IJAREEIE

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

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

Volume 11, Issue 6, June 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.18

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

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.18|

||Volume 11, Issue 6, June 2022||

|DOI:10.15662/IJAREEIE.2022.1106015 |

Real Time Implementation of 31-Level Asymmetrical Cascaded Multilevel Inverter for Dynamic Load

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ABSTRACT: This paper presents an asymmetrical multilevel inverter topology with Different PWM techniques. This paper used one cell of conventional capacitor divided Multilevel inverter structure with additional switch and voltage source to obtain high voltage level. The aim of this paper to enhance the voltage level at the output with using less switch. To improve the output voltage level, the pulse width modulation (PWM) techniques used. The advantage of this proposed topology to reduce the circuit complexity and total harmonic distortion. The results of proposed 31-Level Asymmetrical multilevel Inverter are shown using MATLAB/SIMULINK software. The conventional control methods are mainly restricted to the direct and indirect control of the inverter. The proposed fuzzy logic controller shows improved functionalities in the simulative experimental studies. The Fuzzy Associative Memory (FAM) table is derived after a thorough research of the characteristics and compared with the conventional controller for harmonic disturbance, voltage profile and other system parameters.

KEYWORDS: Multilevel inverter, fuzzy logic controller, The Fuzzy Associative Memory.

I.INTRODUCTION

Large electric drives and utility applications require advanced power electronics converter to meet the high power demands. As a result, multilevel power converter structure has been introduced as an alternative in high power and medium voltage situations. A multilevel converter not only achieves high power ratings, but also improves the performance of the whole system in terms of harmonics, dv/dt stresses, and stresses in the bearings of a motor. Several multilevel converter topologies have been developed; i) diode clamped, ii) flying capacitors, and iii) cascaded or H-bridge. Referring to the literature reviews, the cascaded multilevel inverter (CMI) with separated DC sources is clearly the most feasible topology for use as a power converter for medium & high power applications due to their modularization and extensibility. The H-bridge inverter eliminates the excessively large number of (i) bulky transformers required by conventional multilevel inverters, (ii) clamping diodes required by multilevel diode-clamped inverters, , and (iii) flying capacitors required by multilevel flying-capacitor inverter. As a preliminary study the thesis examined and compared the most common multilevel topologies found in the published literature. Starting from the essential requirements, the different approaches to the construction of multilevel inverter are explained and compared. In particular, aspects of total harmonic distortion (THD) and modulation which are required or desirable for multilevel converters are discussed.

The quality of the output voltage is improved as the number of voltage levels increases, so the quantity of output filters can be decreased. The concept of multilevel converters has been introduced since 1975. The cascade multilevel inverter was first proposed in 1975 Separate DC-sourced full-bridge cells are placed in series to synthesize a staircase AC output voltage. The term multilevel began with the three-level converter . Subsequently, several multilevel converter topologies have been developed. In 1981, diode-clamped multilevel inverter also called the Neutral-Point Clamped (NPC) inverter schemes were proposed , In 1992, capacitor-clamped (or flying capacitor) multilevel inverters, cascaded multilevel inverters were proposed Although the cascade multilevel inverter was invented earlier, its application did not prevail until the mid 1990s. The advantages of cascade multilevel inverters were prominent for motor drives and utility applications. The cascade inverter has drawn great interest due to the great demand of medium-voltage high-power inverters. The cascade inverter is also used in regenerative-type motor drive applications Recently, some new topologies of multilevel inverters have emerged.

