A Review and an Approach of Water Pollution Indication using Arduino Uno

Shubham G. Darokar[1], Rohit R. Dabhade[2], Shubham V. Lasankute[3], Sanket P. Wankhade[4], Prof. Vikramsingh R. Parihar[5*]

[1,2,3,4] U.G. students, Department of Electrical Engineering, Prof Ram Meghe College of Engineering and Management, Badnera-Amravati, India

[5] Assistant Professor, Department of Electrical Engineering, Prof Ram Meghe College of Engineering and Management, Badnera-Amravati, India

Email: vikramparihar05@gmail.com

Abstract— Drinking water is critical for the wellbeing and prosperity of all people and creatures because water play major role in all living beings and most danger disease are caused by water and it is our duty to provide clean and safe water and also to monitor the pollution level in water it is additionally essential for farming utilization for good product yielding and natural way of life linkage wellbeing issues. With over 200 children dying per day due to unsafe water, drinking water crisis is ranked one on the global risk by World Economic Forum, 2015. This paper presents an easy and comprehensive methodology is microcontroller sensor based system continuous observing and pollution recognition for both drinking and non-drinking water dissemination frameworks and in addition for customer locales.

Keywords— Water Pollution Indicator, Arduino Uno, Water Monitoring, pH sensors, Turbidity sensors, Oxidation-Reduction Potential sensors, Temperature sensors, Conductivity Sensor.

I. INTRODUCTION

Clean drinking water is critical resource, important for the health and well-being of all humans. several experimental studies indicate need for continues online water monitoring efficient patio-temporal resolution and demonstrate that the conventional reagent-based water quality methods fail to satisfy this requirements due to higher labor and operational cost it is critical for accurate real-time water quality observing frameworks than the current lab based techniques, which are too ease back to create operational reaction and don't give a level of general wellbeing security continuously conventional strategies for water quality checking and control include the manual accumulation of water test at different areas and at diverse time trailed by research centre scientific procedures keeping in mind the end goal to portray the water quality the main conclusion was that many of the chemical and biological contaminants used have an effort on many water parameters monitored including Turbidity (TU), oxidation Reduction Potential (ORP),Electrical conductivity(EC) and Ph. Thus it is easy to monitor and infer the water quality by detecting the changes in such parameters.

Necessity of Water Monitoring

In the 21st century, there were lots of inventions, but at the same time were pollutions, global warming and so on are being formed, because of this there is no safe drinking water for the world's pollution. Nowadays, water quality monitoring in real time faces challenges because of global warming limited water resources, growing population, etc. Hence there is need of developing better methodologies to monitor the water quality parameters in real time.

II. LITERARURE REVIEW

This chapter presents the critical analysis of existing literature which is relevant to water Pollution Indicator using Arduino Uno. Though, the literature consists of a lot many research contributions, but, here, we have analyzed around eight research and review papers. The existing approaches are categorized based on the basic concepts involved in the mechanisms. The emphasis is on the concepts used by the concerned authors, the database used for experimentations and the performance evaluation parameters. Their claims are also highlighted. Finally, the findings are summarized related to the studied and analyzed research papers. Chapter concludes with the motivation behind identified problem.

Table 1: Literature Review

Sr. No.	Ref. no. Concerned Author(s) and years	Concept used	Performance evaluation parameters	Database used	Claimed by concern authors (s)	Our findings
1	Vaishnavi V. Daigavane and Dr. M.A Gaikwad (2017)	Interfacing pH sensor, turbidity sensor, flow sensor, temp. Sensor with arduino uno and IOT base	Not mentioned	Not mentioned	Low cost, good flexibility,	No ORP detection, No de solved salts detection
2	Prof. SUMATHI.K, Prof. CHRISTINA DALLY.E, Prof.ASHWINI G.V, SAIGOKUL.s	Uses GSM modul sensor with arduino uno	Not mentioned	Not mentioned	Not mentioned	No practical data given, Performance not evaluated,
3	Nidhi Gautam, Sumit Shringi, Ajay Pratap Singh Rathore	Uses electrical conductivity sensor with arduino uno	Not mentioned	theoretical model of electrical conductivity were given	Quick and accurate	Only determine the moisture level, pH and other parameters not determines
4	Nikhil Kedia	A Senso cloud base project	Not mentioned		feasible in all aspect	Good work
5	Akanksha Purohit, Ulhaskumar Gokhale	Water Quality Measurement System based on GSM	Not mentioned	Not mentioned	Versatile and economical	Good work

