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Performance Evaluation of Water Quality Monitoring System Using Arduino Uno with IOT Server Based

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Abstract
Clean drinking water is a critical resource, important for the health and well-being of all humans. So it's very important to monitor the quality of water available in reservoir. For this purpose, we proposed a "Water quality monitoring system using IOT". 40% of deceases in universal are produced by water contaminations. So, the eminence of the drinking water wants to be restrained in real time although it is provided to customers. In this project, we propose a development and extension of a real time water eminence computing structure at compact cost using Arduino Uno. To figure out the parameters of the water such as temperature, pH, Conductivity, Turbidity, TDS. The sensor output data is sent to the concerned authority for additional stages to advance the water quality.

Keywords: Arduino Uno board, Wi-Fi Module, pH sensor, TDS sensor, Turbidity sensor, IOT Module etc.

1. INTRODUCTION

Water quality is affected by both point and nonpoint sources of pollution, which include sewage discharge, discharge from industries, run-off from agricultural fields and urban run-off. Other sources of water contamination include floods and droughts and due to lack of awareness and education among users. The need for user involvement in maintaining water quality and looking at other aspects like hygiene, environment sanitation, storage and disposal are critical elements to maintain the quality of water resources. Poor water quality spreads disease, causes death and hampers socio-economic progress. Fertilizers and pesticides used by farmers can be washed through the soil by rain, to end up in rivers. Industrial waste products are also washed into rivers and lakes. Such contaminants enter the food chain and accumulate until they reach toxic levels, eventually killing birds, fish and mammals. Chemical factories also dispose of waste in the water. Factories use water from rivers to power machinery or to cool down machinery. Raising the temperature of the water lowers the level of dissolved oxygen and upsets the balance of life in the water. All the above factors make water quality monitoring essential.
The aim of this paper is to provide a detailed survey of recent work carried out in the area of smart water

quality monitoring in terms of application, communication technology used, types of sensors employed etc. It is to present a low cost, less complex smart water quality monitoring system using a controller with inbuilt Wi-Fi module to monitor parameters such as pH, turbidity and conductivity. The system also includes an alert facility, to inform the user on deviation of water quality parameters.

2. Problem Formulation

Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. 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 is used to measuring physical and chemical parameters of the water. The parameters such as PH, turbidity 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. Finally, the sensor data can be viewed on internet using WI-FI system.

Water quality monitoring is important in recent years; this is because many factors pollute the water resources. As there is rapid growth in human population, it results in environmental degradation. Now a day's different wireless network systems are present but they are fixed at a particular site. Here is the cost saving RC boat prototype is used to identify the quality of water in different areas such as river, lake, cannel, pond or sea. The different water parameters to be identify are PH, turbidity etc.

3. Objective

Objectives is to proposed the water quality monitoring system in the Arduino platform that measures the pH, conductivity, temperature, and presence of suspended items on the water bodies like lakes and rivers using sensors.

- To developed the concept of water quality monitoring system with IOT communication.
- To study the different aspects and parameters used in water quality monitoring system.
- Understand the water quality management system in rural areas.

4. Literature survey

Nikhil Kedia entitled "Water Quality Monitoring for Rural Areas-A Sensor Cloud Based Economical Project." Published in 2015 1st International Conference on Next Generation Computing Technologies (NGCT-2015) Dehradun, India. This paper highlights the entire water quality monitoring methods, sensors, embedded design, and information dissipation procedure, role of government, network operator and villagers in ensuring proper information dissipation. It also explores the Sensor Cloud domain. While automatically improving the water quality is not feasible at this point, efficient use of technology and economic practices can help improve water quality and awareness among people.

Jayti Bhatt, Jignesh Patoliya entitled "Real Time Water Quality Monitoring System". This paper describes 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 paper, 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, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller and this processed values are transmitted remotely to the core controller

that is raspberry pi using Zigbee protocol. Finally, sensors data can view on internet browser application using cloud computing.

