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Research paper

Internet of Things (Iot) Based Smart Water Quality Monitoring System

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Abstract

The economical and effective system of water quality observation is the toughest implementation of impure water. Drinking water could be terribly precious for all people as water utilities face more challenges. These challenges arise due to high population, less water resources etc. So, different methods are used to monitor in the real time water quality. To make sure that safe distribution of water is done, it should be monitored in real time for new approach in IOT based water quality has been projected. Real time water quality observation is monitored by data acquisition, method and transmission with increase in the wireless device network technology in internet of things. The measured values from the sensors are interfaced by microcontroller and the processed values remotely to the core controller ARM with a WI-FI protocol. This projected water quality observation interfaces sensors with quality observation with IOT setting. WQM selects parameters of water like temperature, pH level, water level and CO2 by multiple different device nodes. This methodology sends the information to the web server. The data updated at intervals within the server may be retrieved or accessed from anyplace within the world. If the sensors do not work or get into abnormal conditions then a buzzer will be ON.

Keywords: *wireless sensor network (WSN), water parameters, Internet of things (IOT), WI-FI.*

1. Introduction

The wireless communication technologies are increased for aiding human's personal and daily tasks. There are many applications developed for building control, automation, data acquisition in recent years. There are many benefits like low cost, easy installation, and maintenance. The remote device network is applicable in several functions like farming, traffic management, remote health care, forest management, security and surveillance [1]. A WSN consists of spread device nodes for sensing, connectivity, computing and signal processing [2].

This system allows user to monitor the devices which are connected together from the bottom station through completely different communication standards like Bluetooth, Zigbee, WIFI, RFID and GPRS [3]. Web of things was developed in parallel to WSN's during which several things are connected into networks from one to different. Jing[4] created a remote wireless watching system for water supply using PIC microcontroller that relies on GPRS. The complexity of the microcontroller architecture is more and the cost is high.

Therefore, to solve these disadvantages, a low cost, low power and system on chip primarily based wireless device node is needed. Purohit and Gokhale [5] created a true time watching system using GSM, Intel, sensors, ADC and LCD. These devices are limited because they are supported advanced dedicated electronic boards [6-8]. There are different WEB applications like RFID tags, smart technique, sensor technique and mobile techniques[9].

2. Literature Review

Wireless sensor networks are also known as wireless sensor and actuator network(WSAN) which is a network consisting of distributed sensors to monitor physical or environmental conditions such as pressure, sound, temperature etc. This system includes a gateway that provides connectivity to the used world and distributed nodes, which can transfer the data through the network to main location. The modern networks are bidirectional in nature and enable the sensor activity.

Jayti bhatt, Jignesh published "Real time water quality monitoring system". This research ensures a safe supply of drinking water. This system consists of different water parameters. The data is processed by microcontroller. At last data from the sensors is viewed in the web server [10]. Ning [11] designed monitoring system for water quality.

3. Existing System

Now a day's water is polluted due to many reasons. In this existing system the equipment cost is high and it takes a lot of time to process. Traditional methods have the disadvantages like complicated methodology, long waiting time for results low measurement precision and high cost. So with the implementation in the technology, we use different methods and techniques to check quality of water. There is a disadvantage in the existing system that the system has high complexity and low performance.

4. Proposed System

In this proposed system the complexity reduces and the performance increases by collecting the data of the water parameters such as temperature, co2, pH, water level. The data collected is updated in the web server which can be retrieved from anywhere in the world.

