Implementation of Water Quality Monitoring System using Zigbee

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ABSTRACT

Water Quality Monitoring is essential and life saving activity at home and offices. In this paper we are proposing Water Quality Monitoring System using ZigBee. The System is designed for sending different water parameter measurements to receiver end using ZigBee. The data is send to the Server. The system is utilized for real time applications of measuring water quality of different parameters such as pHvalue ,Turbidity, Temperature .All these parameters are monitored and displayed using suitable sensors. Visual basic software is used for Graphical User Interface.

Keywords: Zigbee, Water quality Monitoring system, Visual basic, real time Monitoring, pH value ,Turbidity, Temperature.

ARTICLE INFO

I. INTRODUCTION

Water Quality Monitoring is an ever expanding and dynamic area with applications reaching out into our everyday life such as in medicine, surveillance, authentication, automated industry inspection and in many more areas. One of the fundamental challenges for water quality monitoring is we cannot get exact information about the quality of water at instant time at the remote place from actual ground zero. In addition, when the inspection of water is done, industries control there pollution level to a great extent thus we cannot get exact pollutant level of water at all the time in same manner .Water quality is a complex subject, which involves physical, chemical, hydrological and biological characteristics of water and their complex and delicate relations.We are proposing a portable system for water quality monitoring, as there is direct connection with human health. The System is useful for people in rural areas well as people in urban area. The water tested by our system indicates status likes useful for health or not, so this system is useful for day to day life. In the developing countries like India, at rural places people fetch water from wells, ponds, rivers. Hence there is urgent need for monitoring water quality for hygienic water supply. At urban areas, In slums there may be unhygienic conditions, so there is need with cost effective portable Water Quality Monitoring solution.

II. LITERATURE SURVEY

Geetha, S., Gouthami, Sprposed Internet enabled real time water quality monitoring system [1]Cao Jian, QianSuxiang, Hu Hongsheng, Yan Gongbiao proposed a Wireless Monitoring and Assessment System of Water Quality Based On GPRS [2],A wireless System has been designed for monitoring quality of water which uses GPRS technology and the model that is used in this paper .The software part uses Matlab and c++ while the database is developed using Microsoft SQLserver [2].This paper proposed the method to collect the data and help in restoring the river by keeping a check on the water quality and sources of pollution by using sensors which included checking the amount of dissolved oxygen, Bacteria, Conductivity of Water and also the Turbidity in water. Also GIS mapping was used as a software part[3].. Cheng Yongqian, Song Qianwu, Ma Hongmei, [Reaserch on Optimization of Water Quality Monitoring Sites Using Principal Component Analysis and Cluster Analysis],2011,page 570-574This paper Proposed a method to overcome the Disadvantages of the subjective method and used PCA and CA as their tools to analyze the data from the various Water Quality Monitoring sites in order to improve the accuracy[4].John B Copp, EvangelinaBelia, Christian Hubner , Mario Thron, LeivRieger,[Towards The Automation of Water This paper focused on improving the data collection techniques

as traditional method had less storage and less interpretation of data. so they proposed a way which comprised of electronic catalogue of electronic devices which helped users to input data and also read the real time data[5].O. Postolache, P. Silva Girao, J M Dias Pereira, Helena Ramos, proposed aWireless Water Quality Monitoring System Based on Field Point Technology and Kohonen Maps[6].

III. PROBLEM DEFINITION

To design and implement water quality monitoring system which is a cost effective and portable

Challenges in implementation of water quality monitoring system :

One of the fundamental challenges for water quality monitoring is we cannot get exact information about the quality of water at instant time at the remote place from actual ground zero.

In addition, when the inspection of water is done industries control there pollution level to a great extent thus we cannot get exact pollutant level of water at all the time in same manner .Water quality is a complex subject, which involves physical, chemical, hydrological and biological characteristics of water and their complex and delicate relations

III. SYSTEM DESIGN

Our System consist of two sections namely transmitter and Receiver control section. Overall system involves different sensors like level, temperature, turbidity, PH which gives different parameters of water. Our System is efficient in terms of speed due to use of Arm microcontroller. The language being used for Arm processor is Embedded C.

