IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 6, June 2023

DOI: 10.17148/IJARCCE.2023.12627

IMPLEMENTATION OF AUTOMATIC DOMESTICWATER QUALITY MONITORING & DISTRIBUTION CONTROL

Trishala Bhisikar[1], Aakanksha Nimje[2], Yogesh Nandanwar[3], Tanuja Patil[4]

Department Of Electronics and Telecommunication, K. D. K. Collage of Engineering, Nagpur, India[1-4]

Abstract: This study takes a low-cost, all-encompassing approach to the issue of water quality monitoring for both consumer sites and drinking water distribution networks. We intend to construct sensor nodes for on-the-spot pipe monitoring, calculation of water delivery,and water quality measurement. Multiple in-pipe electrochemical and optical sensors make up the principal sensor node, which places a focus on cheap cost, light weight implementation, and reliable long-term operation. This method enables a sensor network method fordelivering spatiotemporally rich data to water customers, water businesses, and regulators and is ideal for large-scale deployments. A sensor array is constructed based on chosen characteristics, together with various microsystems for equivalent signal conditioning, processing, and logging.

Keywords: IoT, NodeMCU ESP8266, Arduino, pH sensor, TDS sensor, Solenoidal valve.

I. INTRODUCTION

For people, clean drinking water is the most important resource. Any disparity in water quality would have a negative impact on people'shealth. Due to scarce water supplies, climate change, an expanding population, and pollution, drinking water utilities today are confronted with a number of difficulties in real time. Therefore, improved approaches for monitoring water quality in real time are required. According to a recent WHO assessment, 21% of ailments are linked to dirty water in India, where 77 million people suffer from problems associated to hazardous drinking water. According to WHO estimates, diarrhoea causes 1600 deaths every day in India.

The traditional method of water quality monitoring is manually collecting water from various locations, and then testing that water in alab. This method is time-consuming and expensive [1–5]. Although there are numerous shortcomings with the present approaches, including: a) laboriousness; b) the lack of real-time information on the quality of the water; c) inadequate spatial coverage; and d) the absence of a controlling unit to regulate the water's flow in the pipeline for the safe delivery of drinking water. For the management ofwater treatment facilities and source water surveillance, online water monitoring technologies have advanced significantly. The installation and calibration of a sizable, dispersed array of monitoring sensors comes at a considerable expense when using their technology.

This research built and constructed an IoT-based water quality monitoring system by focusing on the aforementioned problems. In ourapproach, sensors are used to measure the physical and chemical characteristics of the water. The core controller processes the sensed values. The design's primary controller is the NodeMUC model. The Internet of Things module accesses processed data from the maincontroller. With a particular IoT account, the sensed data can be seen in a web browser. Through IoT, water flow in the pipeline is managed depending on water quality. Additionally, control and monitoring are carried out utilising a mobile device and the Wi-Fi provided by an IoT module.

II. SYSTEM OVERVIEW

The proposed SWQM system is able to read data from water samples by sensors through the microcontroller and analyze them using machine learning algorithm to predict water quality. Four separate sensors are connected to a controller in the proposed block architecture of the SWQM system in Fig. 1 in order to measure four critical physical characteristics of water samples: pH, temperature, conductivity, and turbidity. Any solution's acidity or alkalinity can be determined with the pH sensor SEN0161 on a logarithmic scale.The digital temperature sensor DFR0198 provides accurate reading between –55 to 125ºC. To measure the electrical conductivity of water sample, the analog sensor DFR0300 is utilized. The recommended detection range of this sensor is 1 to 15 ms/cm within a temperature between 0-40ºC. Turbidity sensor SEN0189 is used in the design to detect the presence of suspended particles by using light. The extracted data from these sensors are accessed by the controller Arduino-uno and transfer them to the developed desktop application. Machine

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁝ Impact Factor 8.102 ⁝ Peer-reviewed / Refereed journal ⁝ Vol. 12, Issue 6, June 2023
DOI: 10.17148/IJARCCE.2023.12627

learning algorithm is implemented at the backend to predict the water quality based on the measured data. The rapid forest binary classification technique is used since the system will predict whether the test water sample is "Drinkable" or "Not Drinkable". A total of 60 distinct water samples have been gathered from neighbouring soft drink, tap, and filter sources. For the experimented data, the created system's prediction accuracy is compared.

