Neural Network Mapping Function based Switched Capacitor Inverter for Low Values of THD

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Abstract - This paper shows another DC/AC inverter circuit which depends on a switched-capacitor circuit topology with diminished segments (power switch and capacitor) mainly for low power applications. The proposed circuit has particular highlights of both voltages boost-up and close sinusoidal (staggered/staircase) AC yield voltage. The principle thought is to use a basic circuit technique called full based Double Switch Single Capacitor Switched-Capacitor with variable obligation cycle Pulse Width Modulation (PWM) control technique so that staggered voltage can be acknowledged across a capacitor. The new PWM technique is based on Neural Network Mapping technique with Fuzzy logic controller. The THD is reduced from the value of previous techniques.

Keywords - Switched Capacitor Inverter, PV, Mapping, Neural

I. INTRODUCTION

The DC/AC inverter is one of the classifications of power hardware innovation that includes a transformation procedure and control in exchanging electric power from an electrical DC source to an electrical AC yield load, with an adjustment in voltage greatness, recurrence, and number of yield stages in a structure that is reasonable and effective for the client electrical burden. [3][4] The advances of semiconductor power switch gadgets, for example, the Bipolar Junction Transistor (BJT), Metal Oxide Semiconductor Field Effect Transistor (MOSFET), and Insulated Gate Bipolar Transistor (IGBT) and so on, have the capacity to improve power hardware DC/AC inverter execution. As of late, power hardware DC/AC inverter has turned into an essential gadget, and its significance for some mechanical and business just as local applications, for example, customizable speed drives (ASD), sustainable power source system change (RES), uninterruptable power supplies (UPS), and home machines is developing rapidly. [6][8] The inverter systems in these applications ought to have low all out symphonious contortion (THD), high efficiency, straightforwardness, and minimal effort. What's more, the inverters ought to have the capacity to work ceaselessly without interruption. [7] Many DC/AC inverter topologies and control techniques are proposed in the writing overview, including traditional three-level PWM DC/AC inverters, voltage source inverter (VSI), current source inverter (CSI) and impedance source inverter (ISI), and established staggered inverter (MLI) topologies. [9]

Sun based energy is bounteously available that has made it possible to assemble it and use it properly. Sun situated energy can be a free making unit or can be a system related creating unit depending upon the openness of a grid close-by. As such it tends to be used to power nation districts where the openness of systems is low. Another favoured standpoint of using*sun situated energy is*the adaptable task at whatever point wherever imperative. [7]

With a particular ultimate objective to deal with the present energy crisis one needs to develop a capable manner by which power must be expelled from the moving toward daylight based radiation. The power change frameworks have been uncommonly reduced in gauge if we talk in terms of the couple of years later. The enhancement in power equipment and material science has helped pros to come up little yet powerful structures to withstand the powerful demand. Nevertheless, the damage of these structures is the extended power thickness. For Example has set that for the utilization as multi-input converter units that can sufficiently manage the voltage changes. However, on account of high creation cost and the low capability of these structures they can hardly battle in the forceful markets as a prime power generation source. [1]

The steady addition in the enhancement of the sun based cells creating development would make the use of these headways possible on a broader introduce than what the circumstance is eventually. The use of the most forward-thinking power control parts called the Maximum Power Point Tracking in short MPPT computations has incited the development in the adequacy of operation of the sun situated modules and as such is suitable in the field of use of boundless wellsprings of energy. [3]

Switched Capacitor is the most acclaimed voltage boosting technique. This technique uses energy putting away components, for example, capacitors and inductors related to power semiconductor switches. These components are consolidated in a particular setup to achieve high-voltage boost. The fundamental switched-capacitor (S-C) circuit cell comprises of power semiconductor switches and diodes with DC voltage associated with information circuit. The most acclaimed essential idea of S-C is known as charge siphon where siphon energy is moved starting with one capacitor then onto the next through suitable exchanging control technique. [1][2] Its yield voltage can reaches input voltage levels after a few successions of exchanging control cycles. This has been effectively used for power transformation in low power on chip DC-DC converter application. The switched-capacitor circuit (SCC) technique

can be ordered according to its voltage gain capacity just as its sort of circuit topology/setup association. Utilizing distinctive circuit setup and association, this S-C circuit can have low/medium-voltage addition or high-voltage gain. The low-voltage gain S-C circuits have a basic structure because of it containing less segment (switch and capacitor) tallies and straightforward control. In the meantime, high-voltage gain S-C circuits have an expansive by and large circuit structure due to the multi-stages cell. This uses more switches and capacitor segments. S-C has been connected for some other power electronic applications, such DC/AC inverters [7] and AC power system such active power channel and reactive power remuneration [6]. The switched-capacitor circuit (SCC) can likewise be characterized according to the sorts of circuit topology/arrangement associations as shunt-associated SCC and arrangement parallel association SCC.

