Smart Home Automation for Monitoring pH and TDS Level in Aquarium & Purifier

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***Abstract*—Water is an essential resource. Quality of water is more important, find whether the water is contaminated or pure. To guarantee the protected supply of drinking water the quality ought to be observed progressively for that reason new approach based water quality checking has been proposed. The framework is assembled utilizing the Raspberry Pi which gives low power water quality checking. The outcomes are ordered into two classes utilizing the diverse pH and TDS levels to get a water quality file.**

I. INTRODUCTION

Nowadays, our basic needs depend on surface and ground water. But the quality of water is poor. After installing purifier in home, we do not know the purity of water [1]. There is a possibility of quality degradation of water. Likewise in the aquarium there is a lack of maintenance due to this fishes may die. The above function can be implemented using Raspberry pi because it is a single board microcontroller used to perform multiple functions. Raspberry pi is used at the control station since the memory stockpiling is high when contrasted with Arduino. In comparison with Arduino, Raspberry pi has five times more amount of storage. It also adaptable with external memory which is not possible in Arduino. GSM (Global System for Mobile Communication) is utilized to transmit the information which originates from the hub to focal station [2, 9]. This venture is to build up a framework where water quality is being checked and conveyed similarly utilizing remote system and is produced to screen sensor values at various hubs and transmits information to the focal station when the sensor qualities are exceeds from their individual it has to limit levels.

II. LITERATURE REVIEW

To determine the issue of the manual strategy received in water quality location with terrible continuous character, this paper presents a remote water quality measuring and checking framework. Here GSM is used to understand the water quality parameter remote examining and the continuous checking capacity. The recorded water quality status should be possible effortlessly by the client, and it gives a sensible premise which has a straightforward Engineering. As indicated by the test outcomes, this framework can run stable and its operation is advantageous than the proposed method [5, 7].
Generally, remote systems have basically tended to military applications. Later, man applications appeared, for example, overseeing stock, checking item quality and observing debacle zones [3]. Different specialized issues, for example, control utilization, radio proliferation, delay, steering conventions, sensors and so on should be considered by the applications. In this paper, we propose a framework which is especially utilized for remote systems, particularly a water fair appropriation and observing framework. We propose a correspondence framework observing the quality, and alert the user through GSM.
However, the principle of our proposed framework is to figure a simple and productive technique with ease, low control and user friendly.

III. PROPOSED METHODOLOGY

Here, the development of proposed method is simple and modest. The below figure shows the block diagram of proposed methodology. The proposed method describes the function of transmitting and receiving system.

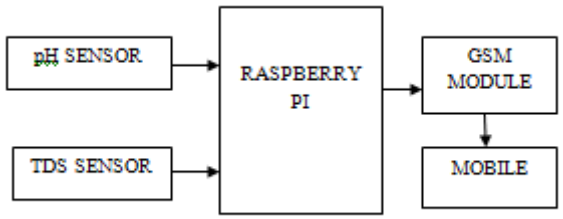

Figure 1 Proposed Method

The data are collected from TDS and pH sensor and transmitted to Raspberry pi. Then the transmitted values are received by the Raspberry pi[4,6]. It will send SMS based on the condition which is described in flow chart.

pH SENSOR:
A pH sensor is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity expressed as pH. In environmental sampling and monitoring, high or low pH values can be indicative of pollution. In food industry, as it plays a role in the taste (acid = fresh, neutral = bland, and alkaline = inedible) and the preservation of food

$pH = -\log[H+]$
Where H+ is the concentration of hydrogen ion

This value can be easily measured using pH sensor. It is used to measure the difference in electrical potential between pH electrode and reference electrode. Both functions can be performed in pH sensor.

TDS SENSOR:

It is used to indicate the Total Dissolved solids of a solution that is concentration of dissolved solids in solution. Usually, the dissolved solids are ionized solids such as salts and minerals. TDS meter displays the TDS in parts per million (ppm). For example, if TDS value is 1ppm means it indicated there is 1 milligram of dissolved ionized solids in 1 kilogram of water.

GSM:

It is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200 kHz channel into eight 25 kHz time-slots. GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3GSM in Australia, Canada and many South American countries. GSM supports data transfer speeds of up to 9.6 Kbit/s, allowing the transmission of basic data services such as SMS (Short Message Service). Another major benefit is its international roaming capability, allowing users to access the same services when travelling abroad as at home.

Figure 1 shows the structure of GSM network and it describes that how it is connected with other network.

The 900 MHz band defined in the ETSI standard includes the primary GSM band and the part of the 900 MHz band that is reserved for railways (R-GSM)[8,10]. Mobiles transmit in the lower band and base stations transmit in the upper band. The 1800 MHz band ranges from 1710 - 1785 MHz and from 1805 - 1880 MHz Mobiles transmit in the lower band and base stations transmit in the upper band.

