ISSN: 2096-3246
Volume 54, Issue 02, December, 2022
Special Issue

SMART WATER QUALITY MONITORING SYSTEM BASED ON IOT

V.Gomathi
Dhanalakshmi Srinivasan College of Engineering, Coimbatore, Tamil Nadu, INDIA

Ashwini Kumar
Babu Banarasi Das University, Lucknow (U.P.) India

ABSTRACT
The need for water consumption not only for humans but also the other livingthings as natural supporting elements for continuity of life. Water consumption depends on the availability of water resources like rivers, lakes, and reservoirs. Certainly, water becomes limited natural resources most of them because of water pollutions. It is necessary to manage water quality to fulfil the sustainability of waterfunctions as natural resources; we create an integrated system based on Internet of Things to measuring the water quality by developing environmental water management monitoring system using sensors. The use of Arduino uno as an embedded system will help in the manufacture of detecting sensors device and the use of remote communications technology can help the interaction of sending data between things. Traditional methods of drinking water quality parameters like turbidity, pH, conductivity and temperature etc., may consume time as samples are tested manually in the laboratory. To overcome this, in the current article an attempthas been made for developing the smart and low-cost IoT system. The parameters considered to test the quality of water are Temperature, Turbidity, pH, Conductivity.Sensors immersed in sampled water are used to measure the above said parameters.All the sensed data will be send to the required mobile with the help of IOT.

INTRODUCTION
Water pollution is the mixed with a large area of water, as an output of humantask. A broad area of water like lakes, sea, canal, puddle, river, ground water. Waterpollution output, when mixing of water particles are proposed into the surrounding.For example, releasing analysis waste water into natural with a large area of water can lead to destroying of aquatic ecosystems. In this result of, can causes to the civilhealth problems for people who in the living ensuing? People can uses the Look- alike Lake or river water for drinking or water for bathing or water for irrigation. Water pollution disease is the largest worldwide death full disease. India and Chinaare two places with high levels of water pollution. A valuation of 580 people in Indiadied due to water pollution disease allied disorder day by day. In India about 90 percentage of the land water is dirty.
In 2007, half a billion China people had no access to secure drinking water. Water pollution disease, one of the most problems in mellow nation, grown nation also carries on encountering with water disease pollution problems. There is much water pollution detection System, till date. But each one has its own benefit and fault. Finding the water quality is one of the main steps to control infection and define thetype of infection in people, water living animals and many horticultural lands. Eventhough it is the administration response to ensure that clean water is send to its citizens, ever aging

infrastructure, which is poorly maintained and continual increase in population puts on strain on the supply of clean water. There are many water pollution detection systems till date. Finding the water quality is one of the main steps to control infection and define the type of infection in people, water living animals and many horticultural lands.

LITERATURE SURVEY

Literature Survey 1

"Design of River Water Quality Assessment and Prediction Algorithm", Sheng Cao, Shucheng Wang, 2018.

Literature Overview

Due to the rapid population growth and economic development, water environmental protection pressures has been increasing recently. This paper focuses on the pollution of water quality, building a water quality assessment model to analyze the water quality level, and makes an objective furtherprediction of the trend of its factors. In this paper, the mutation factor of genetic algorithm is introduced into the PSO algorithm. The Least Squares Support Vector Machine (LS-SVM) based on adaptive Particle Swarm Optimization (PSO) algorithm used to optimize the hyper- parameter builds one water quality classification assessment model. The fuzzy information granulation method is combined with the Least Square Support Regression (LS-SVR) to set up a waterquality time series model, which can predict the trend of changes in water quality data in three days. With the help of the theoretical analysis and experimental data, this assessment model and the prediction algorithm are faster in training speed and higher in accuracy, compared with the traditional BP neural network.

Drawback

Here they used algorithms to predict water quality, sometimes predictionmay go wrong.

Overcome

In our proposed system we can get accurate values on mobile with the help ofmicrocontroller and sensors.

Literature Survey 2

"Measuring the Water Quality in Bore well Using Sensors and Alerting System", S.Jayalakshmi,P.Hemalatha,2019.