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II.LITERATURE SURVEY

Byung Jae Choi [1] has proposed a simple FLC called the SFLC. In this paper we observed that the rule table for conventional PD or PI-type FLC has skew symmetric property and absolute magnitude of control input is proportional to the distance from its main diagonal line. These properties were also satisfied in the general case of input FLC"s using the error and its time derivative terms as fuzzy input variables. These facts allowed us to derive a new variable called the signed distance. The signed distance was used as a sole input variable of the proposed SFLC. The number of rules was greatly reduced compared to conventional FLC"s. Generation, modification and tuning of control rules were much easier. Furthermore, the control performance was nearly the same as that of the conventional skew symmetric FLC"s, which has been confirmed through computer simulations using arbitrary two nonlinear plants. It is possible to design the FLC very simply while obtaining the desired control performance by proposed SFLC.
N. F. Nik Ismail [2] has describes the design of a fuzzy logic controller using voltage output, improving the dynamic performance of boost dc-dc converter by using MATLAB simulink software. The design and calculation of the components especially for the inductor has been done to ensure the converter operates in continuous conduction mode. The evaluation of the output has been carried out and compared by software simulation using MATLAB software between the open loop and closed loop circuit. The simulation results are shown that voltage output is able to be control in steady state condition for boost dc-dc converter by using this methodology. A simple algorithm based on the prediction of fuzzy logic controller, possibly using the fuzzy rules parameter, is showing to be more convenient than the circuit without fuzzy. As the 20 V input on the output voltage for the closed loop circuit (with fuzzy logic controller) with 0% overshoot shows the better performance compared to the open loop circuit (without fuzzy logic controller) whereby it has 80% overshoot. Moreover, the value of the output current also improving corresponds to the system and produce a constant value for the output current as 0.5 A. Using a closed loop circuit with fuzzy logic controller, it is confirmed that the boost dc-dc converter gives a value of output voltage exactly as circuit requirement.
EssamNatsheh [3] has proposed fuzzy logic and proportional integral derivative controllers are compared for use in direct current motors positioning system. A simulation study of the PID position controller for the armature-controlled with fixed armature current DC motors is performed. Fuzzy rules and the interfacing mechanism of the fuzzy logic controller (FLC) are evaluated by using conventional rule lookup tables that encode the control knowledge in a rules form. The results obtained from the FLC are not only superior in the rise time, speed fluctuations, and percent overshoot but also much better in the controller output signal structure. Results of PID like FLC indicate that even without knowing the details of the control plants, we were able to construct a well performed fuzzy logic controller based on the experience about the position controller.

III.EXISTING SYSTEM

Multilevel inverters are gaining more attention in PV applications due to their advantages like better harmonic profile, low dv/dt and so on. But if any one switch of conventional multilevel inverters (NPC or flying capacitor) fails, the entire configuration has to be shut down. In this regard, a multi-level inverter configuration is proposed in this paper which can be operated during the failure of any power electronic switching device/isolated dc source. The proposed configuration is developed by using four isolated DC sources, nine two-quadrant switches and three four-quadrant switches. Requirement of number of switching devices is considerably reduced compared to conventional multilevel inverters. Detailed analysis is carried out to operate the proposed inverter configuration during the failure of different switching devices/isolated dc sources. The proposed configuration is simulated using MATLAB/Simulink and results are presented for different fault conditions. This configuration can be extended to get more number of voltage levels by cascading proposed inverter units.

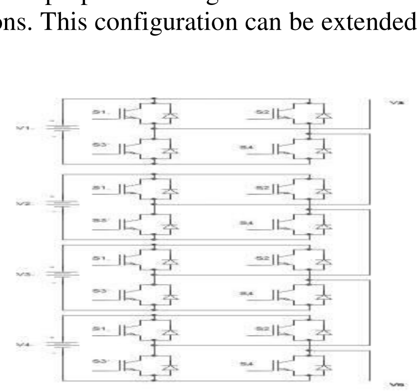

Figure: Circuit Diagram for Existing System

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IV.PROPOSED SYSTEM

In Proposed system, thirty one level inverter was obtained from less number of switches has been implemented in existing system.This unit produces a staircase waveform with positive polarity. It is connected to a single phase full-bridge converter, which particularly alternates the input voltage polarity and provides positive or negative staircase waveform at the output.Proposed System consists of nine switches, Renewable Energy sources with Capacitor Switched Multi level Inverter.Each switch in the proposed topology consists of one (MOSFET)with anti-parallel diode. Voltage and current rating of the switches play an important role in inverters. In this topology, current through all the switches are equal with the rated load current.