III. PROBLEM FORMULATION

This chapter presents the formulation of the identified problem, which base representation of Water Pollution Indicator using Arduino Uno. All the Reviews on theoretical approaches involving the same common terminology.

In the earlier system there was various sensors are use such as flow sensor, pH sensor, and the Wi-Fi module which makes it more expensive but with the less features such as no ORP sensor, no detection of salts present in the water. To overcome these drawbacks we are introducing new sensors in the earlier mechanism. To use the system more efficiently and to get more parameters from the water to identify the problem regarding to water Pollution and to apply control measures the system were introduced.

IV. COMPONENTS USED

This chapter is subdivided into 6 sections wherein the report presents the detailed working of automatic overhead water tank cleaning system that is incorporated in our work along with our approach. Section 4.1 includes the information about the main components used in the project. The platform use for the programming and the hardware use is in point 4.2. Working of system is explained in Section 4.3 with the aid of flowchart. Our proposed approach is introduced in Section 4.4 provides detailed working of the proposed approach.

MAIN COMPONENTS:

A) pH Sensor :

The pH of a solution is the measure of the acidity or alkalinity of that solution. The pH scale is a logarithmic scale whose range is from 0-14 with a neutral point being 7. Values above 7 indicate a basic or alkaline solution and

values below 7 would indicate an acidic solution. It operates on 5V power supply and it is easy to interface with arduino. The normal range of pH is 6 to 8.5.

*Fig.1: pH Sensor*

B) Temperature Sensor:

Temperature is the most often-measured environmental quantity. This might be expected since most physical, electronic, chemical, mechanical, and biological systems are affected by temperature. Certain chemical reactions, biological processes, Water Temperature indicates how water is hot or cold. The range of DS18B20 temperature sensor is -55 to +125 °C. This temperature sensor is digital type which gives accurate reading.

Fig.2: Temperature Sensor

C) Turbidity Sensor:

Turbidity is a measure of the cloudiness of water. Turbidity has indicated the degree at which the water loses its transparency. It is considered as a good measure of the quality of water. Turbidity blocks out the light needed by submerged aquatic vegetation. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.
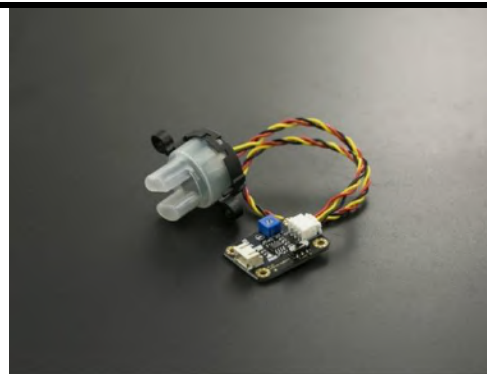
Fig.3: Turbidity Sensor

D) Conductivity Sensor:

EC meter measures the electrical conductivity in a solution. It uses to monitor the amount of nutrients, salts or impurities in the water. An electrical conductivity meter (EC meter) measures the electrical conductivity in a solution. It is commonly used in hydroponics, aquaculture and freshwater systems to monitor the amount of nutrients, salts or impurities in the water.

Fig.4: Conductivity Sensor

E) ORP (Oxidation-Reduction Potential) Sensor:

The Oxidation-Reduction Potential (ORP) Sensor measures the ability of a solution to act as an oxidizing or reducing agent. Use the ORP Sensor to measure the oxidizing ability of chlorine in water or to determine when the equivalence point has been reached in an oxidation-reduction reaction.

