

Double soft-computing techniques based triple functionalities for shunt active power filter with voltage source inverter topology

ABSTRACT

Firstly, a unified adaptive linear neurons based fundamental component extraction algorithm for dual roles is developed; to generate and synchronize a reference current with respect to the phase and the frequency of supply voltage. A modified method of extracting the final amplitude of the reference current is introduced for improving the quality of the reference current. Second, a hybrid Fuzzy-Proportional (P) controller plus Crisp-Integral (I) controller is designed for a self-charging DC-link voltage control algorithm. The proposed controller is utilized in minimizing the error of DC-link voltage and, its control signal is employed in calculating a reference charging current. The Fuzzy-P controller exhibits simple structure for low computational burden and memory requirement. While, the Crisp-I controller is used to eliminate the steady-state error of DC-link voltage. Performances of the SAPF with the proposed techniques are validated by simulation and experimental works.

Keyword: Adaptive Linear Neuron (ADALINE); Fuzzy-proportional controller; Fuzzy-proportional-derivative controller and Crisp-integral controller; Hybrid controller; Shunt Active Power Filter (SAPF); Soft-computing technique