

An 11-switch multilevel inverter with a modified space vector modulation

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Abstract

This paper proposes a new 3-phase multilevel inverter that is able to generate 7 levels in the line-to-line voltage with only 11 switches. The inverter is formed from the 6-switch conventional full-bridge topology with the addition of 5 bidirectional switches in which 2 of them are shared among the three phases. By doing so, the number of power switches can be minimized, thus reducing complexity in generating and controlling the PWM signals. A novel voltage control scheme based on space vector modulation is developed by introducing a virtual vector in every sector of the vector hexagon. This is to overcome the difficulty in decomposing the reference vector in some parts of each sector. To evaluate the performance of the inverter and the effectiveness of the modulation technique in real time, a hardware prototype is constructed and the algorithm is implemented on a TMS320F2812 DSP. From the experimental results, the optimum operating range of the inverter is determined to achieve the best output voltage possible with respect to its quality and amplitude.

Key words: Digital signal processor (DSP), multilevel inverter, space vector modulation, virtual vector