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An Effective Water Quality and Level Monitoring System Using Wireless Sensors through IoT Environment

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ABSTRACT
In most recent years, the usage of internet and its applications has grown rapidly. As everyone's work is dependent on it, without internet it would be difficult. As well as Now a day's wireless sensor networks are widely used and these are low power devices with a processor, storage, power supply, and a transceiver and with one or more sensors. In this project, we are going to combine to these both for the purpose of to reach about to collect the data from water environment) and is displayed on the webpage using wireless networks. Internet of things (IoT) is a network of devices with local intelligence (sensors, lights, gas pumps), which share access & control mechanisms to push and pull status and command information from the networked world. In this paper, a system is proposed for monitoring the weather changes in the environment. Embedded controlled sensor networks have proved as a reliable solution in providing remote control and sensing for environmental monitoring systems. The sensors are integrated with the system to monitor and compute the level of existence of gas, temperature and fire in atmosphere by using the information and communication technologies. The sensor data is uploading in the WEBPAGE using IoT.That's what, the paper is going to deal. So the principal objective is to monitoring the thing of parameters from anywhere in the world. The paper is not aimed to integrate entire world of things right now but dedicated to Water is a limited resource and is essential for agriculture, industry and for creatures existence on earth including human beings. Lots of people don't realize the true importance of drinking enough water every day. More water is wasted by many uncontrolled ways. The microcontroller (ARM 7) based Water level monitoring is used to indicate the level of water in the tank to agent. Sensor Based Water Pollution Detection, it will check the water quality by using these parameters such as the water level, turbidity, gas and temperature are measured in real time by the sensors and it will be monitoring by an agent. This Paper is our motivation to prevent the water wastage by using technology and monitoring the system as a daily life device like laptop or mobile phone.

Keywords: *Water Level and Quality, Internet of Things (IoT), ARM 7, Wireless Sensors.*

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I. INTRODUCTION

Every living thing on earth needs water to survive. Human bodies are made up of more than 60 percent water. We use clean water to drink, grow crops for food, operate factories, and for swimming, surfing, fishing and sailing. Water is vitally important to every aspect of our lives. Monitoring the quality of surface water will help protect our waterways from pollution. Farmers can use the information to help better manage their land and crops. Our local, state and national governments use monitoring information to help control pollution levels. By using water monitoring system, we avoid the water wastage, power consumption and easily prevent the water for our generation.

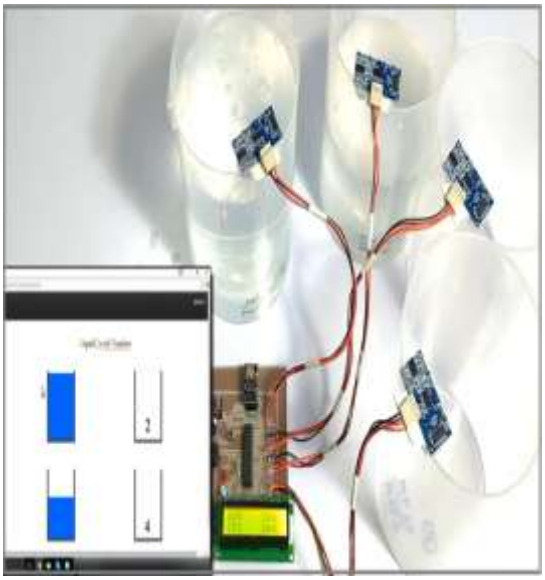

Figure 1: The Basic IoT Based Water Level Monitoring System.

Water monitoring day was established in 2003 by America's clean water foundation as a global educational outreach program that aims to build public awareness and involvement in protecting water resources around the world. world water monitoring day is celebrated on September 18. Tank Water Level Monitoring, is used to avoid overflowing and intimate level of water in the tank. Water controlling system implementation makes potential significance in home applications. The existing automated method of level detection is described and that can be used to make a device on/off. Moreover, the common method of level control for home appliance is simply to start the feed pump at a low level and allow it to run until a higher water level is reached in the water tank. This is not properly supported for adequate controlling system. Besides this, liquid level control systems are widely used for monitoring of liquid levels, reservoirs, silos, and dams etc.