III. METHODOLOGY

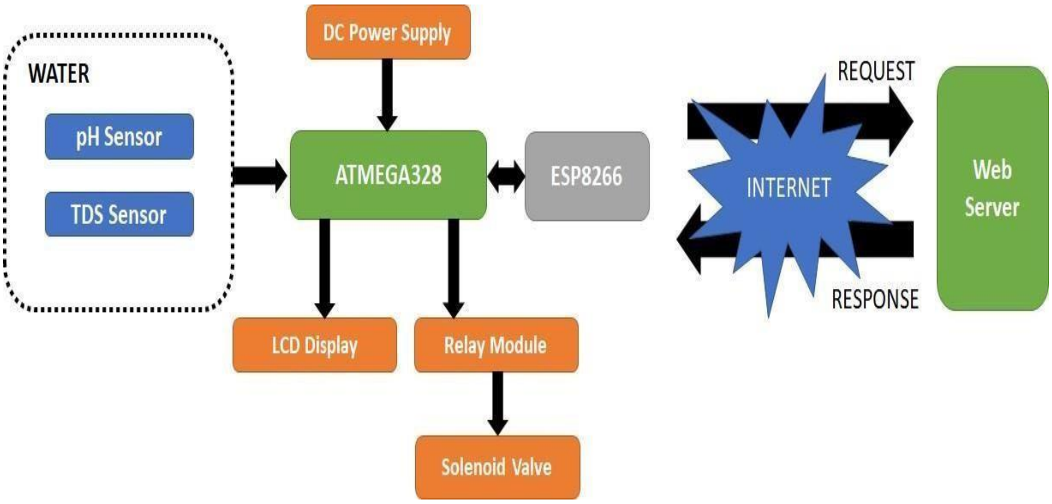


Fig: 1

The entire system's architecture is based in large part on IOT, a recently popularised concept in the field of development. The main components are divided into two categories: hardware and software. The hardware component includes sensors that assist in measuringreal-time values, an Arduino atmega328 that transforms analog values into digital ones, an LCD that displays sensor output, and a Wi-Fi module that connects the hardware and software. In terms of software, we created an application using embedded C.

At the initial stage of construction, the PCB is designed, and components and sensors are mounted on it. When the system is turned on,DC is supplied to the kit, Arduino, and Wi-Fi. Water parameters are examined one by one, and the LCD shows the results. The app thatcamera with the hotspot. provides the precise value that is shown on the kit's LCD. As a result, when the kit is placed near a body of water and Wi-Fi is available, we can view its real-time value on our Android phone from any location and at any time.

Due to its broad operational temperature range, the ESP8266 may regularly function in industrial settings. The chip's highly integratedon-chip functionality and low number of external discrete components make it reliable, small, and sturdy. Antenna switches, RF baluns, power amplifiers, low-noise receive amplifiers, filters, power management modules, a 32-bit Ten silica processor, common digital peripheral interfaces, and more are all included in the ESP8266. Our ESP8266 contains every one of them in a single, compact package.

ESP8266, a device designed for mobile devices, wearable electronics, and Internet of Things activities, uses a combination of several different technologies to achieve low power consumption. The power-saving armature features three modes of operation active mode, sleep mode, and deep sleep mode. This allows battery-powered devices can operate for longer.

A Ten Silica L106 32-bit RISC processor, with an ultra-low power need and a top clock speed of 160 MHz, is integrated into the ESP8266 microcontroller. Operating System for Real-Time (RTOS) and Wi-Fi stack allow about 80% of the processing power to be available for the development and programming of stoner operations.