Literature Overview

A Water disease has been a biggest problem over the last few years. Water pollution disease is the largest worldwide death full disease. To overcome this difficulty, watching of water in real time goodness by using IOT has been proposed.The main aim of this paper is to the identify quality of water using internet of things.Here executing, system for monitoring the water quality through sensors – TDS meter, DC motor, LM35 temperature sensor, GSM. The Microcontroller Avenue thevalue which is monitor by using of sensors. The accessed data are collected in the centralized database server. If the water quality is below the TDS meter values, alertMessage is sent to land owners using GSM. The atmosphere can have adaptable good water.

Drawback

Lot of parameters are there in water. If any one of the parameters will change it willaffect their water quality but here PH of water is not measured here. Salt water has one PH value, drinking water has one PH value

Overcome

In order to overcome these issues we used a PH sensor to monitor the acid and basecontent in water.

Literature Survey 3

“Low Cost Wavelength Specific Water Quality Measurement Technique”, Huzaifa Nayeem, Azeemuddin Syed and Md. Zafar Ali Khan, 2019.

Literature Overview

Optical sensing for chemical analysis is emerging as it provides advantages such as good sensitivity, selectivity, electromagnetic immunity, etc. This work presents a low-cost, robust and easy to use technique for measurement of bulk waterproperty changes, specifically pH, total dissolved solids (TDS), and turbidity. The designed multi-wavelength sensing mechanism is capable of measuring the absorption of light emitted by three different LEDs after passing through water. Theoptical responses obtained using this mechanism are then related to parameter changes of water for quality measurement. The results show that measurements for pH, TDS, and turbidity have a linear regression coefficient of 0.9691, 0.9729 and0.76 respectively. By utilizing narrowband light sources of characteristic wavelengths for the target parameters, a compact and portable device can be designed for rapid measurements. This can work as a replacement of spectrophotometers for parameter specific measurements of water quality and a lowcost prototype for the same has been demonstrated.

Drawback

Here used optical signals for finding water quality,Using optical waves cannot findout all the parameters in water.

Overcome

In our proposed system we used various types of sensor to find conductivity, ph etc.

Literature Survey 4

“An Integrated Platform of Water Quality Management for National Water Supplyand Drainage Board”, Sathira Hettiarachchi, Divan Proboshena, Hashan Rajapaksha, 2019.

Literature Overview

With the growing rates of population and environmental pollution, the need for in-depth research on sustainable water-quality management systems has becomeevident. This paper presents a smart system for water quality management including predictive capabilities. The proposed system facilitates the regular monitoring of water quality parameters at water treatment plants using an easy to use IoT device and facilitates to identify water leakage points in the water distribution network using crowd-sourcing and visualization techniques. Most importantly, proposed system iscapable of predicting of upcoming changes of water quality with an accuracy of 99%and calculating the respective purification costs. Digital dashboard in the system presents summarized information on leakages, customer feedback, water quality patterns and associated purification costs.

Drawback

Here they described there is no device to monitor water quality in home and need adevice to monitor the water quality.

Overcome

Our proposed system is suitable for checking water quality in all areas.

Literature Survey 5

"Analysis of the Water Quality Monitoring System", L. Lakshmanan, Jesudoss A, Sivasangari A, Sardar Maran and Mercy Theresa M, 2020

Literature Overview

Now a days many people are suffering from dangerous diseases which are caused due to impure water. In our project we are doing analysis for water quality monitoring system, it gives data about the quality of water, on a webpage. The quality of water is determined using various sensors like PH sensor and turbidity sensor, connected to the Arduino family microcontroller. The Arduino software is written in embedded C and GSM module is connected to the Arduino. The data willbe transferred constantly from the remote sensor organize through microcontroller and wifi. Wifi module is used to send data to the webpage via internet which is connected to the microcontroller. The total data regarding the purity of water is displayed in the webpage and is analysed in the form of graph, pie chart and valuesare given in the table. We transfer this information to cloud and clients can get to this information through web page application, client from anyplace can screen the data whenever.

Drawback

Here nodemcu is used as a microcontroller and we can connect only one analogsensor in this microcontroller.

Overcome

In order to overcome these issues we are using an arduino microcontroller and it hasmore analog pins compared to NODEMCU microcontroller.

2.1 EXISTING METHODOLOGY

Now a days, water is polluted due to many reasons. The equipment cost is high,and it takes a lot of time to process. Drinking water faces many challenges in the current situation due to growing population and pollutants from industries, agriculture waste etc., are mixed with drinking water. Traditional methods to test drinking water quality parameters like turbidity, pH, conductivity and temperature etc., may consume time because, samples are tested manually in the laboratory. Traditional methods have the drawbacks such as long waiting time foe results high cost, low measurements precision. So with the implementation in the technology weuse different methods and techniques to check the quality of water.