Water pollution monitoring can help with water pollution detection, discharge of toxic chemicals and contamination in water. And also check the quality by using Temperature, pH and turbidity are the typical parameters collected in river/lake water pollution/quality monitoring systems. The goal of this project is to design and manage a Wireless Sensor Network (WSN) that helps to monitor the quality of water with the help of information sensed by the sensors immersed in water, so as to keep the water resource within a standard described for domestic usage and to be able to take necessary actions to restore the health of the degraded water body. Water pipelines leak detection, Pipeline systems are responsible for transporting vital materials such as water, oil and gas. Any leakage in the pipe can cause major financial losses and possible environmental damages. Currently, buried pipelines are only monitored at key points, which can be spaced several kilometers apart. A system with a higher spatial resolution would provide operators with a better understanding of their network. In buried pipeline monitoring, sensor nodes are deployed in soil. The underground environment imposes major limitations on sensor nodes, such as poor RF transmission and lack of maintainability.

II. LITERATURE SURVEY

There are many works on the application of WSN for monitoring system. One classic example of using ZigBee is in security systems. A security system might have several sensors, including motion detectors, security cameras and glass-break sensors. These devices are required to communicate with the central security centre by either wires or a wireless network. ZigBee-based security systems are simple to install, requiring no wired connection, and easy to upgrade. Although ZigBee has a low data rate, it has still the capability to transfer images wirelessly with reasonable quality. ZigBee has been used in a wireless camera system which records the videos of visitor at a front door and then transmits these recordings to monitor, inside the house. Zigbee is also used for Light control in a house or commercial building. In a typical light installation system, it is necessary to install a wire from the light to a switch in order to turn on or off the light. No wired connection between the light and the switch is necessary if the light and switch are equipped with the ZigBee devices. In this way, any switch in the house can be assigned to turn on and off a specific light. One other application of ZigBee is in the healthcare industry, where it is used to monitor a patient‟s vital health information remotely. For example, a patient is staying at his home but for him it is important that his physician monitors his blood pressure and heart rate regularly, continuously. A ZigBee network has the ability to collect the data from various sensors that are connected to the patient. The 802.15.4 standard uses a 128-bit Advanced Encryption Standard (AES) technology in order secure the data flow between ZigBee devices and other networks. A patient wears a ZigBee device that is interfaced with different sensors, such as a blood pressure sensor, which gathers the information from these sensors on a periodic basis. The received information is transmitted to a ZigBee gateway. A ZigBee gateway provides the interface between ZigBee and other types of networks, such as an Internet Protocol (IP) network. The patient‟s gathered information is then transmitted via Internet to a personal computer of a physician or nurse that they use to monitor the patient‟s health status. This system could help hospitals to improve patient care and relieve hospital overcrowding by giving them the authority to monitor patients at home. ZigBee is expected to provide low cost and low power connectivity for equipment that needs battery life as long as several months to several years but does not require data transfer rates as high as those enabled by Bluetooth. This kind of network eliminates use of physical Ethernet cables. The devices could include telephones, hand-held digital assistants, sensors and controls located within a few meters of each other. Thus, ZigBee technology is a low data rate, low power consumption, low cost, wireless networking protocol targeted towards automation and remote control applications. From all the previous related works described, it can be concluded that there are limitless possibilities of Zigbee in wireless sensor network application. Solution providers of Zigbee offer various kinds of platform in the market based on user requirement. For this paper, we exploit the low power consumption and long battery life Zigbee platform.Also Cho Zin Myint, Lenin Gopal, and Yan

Lin Aung proposed theire methodology in IEEE 2016.

Disadvantages of the Existed Methodologies:

- We Can able monitor the water level and pollution only.
- They are not Accurate.

III. IMPLEMENTATION OF METHODOLOGY

The ARM 7 is a low-voltage, high-performance CMOS 32-bit microcomputer. ARM7 is a group of older 32-bit RISC ARM processor cores licensed by ARM Holdings for microcontroller use .LPC2148 is a powerful microcomputer, which provides a highly flexible and cost-effective solution to many embedded control applications. Many beginners sometimes misunderstood that the ARM is microcontroller or processor but in reality, ARM is an architecture which is used in many processors and microcontrollers. The ARM architecture licensed to companies that want to manufacture ARM-based CPUs or System-on-Chip products. This enables the companies to develop their own processors compliant with the ARM instruction set architecture. For example, the device we are using LPC2148 is ARM architecture based SOC product developed by NXP Semiconductor. Similarly, all major semiconductor manufacturers like Atmel, Samsung, TI etc. they all make ARM based SOCs. ARM7 is most successful and widely used processor family in embedded system applications. So we have decided to choose Also, ARM7 is a balance between classic and new Cortex series. ARM7 is excellent to get start with in terms of resources available on internet and quality documentation provided by NXP.The present project is implemented on Keil µvision. In order to program the device, Proload tool has been used to burn the program onto the microcontroller.