A. Transmitter-The transmitter section of our system can be seen as shown in following diagram
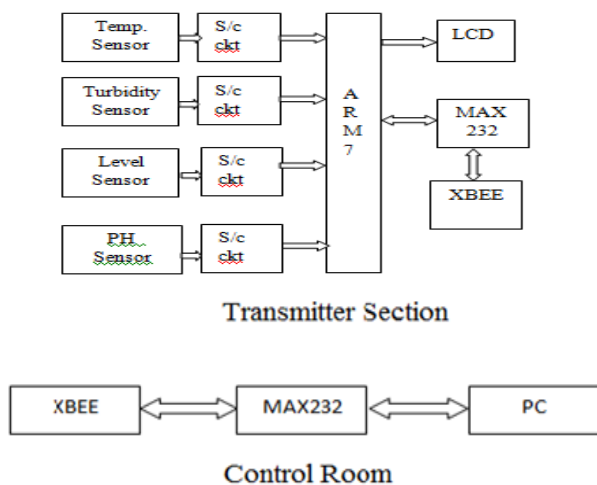

Figure 1. System design

In transmitting section we are using different types of sensors like temperature, turbidity, level, and pH which

measures respective data from water and pass to controller through signal conditioning circuit. The output of sensors is very poor, so the signal conditioning circuit is required for sensors to create proper input to controller. Controller is heart of system. Controller accepts the respective data from signal conditioning circuit. The controller display sense data on LCD screen and also passes to ZigBee transmitter. The ZigBee is the wireless module which is to transmit the data. The ZigBee transmitter receives the data from ARM and transmits to ZigBee receiver.

B.Receiver Section −Receiver gets data from ZigBee transmitter and then passes it to desired location. In our project we are using different types of sensors like level, pH, turbidity and temperature. Level sensor measures the exact level of water and passes it to controller, pH senses the acidic and basic content in water and passes to controller, Turbidity measures the content of dust particles in water and give the data to controller, temp sensor measures the temperature of the water and passes it to controller.ARM takes the data from appropriate sensors and displays on LCD as well as it provide the same data for ZigBee transmitter to transmit this for control room. In control room by using a VB language we can transmit this data over any place for fixed interval of time.

Figure 2. Water Monitoring System Setup

IV. SOFTWARE DESIGN

We are using VB 6.0 for continuous data monitoring. The flowchart of software can be seen as in s Figure 3. Zigbee Transmitter sends information from all sensors to receiverend .
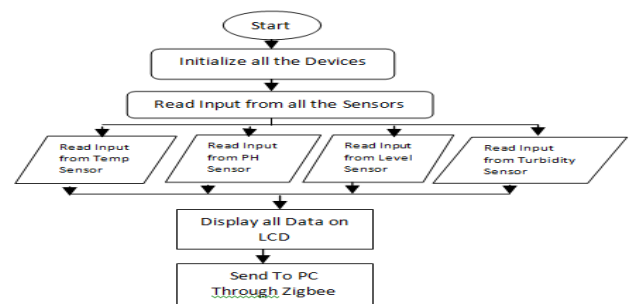

Figure 3.Flowchart for software for Transmitter

The flowchart for receiver can be seen as in figure 4.As all sensors reading of given sample is collected Email of the water quality reportis send to the user (who has paid for getting our service of sending water quality report).
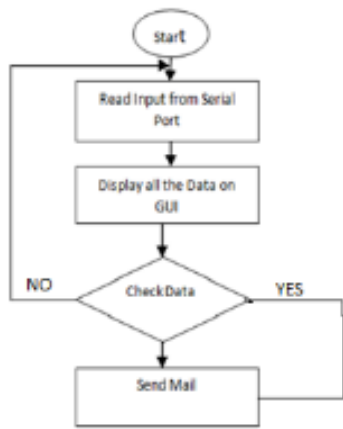

