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Solar Power Interfacing For Remote Area Water Quality Observation Using Zigbee

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ABSTRACT: In the solar battery-powered water quality observance scheme using wireless sensing network, (WSN) is the primary building block of a water quality monitoring technology which is battery-powered by a solar panel. An excellent system architecture established by distributed sensor nodes and a base station is recommended to monitor the water quality over the different places as the real time practical application. Arrangement and execution of a model using one node powered by solar panel and WSN technology are the stimulating work. The data which is assembled by the various sensors at the node side such as pH and turbidity is conveyed via WSN to the base station. Data gathered from the remote site can be displayed in a visual format. Different computer simulation tools at the base station are used to examine. This system has advantages such as pollution free environment, low power consumption, more flexible to deploy at the remote site and so on.

KEYWORDS: Solar Power, WSN, pH Sensor, Turbidity, Zigbee.

I. INTRODUCTION

One of the huge and crucial barrier is world's population does not have safe water for drinking. The situation is even bad in some developing countries, where dirty or polluted water is being used for drinking without any right & proper treatment. One of the reason behind this situation is the ignorance of public & administration and the lack of water quality monitoring system and which creates intolerable health issues.

This paper present a system should be implemented so that it can monitor water quality in easy way so that some important factors of water can be easily examined to take preventive measures for quality maintenance. By utilizing different sensors, this system can collect different physical and chemical parameters from water, such as temperature, pH, oxygen density, turbidity and so on.

The improved wireless sensor network (WSN) technology provides us a different approach to get thereal-time data. The real time data will be transmitted to the main station. The users can obtain real time water quality data from the remote place. In a system of this kind, there are several nodes and a base station. Each node has a group of sensors and the nodes are placed in different water bodies. Data collected by sensors is sent to the base station through WSN channel. The base station is usually a PC for users to analyse water quality data. The recorded data can be analysed using various simulation tools for future correspondence and actions.

II. LITERATURE SURVEY

Central Water Commission (CWC) observes water quality [3][4], by collecting samples from respective locations for the processing system. These samples are analyzed at the well-equipped laboratories. At these laboratories, samples are taken from the raw water, filter water and treated water for analysis. The estimation of water parameters like turbidity, pH, etc is done with the help of different meters. So the disadvantages [5] of this existing system are that; there is manual monitoring and that too is not constant, human resource is required, less reliable. Due to these weaknesses of the existing system, it is necessary to develop a system that will allow real-time and continuous monitoring of water quality [7]. Thus various progressive technologies for monitoring water quality have been proposed in the recent years. In [8] the assembly of the wireless sensor network in which a number of sensor nodes are located in a lake is proposed. Each node contains a group of sensors and the nodes are placed in different water bodies. The sensor nodes are movable whereas the CMS (Central Monitoring System) is fixed. The CMS collects the information from the sensors and process them. A web based wireless sensor network for observing water pollution through Zigbee and WiMax

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technologies[1], [2]. This system have a local Zigbee network that will be able to measuring various water quality parameters. The system is intended to collect and process the data, and accordingly make decisions in real time through a remote web server. The data is processed through the Zigbee gateway from sensor nodes to the web server by means of a WiMax network, thus allowing users to distantly monitor the water quality from their place instead of gathering data from the scene. Experimental results reveals that the system is proficient of monitoring water pollution in real time [12].

III. SYSTEM ARCHITECTURE

The main motto of this project here is to develop a system for continuous monitoring of water quality at remote places using wireless sensor networks with low power intake, low cost and high detection accuracy. pH and turbidity level, etc are the parameters that are analysed to improve the water quality. Following are the objectives of idea implementation:

- To measure water parameters such as pH and turbidity using available sensors at remote place.
- To collect data from different sensor nodes and send it to base station by wireless channel.
- To simulate and analyze quality parameters for quality control. (Using Terminal software)

The proposed water quality monitoring system based on WSN can be divided into three portions:
• Data monitoring nodes
• Data base station
• Remote monitoring center

(a) Data Monitoring Node

Figure 1 Explains the data monitoring node which consist of a number of sensors (pH and turbidity signal conditioning circuit), a controller and RF module. The data sensed by the sensor will be passed through a signal conditioning circuit in order to operate the analog signal in such a way that it meets the requirements of the next stage for further processing. Then the analog data will be given to the controller. The inbuilt ADC will convert the analog signal to digital signal for further processing. With the help of the RF module the manipulated sensed data will be sent to the data base station as shown in figure 1.

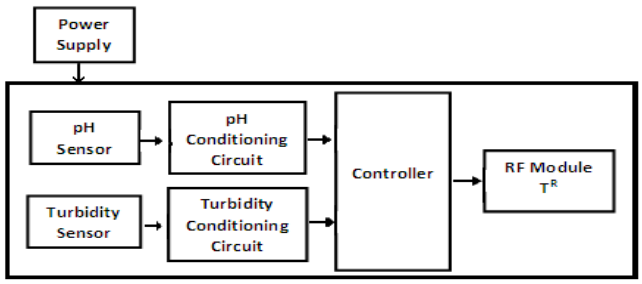

Fig. 1 Data Monitoring Node

(b) Data Base Station

The data from all the nodes is come together at the data base station as shown in figure 2. The data from each node is collected in sequence i.e. using time multiplexing. This data achieved is displayed on a LCD display. Also, this data is sent to the remote monitoring station through zigbee module.

