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IOT Based Real Time Water Quality and Distribution Monitoring System

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Abstract**:** *Clean drinking water is very important for the health of Human being. Water distribution system facilitates the delivery of water to consumers but these systems are prone to contamination – which may be intentional or accidental. Infrastructure of the drinking water distribution system is very complex in the environment. This paper presents a low cost and holistic approach to the water quality monitoring problem for drinking water distribution systems as well as for consumer sites. Our approach is based on the development of low cost sensor nodes for real time and in-pipe monitoring and assessment of water quality on the fly. To observe the contamination factor in water sensor setup is installed in water tank the parameters needed to be monitor is temperature, turbidity, ph value of water which is very important and even water level of tank is monitored and all these data is transmitted to control room through Zigbee wireless communication to alert the authorized persons voice speaker has been added which gives voice announcements for different thresholds and also the data has been updated to GPRS webpage.*

Keywords: *Microcontroller, GPRS Modem, Temperature Sensor, Water Level Sensor, Turbidity Sensor, ph sensor, Zigbee, voice IC.*

I. INTRODUCTION

Clean potable water is very important for health and well being of humans as well as animals. Drinking water utilities are facing new challenges from exploration, storage, treatment and safeguarding of drinking water distribution systems in their real time operations. Traditional methods of water quality control involve the manual collection of water samples at various locations and at different times, followed by laboratory analytical techniques in order to characterize the water quality. Such approaches are no longer considered efficient]. Although, the current methodology allows a thorough analysis including chemical and biological agents, it has several drawbacks:

- The lack of real-time water quality information to enable critical decisions for public health protection (long time gaps between sampling and detection of contamination).

- Poor spatiotemporal coverage (small number locations are sampled).

- It is labor intensive and has relatively high costs (labor, operation and equipment). Therefore, there is a clear need for continuous on-line water quality monitoring with efficient spatio-temporal resolution.

- Absence of tangible water monitoring information for assisting the critical decisions for public health (long delay between sample Collection & analysis).

- Manual operation is cost expensive (equipment and maintenance).Hence there a vibrant need for better online monitoring with precise event detection.

This paper will contribute in designing and development of low cost Wireless Sensor network based system. The system can be used at the premises of Water distribution system for continuous monitoring of water quality.

II. RELEATED WORK

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There are few online water monitoring systems available E.g, J-MAR BioSentry [4], Hach HST Guardian Blue [3] but such systems are very bulky and costly In a research paper "Detection of water-quality contamination events based on multi-sensor fusion using an extended Dempster–Shafer method presented by –" Dibo Hou1, Huimei He1, Pingjie Huang1, Guangxin Zhang1 and Hugo Loaiciga2" [3] The author has presented a method for detecting contamination events of drinking water sources based on the Dempster–Shafer (D-S) evidence theory. The purpose of this system is to protect water supply systems against intentional and accidental contamination events. Research paper Titled "Contamination of Water Distribution Systems" By Walter M. Grayman, PhD, PE[6] presents Mathematical hydraulic and water quality models of water distribution systems which can be used to estimate the movement of a contaminant in a distribution system In paper "Integrated Solid-state Sensors Monitoring Water Quality for the Next Generation of Wireless Sensor Networks " By -Serge Zhuiykov1, Eugene Kats1 1CSIRO [4] the research has been dedicated to the development of solid-state sensors which can be used for real-time monitoring of water quality parameters such as pH and dissolved oxygen (DO), dissolved organic carbon (DOC) at relatively high spatial resolutions. The USACERL (U.S. Army Corps of Engineers Construction Engineering Research Laboratory) is working on a project to develop a more seamless and effective online water quality monitoring system [5].

III.PROPOSED METHOD

In this project we overcome the drawback present in existing system by monitoring water quality problem for drinking water distribution systems as well as for consumer sites. Our approach is based on the development of low cost sensor Nodes for real time and in-pipe monitoring and assessment of water quality on the fly. The main sensor node consists of electrochemical and PH sensors which can be used to monitor the water quality. From the sensor node we are sending monitored values to ARM board through GPIO Pins. The serial cable is connected to one of UART port of ARM board to GPRS module. The controller transmits the data to remote PC through GPRS by using IOT. IOT is a protocol through which users can upload files from their systems to server. Once data is placed at server we can view the data at remote PC (with internet) on web page with unique IP address. We can view continuous sensors data.