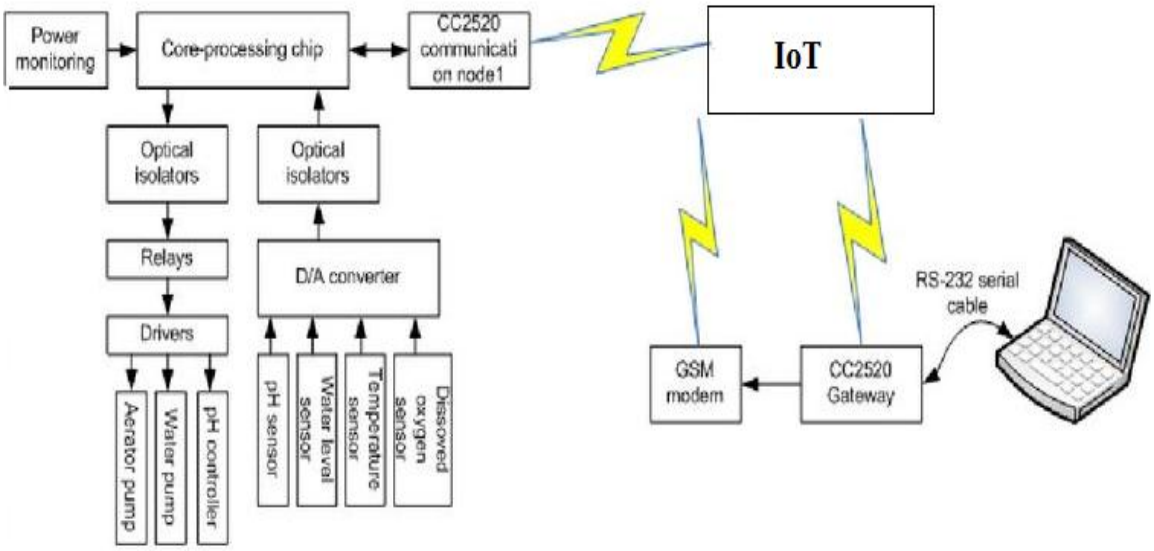


Figure 1: System block diagram

5. Implementation

a)pH Sensor: A pH is an electronic device which is used for measuring the pH level in water. It consists of three types of probes (i) Glass electrode (ii) Reference electrode (iii) combination of gel electrode. pH is defined as the negative logarithm of hydrogen ion concentration in water.

$$pH=-\log[H+]$$

A pH meter consists of special probes which are connected to an electronic meter that would display the reading. If the pH level is less than 7 then it is acidic in nature, if the pH level is greater than 7 then it is alkaline in nature, and generally the range of pH is 0-14pH.

Figure 2: pH sensor

Features

a) Operating range: 0-14
b) Operating temperature: 0-45°c
c) Operating voltage: -5 to 5 v
d) Output voltage: analog

b) CO2 Sensor: The co2 sensor is a device which is used to measure the carbon dioxide in the water. This system uses SKU:SEN0219 to measure the concentration which is a analog infrared co2 sensor. Parts per million (ppm)is the unit which is used for measuring the concentration of co2. One ppm is equivalent to 1 milligram of something per liter of water. The characteristics of this type of co2 sensors are low power consumption, high sensitivity, waterproof, and anti-corrosion, temperature compensation and stability.

Figure 3: CO_2 sensor

Features

a) Operating voltage: 4.5 to 5.5v DC
b) Output signal: Analog output(4-20mA)
c) Digital output: -150mA
d) Measuring range: 0-5000ppm

C) Water Level Sensor: Water level sensor is designed for detecting water level in reservoir and over head tanks. This is widely used in sensing the water leakage, water level and the rainfall. It consists of mainly three parts: 1MΩ resistor, an electronic brick connector and several lines of bare conducting wires. It works by having a series of exposed traces which are connected to ground. This is also interlaced between grounded traces and the sunstrokes. A weak pull up resistor of 1MΩ is present. 1MΩ resistor pulls up the sensor value until a drop of water shorts the sensor trace to the grounded trace. This can measure the water droplet/water size by using a series of exposed parallel wires. The characteristics are it has low power consumption and high sensitivity.

Figure 4: Water level sensor

Features

a) Operating voltage: -3 to 5 V DC
b) Operating temperature: -10°c to 30°c
c) Measuring range: 0 to 15 feet's

D) Temperature Sensor: Temperature sensor is a integrated circuit sensor. The output voltage is linearly proportional to the

centigrade temperature. The LM35 sensor is used in this project because the user cannot convert Kelvin to centigrade temperature. It is not suitable for remote applications and directly measures in Celsius. The applications of the temperature sensor are in microwave, fridges, household devices and air conditioners. It measures not only the heat but also measures cold temperature. They are two types of sensors, they are non contact temperature sensor and contact temperature sensor. Contact temperature sensor is again divided into three types, they are electro mechanical, resistive resistance temperature detectors, and semiconductor based LM35, DS1820 etc.

