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Portable Water Quality Monitoring System

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Abstract: Quality of water on various different factors is essential to check and monitor to ensure the health issues. Considering the health problems arises when water comes from natural sources wherein water quality inspection is very important and necessary. To measure the parameters of water we developed a real-time system using Raspberry Pi Microcontroller which also has the facility of sending notification on giving missed call to associated GSM module. It will also notify the change in the water quality automatically on android app installed on the android device and to the registered mobile numbers. Designed system is of low cost and has low power consumption which will be main factor for using this system for domestic purpose. Device can also be used at social level like in huge societies where management of water source is difficult.
Keywords: Water quality, Embedded processor, Sensors, GSM module, LCD Display, Android

I. INTRODUCTION

The water is very essential factor of life. The drinking water should be safe enough as now-a-days pollution has increased a lot. Many hazardous chemicals have their involvement in water. So there is a need of monitoring water quality to make sure water is safe for drinking. There are many systems available but many of them require expert person for handling therefore it is not possible to take immediate action if quality of drinking water changes.

Proposed system provides easy access and simple understanding of water quality for common person. It contains different sensors for getting water quality parameters. System gets water parameters from sensors through embedded processor. Processor then processes the output of the sensors and check weather water is consumable or not. If water is not consumable then alerts the corresponding authority else it stores the reading in the database.

Sensors used are pH sensor, Temperature sensor, dissolved oxygen sensor and dissolved nitrogen sensor. PH shows the alkalinity of the water. Temperature of the water should remain moderate for aquatic life. Dissolved oxygen is used by the aquatic life in water for breathing. Nitrate is used by some aquatic plants in water. Corresponding sensors get the reading from the water and passes it to the processor for further processing.

Embedded processor used is raspberry pi 3. It receives the reading passed by the sensors and processes further for displaying on the LCD display module and sending to the mobile user. Processor also receives the command passed by the GSM module and processes that command and replies it with corresponding output or data.

GSM module used is GSM SIM800L. It is used for communication purpose. It accepts the commands from embedded processor and sends the data to the registered number. It uses the local SIM card for sending or receiving the SMS or receiving the missed calls from the user.

LCD Display module is used for displaying the reading on field side. The display module used is of dimension 20x16.

Android application can be used by the user for receiving the water reading from the installed field setup. The person having no android or smartphones can check the water parameters readings through SMS. The android application can be used by the normal user for checking whether the water is consumable or not.

If some problem is occur in the water then system automatically alerts to the corresponding authority.

II. LITERATURE REVIEW

In [1], they have focused on the system framework which takes the advantages of wireless sensor network to display the readings of different factors which causes water to become polluted. They designed structure using wireless sensor network that collect the data and transmit it continuously to display unit to monitor the data on display unit. Key component used by this paper are WSN, Water Quality Monitor, ZigBee, Control, System Integration. The process of monitoring the quality of water includes some phases that are data gathering, data transmission, data saving and decision making, which is combined in the form of software and hardware. This system works in IOT environment. Sensors are used to collect the data of different parameter of water. This system obtains the data include PH, Water level, Water Temperature and Dissolved Oxygen. They are also using GPRS module to send the notification (warning message) of the water quality to user.

In [2], they focused on the design and development of low cost system for water quality in IOT. System has many different type of sensor which are used for measuring chemical and physical parameter such as PH, Temperature, Conductivity, Turbidity, Dissolved Oxygen of water are measured. The values measured by sensors are given to Raspberry PI Microcontroller. Raspberry PI B+ is used as core controller. At the end all the data taken by sensors is viewed on the internet through Cloud Computing. Key Component used by system are Water Quality Monitoring, IOT, Raspberry PI, Cloud computing.

In [3], System Architecture of this paper consists of base station, Remote Station and data monitoring nodes. Wireless Communication link is used to collect all these stations. Nodes collect the data and send it to the Base Station which contains ARM controller. Data sent by nodes is PH, Turbidity, Conductivity, etc. which is received by base station. Remote site collects the data from base station is displayed on monitor with the help of MATLAB. If the collected value is more than threshold value then warning message is send automatically to user. Key components of this system are GSM kit, sensors, WSN, ARM Microcontroller.

In [4], WSN System is developed for water quality monitoring. System has Arduino Microcontroller, sensors and Wireless Network Connection module. It checks for Water Temperature, Dissolved Oxygen, PH Value and electric conductivity and display this information in graphical and tabular format on Web Based Portal and on mobile device platform. Key Components used by this system are WSN, Gateway, Sensors GPS module, Microcontroller unit. System collects the information given by different sensors. Arduino microcontroller is used to get and process collected sensor data using RF Transceiver. To send the warning notification Data GPRS module used in the system to communicate with mobile network.

