



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT

Volume 11, Issue 5, May 2024



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.802



IOT Based Water Purifier

S. Mohanbabu¹, K. Vigash², K. Vishnu Prasath³, R. Raja⁴ and S. Saravanan⁵

UG Students, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Tamil Nadu, India^{1,2,3}

Associate Professor, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Tamil Nadu, India⁴

Professor, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Tamil Nadu, India⁵

ABSTRACT: Today, a large portion of the human population around the globe has no access to freshwater for drinking, cooking, and other domestic applications. Water resources in numerous countries are becoming scarce due to over urbanization, rapid industrial growth, and current global warming. Water is often stored in the purifier tanks. In developing countries, these tanks are maintained manually, and in some cases, water is wasted due to human negligence. To address these issues, researchers worldwide turned to the wireless technology to efficiently monitor water levels, detect quality, and auto refill tanks whenever needed. Notably, this technology can also supply real-time feedback to end-users and other experts through a smartphone. To design smart water monitoring including water quality and level using sensors such as pH, Level sensor, Turbidity Sensor and Temperature Sensor are used. However, none of the reviews focus on the IoT-based solution to monitor water level, detect water leakage, and auto control water pumps, especially at the individual level that form a vast proportion of water consumers worldwide. Some important contributions of our work include surveying contemporary work on WiFi based monitoring, elaborating current techniques and technologies in IoT based water storage tanks WST, targeting proper hardware, and selecting a secure mobile server.

I.INTRODUCTION

Clean drinking water is the most valuable resource for humans. Any imbalance in the water quality would seriously affect the health condition of the humans. Now a day's drinking water utilities are facing various challenges in real time due to limited water resources, global warming, growing population and pollution. Hence there is need of better methodologies for real time water quality monitoring. As the recent survey of WHO estimated that in India 77 million people face problems due to unsafe drinking water and 21% of the diseases are related to impure water. WHO also estimated that 1600 people die every day in India due to diarrhea. Clean drinking water is a critical resource, important for the health and well-being of all humans. Drinking water utilities are facing new challenges in their real-time operation because of limited water resources, intensive budget requirements, growing population, ageing infrastructure, increasingly stringent regulations and increased attention towards safeguarding water supplies from accidental or deliberate contamination. There is a need for better on-line water monitoring systems given that existing laboratory-based methods are too slow to develop operational response and do not provide a level of public health protection in real time. Rapid detection (and response) to instances of contamination is critical due to the potentially severe consequences to human health. Breaches in physical and hydraulic integrity of a water distribution system can lead to the influx of contaminants across pipe walls, through breaks, and via cross connections. Drinking water can serve as a transmission vehicle for a variety of hazardous (biological, chemical, etc) agents which can produce adverse effects in humans due to multiple routes (ingestion, inhalation and dermal) of exposure.

Water quality monitoring systems should provide good balance between cost and ease of implementation-maintenance, however to ensure their survival must demonstrate operational benefits (such as better water quality, decreased operating costs or reduced customer complaints). Given the absence of reliable, in-line, continuous and inexpensive sensors for monitoring all possible biological and chemical contaminants, our approach is to measure physicochemical water parameters that can be reliably monitored with low cost sensors and develop low cost networked embedded systems (sensor nodes) as well as contamination detection algorithms to fuse these multi-sensor data in order to infer possible contamination events. Even though this approach may suffer from some false alarms, it can be compensated / eliminated by the large scale deployment and the possibility of correlating the decisions from various sensor nodes which is the topic of our future work.

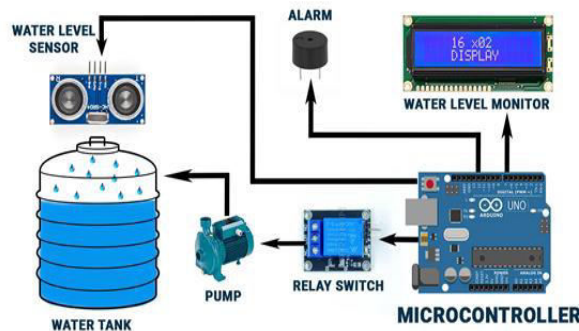


Figure.1. Water Quality Monitoring

II.EXISTING SYSTEM

Predicting water quality has become very important in controlling water pollution. In this work, advanced artificial intelligence (AI) algorithms are developed to predict water quality index (WQI) and water quality classification (WQC). For the WQI prediction, artificial neural network models, namely nonlinear autoregressive neural network (NARNET) and long short-term memory (LSTM) deep learning algorithm have been developed. Existing methods follows machine learning techniques such as neural networks, support vector machines, decision trees, and ensemble methods to analyze historical water quality data which are employed to extract meaningful insights from diverse parameters including pH levels, dissolved oxygen, turbidity, and pollutant concentrations. Validation and performance assessment of the developed models are conducted using robust evaluation metrics, ensuring reliability and accuracy in predicting water quality parameters. Comparative analysis between different AI algorithms is carried out to identify the most effective approach for water quality prediction.