Fig.5: ORP (Oxidation-Reduction Potential) Sensor

F) Display:

A liquid crystal display (commonly abbreviated LCD) is a thin, flat display device made up of any number of colour

or monochrome pixels arrayed in front of a light source or reflector. It is often utilized in battery- powered electronic devices because it uses very small amounts of electric power. Each pixel of an LCD typically consists of a layer of molecules aligned between two transparent electrodes, and two polarizing filters, the axes of transmission of which are (in most of the cases) perpendicular to each other. With no liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer. The surfaces of the electrodes that are in contact with the liquid crystal material are treated so as to align the liquid crystal molecules in a particular direction. This treatment typically consists of a thin polymer layer that is unidirectional rubbed using, for example, a cloth. The direction of the liquid crystal alignment is then defined by the direction of rubbing.
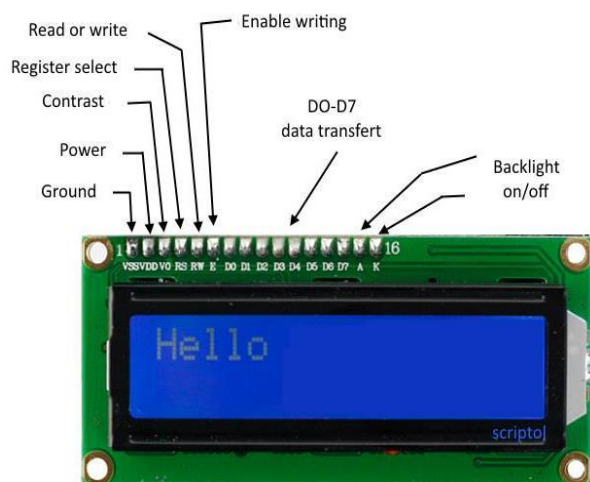

Fig.6: Display

ARDUINO UNO:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The board has the following new features: pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the

shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that uses the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin that is reserved for future purposes.
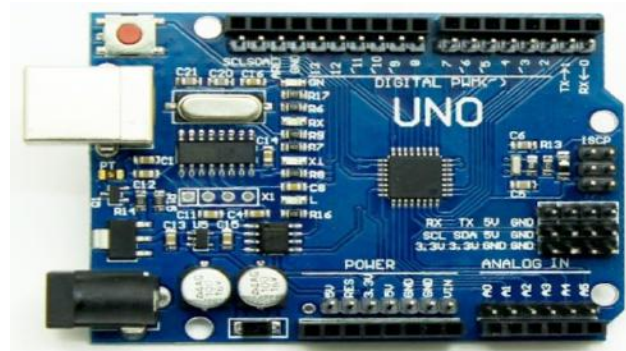

Fig.7: Arduino Uno

Uno means one in Italian and is named to mark the upcoming release of Arduino 1.0.
Microcontroller ATmega328 Operating Voltage 5V Input Voltage (recommended) 7-12V Input Voltage (limits) 6-20V
Digital I/O Pins 14 (of which 6 provides PWM output)
Analog Input Pins 6 DC Current per I/O Pin 40 mA
DC Current for 3.3V6 Pin 50mA Flash Memory 32 KB SRAM 2KB (ATmega328)
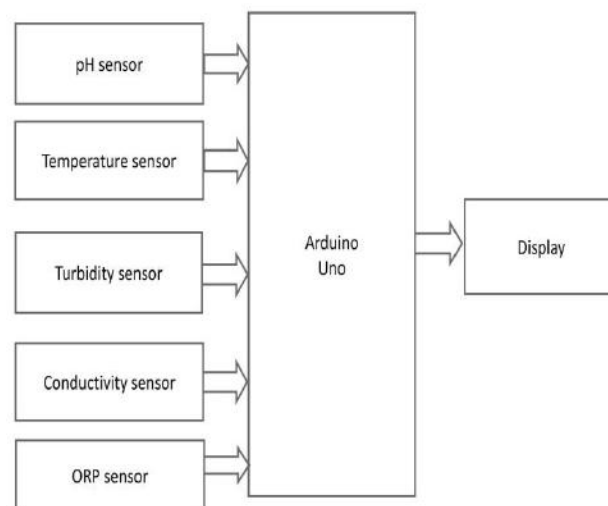EEPROM 1KB (ATmega328) Clock speed 16MHz