5. CONCEPT AND METHODOLOGY

A. Block Diagram

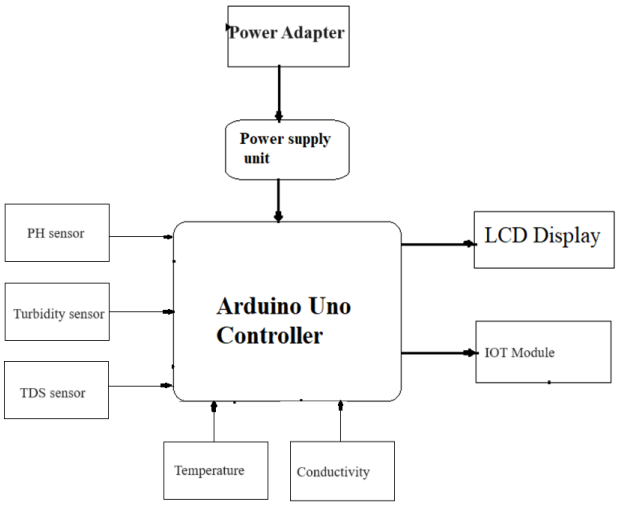


Fig.1. Block Diagram of system

B. Working of system

- In this system it makes use of four sensors (Turbidity, temperature, pH, conductivity, TDS) and the Arduino controller connected with internet of things. The Processing module microcontroller, and the transmission module IOT. The four sensors capture the data in the analogy signals.
- The ADC converter which converts the four signals information's into the digital format. The digital signals are passed to the Arduino controller which is together with the transmission module. The microcontroller in Arduino will examine itself and course the digital information, and here the available IOT module is for next communication in the channel, the IOT model will send the water quality factors to the smartphone by the server. In this, all parameters measured is there with application link.
- If we click on link we obtained all parameters readings in real time. LCD display connect with Arduino also shows the same parameters measurement by each sensor. In this way intelligent water quality monitoring system works at remote location easily.
- Microcontroller in the Arduino accepts the information and processes the information which are collected from the sensors to the Web page via IOT module. With the help of coding the transmission is performed.

Whole system powered with power adapter of 12v is used. The main purpose of this project that it can work in any remote environmental area. And sends information remotely.

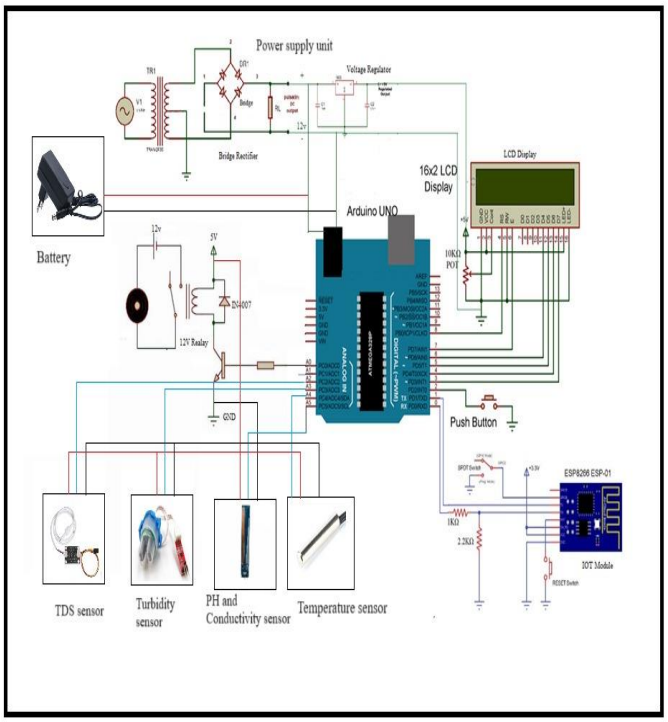


Fig.2. Circuit Diagram for water quality monitoring system using Arduino UNO with IOT server based

