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Smart Tank Water Monitoring System using IOT Cloud Server at Home/Office

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Abstract:
To ensure the safe supply of drinking water the quality should be monitored in real time for that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed. In this project, we present the design of IOT based water quality monitoring system that monitor the quality of water in real time. This system consists some sensors which measure the water quality parameter such as pH, turbidity, hazardous Gas, dissolved oxygen, water Level. The measured values from the sensors are processed by microcontroller and these processed values are transmitted remotely to the core controller that is PIC Microcontroller using IOT protocol. Finally, sensors data can view on internet browser application using cloud computing. Our project also incorporated with an android application to monitor and control of quality of the water via IOT.

Index Terms: Water quality monitoring, real time, PIC Microcontroller, IOT

I. INTRODUCTION

Water is one of the most important substances on earth. People now days always want something that can make their life easier.. Water quality monitoring is incredibly useful to keep the planet healthy and sustainable. Many transmittable diseases are water born. Most of the fresh water resources located near urban areas are contaminated due to the garbage dumped by the individuals or the release of chemicals from manufacturing industries. Overhead tank is one of the containers used to store drinking water. It was observed that main cause of deterioration in water quality is due to re-growth of microorganisms in overhead tanks and the distribution system, corrosion of pipe material, non-replacement of old pipes. There is a need for continuous real time continuous remote monitoring of water quality parameters within the water system as the concentrations of the pollutants lead to serious health consequences. However, in most areas, the traditional approach of water quality monitoring based on collection of water samples from different sources and subsequent analyses in laboratories is expensive, time consuming and does not allow simultaneous and timely monitoring of the water quality.

This project mainly focuses to develop an indigenous, reliable, flexible WSN water quality monitoring system for in-situ monitoring of the remote water quality across a wireless sensor zone. Wireless Sensor Networks (WSNs) provide a new model for sensing and communicate information from various environments, to serve many and diverse applications. WSN provide significant advantages both in distributed intelligence as well as in cost. On the other hand, installation and maintenance expenses are reduced as it does not require any wiring [1][2]. Wireless sensor network for a water quality monitoring consists of coordinator and number of sensor nodes with networking capability which are deployed at different overhead tanks in an area. Each sensor node consists of an PIC microcontroller, a wireless network connection module and water quality sensors that are able to continuously read the water quality parameters such as Electrical conductivity, pH and temperature are sensed continuously and send data to the base station or data center where the data is logged into central server. Graphic User Interface (GUI) is provided for users to analyze water quality data when water quality detected is below standards. The recorded data can be analyzed using various simulation tools for future correspondence and actions to evaluate the reliability, feasibility and effectiveness of the proposed monitoring system.

II. RELATED WORK

Web based automation is a recent development in the industrial sector. The implementation of industrial process control is made possible by the use of Internet. Due to the advances in the Internet, the ability to acquire information and even to control devices at fingertips over the Internet is becoming desirable to the general public as well as professionals.

This has actually leaded to the concept called “Web Based Supervision and Control System”. The Internet is now providing a new and increasingly important medium for distributing information worldwide without time constraints, permitting information to be displayed numerically and graphically on any client platform. It allows end users to access the real-time data and to control the instruments via a web browser.

III. PROBLEM FORMULATION

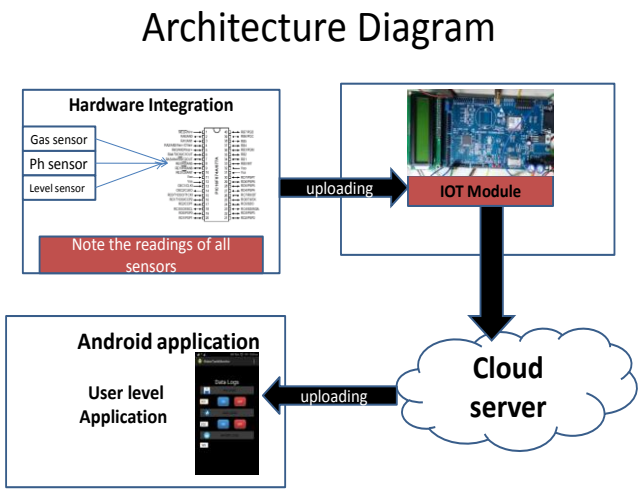
Water is a limited resource and is essential for agriculture, industry and for creature’s existence on earth including human beings. Lots of people don’t realize the true importance of drinking enough water every day. More water is wasted by many uncontrolled way. This problem is quietly related to poor water allocation, inefficient use, and lack of adequate and integrated water management. Therefore, efficient use and

