IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 12, Issue 3, March 2023

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.317

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 3, March 2023||

|DOI:10.15662/IJAREEIE.2022.1203007 |

Charging for Electric Vehicles Using A Zeta Converter

S.Sankar[1], K.Mathesh[2], A.Karthik Raja[3], S.Mayakrishnan[4]

UG Scholars, Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India[1,2,3,4]

ABSTRACT: Electric vehicles make up a large portion of the transportation system of the future. The development of electric vehicles has made them more inexpensive and energy-efficient than traditional gasoline or diesel-powered vehicles, and it is paving the way for the electrification of transportation in the future. The key difference between electric vehicles andIts success is largely dependent on the converter's availability of high efficiency charging techniques the goal of this project is to design and implement fast charging infrastructures while achieving the highest possible standards for variables like output power, power factor, and dependability. This will help to overcome the many difficulties encountered. To comprehend how the prototype works and to develop the optimum strategy for quick charging, it is simulated using MATLAB Simulink. In order to develop a quicker, more efficient charging process, it also assesses the various converter types that can be incorporated into charging stations. This project addresses several environmental concerns that are involved in sustainable development in addition to the technical components of EV charging stations. Putting this intoPractise in the future could be one of the most simple, quick, and effective designs for charging micro electric vehicles, and it could pave the way for a simple, quick technique of charging electric vehicles from low range to larger range of ratings and capacity.

KEYWORDS: E-Vehicle,gasoline or diesel,charging process,LCD display

I. INTRODUCTION

It also evaluates the various converter types that can be added into charging stations in order to provide a faster, more effective charging process. This project addresses the technical aspects of EV charging stations as well as a number of environmental issues related to sustainable development. This could be one of the most straightforward, speediest, and efficient solutions for charging mini electric vehicles in the future, and it could open the way for a straightforward, rapid method of charging electric vehicles from short range to larger range of ratings and capacity. For nearly a century, modern internal combustion engines have dominated the propulsion of motor vehicles, but electric power has remained prevalent in other vehicle types, such as railways and smaller vehicles of all kinds. case day, andday An electric vehicle is frequently referred to as an EV. Because to technology advancements, a greater emphasis on renewable energy, and the possibility to lessen transportation's influence on climate change and other environmental challenges, EVs have had a renaissance in the twenty-first century.

Proposed system

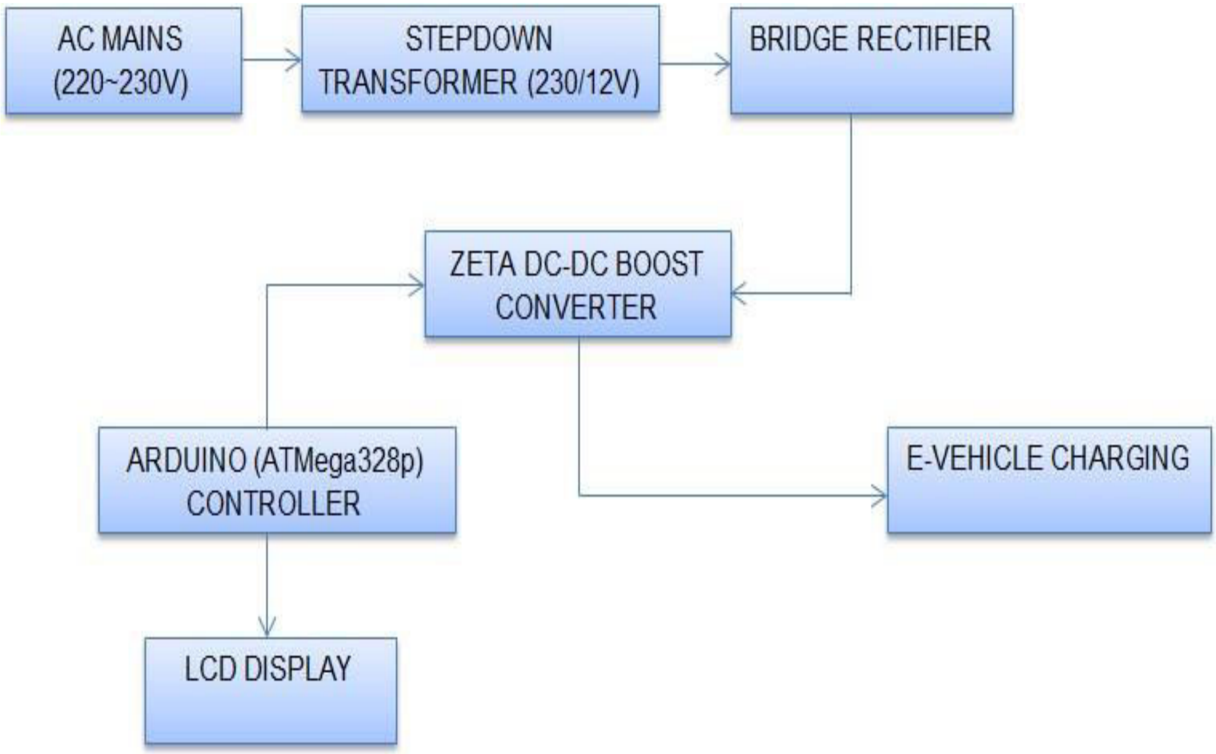
Modern internal combustion engines have dominated motor vehicle propulsion for almost a century, while other vehicle types, such trains and smaller vehicles of all kinds, have continued to be mostly propelled by electric power. instance day, and day the term "EV" is widely used to describe an electric vehicle. In the twenty-first century, EVs have had a rebirth because to technological developments, a focus on renewable energy sources, and the potential to reduce transportation's impact on climate change and other environmental issues.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 3, March 2023||