WORKING FLOWCHART:

Fig.8: Interfacing various sensors with the Arduino Uno

V. PROPOSED APPROACH
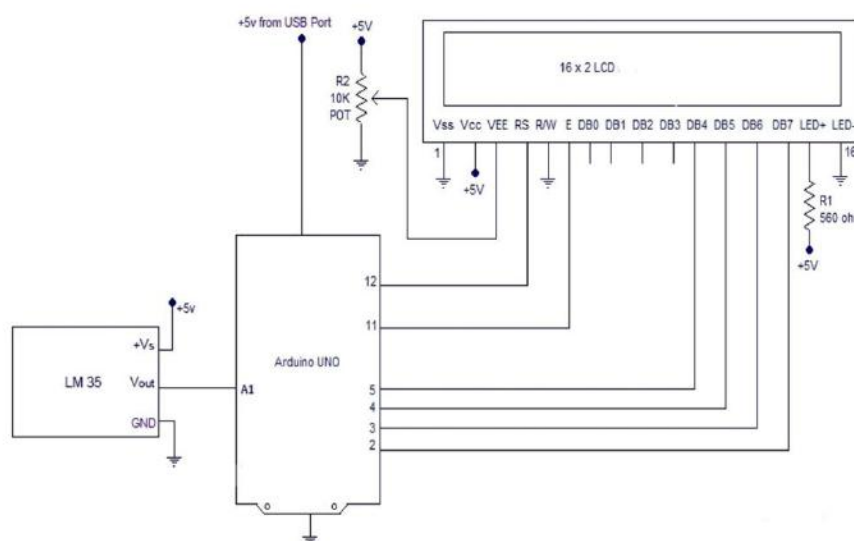A) Circuit Diagram and Working

Fig.9: Circuit Diagram

The whole design of the system is based mainly on Arduino Uno which is newly introduced concept in the world of development. There is basically two parts included, the first one is hardware & second one is software. The hardware part has sensors which help to measure the real time values, another one is Arduino atmega328 converts the analog values to digital one, &

LCD shows the displays output from sensors, in software we developed a program based on embedded c language. The PCB is design at first level of construction and component and sensors mounted on it. The parameters of water are tested one but one and their result are given to the LCD display.
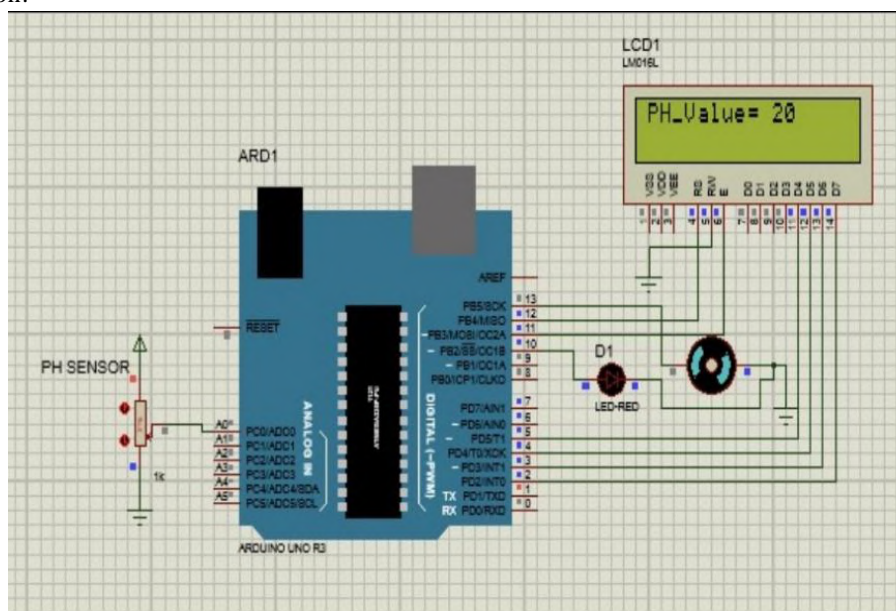
B) Proteus Simulation:

Fig.10: Hardware Simulation

VI. EXPERIMENTAL RESULTS

We have identified a suitable implementation model that consists of different sensor devices and other modules, their functionalities are shown in figure. In this implementation model we used ATMEGA 328 with

versions sensors. Sensors are connected to Arduino UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated. After sensing the data from different

sensor devices, which are placed in particular area of interest. The sensed data will be shown on the display.

VII. CONCLUSION AND FUTURE SCOPE

This chapter presents the conclusions drawn from the evaluation and comparison of experimental results. The chapter concludes with future scope.

Conclusion:

Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage. 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 system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value. 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 Wi-Fi.

Future Scope:

- In future we use IOT concept can be used
- Detecting the more parameters for most secure purpose
- Increase the parameters by addition of multiple sensors
- By interfacing relay we control the supply of water

REFERENCES

[1] Nidhi Gautam, Sumit Shringi, Ajay Pratap Singh Rathore, "Water Contents Determination By Microcontroller and Sensors", IJARSE, Vol.No. 7, Issue no. 2, page no. 310-315, 2018.

[2] Prof. Sumathi. K, Prof. Christina Dally. E, Prof. Ashwini G. V, Saigokul.s, "Water Pollution Indicator using Arduino Uno", IJIET, Vol. No. 9, Issue no. 2, page no. 28-39, 2017.

[3] Vaishnavi V. Daigavane, Dr. M.A Gaikwad, "Water Quality Monitoring System Based on IOT", Research India publication, Vol. No. 5, page No. 1107-1116, 2017.

[4] World Health Organization Guidelines for drinking-water quality, fourth edition, 2011.

[5] Marcelo Marques Costa1, Daniel Marçal de Queiroz, Francisco de Assis de Carvalho Pinto, Elton Fialho dos Reis, and Nerilson Terra Santos, "Moisture content effect in the relationship between apparent electrical conductivity and soil attributes", uem, page no. 396-401, 2014

[6] Pragati Damor, Kirtikumar J. Sharma, "IoT based Water Monitoring System: A Review", IJAERD, Vol. No. 4, page no. 1-6, 2017.

[7] Akanksha Purohit, Ulhaskumar Gokhale, "Real Time Water Quality Measurement System based on GSM", IOSR, Vol. No. 3, page no. 63-67, 2014.

[8] Vikramsingh R. Parihar, Graph Theory Based Approach for Image Segmentation Using Wavelet Transform, International Journal of Image Processing (IJIP), Volume 8, Issue 5, pp 255-277, Sept 2014

[9] Vikramsingh R. Parihar, Heartbeat and Temperature Monitoring System for Remote Patients using Arduino, International Journal of Advanced Engineering Research and Science (IJAERS), Volume 4, Issue 5, PP 55-58, May 2017

[10] Vikramsingh R. Parihar, PC Controlled Electrical Line Cutting System, International Journal of Engineering Science and Computing (IJESC), Volume 7, Issue 5, pp 11380-11381, May 2017

[11] Vikramsingh R. Parihar, Overview and an Approach to Develop a Four Quadrant Control System for DC Motors without using Microcontroller, International Journal of Engineering Science and Computing (IJESC), Volume 7, Issue 5, pp 11879-11881, May 2017

[12] Vikramsingh R. Parihar, Image Analysis and Image Mining Techniques: A Review, Journal of Image Processing and Artificial Intelligence (MAT Journals), June 2017