water monitoring are potential constraint for home or office water management system.

IV. PROPOSED SYSTEM

Water pollution monitoring can help with water pollution detection, discharge of toxic chemicals and contamination in water. And also check the quality by using Gas, 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.

V. DETAILED HARDWARE DESIGN



MODULE DESCRIPTION

Module 1: Hardware Integration:

- This module consist of the hardware integration process.
- Integration chip PIC 16F877A is an main device, it collects the readings of the sensor and transfer to IOT module.

Module 2: IOT Module:

- IOT module is an interface between the cloud and the sensors.
- All the details obtained from the MODULE 1 is uploaded in the cloud memory through IOT.

Module 3: Cloud server:

- Using php , Java Script and MySql the data's are transferred to Web server.
- Endusers collect the data from the web server through android application.

Module 4: Android Application:

- Android Application is the direct way to reach the Enduser.
- Public only notice the readings shown in the Application.
- If the harmful environment of the water tank is noticed by the public, there will inform to the concern workers.

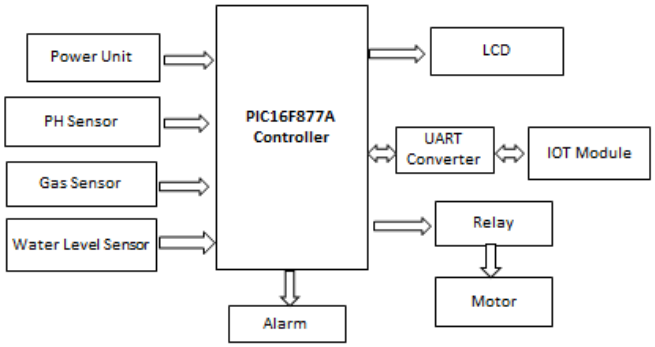


Figure.1. Hardware design

A. Ph Sensor :

PH sensor is a device that measures the hydrogen-ion concentration (ph) in a solution, indicating its acidity or alkalinity. In addition to measuring the ph of liquids, it can also measure the moist and light level. The ph sensor has an inbuilt meter to measure the light intensity.

B. Gas Sensor :

This is a simple-to-use liquefied petroleum gas(LPG) sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm.liquefied petroleum gas(LPG).

C. Water Level Sensor:

Level Sensors detect the level of substances that flow, including liquids, Slurries, granular materials, and powders. The substance to be measured can be inside a container or can be in its natural form. The level measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place. While point-level sensors only indicate whether the substance is above or below the sensing point.

D. PIC Controller:

These devices feature a 14-bit wide code memory, and an improved 8-level deep call stack. The instruction set differs very little from the baseline devices, but the two additional opcode bits allow 128 registers and 2048 words of code to be directly addressed. There are a few additional miscellaneous instructions, and two additional 8-bit literal instructions, add and subtract. The first 32 bytes of the register space are allocated to special-purpose registers; the remaining 96 bytes are used for general-purpose RAM. If banked RAM is used, the high 16 registers (0x70–0x7F) are global, as are a few of the most important special-purpose registers, including the STATUS register which holds the RAM bank select bits. (The other global registers are FSR and INDF, the low 8 bits of the program counter PCL, the PC high preload register PCLATH, and the master interrupt control register INTCON.)