|DOI:10.15662/IJAREEIE.2022.1203007 |

BLOCK DIAGRAM



BLOCK DIAGRAM DESCRIPTION

In this project, the source is the AC supply that is readilyavailable from the grid which values around 220-230 V. It is fed to an ACtransformer (230/12V) that steps down the value from 230V to 12V. This 12VAC is now converted to the DC form through a bridge rectifier that consists ofdiodes. The output of the bridge rectifier which is DC is now the main source tothe Zeta DC-DC converter that boosts up the value of the input given.

Components used

(230/12V)3ATransformer:

Solid Core and Winding information for the transformer is described A general purpose chassis mounted mains transformer is the (12-0-12) 3Amp Center Tapped Step Down Transformer. Transformer has a secondary winding with a central tap and a primary winding of 230V. The transformer has shielded connection lines with flying colours(100 mm long). The transformer functions as a step-down transformer, converting 230V AC to 12V AC. The transformer outputs 12 volts, 12 volts, and 0 volts. The below. A static electrical device called a transformer uses inductivecoupling between its winding circuitsto transmit energy. A changing magnetic flux in the transformer's core and a changing magnetic flux through the secondary winding are both caused by a changing current in the primary winding. This fluctuating magnetic flux causes the secondary winding's electromotive force (E.M.F.) or voltage to fluctuate.

Inductor:

One essential element in any converter arrangement is the inductor. It is a key element in the process of energising and de-energizing charges. Inductors are mostly used to store energy. They assist the converter in staying in continuous mode while also storing energy in this process (In many cases the inductors are designed keeping in mind the ripple current allowed). This continuous conduction mode characteristic is not all that important. Yet, when the DC source is a renewable energy source, continuous current is crucial since discontinuous current shortens the source's lifespan. The converter's intended conversion ratio determines the inductor's value and rating.

MOSFET Switch Module:

Another crucial element in converters is an electronic switch. It is the component that alternates continuously between the ON and OFF states. Hence, a switch must be chosen so that it can flip between different states quickly and effectively while meeting all of the operating conditions. The switching losses must be kept to a minimum because they may be a

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 3, March 2023||

|DOI:10.15662/IJAREEIE.2022.1203007 |

crucial element in a variety of applications. This switch is an N-Channel Mosfet with the IRF540 configuration. It simply requires a minimum driving voltage of 5V and is capable of driving loads up to 23A. It is one of the configurations that are frequently utilised in automotive applications.

OptocouplerIC:

The switching device is used in conjunction with an optocoupler IC, an 8-pin device. A GaAlAs light-emitting diode and an integrated photo detector make up the TLP350. An 8-lead DIP package, this one. IGBT or power MOSFET gate driving is appropriate for the TLP350. The necessary supply voltage is 5V. Using two components—an LED that emits infrared light and a photosensitive device that detects light from the LED—this gadget enables the transmission of an electrical signal between two separate circuits. An optocoupler is a device that successfully isolates low-voltage components from high-voltage circuits, removes electrical noise from signals, and permits the use of small digital signals to regulate higher AC voltages.