IoT

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low -- or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS), microservices and the internet. The convergence has helped tear down the silo walls between operational technology (OT) and information technology (IT), allowing unstructured machine-generated data to be analyzed for insights that will drive improvements.

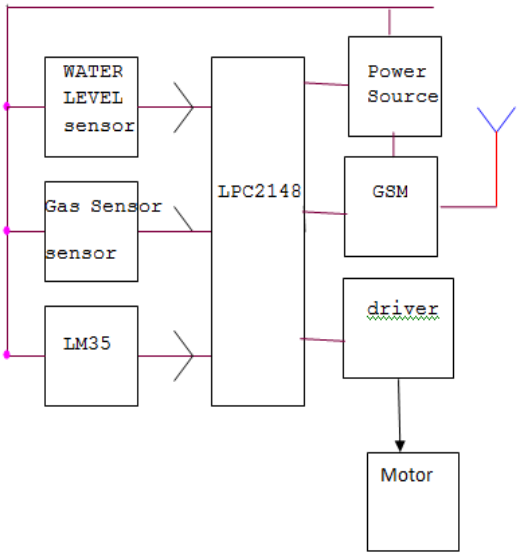

Fig 3: Block Diagram of proposed System.

Sensors

A sensor unit basically consists of several sensors used to detect the predetermined parameters that indicate the quality of water. In this work, three types of sensor; ***Gas Sensor*** that senses the acidity or basicity of the water, ***temperature sensor*** that senses the temperature of the water, and ***turbidity sensor*** that senses the turbidity/purity level of water based on phototransistor are used. All the sensors use battery for their operation. The information being sensed by the sensors is then converted into electrical signal and then it is passed to a microcontroller or microprocessor that processes it to the value understandable by humans. Sensitive material of MQ-2 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exists, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electronic circuit, convert change of conductivity to correspond output signal of gas concentration. MQ-2 gas sensor has high senility to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

Its has Good sensitivity to Combustible gas in wide range, High sensitivity to LPG, Propane and Hydrogen, Long life and low cost, Simple drive circuit. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical

accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. The reed switch is an electrical switch operated by an applied magnetic field. For measuring the patient's activity and guarding against the possibility of falling down, an ADXL213 Accelerometer Sensor is used. It's low cost, ±1.2g Dual and measures both static (Gravity) and dynamic acceleration(MEMS).

The accelerometer is used in order to determine whether the patient is stable and is in good position (standing or sitting) or has fallen down (sudden vertical change of the position). This sensor provides a digital output. The Duty cycles of the digital signals are proportional to acceleration and the typical noise floor is 160 g/Hz. The technique of tank water level sensing system monitoring concentrated with some basic parts which are softly aggregated together in our proposed method. The water level sensor is a reliable circuit. It takes over the task of indicating the water level in the overhead water tanks. It is being used to detect liquid level, as the liquid to be measured either can be inside a water tank. In the present method of ARM Controller is used to control the all the sensors in contrast. And also there is no auto lock system in that MCU. The proposed method completely overcomes the drawback present in existing system by using predominant wireless sensor network.

Advantages of Proposed System:

- We are able to stops the motor everywhere in the world using IoT.
- Economical.
- Easy to maintain. (No need of Specialists)
- Highly Efficient.

IV. RESULTS

From figure 4 clear image of parameter measurements which are needed in medical, small and medium enterprises or anything in optimal way of acquiring data. The system tackle down patient behavior and machinery monitoring. The developed prototype perfectly suitable, computes with high speed as well. This system enables us to simplify our job in more desirable way. We can monitor each and everything from anywhere in the world. In this system, tried to measure different parameter like temperature, water level, Smoke detection or CO2,and Turbidity of the water based things as well.

Fig 4: Screen shots and Hardware kit images of implemented Health care monitoring system.

V. CONCLUSION & FUTURE SCOPE

Water is one of the most important basic needs for all living beings. But unfortunately a huge amount of water is being wasted by uncontrolled use. The main issue that is being addressed in this project is about developing an efficient wireless sensor network (WSN) based water monitoring system. Three different ways to monitoring the water such as water level monitoring, water pollution monitoring. Finally the thesis water monitoring system of smart homes/office research concept will be completed by using wireless sensor technology. The future scope of this project is to add the more sensors and in the proposed system we can able to control the water flow only by switch on or off the motor through out the world. So control the Pollution of the water also control through IoT.By using the monitoring system we can easily prevent the wastage of water and the water will be save to our next generations.