III.PROPOSED SYSTEM

The proposed implementing an Internet of Things (IoT)-based system for monitoring and ensuring water quality in purifiers is a pivotal step toward safeguarding health and ensuring the purity of drinking water. This system utilizes hardware components including Arduino NANO, water pH sensor, conductivity sensor, turbidity sensor, water temperature sensor, LCD, and a buzzer. These components collectively form a robust system for real-time water quality assessment and monitoring. The Arduino NANO serves as the central processing unit, facilitating the integration and communication between the various sensors. Each sensor contributes unique data crucial to evaluating water quality.

- Water pH sensor: Measures the acidity or alkalinity of the water. Fluctuations in pH levels can indicate contamination or the effectiveness of the purification process.
- Conductivity sensor: Assesses the water's ability to conduct electricity, which correlates with the presence of dissolved solids. High conductivity might imply impurities or excess minerals.
- Turbidity sensor: Detects suspended particles in the water. Elevated turbidity levels could signify the presence of sediment, microbes, or pollutants.
- Water temperature sensor: Monitors the temperature of the water, as temperature can affect the proliferation of bacteria and the effectiveness of certain purification methods. The data collected by these sensors is processed and displayed in real-time on an LCD screen, providing users with immediate insights into the water quality.

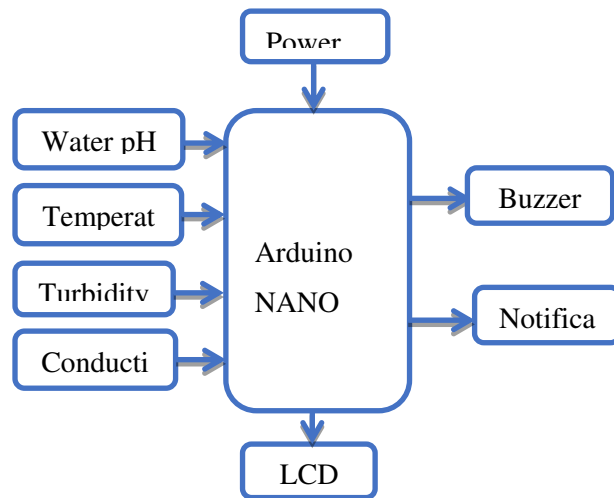


Figure.2.Proposed Block Diagram

4.2 Temperature Sensor

The DS18B20 is a 1-wire programmable Temperature sensor from maxim integrated. It is widely used to measure temperature in hard environments like in chemical solutions, mines or soil etc.It can measure a wide range of temperature from -55°C to +125° with a decent accuracy of $\pm 5^{\circ}\text{C}$.

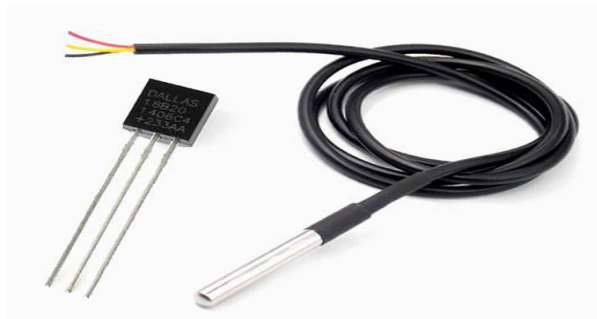


Figure.3. Temperature Sensor

4.3 Conductivity Sensor

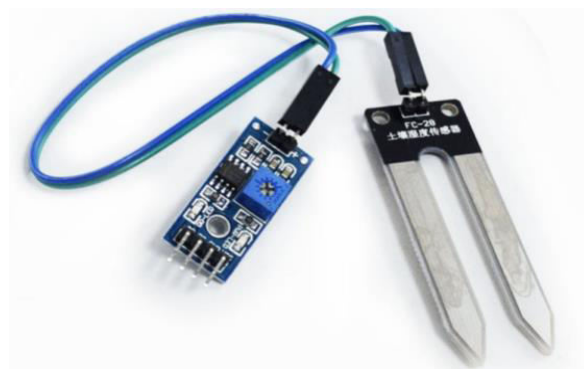


Figure.4.Conductivity Sensor

This sensor measures the volumetric content of water inside the soil and gives us the moisture level as output. The sensor is equipped with both analog and digital output, so it can be used in both analog and digital mode.

