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Design and Simulation of Unified Power Quality Conditioner based on Adaptive Fuzzy PI Controller

Authors : Brahim Ferdi, Samira Dib

Abstract : The unified power quality conditioner (UPQC), a combination of shunt and series active power filter, is one of the best solutions towards the mitigation of voltage and current harmonics problems in distribution power system. PI controller is very common in the control of UPQC. However, one disadvantage of this conventional controller is the difficulty in tuning its gains (Kp and Ki). To overcome this problem, an adaptive fuzzy logic PI controller is proposed. The controller is composed of fuzzy controller and PI controller. According to the error and error rate of the control system and fuzzy control rules, the fuzzy controller can online adjust the two gains of the PI controller to get better performance of UPQC. Simulations using MATLAB/SIMULINK are carried out to verify the performance of the proposed controller. The results show that the proposed controller has fast dynamic response and high accuracy of tracking the current and voltage references.

Keywords : adaptive fuzzy PI controller, current harmonics, PI controller, voltage harmonics, UPQC
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