DRAWBACKS:

The system has high complexity

Performance is low

2.2 PROPOSED SYSTEM:

To overcome these above said problems, a smart and low cost system for real-time monitoring of water quality by using the IoT, which provides global testing using Python programming model was designed and developed. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT(internet of things).The system consist of several sensors isused to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, conductivity, temperature of the water can be measured. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as a core controller. When any of the sensed values exceeds the threshold level then that information will be send to the required person with the help of Internet of Things. And an alert will be given at thesame time. When any of the sensor values changes from the threshold level the watermotor will not be turned on.

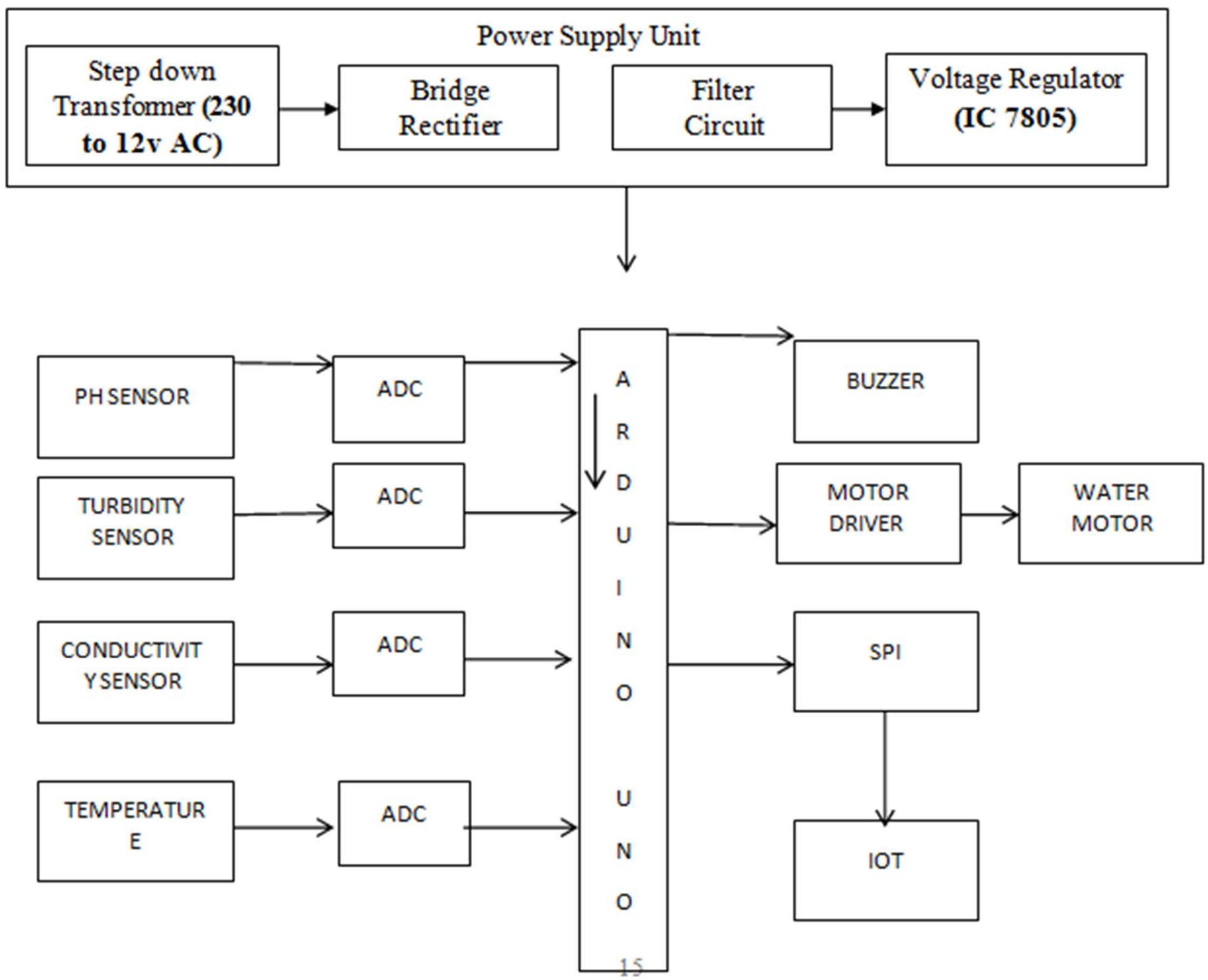
MERITS:

The data will show immediately if conditions change.