Capacitors:

A capacitor is a crucial component that, like inductors, is crucial for the charging and discharging processes of converters. Capacitor ratings are created by analysing and resolving the design equation of converters for zeta. It also changes depending on the input and output needed for a certain application. In a boost converter, a capacitor is linked in parallel with the load to maintain constant load current. The inductor stores energy, the diode creates a short circuit, the capacitor discharges to produce the necessary load current (Ic=-Io), and the voltage across the capacitor (which is the voltage across the output) lowers when the power electronic switch is on. Without the capacitor, the load current would have been zero while the switch was on. Also, the capacitor charges and its voltage rises once more during the switch's off period. Moreover, the capacitor smooths out the output voltage sag. Here, we use a 33mF capacitor on the output side and two (C1&C2) 2200uF 63V electrolytic capacitors for input side charging

Freewheeling Diode:

A diode only shifts into one mode at a time because it is a unidirectional device. Circuits for converters typically employ it. The ideal flyback diode will have a very high peak forward current, capacity to handle voltage transients that prevent the diode from burning out, and an inductor's power supply that is suitable for both low forward voltage drop and reverse breakdown voltage.

InthisprojectweuseaFR607diodebecauseithasthefollowingfeatures:

- Diffused Junction
- Low Forward Voltage Drop
- High Current Capability
- High Reliability
- High Surge Current Capability

Potentiometer:

The potentiometer, which features a knob for adjusting purposes, is a variable resistor. A supply terminal, a ground terminal, and a variable terminal are among the three terminals that it has. Here, the output voltage is adjusted by varying the duty cycle in order to produce various gating pulses. The potentiometer has a rating of 10 K Ohms and 0.3 W of power. The Arduino microcontroller, from which the gate supply is supplied and adjusted as needed, is connected to the potentiometer in this instance.Now, if we position the wiper precisely at 25% of terminal 1 as indicated above, the resistance between terminals 1 and 2 will be 2.5K while terminals 2 and 3 will have a resistance of 7.5K. As a result, the knob can be used to adjust the resistance and set the desired value after connecting terminals 1 and 2 or terminals 2 and 3.

ArduinoATMega328pMicrocontroller:

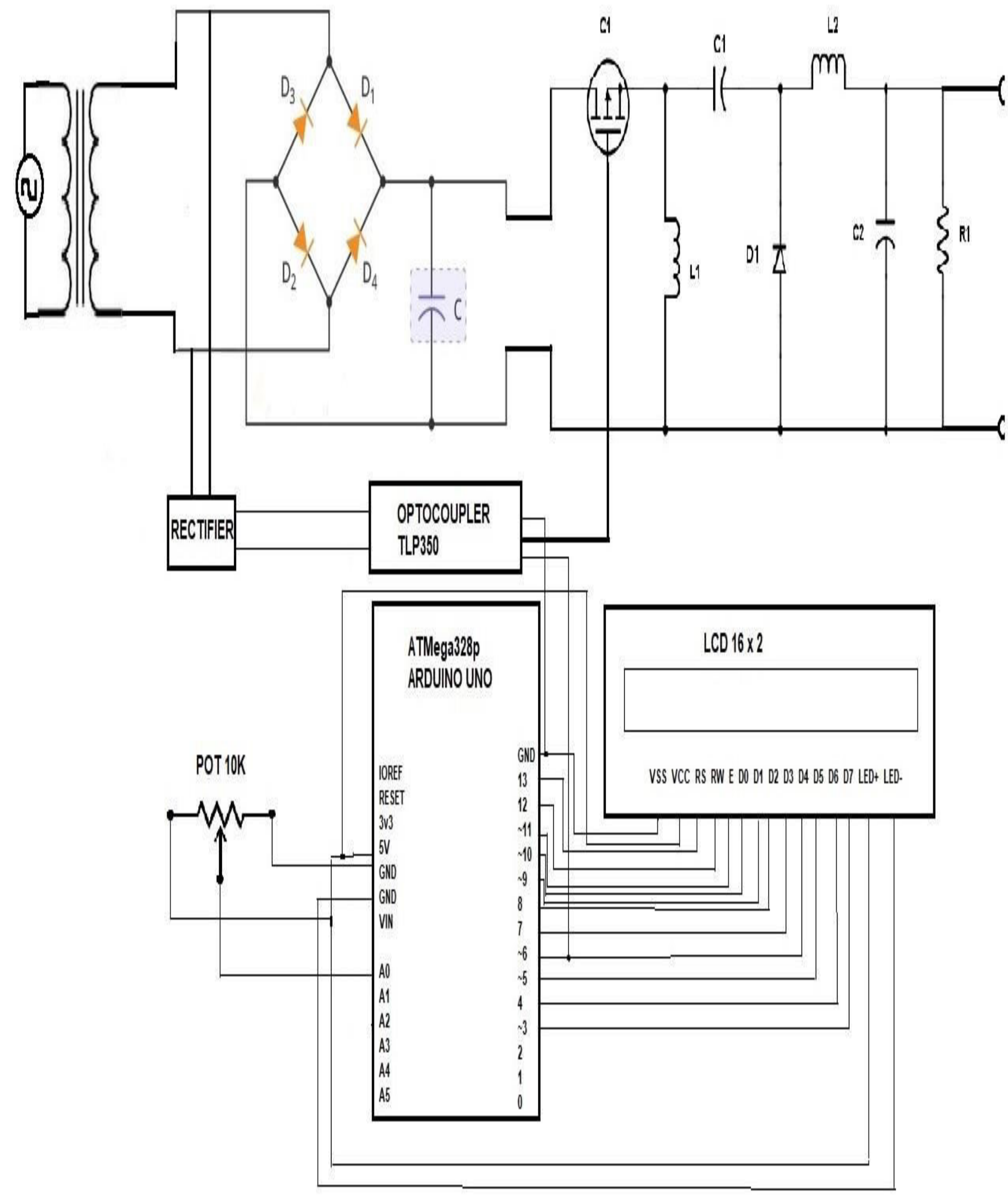
A microcontroller board called the Arduino Uno is based on the ATmega328 from Atmel. It contains 6 analogue inputs, 14 digital input output pins, 6 of which can be utilised as PWM outputs. Both an external power supply and a USB connection are options for powering the Arduino Uno. With a 3.3-5V operating voltage, it has 32KB of programmable FLASH

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 3, March 2023||

|DOI:10.15662/IJAREEIE.2022.1203007 |

memory, 1KB of EEPROM, and 2KB of SRAM. Six analogue input pins are present on the PCB of the Arduino atmega-328 microcontroller. The names of these analogue inputs range from A0 to A5.We may do the process utilising these 6 analogue input pins. Inputs with an analogue signal can be used in the 0 to 5V working range. The 12 digital input pins of the Arduino Atmega328 microcontroller are also included. You can write it out as D0 to D11. Applications requiring digital input/output can use over 12 inputs. The discrete input pulses can be triggered and provided to the digital input ports during the course of their operation. This microcontroller is used in this instance to create pulses with pulse width modulation.



LCD Display:

The project's ongoing procedures are displayed on an LCD. It serves to show the input and output voltage values in this case. It is coded in the Arduino microcontroller and connected to the LCD to obtain these values the LCD used measures 16 by 2. The LCDs are thin and light, measuring only a few millimetres. While LCDs use power, they may be powered for

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 3, March 2023||

|DOI:10.15662/IJAREEIE.2022.1203007 |

extended periods of time and are compatible with low power electrical circuitry. As the LCD doesn't produce light, light is required to read the panel. Reading in the dark is made feasible by the use of backlighting.

The features include:

- 16Charactersx4Lines
- 5x8DotswithCursor
- BuiltinController(HD44780orequivalent)
- +5VPowerSupply
- 1/16DutyCircle
- RoHSCompliant
- Currentconsumptionis1mAwithoutbacklight

Available in Greenand Blue Backlight

Voltage Sensor:

case and day Voltage sensors can identify the level of either AC or DC voltage. Voltage serves as the sensor's input, and its outputs can be switches, analogue voltage signals, current signals, or aural signals. Voltage Sensor is a precise, reasonably priced voltage sensor. It is founded on the resistive voltage divider design theory. It can make the red terminal connection input voltage to 5 times smaller. Arduino analogue input voltages range from 0 to 5V, and the voltage detection module input voltage should not be higher than 5Vx5=25V (or 3.3Vx5=16.5V if utilising 3.3V systems).

