

Research Article

Smart Sensor Network for Water Quality Monitoring System

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Abstract

Water is a fundamental regular part that is significant for the presence of life. In the present situation, because of expanding industrialization and natural unevenness, water quality and new water amount are diminishing step by step. In the exhibited paper, we are stressing on understanding the Raspberry Pi based electronic modules that are being utilized to screen the water related parameters for essentially three kinds of uses identified with water quality, stream water parameters and rural fields. Raspberry Pi is being utilized for controlling and information preparing applications since it gives an adaptable and effectively reconfigurable equipment stage. The perceptions for various parameters as per various applications are likewise assessed.

Keywords: *Raspberry Pi, Water level sensor, Odor sensor, turbidity sensor,firebase Server, Android App.*

Introduction

Earth is called as Blue Planet and is the main planet known up to the here and now having the capacity to help life. This capacity of our planet to help life is just because of the nearness of water on earth. In the event that the parity of water gets upset in our biological framework, at that point this may prompt termination of species and animals driving life on our planet. We can say that the opportunity has already come and gone for us to ponder our condition and its ideal equalization as it has been now upset, all things considered, by our changing ways of life and expanding offices. There are numerous components that depict the environmental framework balance, however in our examination we are focusing on water unevenness and its continuous checking to diminish this lopsidedness. [1]Fresh water present on earth is continually diminishing and is being supplanted by contaminated water; model is expanding measure of corrosive downpours, waterway water contamination, expanding floods, ocean water contamination and terrible effect on amphibian life. Crisp water assets are being corrupted step by step, many living animals are getting by on defiled water and it is prompting numerous maladies. Every one of these impacts are not characteristic but rather they are happened because of our lack of regard and over utilization of offices accessible to us by the temperance of expanding innovative improvement. Contextual analysis from most recent situation (Ganga waterway venture) – Ganga is a strictly significant stream of our nation however it additionally bolsters the presence of human progress in our nation to an incredible

extent.[1]Almost 40 percent of the number of inhabitants in our nation is making due on Ganga water and agribusiness upheld by this water. This as well as the Ganga is pride of our nation since it is the main waterway of the world that has 25 % oxygen content in it's water. Be that as it may, we couldn't have cared less for this righteousness given to us commonly and these days Ganga is very nearly annihilation since it's water is sullyng step by step and it's source the Gangotri ice sheet is likewise contracting. Henceforth, we see that there is a gigantic need of effective waterway water observing framework. [2].These continuous observing frameworks are stream water checking, farming field observing and water quality checking. Condition around us comprises of five key components. These are soil, water, atmosphere, characteristic vegetation and land structures. Among these water the most fundamental component for human to live. It is likewise significant for the endurance of other living habitants. [3]Whether it is utilized for drinking, residential use, and nourishment creation or recreational purposes, safe and promptly accessible water is must for general wellbeing. So it is profoundly basic for us to keep up water quality equalization. Else it would seriously harm the strength of the people and simultaneously influence the biological equalization among different species.

Presently a day's Internet of things is a progressive mechanical wonder. Today is molding's reality and is utilized in various fields for gathering, checking and investigation of information from remote areas. Web of things coordinated system is wherever beginning from savvy urban communities, keen force networks, and shrewd inventory network to brilliant wearable.

[5] Though web of things is still under applied in the field of condition it has enormous potential. It very well may be applied to distinguish woods fire and early seismic tremor, lessen air populace, screen snow level, forestall avalanche and torrential slide and so forth. In addition it very well may be actualized in the field of water quality observing and controlling framework.

