AN INTELLIGENT SYSTEM TO MAINTAIN WATER QUALITY USING INTERNET OF THINGS

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Abstract : An efficient0way of water quality monitoring (WQM) are critical implementation for the issue of polluted water globally, with increasing in the development of Wireless Sensor Network (WSN) technology in the Internet of Things (IoT) environment and real time water quality monitoring is remotely monitored by means of real-time data acquisition and computation. IOT is developing rapidly and widely applied in all wireless environments. In this paper, sensor technology and wireless networks integration of IOT technology has been studied and reviewed based on the polluted water. A combined approach with internet and wireless communications, Remote Monitoring System (RMS) is proposed. Major objective is to collect real time data of polluted water environment and provides easy access for agricultural facilities such as alerts through Short Massaging Service (SMS) and advices on elements. Renesas microcontroller is the main heart of the whole system. Temperature, water level, turbidity etc., will alert the user via GSM module. Data collected from sensors are stored in cloud using Amazon web service (AWS).

IndexTerms - WQM, WSN, SMS, AWS, IOT, RMS.

I. INTRODUCTION

The requirement of building an automation system for an office or home is increasing day-by-day. Researchers are working to build efficient and economic automatic systems to control different machines like lights, fans, air conditioners based on the requirement. Automation makes an efficient use of the electricity and water and reduces much of the wastage. This sensors are used in different aspects such as environmental monitoring, surveillance in development of city infrastructure, health care industries etc., The WSN consists of sensors for computing and embedded computing systems for connectivity. The WSN is not only limited to Temperature and turbidity it also includes Global System for Mobile communication (GSM) and General Packet Radio Service (GPRS) and it can also be used to measure pH value of water, temperature and turbidity. This paper presents an intelligent way to maintain water quality system for polluted or drinking water. GSM is used to control the system wirelessly while embedded C programming language is used for automation purpose. This paper contributes an efficient and fairly cheap automation irrigation system. System once installed has no maintenance cost and is easy to use. Data collected from sensors are stored in cloud using Amazon web service (AWS). Amazon Elastic Compute Cloud (Amazon EC2) EC2 provides scalable computing capacity in the Amazon Web Services (AWS) cloud. Using Amazon EC2 eliminates your need to invest in hardware up front, so you can develop and deploy applications faster. You can use Amazon EC2 to launch as many or as few virtual servers as you need, configure security and networking, and manage storage. Amazon EC2 enables you to scale up or down to handle changes in requirements or spikes in popularity, reducing your need to forecast traffic.

Amazon EC2 has main features such as, Virtual computing environments, known as instances, Preconfigured templates for your instances, known as Amazon Machine Images (AMIs), that package the bits you need for your server (including the operating system and additional software), Various configurations of CPU, memory, storage, and networking capacity for your instances, known as instance types, Secure login information for your instances using key pairs (AWS stores the public key, and you store the private key in a secure place), Storage volumes for temporary data that's deleted when you stop or terminate your instance, known as instance store volumes. Persistent storage volumes for your data using Amazon Elastic Block Store (Amazon EBS), known as Amazon EBS volumes. Multiple physical locations for your resources, such as instances and Amazon EBS volumes, known as regions and Availability Zones. A firewall that enables you to specify the protocols, ports, and source IP ranges that can reach your instances using security groups. Static IP addresses for dynamic cloud computing, known as Elastic IP addresses.

II. RELATED WORKS

2.1 A Review of sensor networks: Technologies and applications.

Sensor network is a group of nodes which gathers data according to their specialty. The node contains the power source, microprocessor, external memory, sensors, analog to digital converter and transceivers. Microprocessors in the nodes perform the necessary operation on data prior to send it to the remote station. Microprocessor has limited internal memory. So the external memory is also provided in the node to store the sensing data. Sensors are the physical devices which collects the environmental data as the analog signal. Then this data is converted into the digital with the help of analog to digital converter present in the node. Transceiver is the device in the node which receives the control signal from the sender and sends the operator data from the sensors to the remote station.

2.2 New Generation Sensor Web Enablement

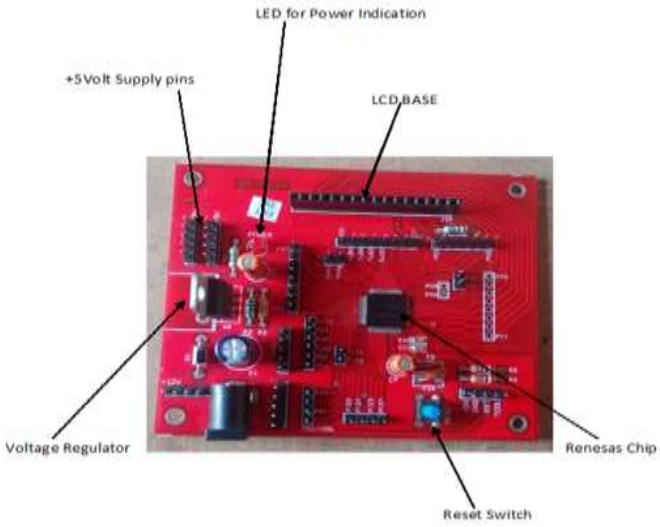
Many sensor networks have been deployed to monitor Earth's environment, and more will follow in the future. Environmental sensors have improved continuously by becoming smaller, cheaper, and more intelligent. Due to the large number of sensor manufacturers and differing accompanying protocols, integrating diverse sensors into observation systems is not straightforward. A coherent infrastructure is needed to treat sensors in an interoperable, platform-independent and uniform way. The concept of the Sensor Web reflects such a kind of infrastructure for sharing, finding, and accessing sensors and their data across different applications. It hides the heterogeneous sensor hardware and communication protocols from the applications built on top of it. The Sensor Web Enablement initiative of the Open Geospatial Consortium standardizes web service interfaces and data encodings which can be used as building blocks for a Sensor Web. This article illustrates and analyzes the recent developments of the new generation of the Sensor Web Enablement specification framework. Further, we relate the Sensor Web to other emerging concepts such as the Web of Things and point out challenges and resulting future work topics for research on Sensor Web Enablement.