IV. OVER HEAD TANK SECTION

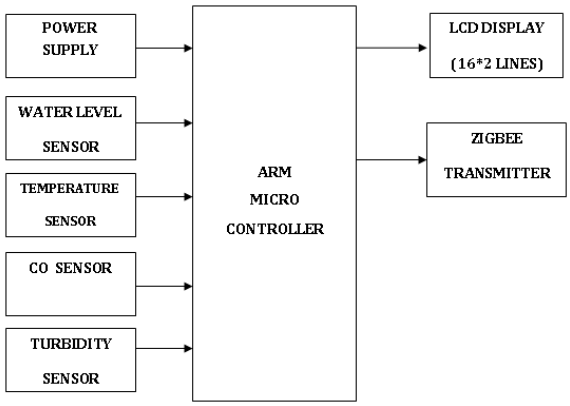

Fig.1.block diagram of water tank.

V. MONITORING SECTION

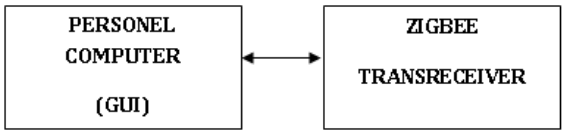

Fig.2.Monitoring section.

VI. METHODOLGY AND WORKING

The system is comprised of two Units Measurement Unit and Control Unit. Measurement Unit consist of the measurement node which is ARM based board that collects measurements of water quality from different sensors which are interfaced to the microcontroller .Based on these measurements the controller decides the water quality .All the sensors are in pipe sensors that are installed at the site.

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The water quality parameters which are collected and detected by the sensors are turbidity, pH level, Electrical conductivity and Temperature. By comparing all these detected values with the standard values system will determine that whether the water is clean water or contaminated water. ZigBee is the emerging communication technology which is used in the proposed system for acquiring different water quality parameters from the water distribution system. This information is then transferred to the remote centre.

Board Hardware Resources Features

Temperature Sensor:

A thermistor is a type of resistor whose resistance varies significantly with temperature, more so than in standard resistors. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting over current protectors, and self-regulating heating elements. Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range, typically −90 °C to 130 °C.

Turbidity sensor:

The circuit designed uses a 5V supply, fixed resistance of 100Ω, variable resistance of 10KΩ, two copper leads as the sensor probes, 2N222N transistor. It gives a voltage output corresponding to the conductivity of the water. The conductivity of water depends upon the amount of flow in it. The voltage output is taken at the transmitter which is connected to a variable resistance. This variable resistance is used to adjust the sensitivity of the sensor

Ph sensor:

The pH of a solution indicates how acidic or basic (alkaline) it is. The pH term translates the values of the hydrogen ion concentration which ordinarily ranges between about 1 and 10 x -14gram equivalents per litre - into numbers between 0 and 14.

When immersed in the solution, the reference electrode potential does not change with the changing hydrogen ion concentration. A solution in the reference electrode also makes contact with the sample solution and the measuring electrode through a junction, completing the circuit.

ZigBee

Zigbee is a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4-2003 standard for Low-Rate Wireless Personal Area Networks (LR-WPANs), such as wireless light switches with lamps, electrical meters with in-home-displays, consumer electronics equipment via short-range radio needing low rates of data transfer. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking.

ZigBee is a low-cost, low-power, wireless mesh networking standard. First, the low cost allows the technology to be widely deployed in wireless control and monitoring applications. Second, the low power-usage allows longer life with smaller batteries. Third, the mesh networking provides high reliability and more extensive range.