Figure 4. Flowchart for software for receiver

V.   CIRCUIT DIAGRAM

The circuit diagram for our proposed water quality monitoring system can be seen as follows. ARM microcontroller, LCD and different sensors with signal conditioning are connected as seen in figure 5 .
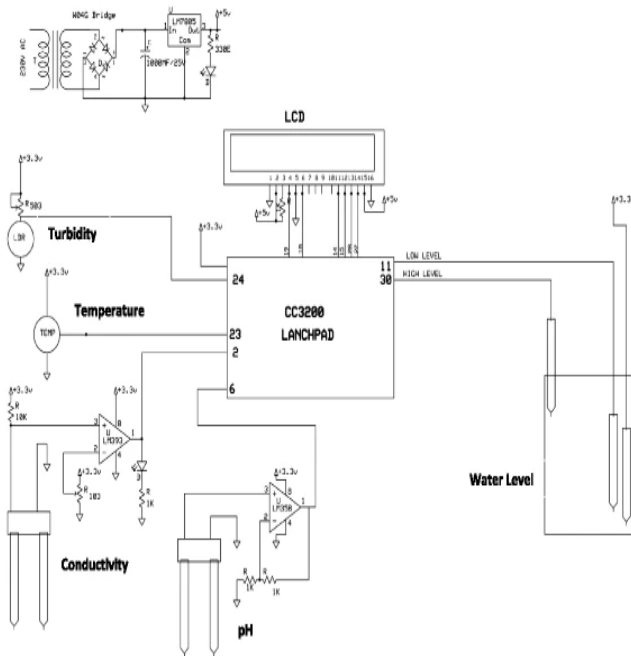

Figure 5A.: Circuit diagram of our proposed water quality
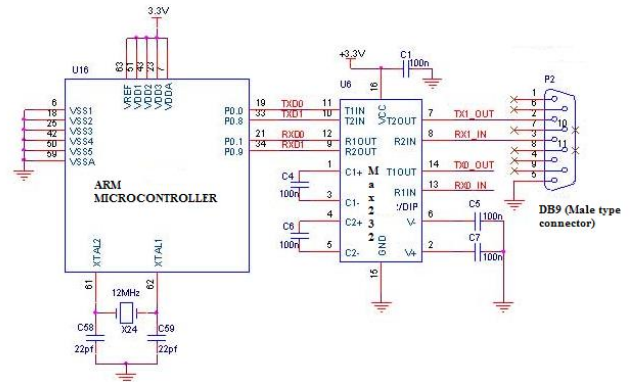
monitoring system

a.   ZIGBEE CONNECTION

Figure 5 B.Circuit diagram of ARM to DB9 via Max232

b.   ZigBee Architecture

ZigBeehas thePhysical (PHY) Layer and Medium Access Control (MAC) Layer, for addressing frequency and data rate specifications. The Physical Layer also allows for two types of devices: full function devices (FFD's) and reduced function devices (RFD's). ZigBee develops the Network Layer and Application Layer, which includes the Applications Support Sub layer, the ZigBee Device Object, and the Security Services. The Network Layer and Application Layer are related toset upand the connections of devices in the network .Zigbee is preferred due to low power usage over other wireless protocols.

c.   Visual Basic used for GUI interface

Visual Basic is a Visual Graphical user interface and is events driven Programming Language.
The login information and other programming interface designed by us for our proposed water quality monitoring system is as shown in figure 6.
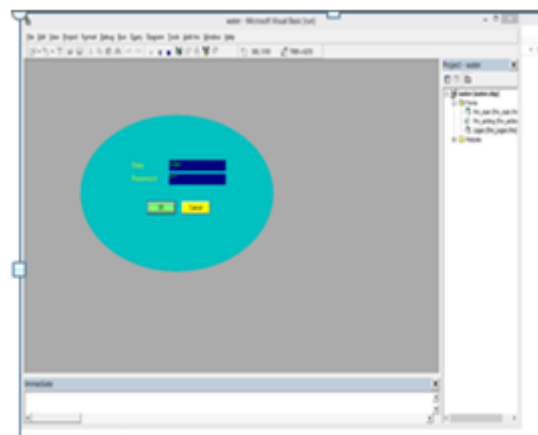