In figure 1, we have shown the model for Switched Capacitor Inverter. [1] The simulations are performed on MATLAB Simulink.
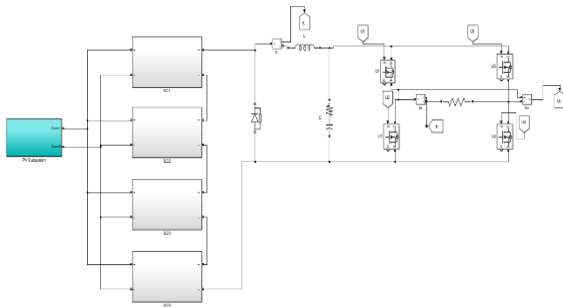

Figure 1: PV based Switched Capacitor Inverter Model Implementation

II. IMPLEMENTATION AND RESULTS

Here we implement the technique of neural network function. The error reduction causes to reduce the THD in the output further. The control scheme is shown in figure 2.
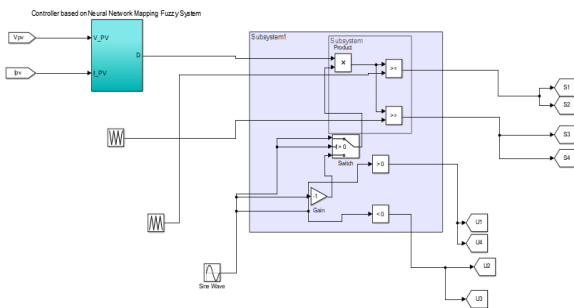

Figure 2: Control Scheme of Neural Network Mapping – Fuzzy

The THD comes out to be in the range below1%, which is enhanced by the use of Neural Network Mapping - Fuzzy Control logic. This is shown in figure 3.
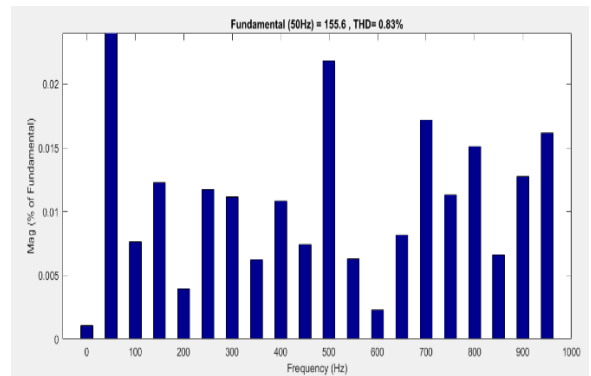

Figure 3: Total Harmonic Distortion

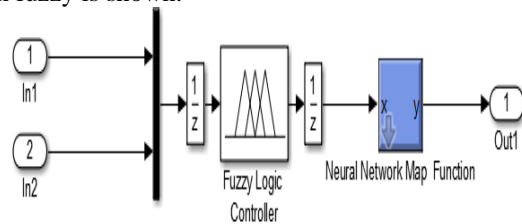In the figure 4 below, the internal block for neural network with fuzzy is shown.

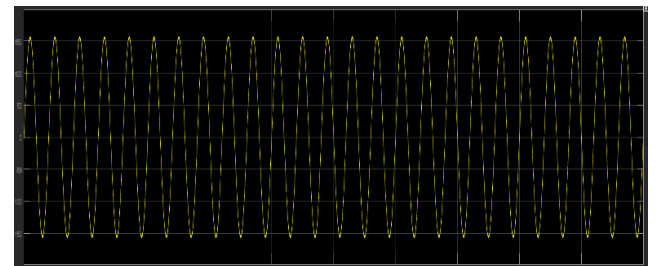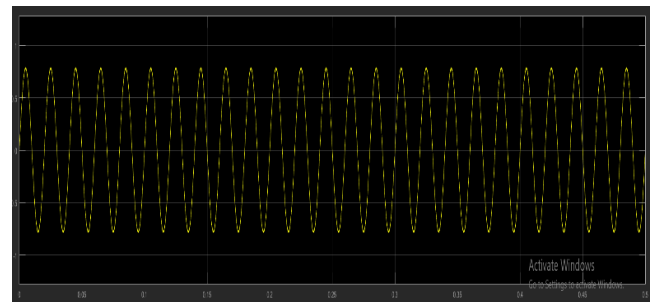Figure 4: Neural Network Mapping Method based Fuzzy Controller

Figure 5: Output Current and Voltage

In figure 5, output current and voltage are shown.

III. CONCLUSION

This paper has talked about a SC switched capacitor-based dc– ac inverter with the accompanying highlights: 1) the inverter is sustained from a PV module; 2) it is a solitary stage topology for PV module's MPP tracking, yield voltage boosting, and reversal, bringing about high efficiency;[1] 3)

it has the ability for remain solitary task since furthest breaking point of yield voltage is directed independent of burden and force of enlightenment of the PV module; and 4) it has scope for mix with the PV module because of the inalienable highlights of the SC inverter like compactness, toughness, and light weight. In this with use of Neural Network Mapping we have improve the THD values.

IV. REFERENCE

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