A. Flow Chart

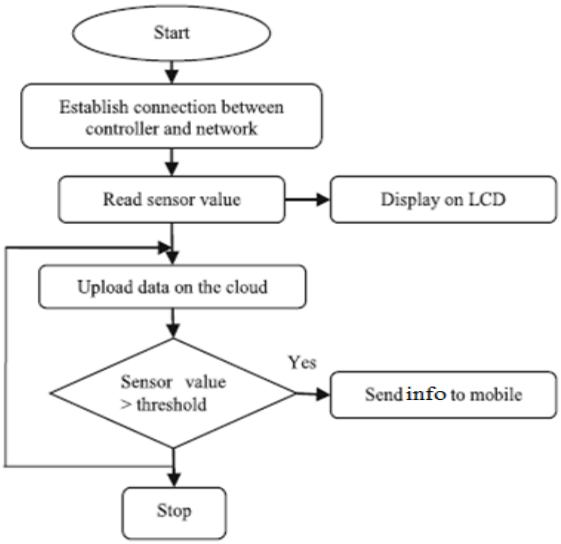


Fig. 3. Flow chart of system

6. COMPONENTS

In this proposed block diagram consist of several sensors (temperature, pH, turbidity, flow) is connected to core controller. The core controller are accessing the sensor values and processing them to transfer the data through internet. Arduino is used as a core controller. The sensor data can be viewed on the internet Wi-Fi system.

- PH sensor
- Turbidity sensor

- TDS sensor
- Conductivity sensor
- Temperature sensor
- Arduino Uno
- LCD Display
- Adapter
- Resistance
- Capacitor
- Developments Board
- IOT Module
- Others

7. Results & Discussion

Main parameters namely pH, turbidity, TDS are measured using the experimental setup. The setup is connected to the BT Terminal platform. The measured results are compared with drinking water quality.

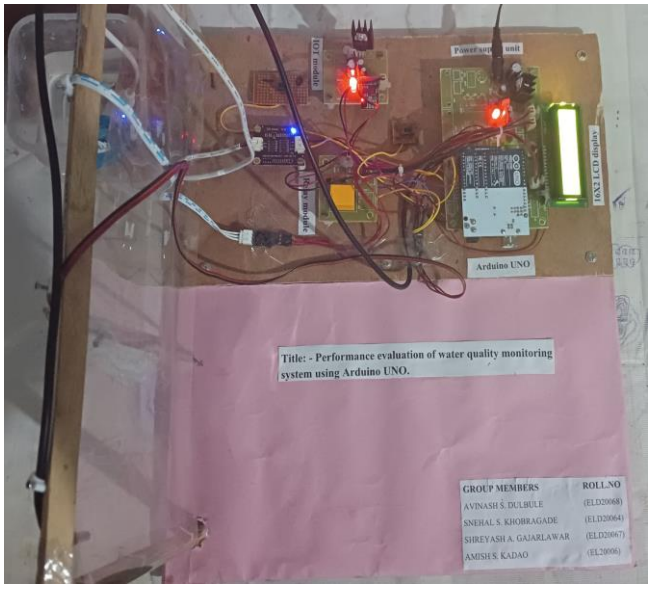


Fig.4. Model design for water quality monitoring system using Arduino UNO with IOT server based

To check the quality of water, the current method is to take the water sample manually. These samples were sent to the laboratories to test the quality which takes extra human effort, cost and time. In our proposed system, it will give the properties of water automatically on screen without any extra human effort. With the help of these properties we could figure out the quality. Monitoring of Turbidity, pH & conductivity of Water used corresponding sensors. The system can monitor water quality automatically, and it updates to servers' websites with low cost and does not require people on duty. So the water quality testing has to be more economical, convenient and fast. The system has good flexibility by replacing the corresponding sensors and changing the relevant python programs. This system can be used to monitor other water quality parameters.

The operation is simple. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value.

Monitoring of Turbidity, PH of Water makes use of water detection sensor with unique advantage and Bluetooth communication. The system can monitor water quality automatically, and it is low in cost and does not require people on duty. So the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple.

By keeping the embedded devices in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the wireless communication.

Survey for water all parameters sensors rating

Table 1

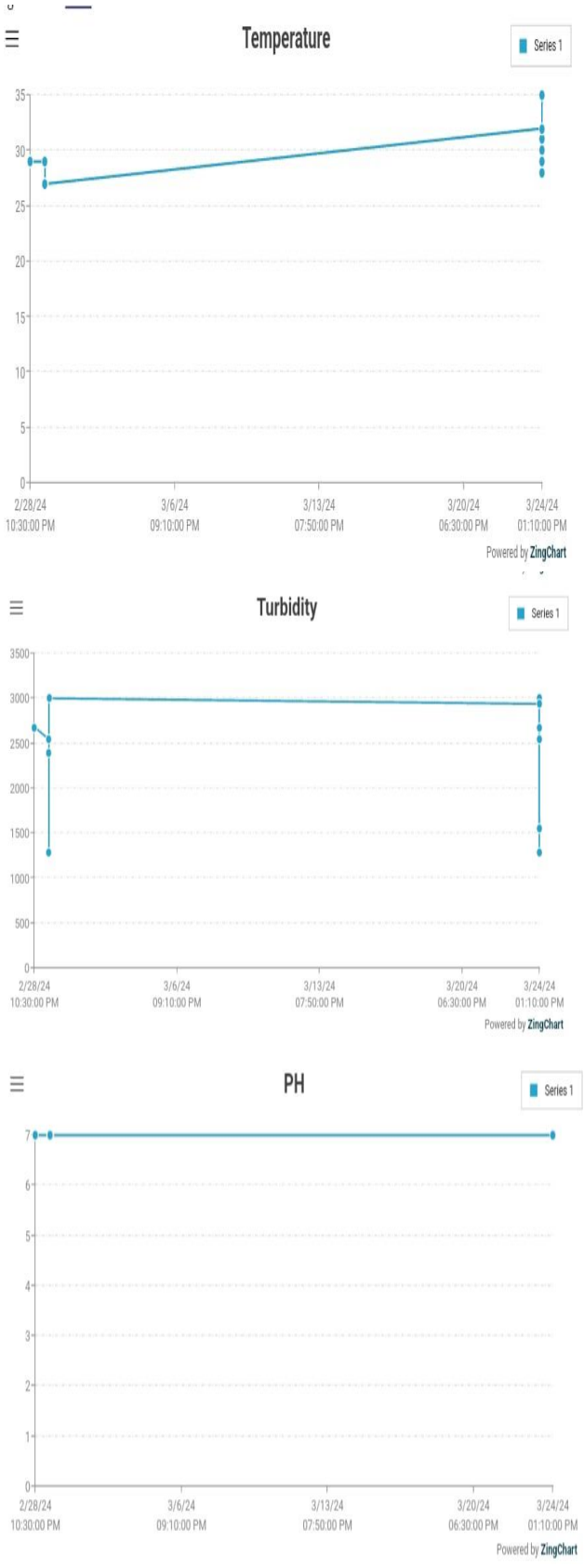
Sr. No.	Survey site	Temp	Turbi-dity	pH	Condu-ctivity	TDS
01	Borewell (Ramtek)	31	1554	07	450	325
02	Domestic R.O (Ramtek)	30	1554	07	450	32
03	R.O Staion (Ramtek)	31	1288	07	450	107
04	Well (Ramtek)	35	1554	07	450	332