II. CONCLUSION

Based on Zeta topology, a straightforward power electronic controller for connecting an electric vehicle charger has been simulated. First, a comparison study was conducted.between the traditional boost converter and the suggested zeta converter design, and the fundamental requirements as well as the component specifics were analysed. Hence, the hardware implementation of Zeta converter-based electric vehicle charging for electric vehicles with shorter range and simulation were effective. The MATLAB Simulink platform was used to simulate the proposed system. It is one of the simplest methods for charging an electric vehicle and may be carried out with the aid of simpler, lower-grade components.The primary benefit of employing a zeta converter is that it draws a line current that is proportionate to the input voltage without drawing harmonic current, much like a flyback converter. Further benefits were minimal conduction loss, increased efficiency, low output ripple voltage, and quicker switching. For the purpose of designing the values of the capacitor and inductor's parameters, a mathematical study of the Zeta converter is performed. It is a reliable step-up DC-DC converter that is utilised in many electronics products.The main advantage of using a zeta converter is that, like a flyback converter, it pulls line current that is proportionate to the input voltage without drawing harmonic current. Reduced conduction loss, improved effectiveness, low output ripple voltage, and quicker switching were further advantages. A mathematical analysis of the Zeta converter is done in order to design the parameters for the capacitor and inductor. Several electronics gadgets use this dependable step-up DC-DC converter.

REFERENCES

[1]. Morris Brenna, Federica Foiadelli, Michela Longo- “Electric Vehicles Charging Technology Review and Optimal Size Estimation”-Journal of Electrical Engineering & Technology Volume 15, pages :2539–2552(2020)

[2]. J. Borges, C. S. Ioakimidis& P. Ferrão, “Fast charging stations for electric vehicles infrastructure”- MIT|Portugal Program, Sustainable Energy Systems, Portugal 2IN+, Instituto Superior Técnico, Lisbon, Portugal noLimits Consulting, Lisbon, Portugal. March 2015, DOI:22356/10.10.2495/ ISLANDS100241 Conference: ISLANDS 2015 ,Volume: 130

[3]. Alia Khatab, Mostafa I Marei–“An Electric Vehicle Battery Charger Based on Zeta Converter Fed from a PV Array” - Conference: 2018 IEEE International Conference on Environment and Electrical Engineering and 2018 IEEE Industrial and Commercial Power Systems Europe (EEEIC / I&CPS Europe).

[4]. A.Ravi , S.Murugan, J. Daniel Sathiyaraj , R.Aandal ,”A Fuzzy Logic Controlled Solar Power Generation withIntegrated Maximum Power Point Tracking using Multi-level inverter”, International Journal of

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 3, March 2023||

|DOI:10.15662/IJAREEIE.2022.1203007 |

Appliedngineering Research,Volume 10,Issue 14,2315-2326.

[5]. Selvam N V, A. Ravi , Aandal R, Daniel sathiyaraj J Selvakumar S, “Performance of Seven Level Inverter withDifferent Modulation Techniques” Test Engineering & Management, Volume 83,March- April 2020.