Water quality monitoring is the low-cost system and used by the people who are concerned about water.

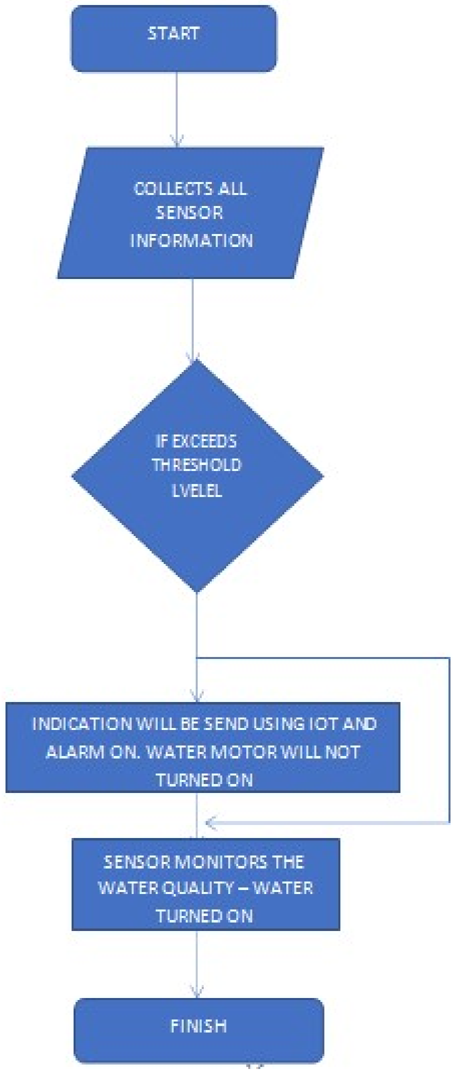
The water quality parameters like turbidity, pH, temperature and conductivity can be calculated or identified by using different water sensors with one of a kind in existent network IoT.

2.3 BLOCK DIAGRAM: TRANSMITTER UNIT:



2.4 RECEIVER UNIT:

2.5 FLOWCHART:



3.1 HARDWARE DESCRIPTION

3.1.1 TURBIDITY SENSOR

The Turbidity Sensor measures the turbidity of fresh-water or seawatersamples in NTU (Nephelometric Turbidity Units, the standard unit used by most water collection agencies and organizations). Its small, sleek design and simple setup make it easy to use at the collection site or in the classroom.

In addition to water quality studies, it can also be used to monitor precipitate formation or algae and yeast populations in chemistry and biology classes. The Turbidity Sensor includes high-quality Hach StablCal™ 100 NTU standard for quick calibration and a high-grade glass cuvette for your water sample.

Fig 3.1.1 TURBIDITY SENSOR

SPECIFICATIONS:

Range: 0 to 200 NTU
Resolution: (LabQuest 2, LabQuest, LabQuest Mini, Go!Link, LabPro)
Standard: StablCal Formazin Standard 100 NTU
Accuracy:
±2 NTU for readings under 25 NTU
±5% of readings above 25 NTU
LED wavelength: 890 nm

3.1.2 TURBIDITY METER

The Global Water Turbidity Meter combines the turbidity sensor (described above) with a handheld meter that has a six digit LED screen, 4-button control panel,and an internal 9V battery. The handheld portable turbidity meter can be used for enivronmental or process sites that do not require permanent monitoring. The turbidity meter will display readings directly in either nephelometric turbidity units(NTU) or parts per million (PPM). The turbidity meter also includes an automatic shutoff feature to conserve battery power.

3.1.3 TURBIDITY SENSOR CLEANING AND USE

To maintain accurate readings with your turbidity sensors the lenses should be cleaned a minimum of once per week. Depending on the monitoring site, the turbidity sensor's lenses may need to be cleaned as much as once per day. The turbidity sensor has been designed for harsh field conditions and uses the latest manufacturing design technology.