Literature Survey

Cho Zin Myint and et al expresses that since the compelling and productive arrangement of water quality checking are basic execution for the issue of dirtied water all around, with expanding in the advancement of Wireless Sensor Network innovation in the Internet of Things (IoT) condition, constant water quality observing is remotely observed by methods for ongoing information obtaining, transmission and handling. This paper displays a reconfigurable shrewd sensor interface gadget for water quality checking framework in an IoT situation. The shrewd WQM framework comprises of Field Programmable Gate Array plan board, sensors, Zigbee based remote correspondence module and. The FPGA board is the center part of the proposed framework and it is modified in rapid incorporated circuit equipment portrayal language and C programming language utilizing Quartus II programming and Qsys device. The proposed WQM framework gathers the five parameters of water information, for example, water pH, water level, turbidity, carbon dioxide on the outside of water and water temperature in equal and progressively premise with fast from numerous distinctive sensor hubs.

Mariana Jurian, and Cristian Panait, Visan Daniel, Cioc Bogdan infer that Having as flight direct the need toward ensure drinking water quality in consistence with the guidelines and guidelines in power, this paper targets introducing the assortment, observing and transmission arrangement of parameters required so as to screen the drinking water quality[2]. As a matter of first importance parameters that decide the nature of drinking water are broke down and parameters are chosen for which the framework utilizing bleeding edge innovation in the assortment and information transmission field will be executed. The framework concerned, the sort of sensors utilized and the remote parameter transmission framework are displayed. The electric graphs and the benefits of utilizing this constant checking framework are exhibited.

R. Meza and et al displayed their paper entitled as "An Intelligent System for Rivers Water Quality Assessment, in light of Pollutants Propagation Modeling and Simulation", in which they expresses that fast natural changes just as potential dangers for the human wellbeing call for water quality constant reconnaissance and on-line dynamic. Data and correspondence innovations can be important in these regions. [3] In this paper they present a shrewd framework for water quality appraisal. A few models

utilized for toxins proliferation, the framework design, the utilitarian depiction, the dispersed procurement subsystems are exhibited. The primary ideas are the combination of appropriated and various data assets through wide zone net-working strategies, yet with a simple to-utilize interface that makes the specialized intricacy totally covered up for the client. Menu driven, graphical and upheld by an inserted master framework, the interface makes association with complex models simple. The framework gives a ground-breaking, yet straightforward instrument for waterway water quality administration, and dynamic, as indicated by European ecological arrangement, rules, and guidelines.

Han Xiao-pack and Huang Ting-lin expresses that the continuous water quality observing system has been operational for water asset insurance and water quality location. It is valuable for the board plans of water utility and neighborhood specialists to acknowledge change normal for water quality. In the paper, the guideline of wavelet examination generally utilized in powerful information preparing was presented. What's more, the time arrangement of three days' persistent checking for some hub remaining chlorine was broke down with the Daubechies wavelet. With the mother wavelet work 'db3', the subjects were disintegrated into 5 levels, and the first run through arrangement was reproduced into the mix of high-recurrence and low-recurrence on different time scales. [4] The results show that the day change of lingering chlorine has a noteworthy attribute of two periods. The wavelet investigation can give a generally excellent portrayal of the change pattern of remaining chlorine time arrangement and furthermore set forward another way to deal with the examinations on the stage change of leftover chlorine and the mid long haul forecast for time arrangement. In the mean time, it additionally has a decent application impact in the clamor end and the assurance of broken point and irregular worth.

Divya Ramavat, a M. Tech Student, surveys paper on FPGA Based Water Monitoring Systems in a Conference on Conservation and Sustainable Management of Wetland Ecosystems in Western Ghats and inferred that water is a basic normal part that is significant for the presence of life. [5] In the present situation, because of expanding industrialization and natural awkwardness, water quality and crisp water amount are diminishing step by step. In the exhibited paper, we are underscoring on understanding the FPGA based electronic modules that are being utilized to screen the water related parameters for essentially three sorts of uses identified with water quality, waterway water parameters and horticultural fields. FPGA IC is being utilized for controlling and information handling applications since it gives an adaptable and effectively reconfigurable equipment stage. The perceptions for various parameters as indicated by various applications are likewise evaluated.