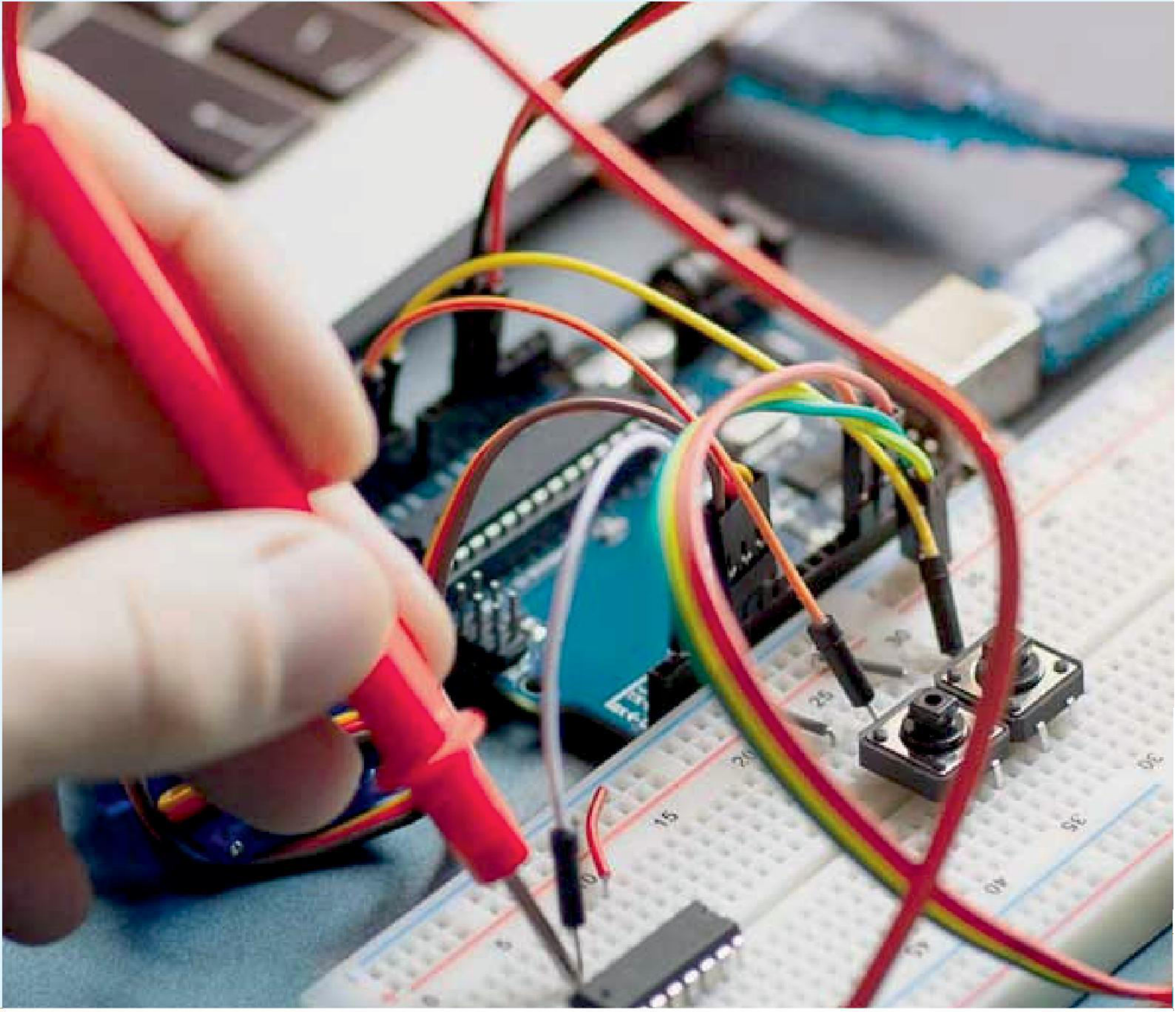
[6]. Muthulakshmi, Ravi A, Shameema Sultana, Megaben, Ragavi. “A Simulated Study on SOLAR PV PoweredBLDC and Induction Motor Drive”, International Journal of Advanced Research in Electrical, Electronics andInstrumentation Engineering, Volume 8,Issue 12,2601-2610.

[7]. A. Ravi, J.DanielSathyaraj, Faustino Adlinde M,Vignesh Arumugam V, R.Aandal,” The State Space AverageModel Of Boost Converter Fed From Photo Voltaic Array”, Test Engineering and Management,” Volume83,May-June 2020.

[8]. Selvam N V, Ravi A, Shameema Sulthana J, Jasper Gnanachandran J, Daniel Sathyaraj J, “Perfromance AnalysisOf Average Model Of Boost Converter Fed From Photo Voltaic Array Using Graphical Tool”, Turkish OnlineJournal of Qualitative Inquiry, Volume 8,Issue 12,3029-3042.

[9]. VK Rajan, A Raymon, AS Sidthik, AS Kumar,”Control of Hybrid System using Multiport Inverter and MaximumPower Point Tracking” IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676, p-ISSN: 2320-3331, Vol.9, Issue 1 Ver. III (Jan. 2014), PP 21-28

[10]. S Kingson Solomon, A Ravi, V Vignesh Arumugam, J Jasper Gnana Chandran, A Novel and AdvancedInterleaved Power Converter for a Three Phase Standalone Inverter Compensated With STATCOM Using ANN,International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Volume 8, Issue 12.2015.



International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering