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Remote Area Water Quality Observation Using ZigBee and Solar Power

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ABSTRACT: The solar energy powered water quality observation scheme using wireless sensor network (WSN) is the primary building block of a water quality monitoring technology which is battery-powered by a solar panel. The architecture established by distributed sensor nodes and a base station is recommended to monitor the water quality over the different base station of different places as the real time practical application. Organisation and implementation of a system model using one node powered by solar panel and WSN technology are the stimulating work. The data which is accumulated by the various sensors at the node side such as pH and turbidity is carried via WSN to the base station. Analysed data gathered from the remote site can be displayed in a visual format. This implemented system has benefits such as pollution free environment, low power consumption, more flexible to arrange at the remote site and so on.

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

I.INTRODUCTION

Main and the hugecrucial 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 &appropriate 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 executed 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 using different sensors, this system can collect different physical and chemical parameters from water, such as temperature, pH, oxygen density, turbidity and so on.

The enhanced wireless sensor network (WSN) technology provides us a different approach to get the real-time data. The real time data will be transmitted to the main station. The users can attain real time water quality records from the remote place. In this kind of a system, 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 gathered 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 gathered data can be analysed using various simulation tools for future correspondence and actions.

II.LITERATURE SURVEY

Central Water Commission (CWC) notes water quality [3][4], by gathering samples from respective locations for the processing system. These samples are analysed at the well-equipped laboratories. At these laboratories, samples are collected from the raw water, filter water and treated water for analysis. The estimation of water parameters like turbidity, pH, etc. is done with the support of altered meters. So the drawbacks [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 faults of the existing system, it is essential to develop a system that will allow real-time and continuous monitoring of water quality [7]. Thus various progressive technologies for observing water quality have been projected 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 encloses a group of sensors and the nodes are placed in different water samples. The sensor nodes are movable whereas the CMS (Central Monitoring System) is fixed. The CMS collects the information from the sensors and

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process them. A web based wireless sensor network for detecting water pollution through ZigBee and WiMax technologies[1], [2]. The proposed system have a local ZigBee network that will be able to computing various water quality parameters. The system is intended to collect and process the data, and accordingly make conclusions in real time through a remote web server. The data is deal with the ZigBee gateway from sensor nodes to the web server bymeans of a WiMax network, thus permitting users to remotely monitor the water quality from their place instead of gathering data from the scene. Monitored results reveals that the system is proficient of monitoring water pollution in real time [12].

III. SYSTEM ARCHITECTURE

The main aim of this project here is to improve a system for continuous monitoring of water quality at remote places using wireless sensor networks with low power consumption, low cost and high detection accuracy. pH and turbidity level, etc. are the parameters that are analysed to increase 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 centre

(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 stagefor 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.

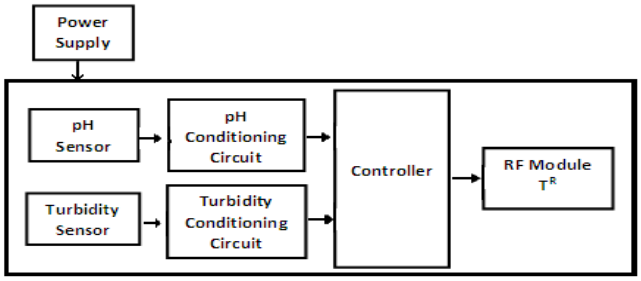

Fig. 1 Data Monitoring Node

(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.

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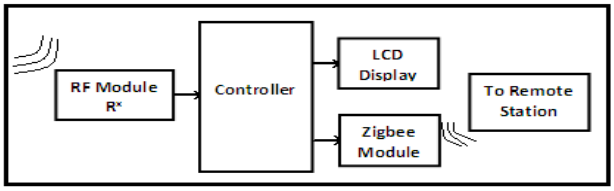

Fig. 2 Data Base Station

(C) REMOTE MONITORING CENTRE

The remote monitoring station involvesa ZigBee module which will collect the data sent by the data base station. This data willbe 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.

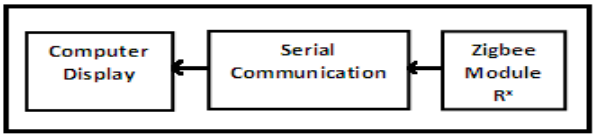

Fig. 3 Remote Monitoring Centre

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.