[13] Vikramsingh R. Parihar, Power Transformer Protection using Fuzzy Logic based Controller, International Journal of Engineering Research (IJER), Volume 6, Issue 7, pp 366-370, July 2017

[14] Vikramsingh R. Parihar, Overview and an Approach to Real Time Face Detection and Recognition, International Advanced Research Journal in Science, Engineering and Technology (IARJSET), Volume 4, Issue 9, PP 39-46, Sept 2017

[15] Vikramsingh R. Parihar, Neural Network and Fuzzy Logic Based Controller For Transformer Protection, International Journal of Current Engineering and Scientific Research (IJCESR), Volume 4, Issue 9, PP 33-38 , Sept 2017

[16] Vikramsingh R. Parihar, A Novel Approach to Power Transformer Fault Protection using Artificial Neural Network, International Journal of Current

Engineering and Scientific Research (IJCESR), Volume 4, Issue 9, PP 33-38, Sept 2017

[17] Vikramsingh R. Parihar, Power Transformer Fault Protection using Artificial Neural Network, Journal of Electrical and Power System Engineering (MAT Journals), Volume 3, Issue 3, pp 1-5 , Sept 2017

[18] Vikramsingh R. Parihar, Fuzzy Logic based Controller for Power Transformer Protection, Journal of Electrical and Power System Engineering (MAT Journals), Volume 3, Issue 3, pp 1-5 , Oct 2017

[19] Vikramsingh R. Parihar, Real Time Face Detection and Recognition: Overview and Suggested Approach, Journal of Image Processing and Artificial Intelligence (MAT Journals), Volume 3, Issue 3, pp 1-6, Sept 2017

[20] Vikramsingh R. Parihar, A Novel Approach to Real Time Face Detection and Recognition, International Journal of Computer Sciences and Engineering (IJCSE), Volume 5, Issue 9, pp 62-67, Sept 2017

[21] Vikramsingh R. Parihar, Automatic Irrigation System Using Android Mobile: A Review, International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), Volume 6, Issue 9, pp 200-203, Oct 2017

[22] Vikramsingh R. Parihar, Transmission Line Multiple Fault Detection: A Review and an Approach, International Journal of Current Engineering and Scientific Research (IJCESR), Volume 4, Issue 10 pp 1-7, Oct 2017

[23] Vikramsingh R. Parihar, Regenerative Braking System for Energy Harvesting from Railways and Vehicles: A Review and an Approach, International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering (IJIREEICE), Volume 5, Issue 10, pp 18-25, Oct 2017

[24] Vikramsingh R. Parihar, RFID Based Student Attendance Management System: A Review and an Approach, International Advanced Research Journal in Science, Engineering and Technology (IARJSET), Volume 4, Issue 9, pp 262-265, Sept 2017

[25] Vikramsingh R. Parihar, Distance Protection Problem in Series-Compensated Transmission Lines, International Journal of Advanced Trends in Technology, Management and Applied Science (IJATTMAS), Volume 3, Issue 10, pp 44-48, Oct 2017

[26] Vikramsingh R. Parihar, Series-Compensated Transmission Line Problem in Distance Protection, International Journal of Electrical, Electronics and Communication Engineering (IJEECE), Volume 3, Issue 10, pp 1-9, Oct 2017

[27] Vikramsingh R. Parihar, Series Compensated Line Protection using Artificial Neural Network, International Advanced Research Journal in Science, Engineering and Technology (IARJSET), Volume 4, Issue 10, pp 102-111, Oct 2017

[28] Vikramsingh R. Parihar, Protection Scheme of Fault Detection in High Voltage Transmission Line, International Journal of Advanced Trends in Technology, Management and Applied Science (IJATTMAS), Volume 3, Issue 11, pp 1-4, Nov 2017

[29] Vikramsingh R. Parihar, IOT Based Communication Technology for High Voltage Transmission System, Journal of Electrical and Power System Engineering (MAT Journals), Volume 3, Issue 3, pp 1-6 , Nov 2017

