International Journal of Research in Circuits, Devices and Systems

E-ISSN: 2708-454X
P-ISSN: 2708-4531
IJRCDS 2023; 4(1): 01-05

www.circuitsjournal.com
Received: 05-10-2022
Accepted: 04-11-2022

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Water quality monitoring system using internet of things

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Abstract
Water pollution has been an increasing problem over the last few years. Water personal satisfaction may be a standout amongst those primary variables with control wellbeing and the state for sicknesses "around kin what's more animals. Lakes and waterways would those fundamental wellsprings about drinking water, which impressively rely on upon water personal satisfaction (refers of the physical, chemical, What's more living aspects about water). The objective of this water quality monitoring system using internet of things is to find the quality of the water i.e., how the pH content varies and sending message to the corresponding authorities. We are going to implement this project at municipal water tanks and drinking water reservoir. For that we are using an Arduino board for finding pH value and GSM module for message technique. We use a led display to have continuous observation on water parameters. Finally, the user gets message of pH value of water Further we extend this project by sending the sensor data to cloud for global monitoring of water quality. Water contamination will be those sullying about water figures (Lakes, rivers, oceans, aquifers what's more groundwater). To provide pure water for marine animals, using wireless oxygen sensor network system quality of water can be detected. In order to estimate the pollution content in and amount of oxygen level in the water for future purification of water. At the oxygen centralization surpasses those ordinary extent our convenient oxygen focus identification What's more screen framework will inform the client promptly. This plan is simple will perused Also know the extent to which oxygen centralization will be exhibit buzzing around.

Keywords: Wireless Sensor Network (WSN), Water parameters, Internet of Things (IoT), Wi-Fi

1. Introduction
The wireless communication technologies are increased for aiding person's individual and regular responsibilities. 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. The "wireless sensor network" contains connectivity, computing and signal processing, and spread device nodes for sensing. This framework permits the user to display the devices which are connected from the bottom station through completely dissimilar communication principles such as "Bluetooth, Zigbee, WIFI, RFID and GPRS". IoT was established in parallel to WSN's during which several things are associated with networks from one to different. Jing 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. So, we 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. There are different WEB applications like RFID tags, smart technique, sensor technique and mobile techniques.

2. Literature Review
Wireless sensor networks are also known as "Wireless Sensor and Actuator Network (WSAN)" that is a network containing" distributed sensors" to observe the environmental or physical situations like pressure, sound, temperature, etc. This system contains a gateway, which offers connectivity to the used world and distributed nodes, which can transfer the information through the network to main position. The existing networks are bidirectional i

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 microcontroller processes the data. At last data from the sensors is viewed on the web server. Ning designed a monitoring system for water quality.

3. Existing System

Now a day's water is polluted due to many reasons. In this current system, the equipment cost is high, and it takes a lot of time to process. Traditional methods have the drawbacks such as long waiting time for results high cost, low measurement precision, and complicated methodology. So, with the implementation in the technology, we use different methods and techniques to check the 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 like temperature, water level, co2, pH. The information collected is updated on the web server that can be retrieved from anywhere in the world.

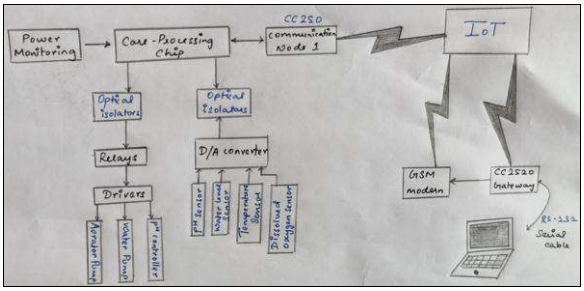
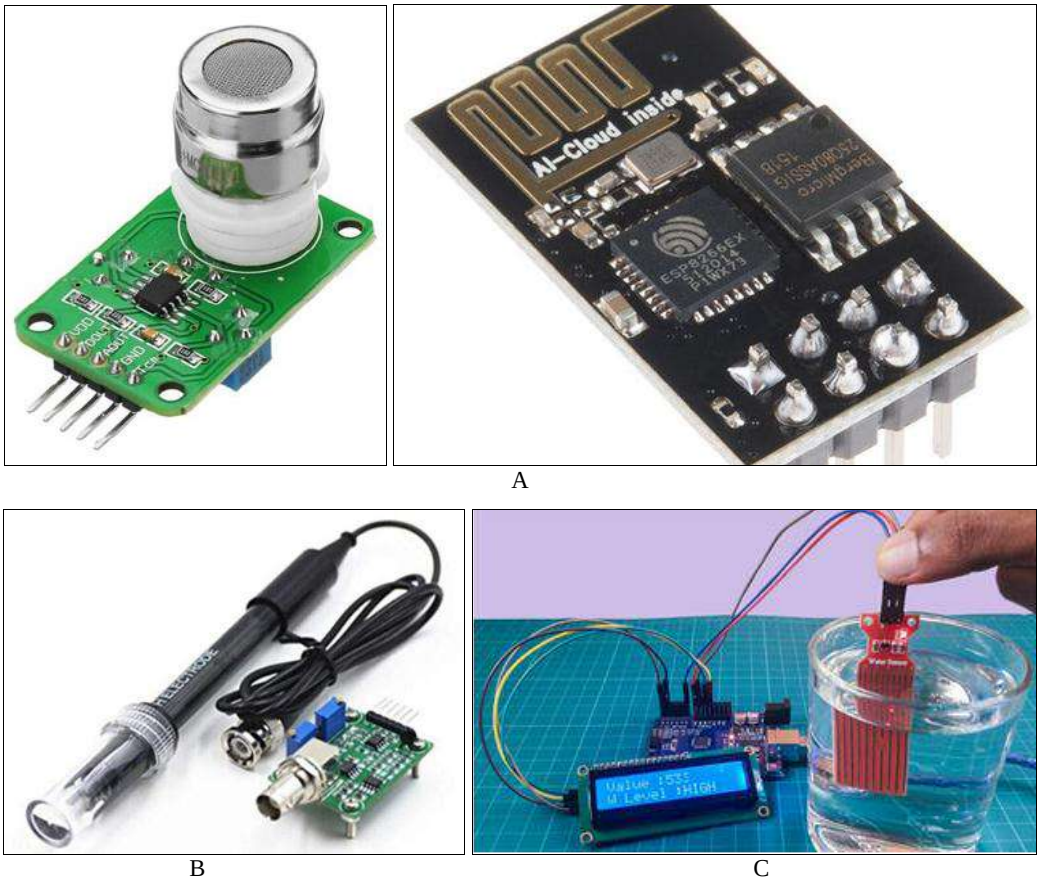