Fig.3.ZIGBEE MODULE

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GPRS:

GPRS technology enabled much higher data rates to be conveyed over a cellular network when compared to GSM.GPRS technology offering data services with data rates up to a maximum of 172 kbps, facilities such as web browsing and other services requiring data transfer became possible. GPRS and GSM are able to operate alongside one another on the same network, and using the same base stations. However upgrades are needed. The network upgrades reflect many of those needed for 3G, and in this way the investment in converting a network for GPRS prepares the core infrastructure for later evolution to a 3G W-CDMA / UMTS.

Fig.4.GPRS MODULE

V. CONCLUSION

With the urbanization of our society and Environment change, water pollution problems have become more complex, which requires continuous on-line monitoring and multi-stage treatment process. Traditional methods of water quality analysis which can called as Offline approach, involves the manual collection of water samples at various locations and at different times followed by coming to the laboratory and carrying a range of analytical tests in order to characterize the water .It is very time consuming an also not much efficient. This is because It involves relatively high labour costs as well as the costs associated with maintaining a laboratory. In This project we have designed a system with the help of Wireless sensor network and Embedded System technology which will monitor and detect the water contamination in Drinking water distribution system. The water parameters selected for the monitoring are Turbidity, pH, Electrical Conductivity and Temperature.

VI. REFERENCES

[1] Li,S.; Xu,L.; Wang,X.; Wang,J., "Integration of Hybrid Wireless Networks in Cloud Services Oriented Enterprise Information Systems," Enterp. Inf. Syst., vol. 6, no. 2, pp. 165–187, 2012.

[2] Akyildiz,I,F.;Su,W.; Sankarasubramaniam,Y.; Cayirci,Y., "Wireless Sensor Networks: A Survey", Computer Networks, vol.38, pp. 393–422, 2002.

[3]. Dibo Hou1, Huimei He1, Pingjie Huang1, Guangxin Zhang1 and Hugo Loaiciga2 "*Detection of* water-quality contamination events based on multi-sensor fusion using an extended Dempster–Shafer method "2013

[4]. Serge Zhuiykov1, Eugene Kats1 "Integrated Solid-state Sensors Monitoring Water Quality for the Next Generation of Wireless Sensor *Networks* "1CSIRO, Materials Science and Engineering Division, 37 Graham Road, Highett, VIC. 3190, Australia 2012

[5]. Drinking Water Contamination Warning Systems – Design and Implementation of an Online Water Quality Monitoring System for Military water systems.

[6]. Walter M. Grayman, "*Contamination of Water Distribution Systems "* - PhD, PE .

[7] M. Sophocleous, M. Glanc, Monika, J. Atkinson, and E. Garcia-Breijo,"The effect on performance of fabrication parameter variations of thick-film screen printed silver/silver chloride potentiometric reference electrodes," *Sens. Actuators A, Phys.*, vol. 197, pp. 1 8, Aug. 2013.

[8] J. Atkinson, J. M. Glanc, M. Prakorbjanya, M. Sophocleous, R. Sion, and E. Garcia-Breijo, "Thick film screen printed environmental and chemical sensor array reference electrodes suitable for subterranean and subaqueous deployments," *Microelectron. Int.*, vol. 30, no. 2, pp. 92–98, 2013.

[9] R. M. Manez, J. Soto, E. G. Breijo, J. I. Civera, and E. G. Morant, "System for determining water quality with thick-film multisensor," in *Proc. Spanish Conf. Electron Devices*, Feb. 2005, pp. 607–610.

[10] R. Martinez-Manez, J. Soto, E. García-Breijo, L. Gil, J. Ibanez, and E. Gadea, "A multisensor in thick-film technology for water quality control," *Sens. Actuators A, Phys.*, vol. 120, no. 2, pp. 589–595, 2005.
[11] S. Zhuiykov, D. O'Brien, and M. Best, "Water quality assessment by integrated multi-sensor based on semiconductor RuO2 nanostructures," *Meas. Sci. Technol.*, vol. 20, no. 9, p. 095201, 2009.
[12] P. Corke, T. Wark, R. Jurdak, H. Wen, P. Valencia, and D. Moore, "Environmental wireless sensor networks," *Proc. IEEE*, vol. 98, no. 11, pp. 1903–1917, Nov. 2010.

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