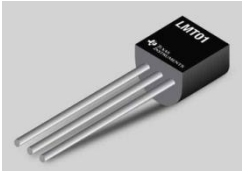


Figure 5: Temperature sensor

e) WI-FI: The WI-FI module used in this project is ESP8266. It follows TCP/IP stack and is a microchip which is less in cost. This microchip allows microcontroller to connect to a WI-FI network, by using Hayes style command connections are done or made through TCP/IP connection. ESP8266 has 1MB of built in flash, single chip devices able to connect WI-FI. Espressif systems are the manufacturers of this module, it is a 32 bit microcontroller. There are 16 GPIO pins in this module. This module follows RISC processor. It has 10 bit DAC. Later Espressif systems released a software development kit(SDK) which is used to programme on the chip, so that another microcontroller is not used. Some of the SDK's are Node MCU, Arduino, Micro Python, Zerynth and Mongoose OS. SPI, I2C, I2S, UART are used for communicating between two sensors or modules. IOT gateway is discussed briefly in [7]

Figure 5.1: Wi-Fi module

6. Flow Chart

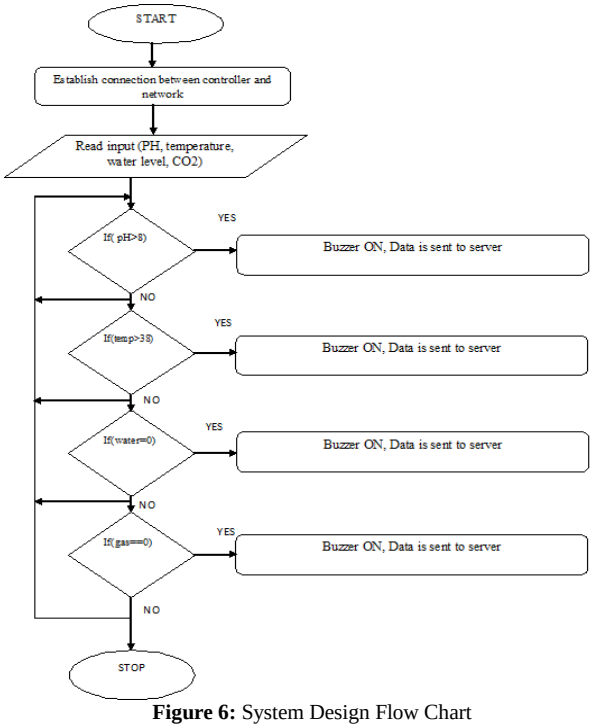


Figure 6: System Design Flow Chart

7. Result

In this WQM system, when the device board is switched ON, the devices get into activated state and will detect the water parameters of individual sensors. Then, the collected data of water parameters are transmitted to the web server wirelessly by using WI-FI module. The data is monitored frequently and displayed on every action because the system is set in a continuous mode. The data is refreshed for every 5 seconds. One hour is selected for the interval of sensing. It reduces power consumption.

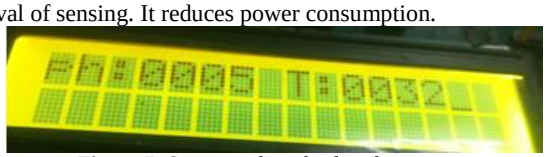
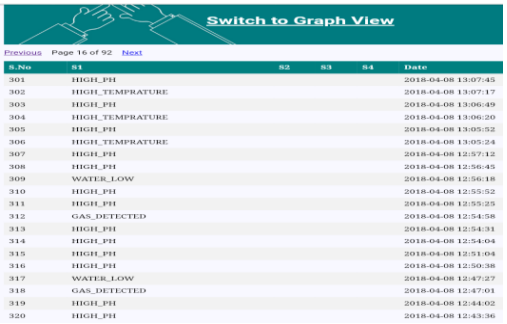


