Dual Function of Unified Adaptive Linear Neurons Based Fundamental Component Extraction Algorithm for Shunt Active Power Filter Operation

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DOI:http://dx.doi.org/10.15866/iree.v10i4.6189

Abstract

Unified Adaptive Linear Neurons (ADALINEs) based fundamental component extraction algorithm is presented for better operation of a Shunt Active Power Filter (SAPF). The proposed algorithm is developed for dual functionality. The first role is to generate a reference current for the SAPF. Whilst, the second function is to coordinate the phase of the generated reference current with the phase of any operating power system. Consequently, the operation of the SAPF will be synchronized with the operating power system. Hence, it replaces the necessity of using conventional synchronization algorithms such as Phase-Locked Loops (PLLs) and Zero-Crossing Detectors (ZCDs). In this work, the proposed algorithm is executed using an integration of two ADALINEs based fundamental current and voltage extraction algorithms. Also, it implements the modified on-line Widrow-Hoff (W-H) weight updating algorithm for high speed extraction process. The effectiveness of the proposed algorithm has been verified in both simulation and experimental works.

Keywords

Adaptive Linear Neuron (ADALINE); Fundamental Component Extraction; Harmonic Current and Reactive Power Compensation; Reference Current Generation; Shunt Active Power Filter (SAPF); Synchronisation

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