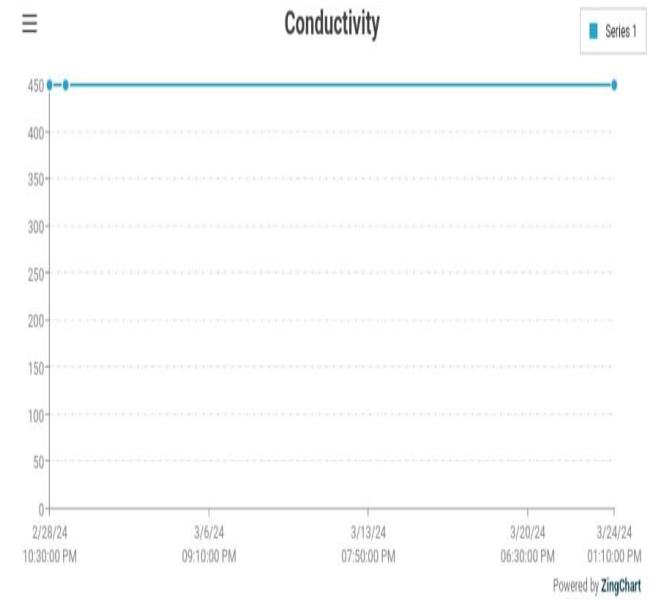
Table 2

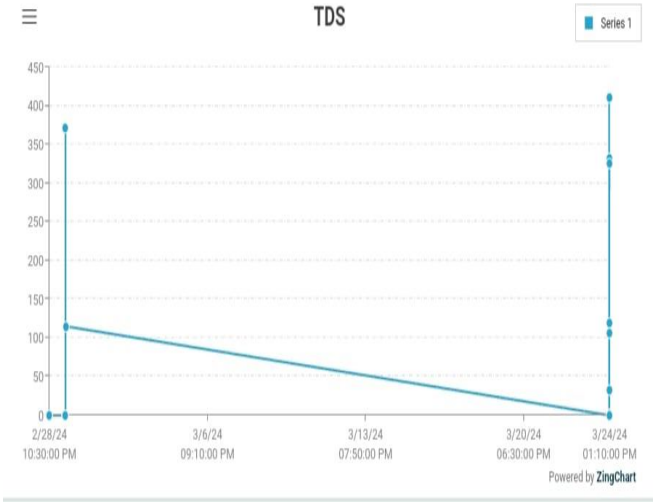
S.No	Temperature	Turbidity	PH	Conductivity	TDS	Date
1	35	1554	7	450	332	2024-03-24 12:55:20
2	28	2548	7	450	0	2024-03-24 12:53:50
3	30	2548	7	450	0	2024-03-24 12:52:20
4	30	1554	7	450	32	2024-03-24 12:50:50
5	28	2940	7	450	0	2024-03-24 12:49:20
6	31	1288	7	450	107	2024-03-24 12:47:50
7	31	3000	7	450	119	2024-03-24 12:46:20
8	30	2548	7	450	0	2024-03-24 12:44:50
9	29	2680	7	450	0	2024-03-24 12:43:20
10	31	2548	7	450	2	2024-03-24 12:41:50
11	31	1554	7	450	325	2024-03-24 12:40:20
12	32	3000	7	450	410	2024-03-24 12:38:50
13	32	2940	7	450	0	2024-03-24 12:37:20
14	27	3002	7	450	115	2024-02-29 15:33:22
15	27	1288	7	450	372	2024-02-29 15:29:35
16	27	2394	7	450	0	2024-02-29 15:28:05
17	27	2548	7	450	0	2024-02-29 15:26:35
18	29	2548	7	450	0	2024-02-29 15:25:05
19	29	2680	7	450	0	2024-02-28 22:36:08
20	29	2680	7	450	0	2024-02-28 22:31:45

Output Values of Sensors using IOT server

Graphical View:







Graphical View

8. CONCLUSION

Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage and existing IOT network. The system can monitor water quality automatically, and it is low in cost and does not require people on duty. So the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple.

The real-time water quality monitoring system for real-time applications which is efficient and low cost has been tested after the implementation. This can help in preventing diseases caused due to polluted water and the presence of metals. It has a positive meaning to strengthen environmental protection. Three parameters are monitored in this system which is pH, temperature and dissolved oxygen. The diseases that are caused due to the presence of metals and pollutants in the water can be protected by this

system. The task of monitoring can be done by using less trained individuals. The installation of the system can be done easily when it is near the target area. To ensure the portability of the device, a self-mode, small size Arduino microcontroller is used. The results of the test for all times have been successful. We conclude that all the objectives of the proposed system have been achieved. To test more parameters of the water quality for some applications, other sensors can be included in the system. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters.

9. FUTURE SCOPE

A project scope statement is a clear definition of the boundaries of a project. It includes all the assumptions, responsibilities, requirements, constraints, milestones, and deliverables needed to ensure the project is a success.

- In future we use wireless camera added in this concept
- Detecting the more parameters for most secure purpose
- Increase the parameters by addition of multiple sensors
- By interfacing relay we controls the supply of water.