Figure6. GUI created for login of system

Reason for using Visual Basic is easiness of coding by dragging and dropping any graphical objects anywhere on the form. Alsochanges ofcolor and other appearance is easily possible with properties windows.

VI. RESULTS AND OBSERVATIONS

The output on the LCD display can be seen as shown in following figure.
The reading for PH, Temperature (In Celsius), Turbidity and Level are available on the liquid crystal display

Figure 7. Sensors Readings on LCD (for water sample1 in observation table)

VII. OBSERVATION

The output after taking samples from different samples we get following observation table.
Observation table 1

Water Sample \ Parameter	Water Sample 1	Water Sample 2	Water Sample 3
PH	6.4	7.4	11
Temperature (In Celsius)	13	0	100
Turbidity	33%	11%	57%
Level	82%	82%	82%
Remarks	Acidic water	Drinkable water	Harmful water

In this work, we are using different types of water and have used sensors like pH, Pt100, Turbidity and Level. These sensors sense the respective parameter of waste water and send to processor. The processor takes the proper action on output of sensors, and display sensor's values on Liquid Crystal display (LCD) and our system also displays these values on GUI of VB throughZigBee wireless module.

VIII.   CONCLUSION

From above observation table it is observed that Water sample 1 is acidic which is not suitable for drinking purpose but can be purified and then used.

A. Water sample 2 is sample which can be used for drinking as it is.
B. Water sample is hazardous for health as it has high turbidity which is chemically not suitable for drinking purpose.
C. Increase in Turbidity is resulting in increasing the water temperature.
D. We have successfully designed implemented portable and cost effectiveWater quality monitoring system using ZigBee.

IX. FUTURE SCOPE

With availability of IoT analytics platforms like Ubidots and things speak, it is possible to upgrade our water monitoring system for IoT. Real timeand field wise graphs of water quality monitoring is future scope of our proposed Water quality monitoring system using ZigBee system.

REFERENCES

[1]   Geetha, S., Gouthami, S. Internet of things enabled real time water quality monitoring system. Smart Water 2, 1 (2016). https://doi.org/10.1186/s40713-017-0005-yInternet of things enabled real time water quality monitoring system

[2] Cao Jian, QianSuxiang, Hu Hongsheng, Yan Gongbiao, [Wireless Monitoring and Assessment System of Water Quality Based On GPRS],2007, page124-127.https://ieeexplore.ieee.org/document/4350635.

[3] Alex Anvari, Jenny Delos Reyes, EhsanEsmaeilzadeh, Ali Zarvandi, Nicholas Langley [Designing An Automated Water Quality Monitoring System For West And Rhode Rivers],April 24,2009.Page 131-136.https://ieeexplore.ieee.org/document/5166167.

[4] Cheng Yongqian, Song Qianwu, Ma Hongmei, [Reaserch on Optimization of Water QualityMonitoring Sites Using Principal Component Analysis and Cluster Analysis],2011,page 570-574.https://ieeexplore.ieee.org/document/5747882

[5] John B Copp, EvangelinaBelia, Christian Hubner , Mario Thron, LeivRieger,[Towards The Automation of Water Quality Monitoring Networks],August 2010,Page:491-497.https://ieeexplore.ieee.org/document/5584638.

[6] O. Postolache, P. Silva Girao, J M Dias Pereira, Helena Ramos, [Wireless Water Quality Monitoring System Based on Field PointTechnology and KohoneMaps],2003,Page1873-1876.https://ieeexplore.ieee.org/document/4350635