3.1.4 PH SENSOR

Soil moisture sensors measure the water content in soil. A soil moisture probe ismade up of multiple soil moisture sensors.

3.1.5 WATER CONDUCTIVITY SENSOR

FEATURES:

- Operating voltage: 5V
- Provide both digital and analog output
- Adjustable sensitivity
- Output LED indicator
- Compatible with Arduino
- TTL Compatible
- Bolt holes for easy installation
- Jumper wires included

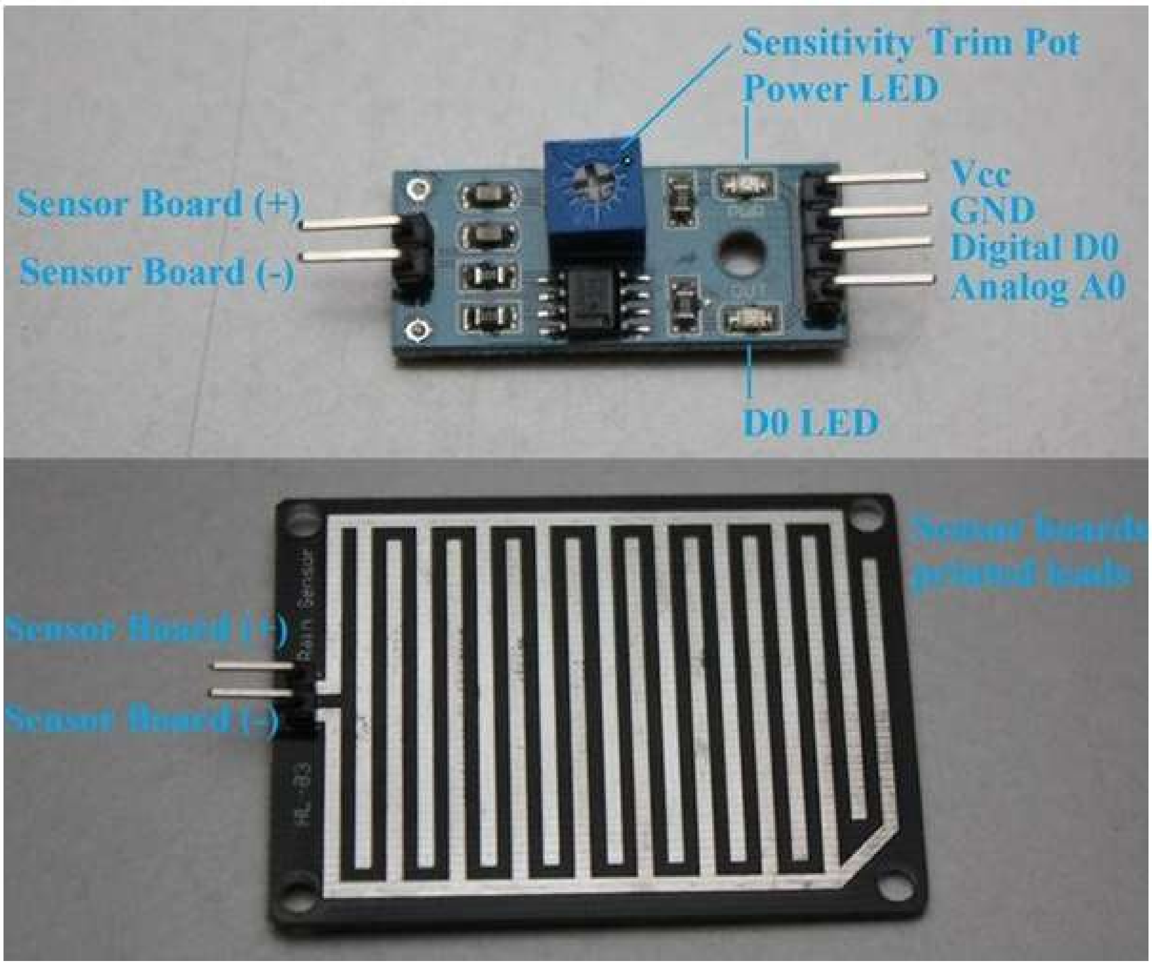


Fig 3.1.5 WATER CONDUCTIVITY SENSOR

4.1 IOT (INTERNET OF THINGS)

IoT systems allow users to achieve deeper automation, analysis, and integration within a system. They improve the reach of these areas and their accuracy. IoT utilizes existing and emerging technology for sensing,networking, and robotics. IoT exploits recent advances in software, falling hardware prices, and modern attitudes towards technology. Its new and advanced elements bring major changes in the delivery of products, goods, andservices; and the social, economic, and political impact of those changes.