REFERENCES

[1] Benini.L (2013), "Designing nextgenerationsmart sensor hubs for theInternet of- Things," in Proc. 5th IEEE Int.Workshop Adv. Sensors Interfaces, p. 113. Aug 2013.

[2] Cheong.P , "A ZigBee-based wireless sensornetwork node for ultraviolet detection offlame," IEEE Trans. Ind. Electron., vol. 58,no. 11, pp. 5271–5277. Feb 2011.

[3] Hanzalek.Z and Jurcik.P, "Energy efficientscheduling for cluster-tree wireless sensornetworks with time-bounded data flows:Application to IEEE 802.15. 4/ZigBee,"IEEE Trans. Ind. Informat., vol. 6, no. 3, pp.438–450. Jan 2010

[4] LazarescuM.T,(2010) "Design of a WSNplatform for long-term environmental monitoring for IoT applications," IEEE J. Emerg. Sel. Topics Circuits Syst., vol. 3, no. 1, pp. 45–54.

[5] Lee K.C, "IEEE-1451-based smart modulefor in-vehicle networking systems of intelligent vehicles," IEEE Trans. Ind.Electron., vol. 51, no. 6, pp. 1150–1158. Aug 2004.

[6] Li.L, Da Xu.L, and Wang.X,"Compressedsensing signal and data acquisition inwireless sensor networks and internet ofthings," IEEE Trans. Ind. Informat., vol. 9,no. 4, pp. 2177–2186. June 2013.

[7] [7] Estuary Ethier, Bedard, Jeannette " Development of a Real-Time Water Quality Buoy" for The Fraser River Estuary http://axystechnologies.com/wpcontent/uploads/2013/11/Development-of-a-real-time-water-quality-buoy-for-the-fraser-river-estuary.pdf

[8] [8] Bergant, A., Tusseling, A.S., Vitkovsky, J.P., Covas, D.I.C., Simpson, A.R., Lambert, M.F. (2008) "Parameters affecting water-hammer wave attenuation, shape and timing – Part 1: mathematical tools," Journal of Hydraulic Research, 46(3), 373–381. [9] Misiunas, D., Vitkovskyt', J.P., Olsson, G., Simpson, A.R., Lambert, M.F. (2003) "Pipeline burst detection and location using a continuous monitoring technique," Proc. Intl. Conf. on Computing and Control for the Water Industry (CCWI), 89–96. [10] Misiunas, D., Lambert, M., Simpson, A., Olsson, G. (2005) "Burst detection and location in water distribution networks," Water Science and Technology: Water Supply, 5(3–4), 71–80. [11] W. Ye, J. Heidemann, and D. Estrin, "An Energy-Efficient MAC Protocol for Wireless Sensor Networks," Proceedings of IEEE INFOCOM, June 2002. [12] G. Lu, B. Krishnamachari, and C. Raghavendra, "An Adaptive Energy Efficient and Low-Latency MAC for Data Gathering in Sensor Networks," IEEE WMAN, April 2004. [13] R.E. Shaffer, S.L. Rose-Pehrsson, R.A. McGill, "A comparison study of chemical sensor array pattern recognition algorithms", Anal. Chim.Acta 384 (1999) 305–317.

[9] [14] Roderick L. Shepherd, William S. Yerazunis and Senior Member, "Low-Cost Surface Mount LED Gas Sensor", IEEE King Tong Lau and Dermot Diamond, Sensors-00997, 2005.

[10] [15] T. S. Aye, and Z M. Lwin, "Microcontroller Based Electric Expansion Valve Controller for Air Conditioning System", World Academy of Science, Engineering and Technology, 2008. [16] D. Ganesan, B. Krishnamachari, A. Woo, D. Culler, D. Estrin, and S. Wicker, "Complex Behavior at Scale: An Experimental Study of Low-Power Wireless Sensor Networks," UCLA CS Technical Report UCLA/CSD-TR 02-0013, 2008.

[11] [17] J Goldman and D Estrin ,"Distributed Sensing System for Water Quality Assessment and Management", Feb 1, 2010, pp 312-356.

[12] [18] R. R.Lakhe, "Wireless Network Using Zigbee for Water Monitoring" , International Journal of Engineering research and Applications (IJERA), 2008,http://www.ijera.com/special_issue/VNCET_Mar_2012/55.pdf

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