ZulhaniRasin and Mohd Abdullah entitled "Ongoing Water Quality Monitoring System".[6] In this paper they examine about security of drinking water, the quality ought to be checked progressively for that reason they utilized Zigbee innovation. This framework comprises of sensors like pH, turbidity, temperature by utilizing these sensors they gauges the nature of water. Right now utilized zigbee innovation with the goal that all sensors information are sent to the checking segment, the observing area comprise of zigbee beneficiary which is associated with the PC.

Ch. Pavankumar, S. Praveenkumar they propose a framework which screen air and water quality dependent on Bluetooth stage. The framework comprises of different sensors like temperature, mugginess, gas and salt[7]. Additionally they utilized ultrasonic sensor to gauge submerged deterrent. Right now all sensors information are legitimately send to client's cell phone by utilizing Bluetooth. For checking air and water quality they utilized android application which will get to all sensors parameters from the framework.

Nikhil Kedia [8] entitled "Water Quality Monitoring for Rural Areas-A Sensor Cloud Based Economical Project" This paper features checking strategies, sensors, installed structure for measure water quality and furthermore investigates the Sensor Cloud space. While consequently improving the water quality isn't plausible now, productive utilization of innovation and monetary practices can help improve water quality and mindfulness among individuals.

In the assessments from [9], the maker suggested that an IoT based water watching system that appraisals water level is nonstop. The model relies upon imagined that the water level can be a critical parameter with respect to the flood occasions, especially in a disaster slanted zones. A water level sensor is used to perceive the perfect parameter, and if the water level lands at the parameter, the sign will be channel in steady to a relational association like Twitter.

In [10] the maker prescribed that starting late, the gigantic improvement of Internet of Things applications is found in sharp homes. The colossal collection of various IoT applications, generally, prompts interoperability necessities that should be fulfilled. The current IoT adventure is practiced using physical stages that need knowledge on fundamental initiative. A plan that realizes Event-Condition-Action (ECA) procedure is proposed to clarify the organization of heterogeneous IoTs in wise homes. The proactive designing, made with a middle document stores determined data of IoTs development, wind up being an ideal course of action in understanding interoperability in wise homes.

In [11] the paper suggested that drinking water the quality ought to be screen persistently. A structure and progression of a negligible exertion system for continuous seeing of the water quality in IoT (web of things). The system includes various sensors is familiar with assessing physical and engineered parameters of the water.

In [12] the maker advised the most ideal approach to screen the water level of water systems, for instance, water tanks, streams, groundwater tables, and bore wells remotely. They moreover advised that the most ideal approach to control the working of siphon therefore and remotely. It tends to be used to remotely screen the flood impacted regions remotely and information can be sent to flexible remotely. This structure is expected to screen the level of water with the help of water level sensors.

Nikhil Kedia entitled "Water Quality Monitoring for Rural AreasA Sensor Cloud-Based Efficient Project." Published in 2015 first International Conference on Next Generation Processing Technologies (NGCT-2015) Dehradun, India. This paper includes the whole water quality watching procedures, sensors, embedded arrangement, and information dissipating methodology, the activity of government, mastermind executive and local people in ensuring fitting information dispersal. It also explores the Sensor Cloud territory. While thus improving the water quality isn't down to earth now, capable usage of advancement- and fiscal practices can help improve water quality and care among people.[13]

Existing System

The system, as appeared in Figure 1 is part into four subsystems; the detecting hub; the estimation hub; the remote hub; and the notice hub. The detecting hub contains all the water quality sensors, just as the sign molding circuits required to interface with the estimation hub. The estimation hub comprises of a microcontroller that procedures the crude sensor information and afterward transmits the information to the remote transmitter module. The remote transmitter and collector modules are a piece of the remote hub and are:

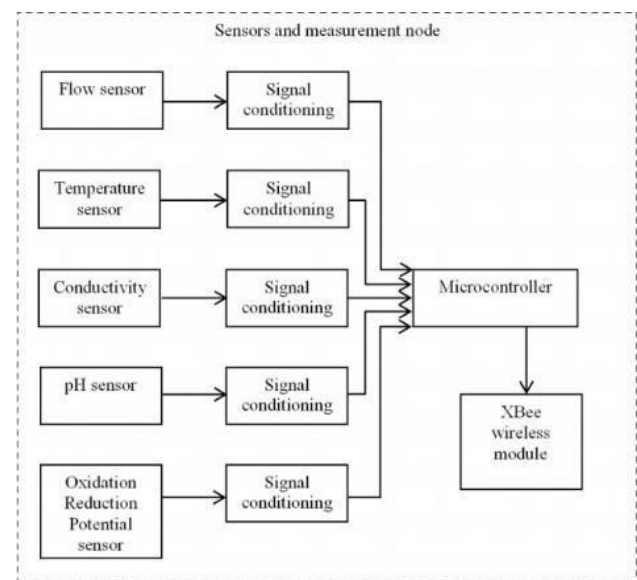


Fig. 1. Module 1: the measurement and sensing module block diagram

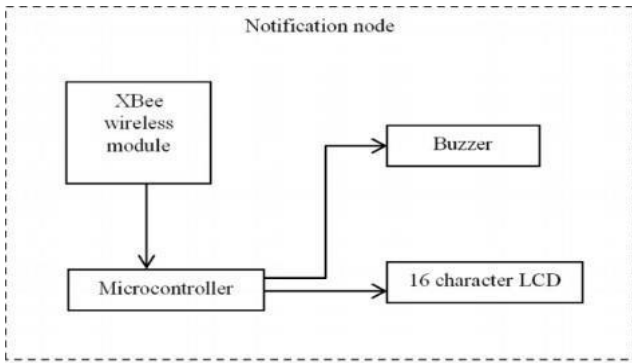


Fig. 2. Module 2: the notification module block diagram. used to relay the data to the notification node. The notification node receives data from the wireless receiver module and then notifies the user in real-time of the water quality.

Proposed Methodology

Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. Nowadays ,water quality monitoring in real time faces challenges because of global warming limited water resources, growing population, etc. Hence there is need of developing better methodologies to monitor the water quality parameters in real time.

A. Architecture

Turbidity measures the large number of suspended particles in water that is invisible. Higher the turbidity, higher is the risk of diarrhea, cholera. Lower the turbidity then the water is clean. The traditional methods of water quality monitor involve the manual collection of water samples from different locations.

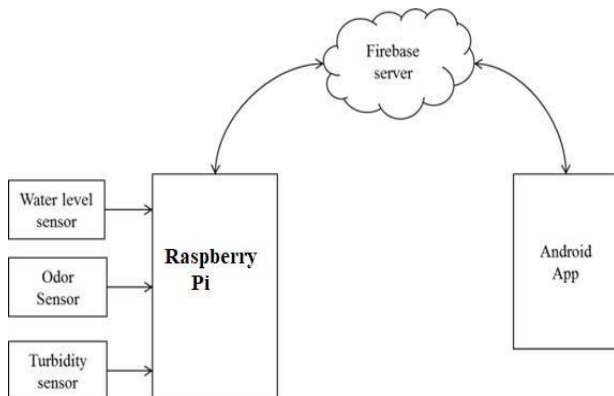
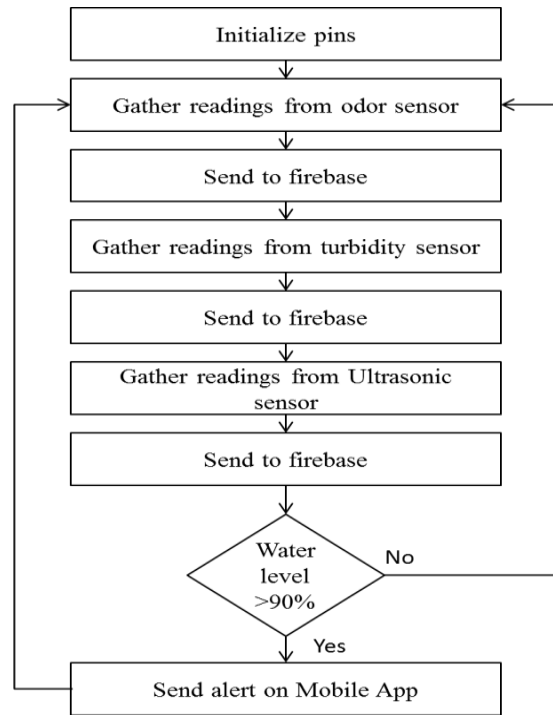


