

Enhance Cascaded H-Bridge Multilevel Inverter with Artificial Intelligence Control

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ABSTRACT

This paper proposed a 7-level Cascaded H-Bridge Multilevel Inverter (CHBMI) with two different controller, ie, PID and Artificial Neural Network (ANN) controller to improve the output voltage performance and achieve a lower Total Harmonic Distortion (THD). A PWM generator is connected to the 7-level CHBMI to provide switching of the MOSFET. The reference signal waveform for the PWM generator is set to be sinusoidal to obtain an ideal AC output voltage waveform from the CHBMI. By tuning the PID controller as well as the self-learning abilities of the ANN controller, switching signals towards the CHBMI can be improved. Simulation results from the general CHBMI together with the proposed PID and ANN controller based 7-level CHBMI models will be compared and discussed to verify the proposed ANN controller based 7-level CHBMI achieved a lower output voltage THD value with a better sinusoidal output performance.

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1. INTRODUCTION

Inverters are the power electronic circuit, which converts the DC voltage into AC voltage. It can also say that it transfers or converts power from a DC source to an AC load. Inverters usually give output in the form of square wave, quasi-square wave or low distorted sine wave. However, the inverter is generally not ideal because the ideal output voltage waveform of an inverter should be a sinusoidal waveform. With the help of drives of the switches in control circuit or smoothing circuit, the output voltage can be controlled [1]. Inverters are widely used in many technologies such as multiple renewable energy applications. There are many kinds of inverter designs and the most common and well-known topology used nowadays is the H-bridge topology [2].

Cascaded H-bridge Multilevel Inverter (CHBMI) is one of the basic and well-known topology among other multilevel inverter and was first proposed in 1975 [3]. It synthesizes a desired AC voltage from several levels of DC voltages. In the past several years, this type of inverter has been the subject of research,