4.4 PH Sensor

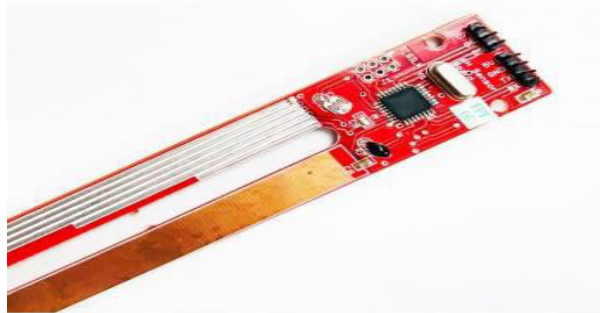


Figure.5. PH sensor

PH, commonly used for water measurements, is a measure of acidity and alkalinity, or the caustic and base present in a given solution. It is generally expressed with a numeric scale ranging from 0-14.

4.5 Turbidity Sensor



Figure.6.Turbidity Sensor

The turbidity of water refers to the degree of turbidity caused by suspended matter such as sediment, clay, organic matter, plankton and microorganisms contained in water. Industrial grade turbidity sensors or turbidimeters are expensive and not costly in electronics design; therefore, we have chosen a turbidity sensor that is widely used in household appliances washing machines and dishwashers.

ARDUINO NANO

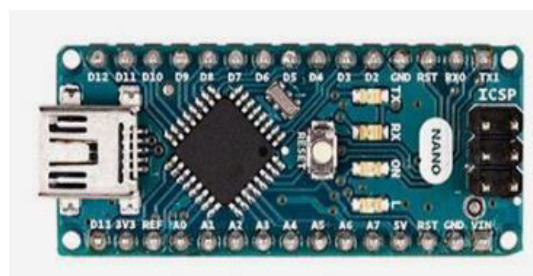


Figure.7. Arduino NANO

Arduino Nano has similar functionalities as Arduino Duemilanove but with a different package. The Nano is inbuilt with the ATmega328P microcontroller, same as the Arduino UNO. The main difference between them is that the UNO board is presented in PDIP (Plastic Dual-In-line Package) form with 30 pins and Nano is available in TQFP (plastic quad flat pack) with 32 pins. The extra 2 pins of Arduino Nano serve for the ADC functionalities, while UNO has 6 ADC ports but Nano has 8 ADC ports.

LCD (LIQUID CRYSTAL DISPLAY)

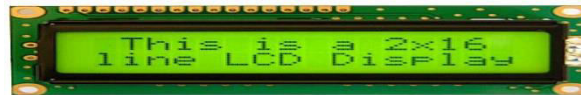


Figure.8. LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

IV.RESULTS ANDDISCUSSION

The proposed work of simulation results by using Proteus software.

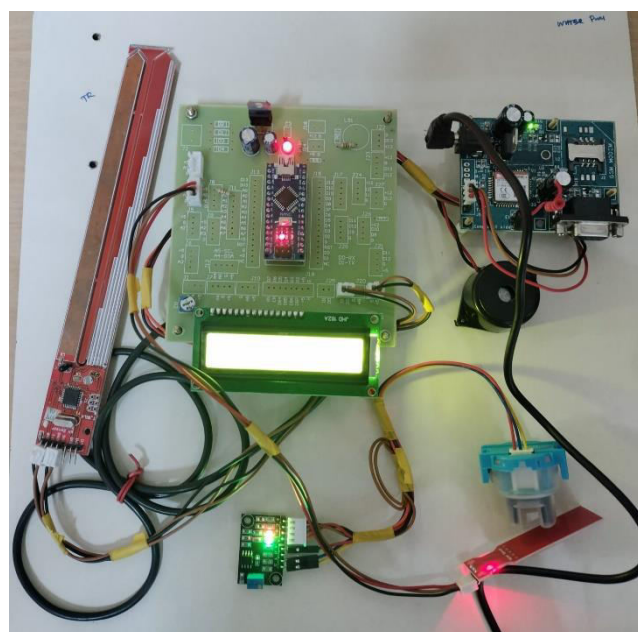
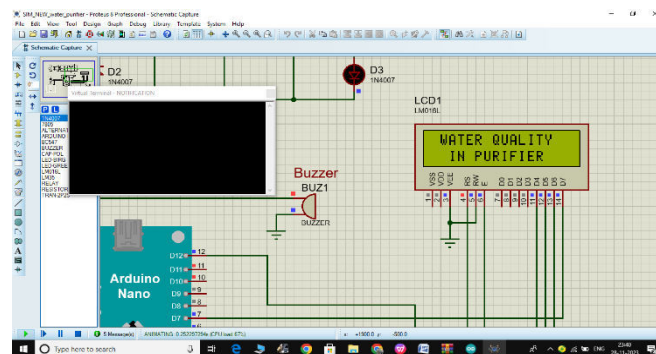