Fig 1: Block Diagram for proposed system
System Block Diagram can be found in figure 1.

5. Implementation

a) Water Level Sensor: "Water level sensor" is designed for detecting the water level in the reservoir and overhead tanks. This is generally utilized in sensing the water leakage, water level, and the rainfall. It consists of mainly three parts: 1MΩ resistor, an electronic brick connector and numerous lines of bare conducting wires. It works by having a series of "exposed traces" that are associated 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 till a drop of water shorts the sensor trace to the grounded trace (refer figure 2).



A

B C

Fig 2: Diagram for Sensor (a), wifi (b) and ph sensor (c)

This can measure the water droplet/water size by using a series of "exposed parallel wires". The characteristics are it has high sensitivity and low power consumption. Few Features are:

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

b) 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 the 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. Espress if systems are the manufacturers of this module, and it is a 32-bit microcontroller. There are 16 GPIO pins in this module. This module follows the RISC processor. It has 10 bit DAC. Later Espress if systems released a software development kit(SDK) which is used to program 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 Result Section.

c) pH Sensor: A pH is an electronic device which is used for measuring the pH level in the water. It consists of three types of probes **(i) Glass electrode (ii) Reference electrode (iii) combination of gel electrode.** pH is described 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 greater than 7 then it is alkaline in nature, if the pH level is less than 7 then it is acidic in nature, and generally the range of pH is 0-14pH.

Features:

- Operating range: 0-14
- Operating temperature: 0-45°*c*
- Operating voltage: -5 to 5 v
- Output voltage: analog

d) 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 an analog infrared co2 sensor. Parts per million (ppm) is the unit which is used for measuring the concentration of co2. One "ppm (parts per million)" is equal 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.

Features:

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

e) Temperature Sensor: This sensor is an "integrated circuit sensor". The yield voltage is linearly proportional to the Celsius 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 the microwave, fridges, household devices, and air conditioners. It measures not only the heat but also measures cold temperature. They are two categories of sensors; they are "contact temperature sensor" and "non-contact temperature sensor". Contact temperature sensor is again divided into three types; they are electromechanical, resistive resistance temperature detectors, and semiconductor-based LM35, DS1820, etc (refer figure 3).

Fig 3: Diagram for temperature Sensor

6. Flow chart

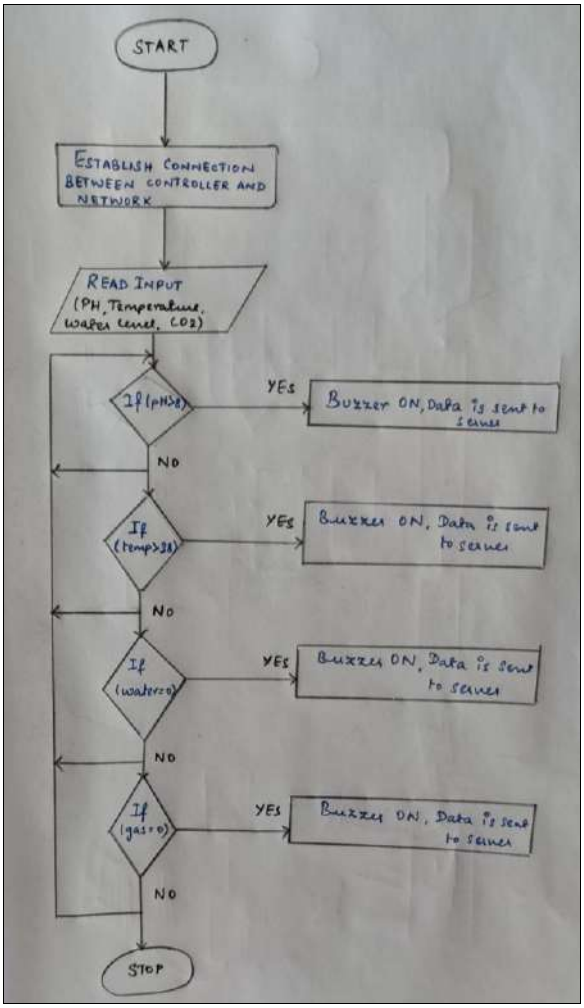


Fig 4: Flow chart

7. Result

In this WQM framework, when the device board is switched ON (refer figure 4), the devices get into activated state and will discover the water parameters of individual sensors. Then, the composed data of water parameters are transmitted to the web server wirelessly by using WI-FI module. The information is monitored frequently and presented in every action because the framework is set in a continuous mode. The information is refreshed for every 5 seconds. One hour is selected for the interval of sensing. It reduces power consumption.

Sensor Data (refer figure 5)

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

Fig 5: Access data 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 might be changed depending upon the necessity. Ecological environment of water resources is protected in this research. The time is reduced, and the cost is low in this environmental management.

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