PROPOSED BLOCK DIAGRAM:

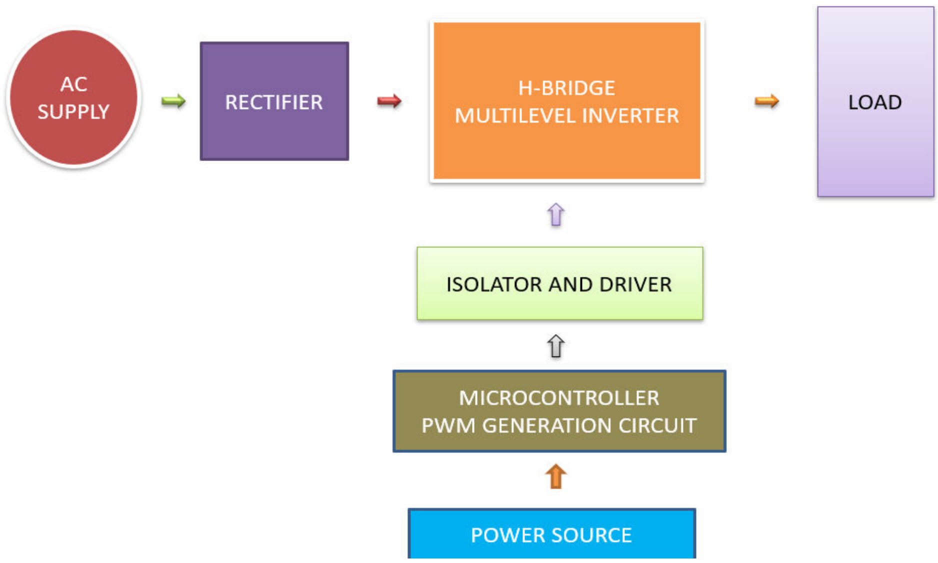

Figure: Circuit Diagram for Proposed System

V. RESULT AND DISCUSSION

The Matlab/Simulink model of the proposed inverter for 31 level output is shown in Figure 4. It consists of two upper H-bridges are cascaded with lower H-bridge of series/parallel circuit. Simulation is performed for the proposed circuit with MATLAB/SIMULINK. use of several voltage sources is suitable in Electric Vehicles (EV) since battery cells ithe power source.

