Harmonics Minimization in Multilevel Inverter by Continuous Mode ACO Technique

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Abstract Low switching frequency operation of multilevel inverter enables it for applications in high power processing needs. The stepped waveform synthesized from multilevel inverter after Fourier series analysis will result in system of nonlinear equations to selectively minimize certain lower-order harmonics from it. These equations are transcendental and exhibits solutions or no solution in certain range of modulation index. In order to obtain continuous solution in entire modulation index range optimization techniques based on meta-heuristic approach is used. In order to achieve better quality waveform at output and selectively removing certain low-order harmonics an ant colony optimization-based technique in continuous mode implementation is proposed in this paper. The simulation and experimental results are provided to confirm the correctness and effectiveness of the method.

Keywords Ant colony optimization · Pulse width modulation · Multilevel inverter

1 Introduction

Voltage source inverters (VSI) are extensively used in many industrial applications such as in variable speed electric drives, STATCOM, active filters, HVDC, flexible AC transmission, pump storage plants, and solar photovoltaic system of renewable energy harnessing [1, 2]. Earlier only two-level VSI most popularly used for these applications produces a bipolar waveform at the output. But since the power processing need increased, the need to develop high power processing converters, and efficient modulation and control techniques become an active area of research. Therefore, in this direction, several multi-phase topologies and series parallel combination

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