Figure.10.Implementation Model

V.CONCLUSION

The implementation of IoT devices in water purifiers significantly enhances water quality management and assurance. These devices offer real-time monitoring, enabling constant assessment of water parameters such as pH levels, dissolved solids, contaminants, and overall purity. By leveraging IoT, purifiers can automatically adjust their filtration processes based on the detected water quality, ensuring consistent and optimal purification. By utilizing sensors for pH, conductivity, turbidity, and temperature, we can obtain crucial data about water quality. Implementing an LCD screen and a buzzer can enable real-time monitoring and alerts for any fluctuations or issues detected in the water. The pH sensor helps in assessing the acidity or alkalinity level, crucial for determining water safety. The conductivity sensor measures the water's ability to conduct electricity, indicating the presence of dissolved solids or impurities. Turbidity sensors measure water clarity by detecting suspended particles, while temperatures sensors help assess optimal conditions. Combining these sensors with IoT capabilities allows for remote monitoring and data collection. Analyzing this data can provide insights into trends, anomalies, or potential contaminants present in the water. It's crucial to establish thresholds or benchmarks for each parameter to trigger alerts or actions when levels deviate from the accepted range. IoT-based water quality monitoring system can offer a proactive approach to ensuring safe and clean water, enabling timely interventions and maintenance to preserve water quality.

REFERENCES

1. Haq, KP Rasheed Abdul, and V. P. Harigovindan. "Water quality prediction for smart aquaculture using hybrid deep learning models." IEEE Access, Vol: 10, 2022.
2. Sekhwela, Delight, Pius AdewaleOwolawi, TemitopeMapayi, and KehindeOdeyemi. "Water Quality Monitoring with Notifications System." In 2020 2nd International Multidisciplinary Information Technology and Engineering Conference (IMITEC), 2020.
3. Nayan, Al-Akhir, Muhammad GolamKibria, MdObaidurRahman, and JoyetaSaha. "River water quality analysis and prediction using GBM." In 2020 2nd International Conference on Advanced Information and Communication Technology (ICAICT), 2020.
4. Abhinav,S.,SahanaSrinivasan, AishwaryaGanesan, M. R. Anala, and T. Mamatha. "Wireless water quality monitoring and quality deterioration prediction system." In 2019 26th International Conference on High Performance Computing, Data and Analytics Workshop (HiPCW), 2019.
5. Benedict, Shajulin, NilaGowtham, Deepak Giri, and N. Sreelakshmi. "Real time water quality analysis framework using monitoring and prediction mechanisms." In 2018 Conference on Information and Communication Technology (CICT), 2018.
6. Sowmya, Ch, et al. "Implementation of wireless sensor network for real time overhead tank water quality monitoring." 2017 IEEE 7th International Advance Computing Conference (IACC). IEEE, 2017.
7. K. H. Kamaludin and W. Ismail, "Water quality monitoring with internet of things (IoT)," 2017 IEEE Conference on Systems, Process and Control (ICSPC), Malacca, 2017.
8. Indu, K., and Jishmi Jos Choondal. "Modeling, development &analysis of low cost device for water quality testing.",IEEE Annual India Conference (INDICON), 2016.
9. F. Adamo, F. Attivissimo, C. G. C. Carducci and A. M. L. Lanzolla, "A smart sensor network for sea water quality monitoring", IEEE Sensors Journal, vol. 15, 2015.
10. B O'Flynn, Rafael Martinez-Catala, S. Harte, C. O'Mathuna, John Cleary, C. Slater, et al., "SmartCoast-A Wireless Sensor Network for Water Quality Monitoring", 32nd IEEE Conference on Local Computer Networks, 2007.
11. V.Dhinesh, T.Premkumar, S.Saravanan and G.Vijayakumar," Online Grid Integrated Photovoltaic System with New Level Inverter System" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.1544-1547, 2018.
12. J.Vinoth, T.Muthukumar, M.Murugandam and S.Saravanan," Efficiency Improvement of Partially Shaded PV System, International Journal of Innovative Research in Science, Engineering and Technology, Vol.4, Special issue 6, pp.1502-1510, 2015.
13. M.B.Malayandi, Dr.S.Saravanan, Dr. M.Muruganandam, "A Single Phase Bridgeless Boost Converter for Power Factor Correction on Three State Switching Cells", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1560-1566, May 2015.
14. A.Sasipriya, T.Malathi, and S.Saravanan, "Analysis of Peak to Average Power Ratio Reduction Techniques in SFBC OFDM System" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Vol. 7, No.5, 2013.
15. P.Ranjitha, V.Dhinesh, M.Muruganandam, S.Saravanan, "Implementation of Soft Switching with Cascaded Transformers to drive the PMDC Motor", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1411-1418, May 2015.

