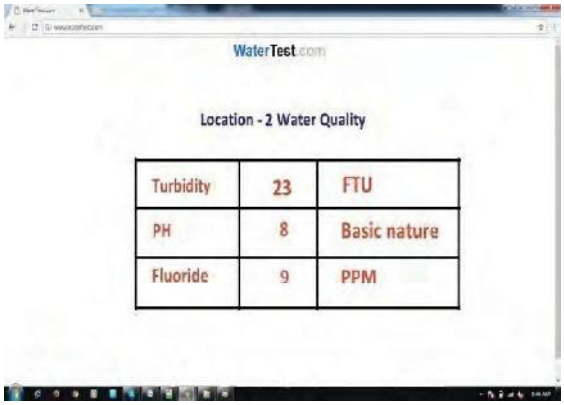

Figure.8. Location-2 Output

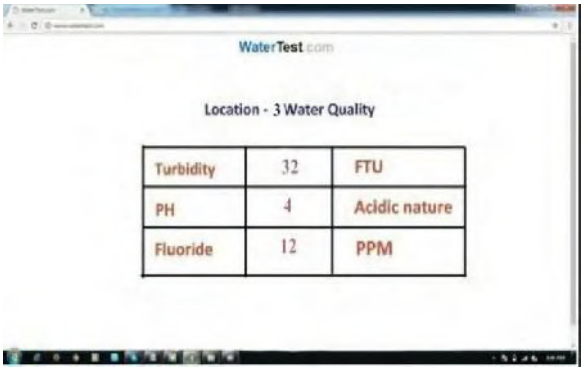

Figure.9. Location-3 Output

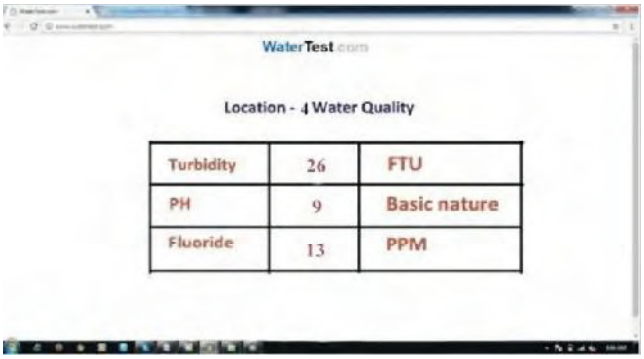

Figure.10. Location-4 Output

The proposed system, discussed in the paper provides data pertaining to water quality to the wide variety of users stationed at geographically different locations.By using more number of sensors, additional parameters such as temperature and conductivity can also be monitored. However skilled technicians are required to maintain the sophisticated electronic gadgets comprising Raspberry Pi board, sensors, and associated electronic circuitry. This drawback can be overcome by enhancing the reliability and simplicity of operation.

Applications:

- Water storage tanks before distribution.
- Health inspection agencies check and evaluates water quality at public gathering places like transport stations hotels etc.
- In health department for identifying the cause of water diseases.

VII. Conclusions

Testing of Turbidity, pH and fluoride of Water requires the use of corresponding sensors. The framework can screen water quality consequently, and it updates to servers website with minimal effort and does not require individuals on obligation. So the water quality testing must be more efficient, helpful and quick. The framework has great adaptability by supplanting the corresponding sensors and changing the applicable python programs. This framework can be utilized to screen other water quality parameters.

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