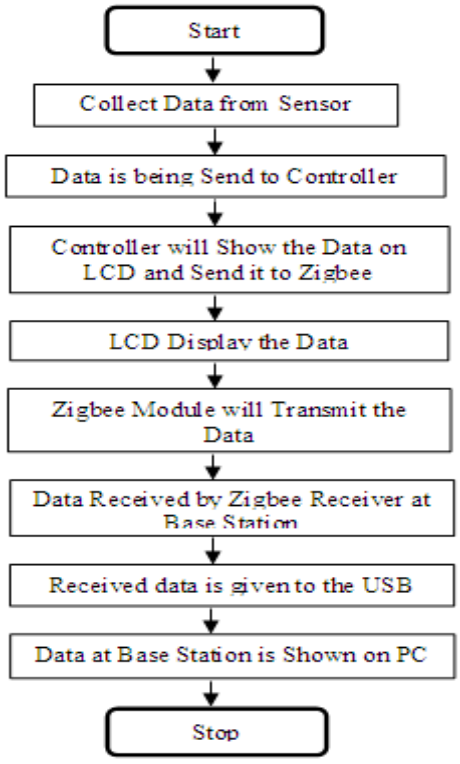

Fig. 4 Flowchart of Software Working

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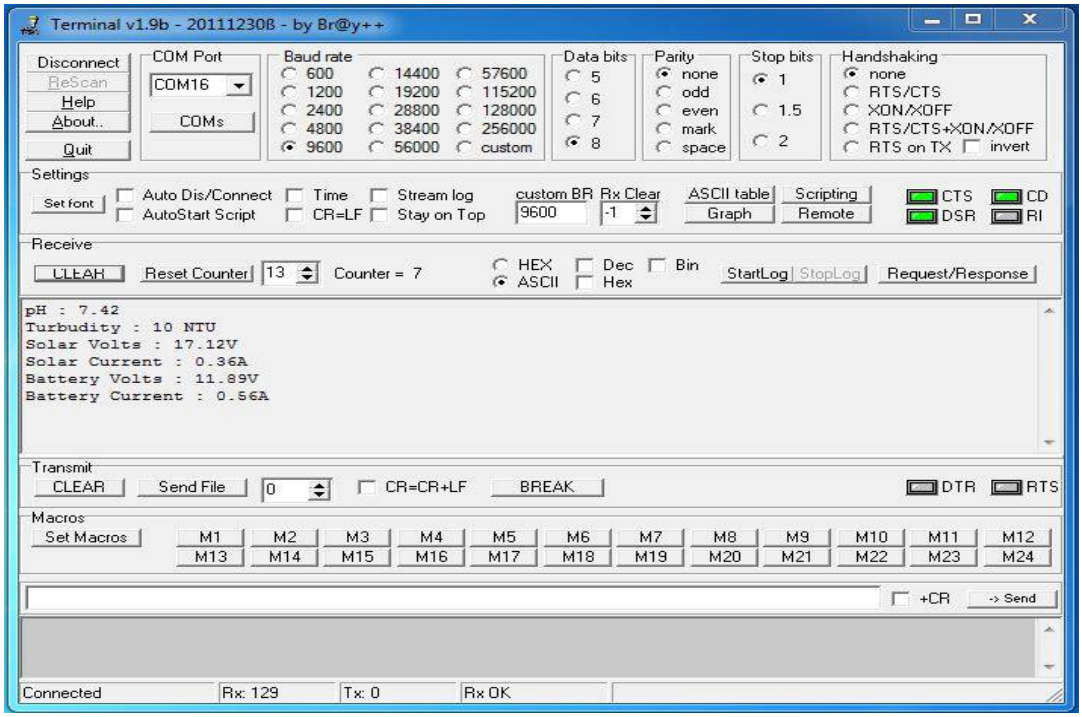
V. RESULT AND DISCUSSION

The Terminal software showing results is shown in figure 5.From previous testing, a range of values is defined for the monitoring of pH and turbidity of water.Depending on whether the average of the values obtained is approximately equal to 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 reveals about developing an efficient wireless sensor network (WSN) based water quality monitoring system, whichexamines “water quality”, an important factor as far as, irrigation, domestic use, industries, etc. are concerned. Overall the projected implementation of ZigBee based WSN for water quality monitoring system contributes low power consumption and low cost is presented. Another key 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 negligible training at the beginning of the system installation.



Figur.5 Terminal Software Displaying Results

VI. CONCLUSION

The system is wireless so it can be mounted at any remote site. The ZigBee model will link the values of these parameters at our required place. After determining the values their usability and application is decided. For the determination 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 monitors the quality of water at any place where manual test cannot be taken. Higher turbidity and imbalance pH reduces the quality of water which is not safe for drinking purpose and for agriculture so by observing the values action can be taken.We have organised and 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 benefits of easy development, real time monitoring, low budget. The ZigBee is used to collect the pH, turbidity values from water so, by monitoring these values we can attain follow up of water pollution status.As the whole system is powered by solar panel it supports to keep environment pollution free. The system is wireless so that it can be worked at remote places, the system is easy for monitor and setting up so that any person can monitor the parameter values with minimal training.

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BIOGRAPHY

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