16. C.Sowmiya, N.Mohanandhini, S.Saravanan and M.Ranjitha, "Inverter Power Control Based On DC-Link Voltage Regulation for IPMSM Drives using ANN" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 11, pp.1442-1448, 2018.
17. N.Yuvaraj, B.Deepan, M.Muruganandam, S.Saravanan, "STATCOM Based of Adaptive Control Technique to Enhance Voltage Stability on Power Grid", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1454-1461, May 2015.
18. P.Manikandan, S.Karthick, S.Saravanan and T.Divya, "Role of Solar Powered Automatic Traffic Light Controller for Energy Conservation" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.989-992, 2018.
19. R.Satheesh Kumar, D. Kanimozhi, S. Saravanan, "An Efficient Control Scheme for Wind Farm Using Back to Back Converter," International Journal of Engineering Research & Technology (IJERT), Vol. 2, No.9, pp.3282-3289, 2013.
20. K.Prakashraj, G.Vijayakumar, S.Saravanan and S.Saranraj, "IoT Based Energy Monitoring and Management System for Smart Home Using Renewable Energy Resources," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1790-1797, 2020.
21. J Mohammed siddi, A. Senthil kumar, S.Saravanan, M. Swathisriranjani, "Hybrid Renewable Energy Sources for Power Quality Improvement with Intelligent Controller," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1782-1789, 2020.
22. S. Raveendar, P.M. Manikandan, S. Saravanan, V. Dhinesh, M. Swathisriranjani, "Flyback Converter Based BLDC Motor Drives for Power Device Applications," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
23. K. Manikanth, P. Manikandan, V. Dhinesh, Dr. N. Mohananthini, Dr. S. Saravanan, "Optimal Scheduling of Solar Wind Bio-Mass Systems and Evaluating the Demand Response Impacts on Effective Load Carrying Capability," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
24. T.R. Vignesh, M.Swathisriranjani, R.Sundar, S.Saravanan, T.Thenmozhi, "Controller for Charging Electric Vehicles Using Solar Energy", Journal of Engineering Research and Application, vol.10, Issue.01, pp.49-53, 2020.
25. V.Dhinesh, Dr.G.Vijayakumar, Dr.S.Saravanan, "A Photovoltaic Modeling module with different Converters for Grid Operations", International Journal of Innovative Research in Technology, vol.6, Issue 8, pp.89-95, 2020.
26. V. Dhinesh, R. Raja, S. Karthick, Dr. S. Saravanan, "A Dual Stage Flyback Converter using VC Method", International Research Journal of Engineering and Technology, Vol.7, Issue 1, pp.1057-1062, 2020.
27. G. Poovarasan, S. Susikumar, S. Naveen, N. Mohananthini, S. Saravanan, "Study of Poultry Fodder Passing Through Trolley in Feeder Box," International Journal of Engineering Technology Research & Management, vol.4, Issue.1, pp.76-83, 2020.
28. C. Sowmya, N. Mohananthini, S. Saravanan, and A. Senthil kumar, "Using artificial intelligence inverter power control which is based on DC link voltage regulation for IPMSM drives with electrolytic capacitor," AIP Conference Proceedings 2207, 050001 (2020); <https://doi.org/10.1063/5.0000390>, Published Online: 28 February 2020.
29. M.Revathi, S.Saravanan, R.Raja, P.Manikandan, "A Multiport System for A Battery Storage System Based on Modified Converter with MANFIS Algorithm," International Journal of Engineering Technology Research & Management, vol.4, issue 2, pp.217-222, 2020.
30. D Boopathi, S Saravanan, Kaliannan Jagatheesan, B Anand, "Performance estimation of frequency regulation for a micro-grid power system using PSO-PID controller", International Journal of Applied Evolutionary Computation (IJAE), Vol.12, Issue.4, pp.36-49, 2021.
31. V Deepika, S Saravanan, N Mohananthini, G Dineshkumar, S Saranraj, M Swathisriranjani, "Design and Implementation of Battery Management System for Electric Vehicle Charging Station", Annals of the Romanian Society for Cell Biology, Vol.25, Issue.6, 17769-17774, 2021.
32. A Senthilkumar, S Saravanan, N Mohananthini, M Pushparaj, "Investigation on Mitigation of Power Quality Problems in Utility and Customer side Using Unified Power Quality Conditioner", Journal of Electrical Systems, Vol.18, Issue.4, pp.434-445, 2022.
33. V Kumarakrishnan, G Vijayakumar, D Boopathi, K Jagatheesan, S Saravanan, B Anand, "Frequency regulation of interconnected power generating system using ant colony optimization technique tuned PID controller", Control and Measurement Applications for Smart Grid: Select Proceedings of SGESC 2021, pp.129-141.
34. C Nagarajan, B Tharani, S Saravanan, R Prakash, "Performance estimation and control analysis of AC-DC/DC-DC hybrid multi-port intelligent controllers based power flow optimizing using STEM strategy and RPFC technique", International Journal of Robotics and Control Systems", Vol.2, Issue.1, pp.124-139, 2022.
35. G Vijayakumar, M Sujith, S Saravanan, Dipesh B Pardeshi, MA Inayathullaa, "An optimized MPPT method for PV system with fast convergence under rapidly changing of irradiation", 2022 International Virtual Conference on