Figure 7: Sensors values displayed on screen



S.No	S1	S2	S3	S4	Date
301	HIGH_PH				2018-04-08 13:07:45
302	HIGH_TEMPRATURE				2018-04-08 13:07:17
303	HIGH_PH				2018-04-08 13:06:49
304	HIGH_TEMPRATURE				2018-04-08 13:06:20
305	HIGH_PH				2018-04-08 13:05:52
306	HIGH_TEMPRATURE				2018-04-08 13:05:24
307	HIGH_PH				2018-04-08 12:57:12
308	HIGH_PH				2018-04-08 12:56:45
309	WATER_LOW				2018-04-08 12:56:18
310	HIGH_PH				2018-04-08 12:55:52
311	HIGH_PH				2018-04-08 12:55:25
312	GAS_DETECTED				2018-04-08 12:54:58
313	HIGH_PH				2018-04-08 12:54:31
314	HIGH_PH				2018-04-08 12:54:04
315	HIGH_PH				2018-04-08 12:51:04
316	HIGH_PH				2018-04-08 12:50:38
317	WATER_LOW				2018-04-08 12:47:27
318	GAS_DETECTED				2018-04-08 12:47:01
319	HIGH_PH				2018-04-08 12:44:02
320	HIGH_PH				2018-04-08 12:43:36

Figure 7.1: Sensor data accessing in web through IOT

8. Conclusion

By using a WI-FI module the interfacing is done between transducers and the sensor network on a single chip solution wirelessly. For the monitoring process the system is achieved with reliability and feasibility by verifying the four parameters of water. The time interval of monitoring can be changed depending upon the need. Ecological environment of water resources is protected in this research. The time is reduced and the cost is low in this environmental management.

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, (2012), pp.165–187.

[2] Heinzelman WR, Kulik J & Balakrishnan H, "Adaptive protocols for information dissemination in wireless sensor networks", *Proceedings of the 5th annual ACM/IEEE international conference on Mobile computing and networking*, (1999), pp.174-185.

[3] Sharma H & Sharma S, "A Review of Sensor Networks: Technologies and Applications", *Recent Advances in,Engineering and Computational Sciences (RAECS)*, (2014) pp.1–4.

[4] Godavarthi B & Nalajala P, "Design and Implementation of Vehicle Navigation System in Urban Environments using Internet of Things (IoT)", *IOP Conf. Series: Materials Science and Engineering*, Vol.225, (2017).

[5] Jing M, "The Design of Wireless Remote Monitoring System of Water Supply Based on GPRS", *International Symposium on Computer Science and Society (ISCCS)*, (2011), pp.29-31.

[6] Purohit A & Gokhale U, "Real Time Water Quality Measurement System based on GSM", *IOSR Journal of Electronics and Communication Engineering*, Vol.9, No.3, (2014), pp.63-67.

[7] Chen S, Xu H, Liu D, Hu B & Wang H, "A vision of IoT: Applications, challenges, and opportunities with china perspective", *IEEE Internet of Things journal*, Vol.1, No.4,(2014), pp.349-359.

[8] Nalajala P, Godavarth B, Lakshmi Raviteja M & Simhadri D, "Morse code Generator Using Microcontroller with Alphanumeric Keypad", *International Conference on Electrical, Electronics, and Optimization Techniques*, (2016), pp.762-766.

[9] Stankovic JA, "Research directions for the Internet of Things", *IEEE Internet Things J.*, Vol.1, No.1, (2014), pp.3–9.
[10] Nalajala P & Bhagya Lakshmi S, "A Secured IoT Based Advanced Health Care System for Medical Field using Sensor Network", *international journal of engineering &Technology*, Vol.7, (2018), pp.105-108.
[11] Bhatt J & Patoliya J, "Iot Based Water Quality Monitoring System", *IRFIC*, (2016).
[12] Rao T, Ling Q, Yu B & Ji H, "Estimate the densities of pollutions in water quality monitoring systems based on UV/vis spectrum", *The 26th Chinese Control and Decision Conference*, (2014), pp. 2984-2989.