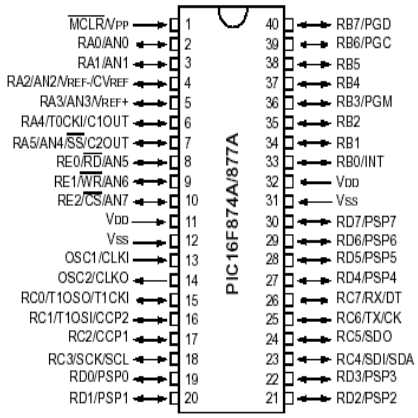


Figure.2. PIC Controller

E. IOT Module:

Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all input UART data to GPRS based online data. Data may be updated to a specific site or a social network by which the user can able to access the data.

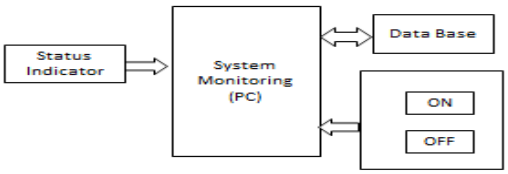


Figure.3. IOT module

F. Relay :

When a current flows through the coil, the resulting magnetic field attracts an armature that is mechanically linked to moving contact. The movement either makes or breaks a connection with a fixed contact.

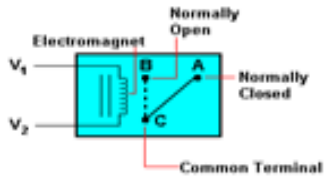


Figure.4. Relay Work

G. Power Unit:

The Essential power needed to the working of sensor is being offered by the power unit which is as shown below in fig.5.

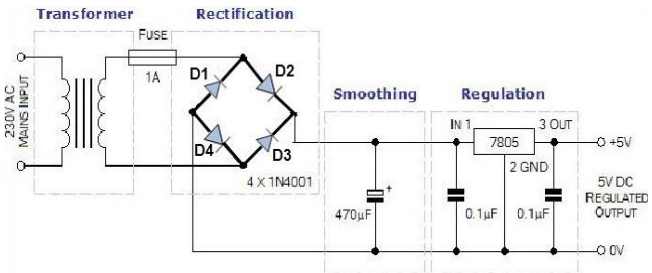


Figure.5. Power Unit

VI. EXPERIMENTAL RESULTS

After the establishment of reliable mesh network, the sensor nodes at different areas starts sensing the respective data and are transmitted to base station. Three physical sensors pH ,EC, water proof DS18B20 Temperature Sensor are connected to Arduino and XBee module is also interfaced to Arduino . The hardware implementation of sensor node and nodes deployed at different overhead tanks are shown in the Fig. 6 below.

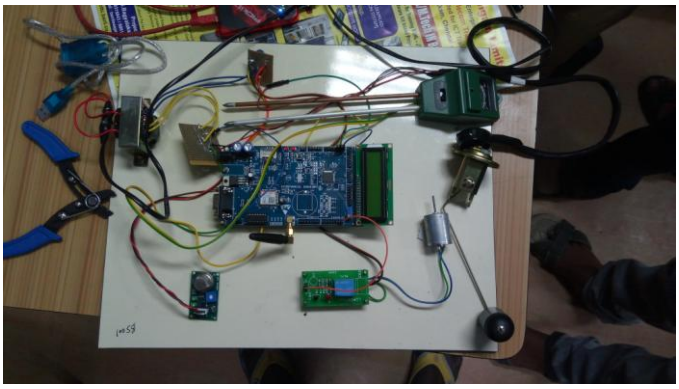


Figure.6. .Node setup at different overhead tanks

VII. CONCLUSION AND FUTURE WORK

In this paper an efficient, real time water quality monitoring system based on IOT is presented. Central base station and nodes are connected through IOT networks and base station is interfaced to internet so that users can login and get the real time water quality data. Future works include the using of more efficient routing algorithms to extend the network to wide area. A future work also lies on Integration of turbidity sensor, dissolved oxygen sensor and color sensor to the sensors used in this work.

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