IoT − Technology and Protocols
IoT primarily exploits standard protocols and networking technologies. However, the major enabling technologies and protocols of IoT are RFID, NFC, low-energy Bluetooth, low- energy wireless, low-energy radio protocols, LTE-A, and WiFi-Direct. These technologies support the specific networking functionality needed in an IoT system in contrast to a standard uniform networkof common systems.

4.2 EMBEDDED C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

DIFFERENCE BETWEEN C AND EMBEDDED C

Though **C and embedded C** appear different and are used in different contexts, they have more similarities than the differences. Most of the constructs are same; the difference lies in their applications. C is used for desktop computers, while **embedded C** is for microcontroller-based applications. Accordingly, C has the luxuryto use resources of a desktop PC like memory, OS, etc. While programming on desktop systems, we need not bother about memory.However, embedded C has to use with the limited resources (RAM, ROM, I/Os) on an embedded processor. Thus, program code must fitinto the available program memory. If code exceeds the limit, the system is likely to crash. Compilers for C (ANSI C) typically generateOS dependant executables. **Embedded C** requires compilers to createfiles to be downloaded to the microcontrollers/microprocessors whereit needs to run. Embedded compilers give access to all resources whichis not provided in compilers for desktop computer applications.

5.1 CONCLUSION
The design and construction of a novel, compact and low-cost optical system has been described for water quality measurement. The system is able to measure the change in optical signal for pH, TDS, and turbidity at different concentration values. The results show linear correlations between concentration values and the optical signal response with good reproducibility and stability. The experiments show that the instrument developed is sufficient for preliminary estimation of the concentration and can be an economical and simple alternative for the application studied. Compared to a conventional spectrophotometer, the proposed device provides flexible and rapid measurements. Using an LED directly, the costof the instrument is remarkably reduced without the usage of any elaborateoptical components. This approach can be attractive particularly for low-income countries struggling with water-related challenges. It also shows potential for bioprocess applications and scientific projects on a large scale.

REFERNCES

[1] S. B. Megdal, Invisible water: the importance of good groundwater governance and management, npj Clean Water, vol. 1, no. 1, pp. 15, 2018.

[2] K. Onda, J. Lobuglio, and J. Bartram, Global access to safe water: Accounting for water quality and the resulting impact on MDG progress, Int. J. Environ. Res.Public Health, vol. 9, no. 3, pp. 880894, 2019.

[3] D. Awasthi, S. Azeemuddin, S. Purini and M. Annesha, ”Flow Sensor IoT Node for Wi-Fi Equipped Apartments and Gated Communities,” 2018 IEEE SENSORS, New Delhi, 2018, pp. 1-4.

[4] D. Jolis, W. W. Faber, and V. Diyamandoglu, Biological stability of drinkingwater in New York City, Water Sci. Technol., vol. 38, no. 6, pp. 181190, 2019.

[5] C. K. Ho, A. Robinson, D. R. Miller, and M. J. Davis, Overview of sensors and needs for environmental monitoring, Sensors, vol. 5, pp. 4-37, 2017.

[6] S. Levin, S. Krishnan, S. Rajkumar, N. Halery, and P. Balkunde, Monitoringof fluoride in water samples using a smartphone, Sci. Total Environ, vol. 551- 552, pp. 101-107, 2016.

[7] T. P. Lambrou, C. G. Panayiotou, and C. C. Anastasiou, A lowcost system for real time monitoring and assessment of potable water quality at consumer sites, 2012 IEEE SENSORS, Taipei, 2019.

[8] K. Murphy et al., A low-cost autonomous optical sensor for water qualitymonitoring, vol. 132, pp. 520-527, Talanta, 2019.

[9] A. Sohanghpurwala, G. Rao and Y. Kostov, Optical Replacement of pHElectrode, IEEE Sens. J., vol. 9, no. 3, pp. 219-220, 2019.

[10] L. Shen, J. A. Hagen, I. Papautsky, Point-of-care colorimetric detection witha smartphone, Lab on a Chip, vol. 12, no. 21, pp. 4240-42433, 2017.