Because of their compact size and integrated antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power operation modules at the SOC level, ESP8266 modules are easily integrated into devices with limited space. ESP8266 modules can work with ESP-AT firmware to provide Wi-Fi connectivity to external host MCUs, or as autonomous MCUs with an RTOS-basedSDK that can natively run connectivity applications. In both operation modes, customers can take advantage of using features like out-of-box cloud connectivity, powerless operation, and Wi-Fi

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

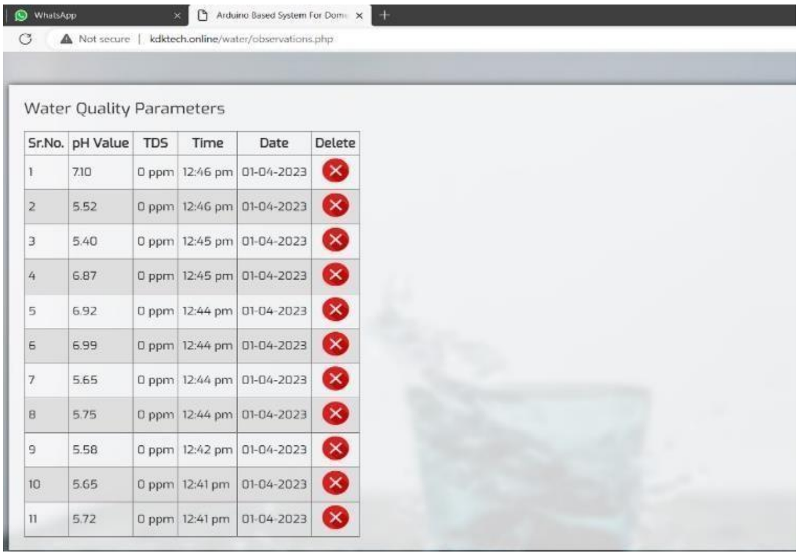
International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁘ Impact Factor 8.102 ⁘ Peer-reviewed / Refereed journal ⁘ Vol. 12, Issue 6, June 2023

DOI: 10.17148/IJARCCE.2023.12627

security support, including WPA3.Virtual RISC (AVR) microcontroller. It supports 8-bit data processing. atmega328 has 32KB internal flash memory.1 KB Electrically Erasable Programmable Read-Only Memory is available in the ATmega-328 (EEPROM). This property shows if the electric Power supplied to the microcontroller is removed, even then it can store the data and can provide results after supplying it with the electric power. Moreover, the atmega328 includes a 2 KB Static RAM (SRAM). Other characteristics will be explained later. atmega328 has several different characteristics which make it the most popular device in today's market. These features consist of advanced RISC architecture, accomplishment, consumption of little energy, real timer counter having a separate oscillator, 6 PWM pins, programmable Serial USART, programminglock for software security, throughput up to 20 MIPS, etc. more information regarding the atmega328 will be provided in this section.

IV. RESULT


WhatsApp
Arduino Based System For Dom
Not secure | kdktech.online/water/observations.php

Water Quality Parameters

Sr.No.	pH Value	TDS	Time	Date	Delete
1	7.10	0 ppm	12:46 pm	01-04-2023	
2	5.52	0 ppm	12:46 pm	01-04-2023	
3	5.40	0 ppm	12:45 pm	01-04-2023	
4	6.87	0 ppm	12:45 pm	01-04-2023	
5	6.92	0 ppm	12:44 pm	01-04-2023	
6	6.99	0 ppm	12:44 pm	01-04-2023	
7	5.65	0 ppm	12:44 pm	01-04-2023	
8	5.75	0 ppm	12:44 pm	01-04-2023	
9	5.58	0 ppm	12:42 pm	01-04-2023	
10	5.65	0 ppm	12:41 pm	01-04-2023	
11	5.72	0 ppm	12:41 pm	01-04-2023	

Fig: 2

To demonstrate the quality of water, the pH sensor and EC sensor is put into a container filled with tap water, to which 3- 4 drops of acid is added. We can see that the pH of the water remains at around 3 to 4.5 means the water is acidic in nature. The temperature of the surrounding stays between 32 to 34 degrees. The conductivity of water is at 7 to 9 micro Siemens/centimeter. Total Dissolved Solids are 0.67*electrical conductivity which can be measured from the experimental results, the pH value for drinking water was obtained inthe range6.7-7.2 which was found to be within the range prescribed by the Indian Standards Institution i.e.6.5-8.5. Lemon juice and rainwater both had monitored values in the 5.6-6.4 and 2.2-2.9 ranges, respectively.

