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A Simple Nonlinear Adaptive-Fuzzy Passivity-Based Control of Power Systems

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Abstract: A new intelligent nonlinear control for power system stabilizers that improves the transient stability is proposed. To guarantee high performance with low complexity cost, new concepts on the passivity design under unknown disturbance inputs, as well as on the adaptive fuzzy logic rule extraction are introduced. This permits the most possible simple design implementation of an adaptive-fuzzy logic passivity-based controller which is developed on an equivalent model of the system obtained by a suitable use of the backstepping technique. The overall scheme is decentralized providing local output feedback controllers, supported by a very simple adaptive-fuzzy scheme of only three rules. A detailed analysis proves that the proposed control scheme ensures uniform ultimate boundedness of all the error variables in an arbitrarily small region around the origin. Extensive simulations on a two machine infinite bus power system on which a permanent serious fault occurs, confirm the theoretical results and verify an excellent system performance.

Keywords: *Adaptive control; fuzzy logic control; passivity; power system control.*

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