Fig.3 shows the block diagram of the proposed system. It consists of sensing unit such as Turbidity Sensor, ultrasonic sensor and odor sensor to measure quality of water, level of water in reservoir and odor of water respectively. When the water overflows from reservoir (tank, well etc.) alert is sent to authorize person via mobile app

B. Algorithm



Result and Discussions



Fig.5 Hardware Module

Table 1 different sensor values at different times

| Time | Turbidity sensor | Odor sensor | Ultrasonic sensor (%) | Alert message |
|------|------------------|-------------|-----------------------|---------------|
| 10AM | 4 | 1 | 80 | NO |
| 12AM | 5 | 1 | 87 | NO |
| 2PM | 5 | 1 | 80 | NO |
| 4PM | 3 | 0 | 89 | NO |
| 6PM | 4 | 0 | 90 | YES |
| 8PM | 5 | 1 | 88 | NO |
| 10PM | 4 | 1 | 84 | NO |

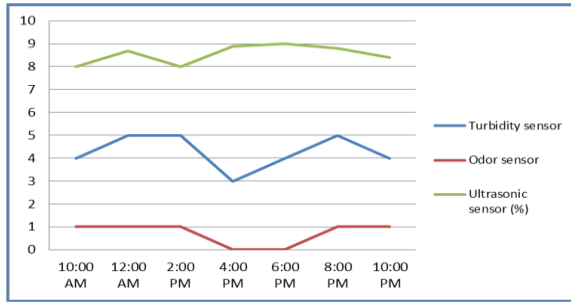


Fig.6 sensor's reading

Table 2 comparison with previous systems

| | Present system | smart WQM system [1] | drinking water parameter monitoring system [2] |
|-----------------------------|----------------|----------------------|--|
| Water monitoring Parameters | Water level | Water level | |
| | Turbidity | Turbidity | Turbidity |
| | odor | | |
| | | pH | pH |
| | | Temperature | Temperature |
| | | Oxygen level | Oxygen level |
| | | | Conductivity |
| Communication | Wi-Fi | xBee | ZigBee |
| Weight | Light weight | Bulky | Bulky |
| Power consumption | Moderate | Less | Less |
| Display unit | Android App | PC | Graphic Display |

Conclusions

Monitoring of Turbidity, Water level and Temperature of Water utilizes water identification sensor with extraordinary favorable position. The framework can screen water quality consequently, and it is low in cost and doesn't require individuals on obligation. So the water quality testing is probably going to be increasingly prudent, helpful and quick. The framework has great adaptability. Just by supplanting the comparing sensors and changing the applicable programming programs, this framework can be utilized to screen other water quality parameters. The activity is basic. The framework can be extended to screen hydrologic, air contamination, modern and farming generation, etc. It has far reaching application and augmentation esteem. By keeping the inserted gadgets in nature for observing empowers self-security (i.e., brilliant condition) to the earth. To execute this need to send the sensor gadgets in the earth for gathering the information and examination. By sending sensor gadgets in nature, we can bring the earth into genuine for example it can interface with different articles through the system. At that point the gathered information and investigation results will be accessible to the end client through the WiFi.

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