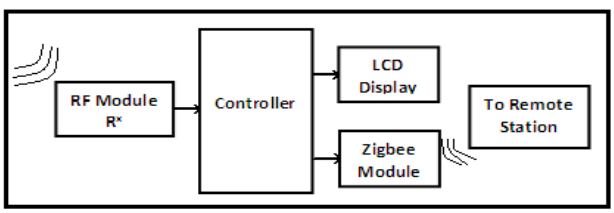

Fig. 2 Data Base Station

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(*c) Remote Monitoring Center*

The remote monitoring station involves a zigbee module which will collect the data sent by the data base station. This data will be served to a server PC consisting of Graphic User Interface (GUI) via serial communication as shown in figure 3. The obtained data will be represented with the help of Terminal software and will be saved for further reference. Also the data achieved is compared with the standard values of the water parameters. If the obtained water parameters be dissimilar the preset values then it will denote it.

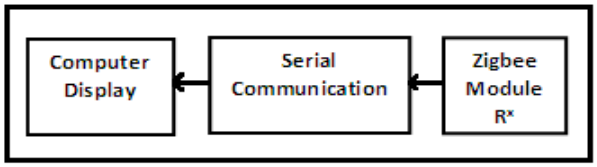

Fig. 3 Remote Monitoring Center

IV.SOFTWARE DESIGN

Software design methodology for water quality monitoring system is explained in following diagram which shows the flow chart of the system which provides the idea of working of the system.

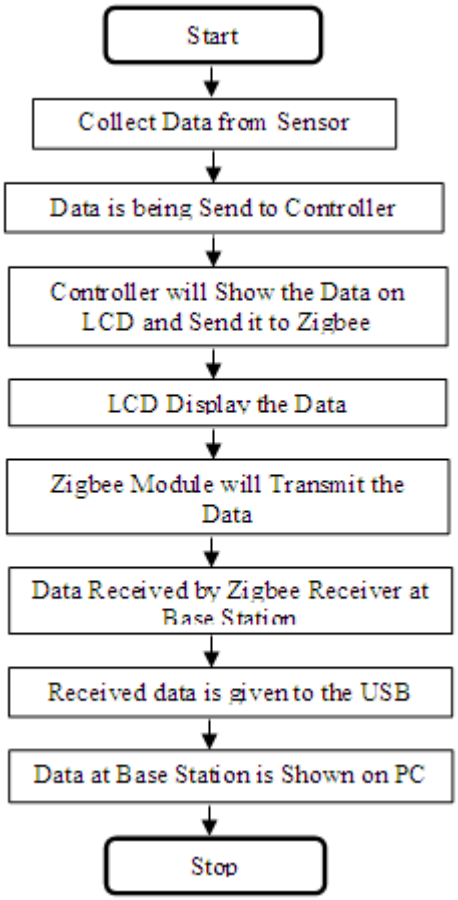

Fig. 4 Flowchart of Software Working

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V. RESULT AND DISCUSSION

The Terminal software displaying results is shown in figure 5. From prior testing, a threshold value (range of values) is defined for the monitoring of pH and turbidity of water. Depending on whether the average of the values obtained is less or greater than the defined threshold, we get to know whether the water is acidic or basic and the water is pure or impure and hence if it is suitable or not for the specific purpose.

The project addresses about developing an efficient wireless sensor network (WSN) based water quality monitoring system, which examines “water quality”, an important factor as far as, irrigation, domestic purposes, industries, etc are concerned. Overall the proposed implementation of high power Zigbee based WSN for water quality monitoring system offering low power consumption and low cost is presented. Another important fact of this system is the easy installation of the system where the base station can be placed at the local residence close to the target area and the monitoring task can be done by any person with minimal training at the beginning of the system installation.

VI. CONCLUSION

The system is wireless. It can be installed at any remote site. The Zigbee model will communicate the values of these parameters at our required place. After determining the values their usability and application is decided. For the purpose of drinking water the recommended value of pH is 6 to 8 and turbidity within 0 to 5 NTU. As the system is wireless it checks the quality of water at any place where manual test cannot be taken. Higher turbidity and pH decreases the quality of water which is not safe for drinking purpose and for agriculture so by observing the values action is taken. We have implemented the wireless sensor network system for monitoring the quality of water as the wireless sensor networks are highly promising technique for monitoring the parameters because of their advantages of easy development, real time monitoring, low cost. The Zigbee is used to receive the pH, turbidity values from water so, by monitoring these values we can achieve follow up of water pollution status. As the whole system is powered by solar panel it helps to keep environment pollution free. As the system is wireless it can be worked at remote places, the system is easy for monitor and installation so that any person can monitor the parameter values with minimal training.

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