2.3 The design of wireless remote monitoring system of water supply based on GPRS

A wireless remote monitoring system of water supply based on GPRS had been designed and realized, and it has the advantage of low cost, easy to realize and convenient to maintain, etc. Firstly, the terminal system concentrated the correlative information of sensors by the RS485 line, then through the GPRS and Internet network the relative information of water level, pressure and flux would be sent over to the monitoring center, at last the monitoring center would give command to terminal equipment according to the information. The whole system is simply and reliable testified by experiment. General Packet Radio Service (referred as GPRS), is a kind of new Packet data load, and a mobile data service to which GSM mobile phone users are available. Its main features: high resources efficiency, supporting the standard data communications protocol, high transmission rate, short access time, permanent virtual data connection, reasonable pricing, etc. Therefore, GPRS is especially suitable for discontinuous, sudden or frequent, small amounts of data transmission and also applicable to the occasional large amount of data transmission. General Packet Radio Service (referred as GPRS), is a kind of new Packet data load, and a mobile data service to which GSM mobile phone users are available. Its main features: high resources efficiency, supporting the standard data communications protocol, high transmission rate, short access time, permanent virtual data connection, reasonable pricing, etc. Therefore, GPRS is especially suitable for discontinuous, sudden or frequent, small amounts of data transmission and also applicable to the occasional large amount of data transmission.

III. METHODOLOGY

This paper presents proposed model for smart water to develop real time monitoring system for soil properties like temperature, moisture, pH and to implement decision support advisory models for Pest & Disease forewarning and SMS based alerts. It will also be possible to control various operations of the field remotely from anywhere, anytime by mobile as well as web application The system supports water management decision, used for monitoring the whole system with GSM module The system continuously monitors the water level (Water level Sensor) in the tank and provide accurate results of pH values, temperature and turbidity of the water. Every information is stored in the cloud using amazon web service and SMS alerts are given using GSM.



IV. LIST OF SENSORS

3.1 Temperature Sensor

Temperature is a standout amongst the most generally estimated factors and it is in this way not astounding that there are numerous methods for detecting it. Temperature detecting should be possible either through direct contact with the warming source, or remotely, without coordinate contact with the source utilizing transmitted vitality. There are a wide assortment of temperature sensors available today, including Thermocouples, Resistance Temperature Detectors (RTDs), Thermistors, Infrared, and Semiconductor Sensors.

3.2 pH Sensors

In the process word pH is an important parameter to be measured and controlled. 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 -14 gram-equivalents per liter - into numbers between 0 and 14. On the pH scale a very acidic solution has a low pH value such as 0, 1, or 2 (which corresponds to a large concentration of hydrogen ions; 10 x 0, 10 x -1, or 10 x -2 gram-equivalents per liter) while a very basic solution has a high pH value, such as 12, 13, or 14 which corresponds to a small number of hydrogen ions (10 x -12, 10 x -13, or 10 x -14 gram-equivalents per liter). A neutral solution such as water has a pH of approximately 7. A pH measurement loop is made up of three components, the pH sensor, which includes a measuring electrode, a reference electrode, and a temperature sensor; a preamplifier; and an analyzer or transmitter. A pH measurement loop is essentially a battery where the positive terminal is the measuring electrode and the negative terminal is the reference electrode. The measuring electrode, which is sensitive to the hydrogen ion, develops a potential (voltage) directly related to the hydrogen ion concentration of the solution. The reference electrode provides a stable potential against which the measuring electrode can be compared. 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. Output of the measuring electrode changes with temperature (even though the process remains at a constant pH), so a temperature sensor is necessary to correct for this change in output. This is done in the analyzer or transmitter software.

3.3 Renessa microcontroller

Chip is mounted on PCB. Renessa having 64 pins Renesas is a 16 bit microcontroller with 11 ports and 4 channels. Ports: P0 to P7 and P11 – P14 total 11 ports. 32 MHz and10 bit resolution A/D converter. On-chip high-speed (32 MHz to 1 MHz) as well a low-speed

(15 KHz) oscillator is present. Most of the pins of Renessa have multi-task features. Cost of Renessa microcontroller is comparatively less. Rigid body of microcontroller hence less prone to damages due to electrostatic charge and operates at 5 volts power supply.

3.4 GRPS and GSM

General Packet Radio Services (GPRS) is a packet-based wireless communication service that promises data rates from 56 up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users and GSM stands for Global System for Mobile Communications formerly called as Grouped Special Mobile. This is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies for second generation (or "2G") digital cellular networks. The GSM standard initially was used originally to describe switched circuit network for full duplex voice telephony to replace first generation analog cellular networks The standard was expanded over time to include first circuit switched data transport, then packet data transport via GPRS(General packet radio service). Packet data transmission speeds were later increased via EDGE. The GSM standard is succeeded by the third generation (or "3G") UMTS standard developed by the 3GPP. GSM networks will evolve further as they begin to incorporate fourth generation (or "4G") LTE Advanced standards. "GSM" is a trademark owned by the GSM Association.

V. ACKNOWLEDGMENT

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