[30] Vikramsingh R. Parihar, Transmission Line Protection Analysis using STATCOM, International Journal of Advanced Trends in Technology, Management and Applied Science (IJATTMAS), Volume 3, Issue 11, pp 23-26, Nov 2017

[31] Vikramsingh R. Parihar, A Review on Transmission Line Fault Detection Techniques, International Journal of Advanced Trends in Technology, Management and Applied Science (IJATTMAS), Volume 3, Issue 11, pp 27-32, Nov 2017

[32] Vikramsingh R. Parihar, Transmission Line Protection using Distance Relays, International Journal of Electrical, Electronics and Communication Engineering (IJEECE), Volume 3, Issue 1, pp 1-15, Nov 2017

[33] Vikramsingh R. Parihar, Protection of Power Transformers using Artificial Neural Network and Fuzzy logic, International Journal of Advanced Trends in Technology, Management and Applied Science (IJATTMAS), Volume 3, Issue 11, pp 72-79, Nov 2017

[34] Vikramsingh R. Parihar, Control System Security: An Issue, Journal of Control System and Control Instrumentation (MAT Journals), Volume 3, Issue 3, pp 1-5 , Dec 2017

[35] Vikramsingh R. Parihar, Resilient Designs of Control Systems Analysis and Review, Journal of Control System and Control Instrumentation (MAT Journals), Volume 3, Issue 3, pp 1-9 , Dec 2017

[36] Vikramsingh R. Parihar, Industrial Control System Cyber Security: Review & Recommendations, Journal of Network Security Computer Networks (MAT Journals), Volume 3, Issue 3, pp 1-9 , Dec 2017

[37] Vikramsingh R. Parihar, Operational Analysis of Infrared Gas Sensor, Journal of Instrumentation and Innovation Sciences (MAT Journals), Volume 4, Issue 1, pp 1-5 , Dec 2017

[38] Vikramsingh R. Parihar, Automatic Fault Detection in Transmission Lines using GSM Technology, International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering (IJIREEICE), Volume 6, Issue 4, pp 90-95, April 2018

[39] Vikramsingh R. Parihar, UPFC based distance relays for protection of transmission systems employing FACTS, International Journal of Advanced Engineering and Technology (IJAET), Volume 2, Issue 2, pp 4-7, May 2018

[40] Vikramsingh R. Parihar, Power Substation Protection from Lightening Over voltages and Power Surges, International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering (IJIREEICE), Volume 6, Issue 6, pp 26-31, June 2018

[41] Vikramsingh R. Parihar, An Overview of Transmission Line Fault Detection Techniques, International Journal of Innovative Research & Studies (IJIRS), Volume 8, Issue VII, pp 64-77, July-2018

[42] Vikramsingh R. Parihar, Power Monitoring System Using Microcontroller for Optimum Power Utility in homes, Reinvention International: An International Journal of Thesis Projects and Dissertation, Volume 1, Issue 1, pp 96-112, Aug-2018

[43] Vikramsingh R. Parihar, Automatic Wireless Health Monitoring System, Reinvention International: An International Journal of Thesis Projects and Dissertation, Volume 1, Issue 1, pp 84-95, Aug-2019

[44] Vikramsingh R. Parihar, Overview and an Approach for QR-Code Based Messaging and File Sharing on Android Platform in View of Security, Proceedings of the IEEE 2017 International Conference on Computing Methodologies and Communication (ICCMC), July 2017

[45] Vikramsingh R. Parihar, Line Trap and Artificial Intelligence Based Double Circuit Transmission Line Fault Classification, International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS 2017), August 2017

[46] Vikramsingh R. Parihar, Hybrid Power System with Integration of Wind, Battery and Solar PV System, IEEE International Conference on Power, Control, System and Instrumentation Engineering (ICPCSI), Sept 2017

[47] Vikramsingh R. Parihar, A Novel System of Real Time Hand Tracking and Gesture Recognition, IEEE International Conference on Inventive Computing and Informatics (ICICI), Nov 2017.