III. PROPOSED SYSTEM

System proposed in this paper have different sensors at field setup which is integrated at the actual application field and which will collect readings of water parameter and will send it to microcontroller Rasp Berry Pi which will perform important role in inspecting the water quality to make decision if water is consumable or not. It will take the readings as input and check these readings with already stored threshold values and according to this comparison it will notify the user about change in water quality if there is any change in the quality of water.

The major advance feature of this system is that we are using GSM module as well as Android based application using which every user of the system can get the parameter readings and can make decision on his own if he can use that water for consumable purpose or not. If system comes to know that there is some change in water quality even if it is too small it will automatically give notification to user through above discussed communication tools. And also, if user wants to check the water quality he also can request to system for readings by giving missed-call facility, only requirement is that the mobile number of user needs to be registered. There is also facility of checking the previous records, comparing current records with previous records by some missed-call patterns.

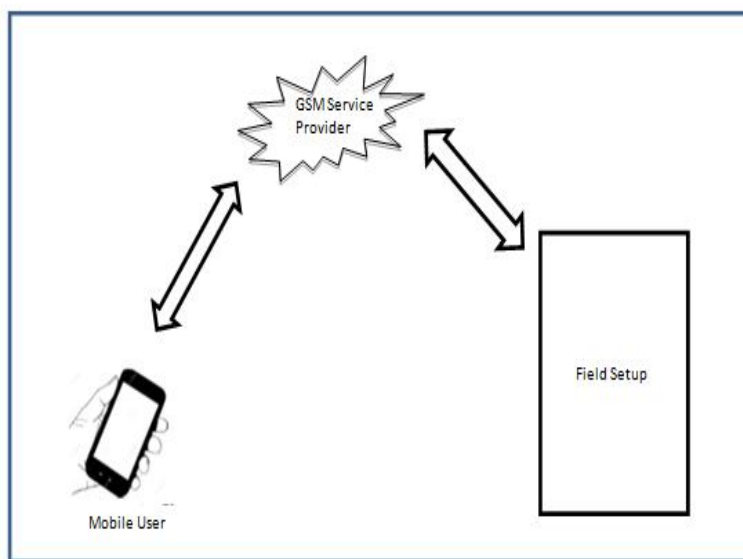1) The proposed system (Fig. 1) consists of field setup and user side environment.

Fig. 1 Proposed System Architecture

2) *Field setup:* Field setup (Fig. 2) contains Sensors, Embedded processor, GSM Module.

3) *Sensors:* Sensors are used for getting water parameters like PH, Temperature, Dissolved Oxygen, and Dissolved Nitrogen.

4) *Embedded Processor:* Embedded processor used is Raspberry pi B3. It is interfaced with sensors to collect and process   the readings. It is also interfaced with GSM module. It collects reading from sensors and transmits it using GSM module. Processor stores the readings into database.

5) *GSM Module:* GSM module is used to send and receive the data. It Receives command from user through SMS and passes it to embedded processor. Processor processes command and sends data using GSM Module.

6) *Display Module:* Display module is used to display the reading of water parameters at the field. It has dimensions 20x4.
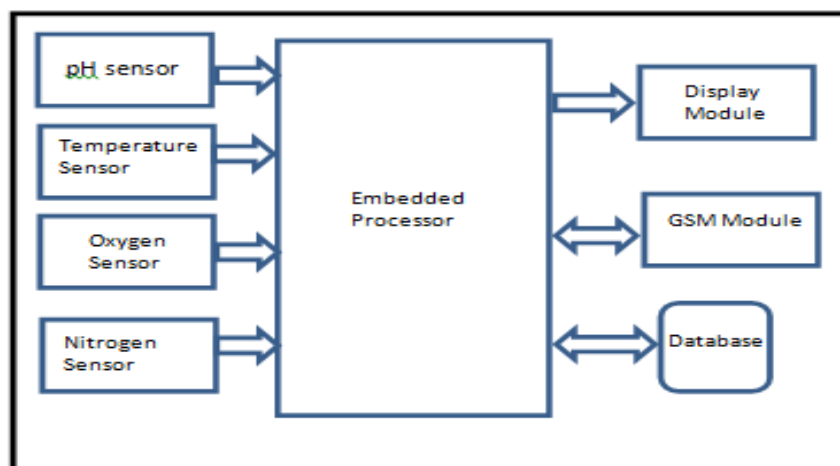

Fig. 2 Field Setup Architecture

IV.CONCLUSION

The system proposed in the paper is integrated system for monitoring and notification for quality of water. It gives auto alerts if quality of water changes. It has additional feature that anyone can check the reading of water parameters and check weather water is suitable for consuming or not without having the expert knowledge. Any user can use the proposed system easily. The system requires one-time installation charge and further low maintenance charge. The proposed system can be easily installed to different fields like society water resource, local water dams and other fields. Hence it is very useful system for the places where it is not possible to take immediate action against health problems caused by quality of water.

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