SOLAR BASED WATER QUALITY MONITORING SYSTEM BY USING WIRELESS SENSOR NETWORK

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Abstract

Clean water is essential for life. You can test the quality of the water in your home by purchasing and using a home test kit, by engaging your senses, or by procuring a Water Quality Report for your area. Ensuring that your water does not contain harmful levels of bacteria, lead, pesticides, nitrites/nitrates, chlorine, or hardness, and maintains an appropriate pH is crucial for good health. To monitor the quality of water over different sites as a real time application, a base station and distributed sensor nodes are suggested. A WSN technology like Bluetooth is used to connect the nodes and base station. To design and implement this model powered by solar cell and WSN technology is a challenging work. Through WSN various data collected by various sensors at the node side such as pH, Turbidity and oxygen level are sent to base station.

Keywords: *Solar panel,Bluetooth module,TDS sensor,PH Sensor,LCD*

1. INTRODUCTION

Water is used in various activities, such as consumption, agriculture and travel, which may affect water quality. Therefore, the water quality monitoring is necessary which includes several chemical parameters. Some of these are: pH, redox potential, conductivity, dissolved oxygen, ammonium and chloride ion amount. There is need to improve existing system for monitoring water bodies, given that laboratory methods are too slow to develop an operational response and does not provide a level of public health protection in real time.This paper presents a smart water quality monitoring system.The development of WSN technology provides us approach to real time data acquisition, transmission and processing.In general the user can get real time water quality data from faraway, but in this system there are several nodes and a base stations where each node contains a group of sensors and the nodes are distributed in different water bodies. By those sensors in water the collected date is sent to base station via WSN channel. Basically a PC with Graphic User Interface

2. I.LITERATURE SURVEY

[1] 'An IoT Based System for Water Quality Monitoring' by Aaina Venkateswaran, Harsha Menda P, Prof Priti Badar published in 2017, This paper presents a smart water quality monitoring system. The system consists of several sensors which are used for measuring physical and chemical parameters of water. The parameters such as temperature, pH, turbidity, conductivity, dissolved oxygen of the water can be measured. Using this system a person can detect pollutants from a water body from anywhere in the world.[2]'IOT Based Water Quality Monitoring System ' by AYTI BHATT, JIGNESH PATOLIYA published in the year 2016, This paper, represent the design of IOT based water quality monitoring system that monitor the quality of water in real time. This system consists some sensors which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller and this processed values are transmitted remotely to the core controller that is raspberry pi using Zigbee protocol. Finally, sensors data can view on internet browser application using cloud computing.

[3]‘ Solar based advanced water quality monitoring system using wireless sensor network by R.Karthik Kumar, M.Chandra Mohan, S.Vengateshapandiyan, M.Mathan Kumar, R.Eswaran published in 2014, This paper represent the to monitor the quality of water over different sites as a real time application, a base station and distributed sensor nodes are suggested. A WSN technology like zigbee is used to connect the nodes and base station . The advantage in this system is low power consumption, no carbon emission, more flexible to deploy at remote site and so on.

3. IMPLEMENTATION DETAILS

The system consist sensor for measuring water quality parameter such as pH, temperature. The data of sensors are not in a proper manner for sending them directly to the core controller using Bluetooth. So, the microcontroller is introduced in a proposed system for getting data from sensors and processes on them to make compatible for Bluetooth module.

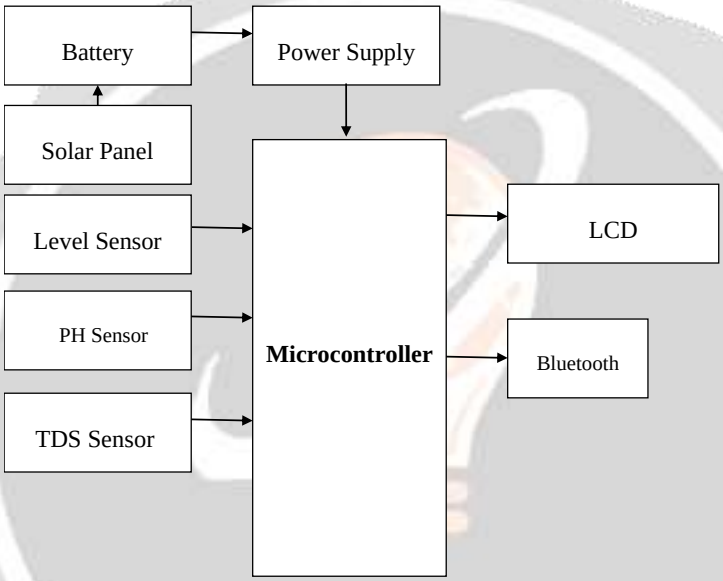


Fig: water quality check system

Step by step methodology which will be used for the project is given as:

- **Design on paper**–Block diagram, Study of required components and specification, Circuit diagram and component value selection.
- **Software Analysis** –Analyze the circuit on Diptrace, and test the results for different component values, Embedded programming is used.
- **PCB layout and Itching** – Layout by using Diptrace software, Itching by suitable method.
- **Soldering and debugging**
- **Final check on design**

4. HARDWARE DESIGN

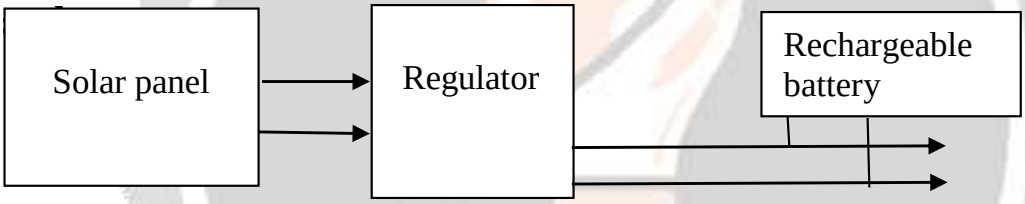
In this part we are going to discuss the detailed design of pH sensor interfacing, oxygen sensor interfacing, turbidity sensor interfacing and solar power module.

A. pH Sensor Interfacing: The high accuracy pH probe IH20 is used as a pH sensor which has output voltage from -412mV to 412mV. The theoretical output of the IH20 pH probe is approximately 59.16 mV/pH at 25°C, i.e. for acid output voltage is positive, for neutral it is null and for bases it becomes negative with 59mV per unit pH starting from null. This output voltage is affected by environmental temperature thus it is required to compensate the temperature factor. The necessary arrangement is done to compensate the temperature effect as shown in figure 2. Output of IH20 sensor is converted into 0~2.5V range which is further given to ARM processor for processing.

B. Turbidity level sensor interfacing: Turbidity sensor is to measure the clarity of water, the output voltage range represents turbidity value ranging from 0 to 4000NTU (Nephelometric turbidity unit) Output of circuit is 0~5V which is transferred to 0~3v compatible to ARM controller.

C. Bluetooth Module Interfacing:A Bluetooth module widely used with Microcontroller to enable Bluetooth communication. This module cam be interfaced using the UART in microcontroller where the data are transmitted in the form of packets.

D. Solar panel interfacing: In a practical water quality monitoring system, where sensor nodes are distributed in remote sites, power supply has become an extremely important issue, sometimes even the bottleneck of the system. Using wires to connect nodes to power lines nearby is not practical, because the nodes usually distribute in remote places, and the total expense in connecting all these nodes is unbearable. Another method is to use battery only. The advantages are obvious, but batteries have limited lifespan and cannot stand for a long time. Replacing depleted batteries regularly is inconvenient. To avoid unnecessary work and make the system more flexible to deploy, solar panel is to use in this system to supply power for the sensor node, together with the battery to recharge when solar power is not enough, such as night. [8] The output voltage and power of the solar panel used is 13.5V, 1.5W. Since the sunlight changes day and night, a battery with 12V output is needed to store and maintain the output voltage of the solar power module. When the sunlight is strong and solar panel outputs higher than 12V, the regulator turns on, thus solar panel powers remaining blocks and battery is in charging mode. When the sunlight become poor, the regulator turns off & the whole sensor node is powered by 12V battery. Solar charging controller 12 V/DC, 6 A [M149] is used as a regulator to convert 13.5V into regulated 12V DC. Figure 6 below shows the detailed diagram of solar power module.



5. RESULTS

The graphical user interface using VB 6.0. Through WSN channel data collected is sent to the base station. A PC with graphic user interface (GUI) for user is a base station to analyze water quality data or alarm automatically when water quality detected is below preset standards

6. CONCLUTION

Sequential follow up of water pollution status in remote region can be archived by monitoring the quality of water & collecting comprehensive data. This system not only provides comprehensive evaluation of water environment but also can quickly discover urgent water pollution accidents or natural disasters, transferring the abnormal water quality information to monitoring center by quicker communication network and provides graphical references for the decision making department to comprehend the status of the disaster to establish the prevention and cure policy.

7. REFERENCES

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