CONCLUSION

Thus, the sensors will be managed by the distribution team. The distribution team's manpower has been reduced. The water quality is observed and maintained in this project, leakage detection can be identified in this project, and the central office can control the wholesetup using the Arduino-based system for domestic water quality monitor and distribution control. The water crisis can be reduced, andthe future usage of water can be maintained by the management and distribution teams.

REFERENCES

[1] Gokulanathan, N. Prabu, and T. Venkatesh, "GSM-based water quality monitoring system using Arduino," International Journal ofArts, Science, and Humanities (2019).2. Samia Islam, Surajit Das Brman, and Ahmad Warif Mreza "IOT-Based Smart Water QualityMonitoring System," IEEE 4th International Conference on Computer and Communication Systems (ICCCS) 2019.

[2] M. Mohammed, Zidan, and S. Subhi, "IOT-Based Monitoring and Controlling System for Water Chlorination Treatment," 2nd International Conference on Future Networks and Distributed Systems (2018).

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁚ Impact Factor 8.102 ⁚ Peer-reviewed / Refereed journal ⁚ Vol. 12, Issue 6, June 2023
DOI: 10.17148/IJARCCE.2023.12627

[3] Sai Kumar, B.V. Subba Rao, and J. Rajendra Prasad "Design and Development of a Water Quality Monitoring System by Using IoT" International Journal of Emerging Trends in Engineering Research (2020).

[4] Ali Hadi Abdulwahid, "IoT-Based Water Quality Monitoring System for Rural Areas," 9th International Conference on RenewableEnergy Research and Applications (2020).

[5] Jayti Bhatt and Jignesh Patoliya, "IoT-Based Water Quality Monitoring System," IRFIC, February 21, 2016.

[6] Nikhil Kedia, "Water Quality Monitoring for Rural Areas: A Sensor Cloud Base Economical Project," in the 1st International Conference on Next Generation Computing Technologies(NGCT-2015), Dehradun, India, 4-5 September 2015. 978-1-4673-6809-4/15/$31.00 ©2015 IEEE.

[7] Ramprbu, C. Paramesh. "Automated sensor network for monitoring and detection of impurities in drinking water systems." International Journal for Research in Applied Science and Engineering Technology (2015) [pp. 275–280].

[8] M.M. Srihari, "Intelligent water distribution and management system using the Internet of Things." international conference on inventive research in computing applications (ICIRCA 2018).

[9] Gopavanitha, V. Nagarajan, "A low-cost system for real-time water quality monitoring and control using the Internet of Things," International Conference on Energy, Communication, Data Analysis, and Soft Computing (ICECDS-2017).

[10] Niel Andre Cloete, Reza Malekian, and Lakshmi Nair, "Design of Smart Sensors for Real-Time Water Quality Monitoring," 2016 IEEE conference.

[11] Vaishnavi V. Daigavane and Dr. M. A. Gaikwad, "Water Quality Monitoring System Based on IoT," Advances in Wireless and Mobile Communications, ISSN (2017).13. Dong He, Li-Xin Zhang "The water quality monitoring system based on wireless sensornetwork".

[12] Mechanical and Electronic Information Institute, China University of Geo Science, Wu Hen, Chain, (2012).

[13] 14. Nivit Yadav, "CPCB Realtime Water Quality Monitoring," Report: Centre for Science and Environment, 2012.15. M. Bhardwaj,"Overview of Ganga River Pollution," Report: Central Pollution Control Board,Delhi, (2011).