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REFERENCES

1. Brinda Das, P.C.Jain, "Real-Time Water Quality Monitoring System using the Internet of Things", International Conference on Recent Advances in Electronics and Communication Technology. 2017
2. Kulkarni Amruta M, Turkane SatishM,"Solar Powered Water Quality Monitoring system using wireless Sensor Network" AIETE, Nagpur 2013 IEEE.
3. K.A.Unnikrishna Menon, Divya P, Maneesha V. Ramesh, "Wireless Sensor Network for River Water Quality Monitoring in India" ICCCNT' July 26 - 28, IEEE –2018.
4. MitarSimic, Goran M. Stojanovic, LibuManjakkal and KrzystofZaraska, "Multi-Sensor System for Remote Environmental (Air and Water) Quality Monitoring" Serbia, Belgrade, November 2016 IEEE.
5. Nikhil Kedia, Water Quality Monitoring for Rural Areas- "A Sensor Cloud Based Economical Project", 1st International Conference on Next Generation Computing Technologies (NGCT) 2015.
6. Arjun K, Dr. Latha C A, Prithviraj, "Detection of Water Level, Quality and Leakage using Raspberry Pi with Internet of Things", International Research Journal of Engineering and Technology Volume: 04 Issue: 06 | June -2017 e-ISSN: 2395 -0056 p-ISSN: 2395-0072.
7. Cho Zin Myint, Lenin Gopal, and Yan Lin Aung, "Reconfigurable Smart Water Quality Monitoring System in IoT Environment", 978-1-5090-5507- 4/17/$31.00 ©2017 IEEE ICIS 2017, May 24-26, 2017, Wuhan, China.2
8. Allula Rajini, P. Rajendra Chaitanya, "Implementation of RF Controlled Robotic Boat with Wireless Video Transmission to Remote Television Using Raspberry Pi", ISSN No: 2348-4845 International

journal and Magazine of Engineering, Technology, Management and Research, A peer Reviewed Open Access International Journal Jan 2017.

9. K. A. Unnikrishna Menon, Divya P, Maneesha V. Ramesh, “Wireless Sensor Network for River Water Quality Monitoring in India”,IEEE-20180 ICCCNT' 2012 July 26 - 28, 2012.
10. Gregg Podnar, John M. Dolan, Kian Hsiang Low, Alberto Elfes, “Telesupervised Remote Surface Water Quality Sensing”, IEEEAC paper#1617, Version 4, Updated 2010:01:05 2 978-1-4244-3888-4/10/$25.00 ©2010 IEEE .
11. Peng Jiang, Hongbo Xia, Zhiye He and Zheming Wang, “Design of a Water Environment Monitoring System Based on Wireless Sensor Networks”, ISSN 1424-8220 Sensors 2009, 9, 6411-6434; doi: 10.3390/s90806411.
12. R. Bachmayer, N. Ehrich Leonard, J. Graver, E. Fiorelli, P. Bhatta and D. Paley, “Underwater Gliders: Recent Developments and Future Applications” Invited Paper, National Research Council.
13. Joshua G. Graver and Ralf Bachmayer and Naomi Ehrich Leonard, “Underwater Glider Model Parameter Identification”, Proc. 13th Int. Symp. On Unmanned Untethered Submersible Technology (UUST), August 2003.
14. Sokratis Kartakis, Weiren Yu, Reza Akhavan, and Julie A. McCann, 2016 IEEE First International Conference on Internet-of-Things Design and Implementation, 978-1-4673-9948-7/16 © 2016IEEE
15. Mithaila Barabde, shruti Danve, Real Time Water Quality Monitoring System, IJIRCCE, vol 3, June 2015.
16. Akanksha Purohit, Ulhaskumar Gokhale, Real Time Water Quality Measurement System based on GSM , IOSR (IOSR-JECE) Volume 9, Issue 3, Ver. V (May - Jun. 2014)
17. Eoin O’Connell, Michael Healy, Sinead O’Keeffe, Thomas Newe, and Elfed Lewis, IEEE sensors journal, vol. 13, no. 7, July 2013, 1530-437x/$31.00 © 2013 IEEE
18. Nidal Nasser, Asmaa Ali, Lutful Karim, Samir Belhaouari, 978-1-4799-0792-2/13/$31.00 ©2013 IEEE
19. Niel Andre cloete, Reza Malekian and Lakshmi Nair, Design of Smart Sensors for Real-Time Water Quality monitoring, ©2016 IEEE conference.