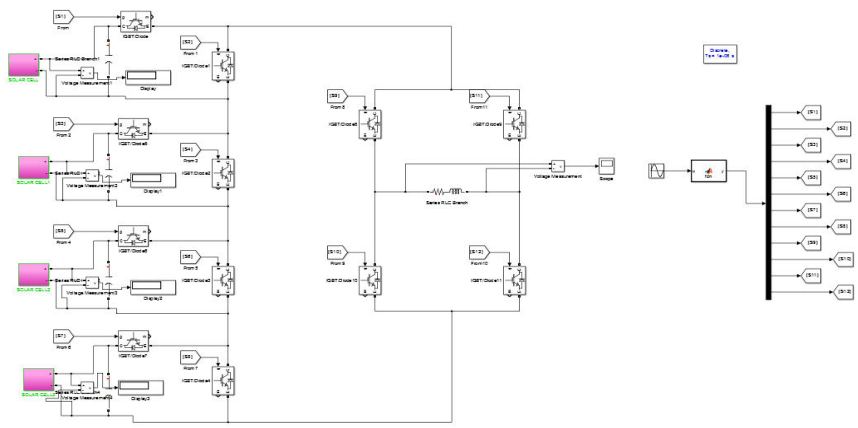

Figure: Simulation Circuit Diagram

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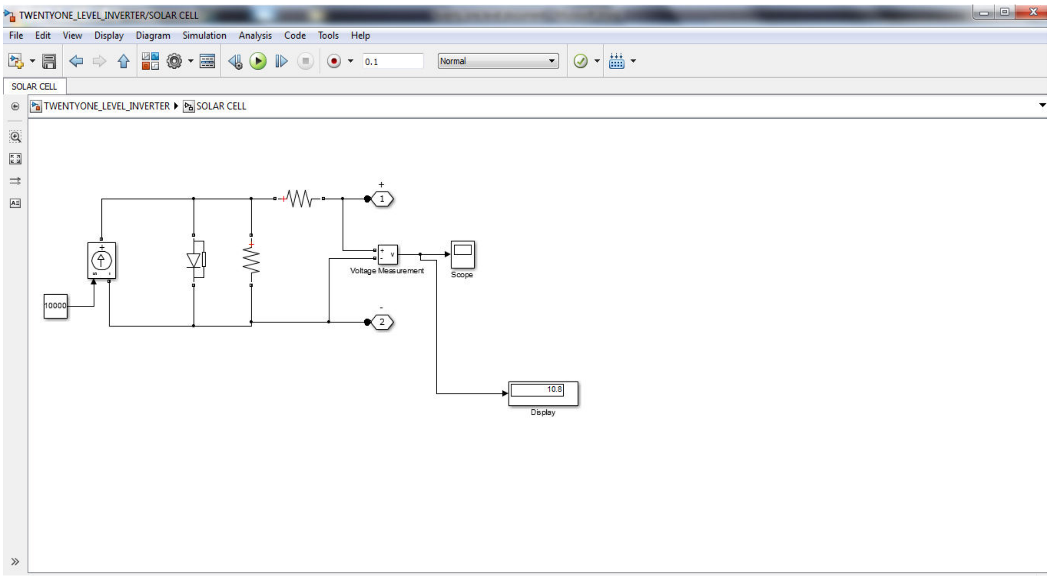

Figure: Solar Cell Construction

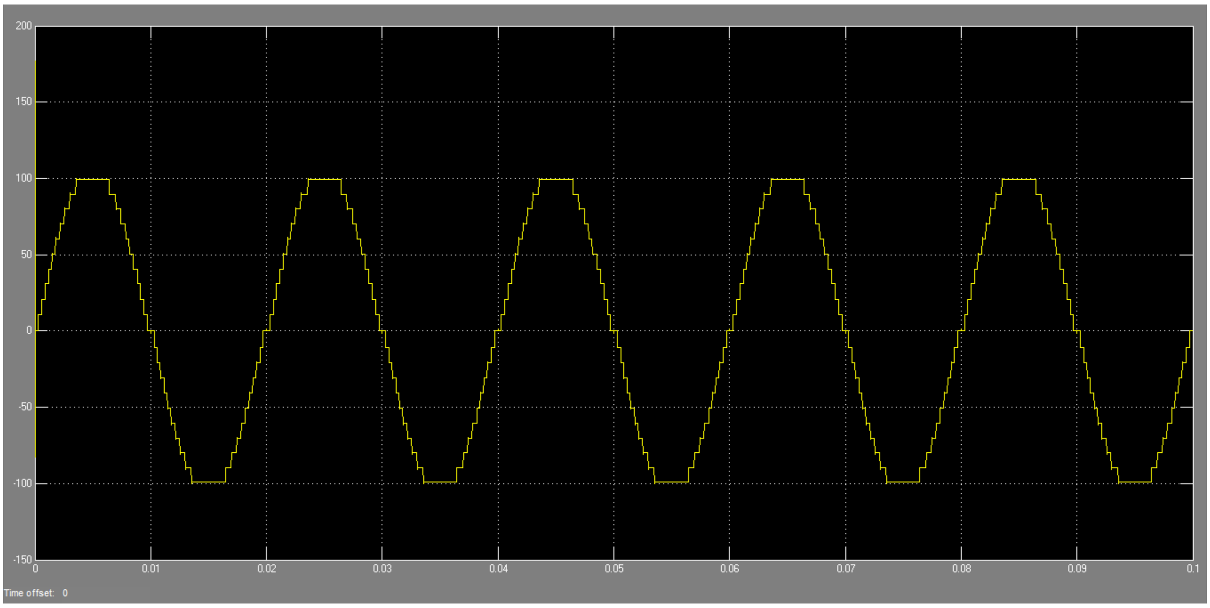

Figure: Simulation Output Waveform

The 5 level CMI shown in above figure 8. is connected to an active/mixed power load and a pure reactive power load can be seen. Each capacitor where charged to 500V during the beginning of the simulation with the charging voltage source. The charging voltage source where disconnected after the circuit reached steady-state operation. It should be noted that there are battery.

VI.CONCLUSION

Cascaded multilevel inverters in addition to acceptable reliability and simple control, provide a better voltage waveform than the other types of multilevel inverters. In this paper, a new cascaded multilevel inverter topology was

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proposed which was connected to the dc voltage sources in series and parallel. The suggested topology needs less number of switching devices with minimum standing voltage. THD is also reduced without using modulation techniques. And the proposed topology shows how to operate the Cascaded multilevel inverter without any voltage unbalance problems. The simulation results are shown which are accorded with the theoretical results. The proposed inverter is used in high power applications like EV and HEV drives.