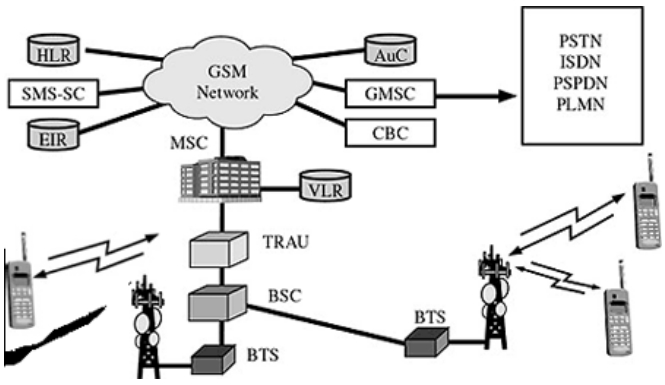

Figure 2 Structure of GSM Network

RASPBERRY PI:

A Raspberry Pi is a credit card-sized computer originally designed for education, inspired by the 1981 BBC Micro. Creator Eben Upton's goal was to create a low-cost device that would improve programming skills and hardware understanding at the pre-university level. But thanks to its small size and accessible price, it was quickly adopted by tinkerers, makers, and electronics enthusiasts for projects that require more than a basic microcontroller (such as Arduino devices).

The Raspberry Pi is slower than a modern laptop or desktop but is still a complete Linux computer and can provide all the expected abilities that implies, at a low-power consumption level.The Raspberry Pi was designed for the Linux operating system, and many Linux distributions now have a version optimized for the Raspberry Pi.

Two of the most popular options are Raperian, which is based on the Debian operating system, and Pidora, which is based on the Fedora operating system. For beginners, either of these two works which one you choose to use is a matter of personal preference. A good practice might be to go with the one which most closely resembles an operating system you're familiar with, in either a desktop or server environment.

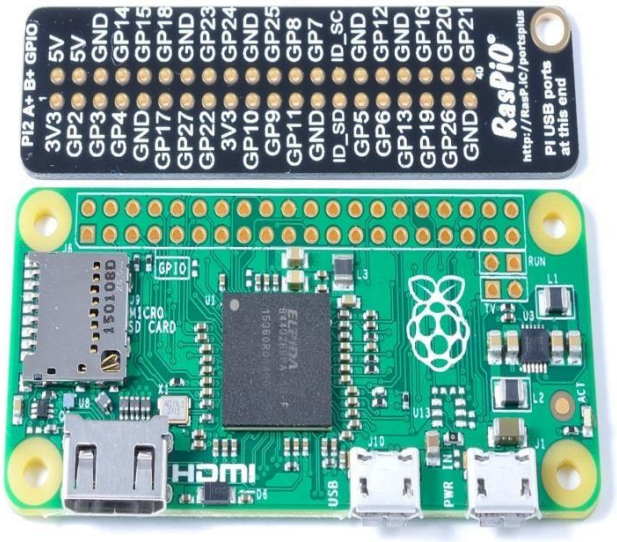

Figure 3 Raspberry pi and pin diagram

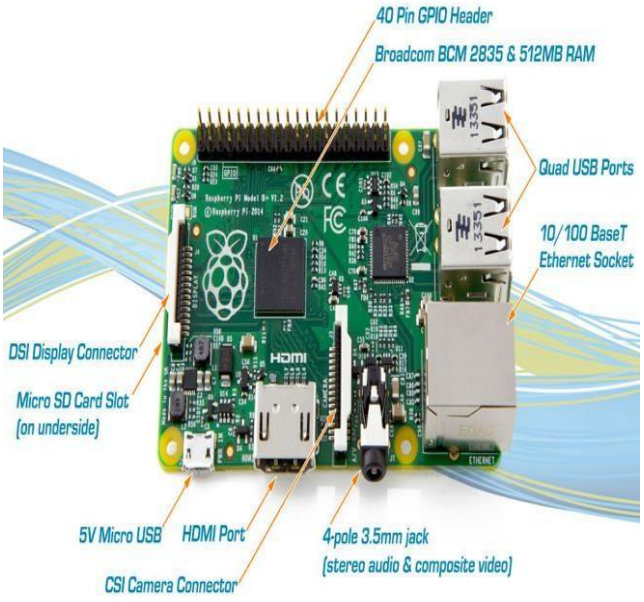

Figure 4 Raspberry Pi Ports diagram

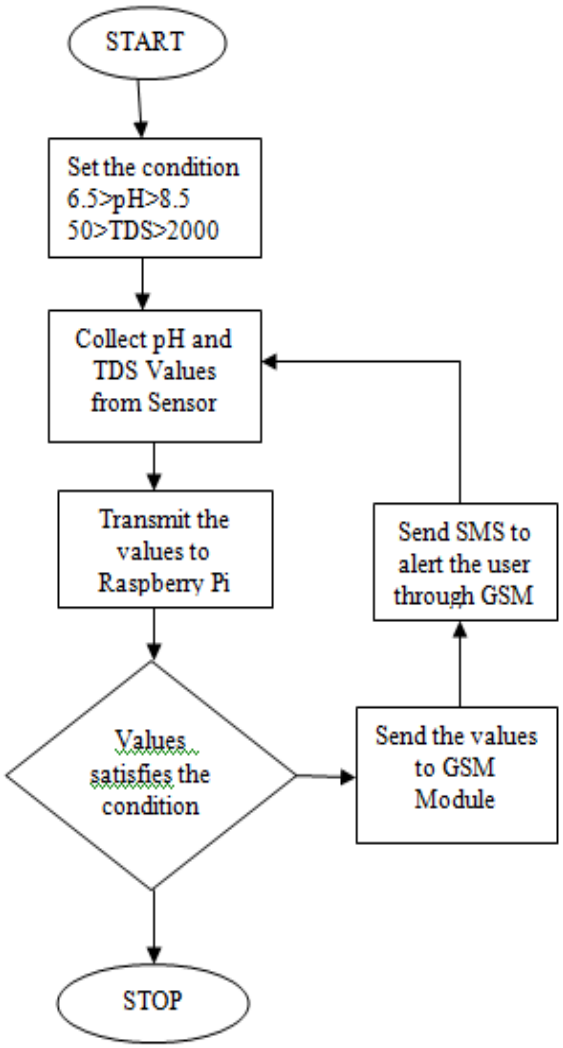

Figure 5 Flow Chart for Proposed Method

The flow chart describes about the detailed function which has proposed. Initially, the values of pH and TDS are collected from corresponding sensors. It will be transferred to Raspberry pi. In Raspberry pi it has already programmed that if the pH and TDS value satisfies the condition then the algorithm stop its function. Else, it exceeds the given condition or below the condition the user gets alerts. The alert SMS send to the user by using GSM Module. The GSM Module program setup was also dumped in Raspberry pi. By giving the user mobile phone number the alert message reaches its destination. There by the user knows the purity of water. The use of Raspberry pi gives low power consumption and large amount of data storage because of external memory. The SMS is also cost effective and it can be easily identified by the corresponding user.

IV. EXPERIMENTATION RESULT

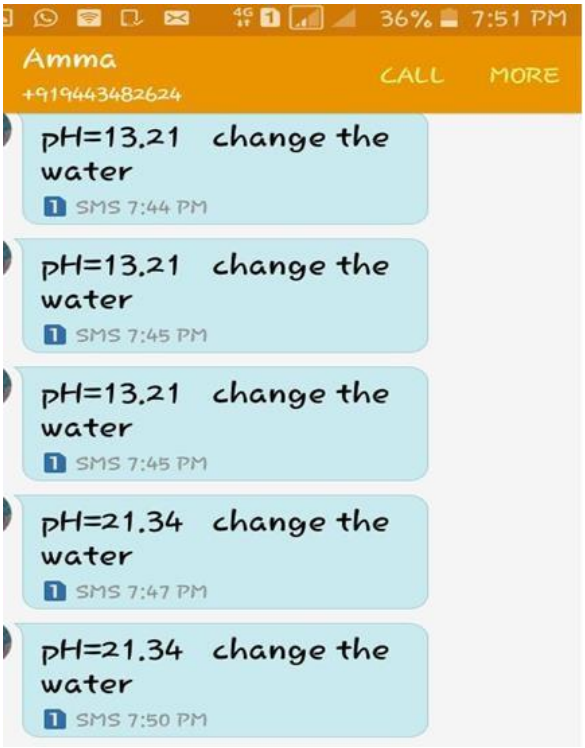

Figure 6 Experimental Result of Proposed Method

The figure 6 shows the Experimental result of proposed methodology. It is a SMS form GSM Module that alerts the user. For example, pH value is 13.21 which is beyond the level of typical value then it also tells that “change your water”.

V. RESULT & CONCLUSION

The water quality is decided by taking the pH and TDS value collected continuously. The collected value data from sensors are classified into three categories as: “Water is safe, Water is unsafe for fish”, “Drinkable water and Non- Drinkable water”. As per the above condition, the pH value 06, 07 for drinkable. If it is 01-06 means water is acidic and from 08 to 14 is alkaline. The TDS level is less than 300 means then it is excellent, 300-600 means good, 600-900 means fair, 900-1200 means poor and above means it is unacceptable for drinking.

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