Power Engineering Computing and Control: Developments in Electric Vehicles and Energy Sector for Sustainable Future (PECCON), pp.1-4.

36. C Nagarajan, K Umadevi, S Saravanan, M Muruganandam, "Performance Analysis of PSO DFFP Based DC-DC Converter with Non Isolated CI using PV Panel", International Journal of Robotics and Control Systems' Vol.2, Issue.2, pp.408-423, 2022.
37. VM Geetha, S Saravanan, M Swathisriranjani, CS Satheesh, S Saranraj, "Partial Power Processing Based Bidirectional Converter for Electric Vehicle Fast Charging Stations", Journal of Physics: Conference Series, Vol.2325, Issue.1, pp.012028, 2022.
38. M Santhosh Kumar, G Dineshkumar, S Saravanan, M Swathisriranjani, M Selvakumari, "Converter Design and Control of Grid Connected Hybrid Renewable Energy System Using Neuro Fuzzy Logic Model", 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA), pp.1-6, 2022.
39. C Gnanavel, A Johny Renoald, S Saravanan, K Vanchinathan, P Sathishkhanna, "An Experimental Investigation of Fuzzy-Based Voltage-Lift Multilevel Inverter Using Solar Photovoltaic Application", Smart Grids and Green Energy Systems, pp.59-74, 2022.
40. C Nagarajan, K Umadevi, S Saravanan, M Muruganandam, "Performance investigation of ANFIS and PSO DFFP based boost converter with NICI using solar panel", International Journal of Engineering, Science and Technology, Vol.14, Issue.2, pp.11-21, 2022.
41. K Priyanka, N Mohananthini, S Saravanan, S Saranraj, R Manikandan, "Renewable operated electrical vehicle battery charging based on fuzzy logic control system", AIP Conference Proceedings, Vol.2452, Issue.1, pp.030007, 2022.
42. V Kumarakrishnan, G Vijayakumar, D Boopathi, K Jagatheesan, S Saravanan, B Anand, "Optimized PSO technique based PID controller for load frequency control of single area power system", Solid State Technology, Vol.63, Issue.5, pp.7979-7990, 2020.
43. G. Poovarasan, S. Susikumar, S. Naveen, N. Mohananthini, S. Saravanan, "Implementation of IoT Based Poultry Feeder Box", International Journal of Innovative Research In Technology, Vol.6, Issue.2, pp.33-38, 2020.
44. N.Gokulnath, B.Jasim Khan, S.Kumaravel, Dr.A.Senthil Kumar and Dr.S.Saravanan, "Soldier Health and Position Tracking System", International Journal of Innovative Research In Technology (IJIRT)), Vol-6 Issues 12, pp.39-45, 2020.
45. P.Navaneetha, R.Ramiya Devi, S.Vennila, P.Manikandan and Dr.S.Saravanan , " IOT Based Crop Protection System against Birds and Wild Animal Attacks", International Journal of Innovative Research In Technology (IJIRT)), Vol-6 Issues 11, pp.133-143, 2020.
46. V. Dhinesh, D. Prasad, G. Jeevitha, V. Silambarasan, Dr. S. Saravanan, " A Zero Voltage Switching Pulse Width Modulated Multilevel Buck Converter", International Research Journal of Engineering and Technology (IRJET), Vol 7 Issue 3, pp.1764,2020.
47. K. Punitha, M. Rajkumar, S. Karthick and Dr. S. Saravanan, " Impact of Solar And Wind Integration on Frequency Control System", International Research Journal of Engineering and Technology (IRJET), Vol 7 Issue 3, pp.1357-1362,2020.
48. A.Arulkumar, S.Balaji, M.Balakrishnan, G.Dineshkumar and S.Saravanan, "Design And Implementation of Low Cost Automatic Wall Painting Machine" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.170-176, 2020.
49. V.Periyasamy, S.Surya, K. Vasanth, Dr.G.Vijayakumar and Dr.S.Saravanan, "Design And Implementation of Iot Based Modern Weaving Loom Monitoring System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.11-18, 2020.
50. M.Yogheshwaran, D.Praveenkumar,S.Pravin,P.M.Manikandan and Dr.S.Saravanan, "IoT Based Intelligent Traffic Control System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.59-63, 2020.
51. R.Pradhap, R.Radhakrishnan, P.Vijayakumar, R.Raja and Dr.S.Saravanan, "Solar Powered Hybrid Charging Station For Electrical Vehicle" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.19-27, 2020
52. S.Shenbagavalli, T.Priyadharshini, S.Sowntharya, P.Manikandan and Dr.S.Saravanan, "Design and Implementation of Smart Traffic Controlling System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.28-36, 2020.
53. M.Pavithra, S.Pavithra, R.Rama Priya, M.Vaishnavee, M.Ranjitha and S.Saravanan, "Fingerprint Based Medical Information System Using IoT" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.45-51, 2020.
54. A.Ananthan, A.M.Dhanesh, J.Gowtham, R.Dhinesh, G.Jeevitha and Dr.S.Saravanan, "IoT Based Clean Water Supply" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.154-162, 2020.

55. R.Anbarsan, A.Arsathparvez, K.S.Arunachalam, M.Swathisriranjani and Dr.S.Saravanan, "Automatic Class Room Light Controlling Using Arduino" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.192-201, 2020.
56. S.Karthikeyan, A.Krishnaraj, P.Magendran, T.Divya and Dr.S.Saravanan, "The Dairy Data Acquisition System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.163-169, 2020.
57. M.Amaran, S.Mannar Mannan, M.Madhu, Dr.R.Sagayaraj and Dr. S.Saravanan, "Design And Implementation of Low Cost Solar Based Meat Cutting Machine" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.202-208, 2020.
58. N.Harish, R.Jayakumar, P.Kalaiyarasan, G.Vijayakumar and S. Saravanan, "IoT Based Smart Home Energy Meter" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.177-183, 2020.
59. K.Subashchandrabose, G.Moulieshwaran, M.Raghul, V.Dhinesh and S.Saravanan, "Design of Portable Sanitary Napkin Vending Machine", International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.52-58, 2020.
60. R.Gopi, K.Gowdhaman, M.Ashok, S.Divith, S.Saravanan and G.Dineshkumar, "An Online Method of Estimating State of Health of A Li-Ion Battery", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.31-36, 2023.
61. S.Azhaganandham, P.Elangovan, M.S.Kayalkanan, M.Dineshkumar and S.Saravanan, "Automatic Direct Torque Control System For 3 Phase Induction Motor", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.1-3, 2023.
62. K. Ranjith Kumar, A.Naveen, R.Ragupathi, S. Savitha and S. Saravanan, "Automatic Industrial-Based Air Pollution Avoidance System Using Iot", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.100-105, 2023.
63. G.T.Nandhini, V.Megasri, T.Jeevitha, S.Sandhiya and S. Saravanan, "Automatic Pick And Drop Helping Robot", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.72-76, 2023.
64. K.Deepika, S.Divya, A.Hema, R.Meena, V.Deepika and S.Saravanan, "Automatic Solar Panel Cleaning System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.62-66, 2023.
65. A.Balaji, K.Harikiruthik, A.Mohamed Hassan, S.Saravanan and S.Saranraj, "Design and Implementation of A Single Stage Multi-Pulse Flexible Topology Thyristor Rectifier for Battery Charging in Electric Vehicles", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.37-42, 2023.
66. D.Hemalatha, S.Indhumathi, V.Myvizhi and S.Saravanan, "Design and Implementation of Intelligent Controller for Domestic Applications", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.4-7, 2023.
67. N.Priyadharshini, S.Saraswathi, T.Swetha, K.Sivaranjani, K.Umadevi and S.Saravanan, "Fuel Monitoring System using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.126-130, 2023.
68. S. Divyasri, E. Indhu, M. P. Keerthana, M. Selvakumari and S. Saravanan, "Gas Cylinder Monitoring System using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.67-71, 2023.
69. J.Arul, R.Balaji, S.Jeyamoorthy, M.Manipathra, R.Sundar and S.Saravanan, "IoT based Air Conditioner Control using ESP32", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.48-52, 2023.
70. Vundel Munireddy, J.Prahathesvaran, C.R.Thirunavukarasu, M.Santhosh Kumar and S.Saravanan, "IoT Based Charge Controller for Direct Fast Charging of Electric Vehicles Using Solar Panel", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.77-81, 2023.
71. D.Monish Kumaar, K.Akash, S.Aswinkumar, S.Saravanan and R. Sagayaraj, "IoT based Industry Surveillance and Air Pollution Monitoring using Drones", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.14-18, 2023.
72. T.Silambarasan, R.Surya, J.Pravinkumar, R.Sundar and S Saravanan, "IoT based Monitoring System For Sewage Sweeper", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.88-93, 2023.
73. R.Aravinthan, Alwin.Augustin, P.Divagaran, S.Saravanan and P.Manikandan, "IoT Based Power Consumption and Monitoring System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.43-47, 2023.
74. S.Partheeban, S.Sundaravel, S.Umapathi, R.Sagayaraj and S.Saravanan, "IoT based Safety Helmet for Mining Workers", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.116-120, 2023.

75. D.K.Vignesh, K.Sabarishwaran, S.Yuvaraj, P.Manikandan and S Saravanan, "IoT based Smart Dustbin", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.82-87, 2023.
76. P Muthukrishnan, P Poovarasan, S Vasanth, R Raja and S Saravanan, "Smart Borewell Child Rescue System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.121-125, 2023.
77. S. Gokul, B. Gokulnath, P. Manikandan, S.Saravanan and N. Mohananthini, "Smart Crop Protection From Animals And Birds Using Arduino", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.19-25, 2023.
78. M.Abinesan, S.Jawahar, S.A.Gopi, A.Gokulraj and S.Saravanan, "Smart EV Charging Hub Integrated with Renewable Energy for Highway Utility", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.58-61, 2023.
79. K.Eswaramoorthi, R.Manikandan, R.Balamurugan, C.Ramkumar and S.Saravanan, "Smart Parking System using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.53-57, 2023.
80. S.Nirmalraj, C.Pranavan, M.Prem and S.Saravanan, "Smart Trolley With IoT Based Billing System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.111-115, 2023.
81. S. NithyaSri, S.S.Sabitha, M.Thilagavathi, S.Umameshwari, C.Nithya and S.Saravanan, "Smart Wireless Notice Board using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.106-110, 2023.
82. V.Gunasekaran, M.Gowtham, S. Anbubalaji, S.Saravanan and R.Prakash, "Solar based Electric Wheel Chair", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.8-13, 2023.
83. S.Naveenkumar, S.Prakash, A.P.Shrikirishnaa, C.Ramkumar and S.Saravanan, "Two to Three Phase 5HP Digital Panel", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.94-99, 2023.
84. Harivignesh K, Jaisankar.A, Chandru.J, Saravanan.S and Raja.R, "Voice Controlled Automatic Writer", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.26-30, 2023.
85. N.Sakthiselvam, S.Srinivasan, S.Raajkumar, M.Selvakumari, S.Saravanan, "An Integrated Fault Isolation and Prognosis Method for Electric Drive Systems of Battery Electric Vehicles", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.166-171, 2023.
86. P Thava Prakash, P.Venketesan, D.Vignesh, S.Prakash, S.Saravanan, "Design of Low Cost E-Bicycle using Brushless DC Motor with Speed Regulator", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.148-153, 2023.
87. D.Tamilarasan, V.S.Vairamuthu, Y.Vasanth, K.Umadevi, S.Saravanan, "GSM based Agricultural Motor Control", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.172-177, 2023.
88. P. Vimal, S.Veerasingamani, R.Srihari, C.S.Satheesh, S.Saravanan, "IoT Based Optimal Power Management System For Smart Grid", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.160-165, 2023.
89. S.Abimanyu, P.Jagadheeswaran, S.Jaganath, K.Sanjay, R.Sivapraneesh, K.Velmurugan, N.Mohananthini, C.S.Satheesh, S.Saravanan, "Portable Solar Tree", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.154-159, 2023.
90. J.Sriboopathi, G.Sridhar, R.Sharunesh, S.Tamilarasan, S.Saranraj and S.Saravanan, "A Dual Stage Power Electronic Converter for Electric Vehicle Charger", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.197-202, 2023.
91. M.Karthikeyan, S.Bilalahamad, V.A.Chandru, V.Deepika and S.Saravanan, "Design and Development of IoT based Motor Starter", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.178-183, 2023.
92. S.Yokesh, M.Manoj Kumar, M.Sankar, G.Dineshkumar and S.Saravanan, "Estimation of Maximum Power in Lithium Ion Batteries using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.191-196, 2023.
93. P.Preedeepa, S.Sivaranjani, M.Nandhini, M.Swathisriranjani and S.Saravanan, "Optimization of Power Quality Issues in EV Charging Station", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.203-209, 2023.
94. R. GokulRaj, N. Kannan, S. Karthick, M.Swathisriranjani and S.Saravanan, "Power Quality Enhancement in Smart Grids for Electric Vehicles Charging Station", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.184-190, 2023.



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT



+91 99405 72462



+91 63819 07438



ijmrsetm@gmail.com

www.ijmrsetm.com