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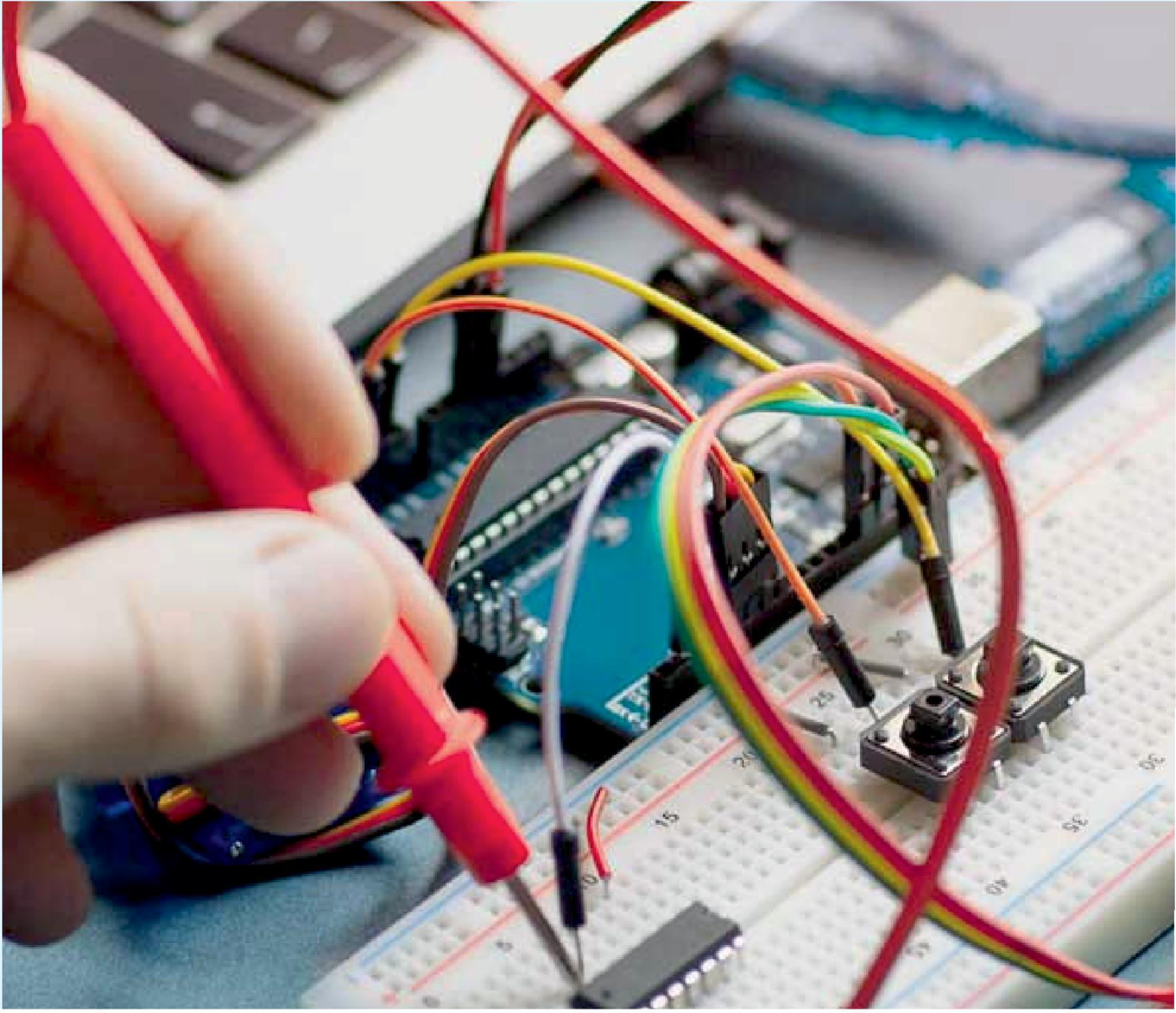

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