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Chapter 6

Design of FUZZY-(1+PD)-FOPID Controller for Hybrid Two-Area Power System

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Summary

Approach of the fuzzy logic control (FLC) has been one of the most vibrant and productive fields for study in the use of fuzzy set theories during the past couple of decades. Zadeh's influential publications on the linguistic methodology and analysis of the system based on the idea of fuzzy sets served as the inspiration for Mamdani and his coworkers' revolutionary study on FLC. The fundamental tenet of this strategy was to develop the controller while taking into account the "learning" of a human process of operations. A control algorithm is built from a collection of linguistic rules that characterize the operator's controlling approach, with the words described as fuzzy sets. To triumph over the LFC in all two-area power systems, a hybrid FUZZY-(1+PD)-FOPID controller is introduced in this study as a novel expert control approach. The proposed controller settings such as K_{P1}, K_{P2}, K_{D1}, K_{D2}, and K_{I2} as well as additional parameters, such as the integrator-exponential (λ) and differentiator-exponential (μ), are optimized using a recently published population-based, nature-inspired algorithm named tree-seed algorithm (TSA) while using the integral of squared error (ISE) criteria. The recommended FUZZY-(1+PD)-FOPID controller has been suggested to be utilized for controlling a two-area power system that includes thermal and nuclear units along with non-conventional energy sources (NCESs) like solar and ocean thermal. The whole system with the proposed controller is sketched and tested in the MATLAB simulation platform. The simulation results are analyzed using the acquired time-domain parameters such as settling time (ST), overshoot (OS), and undershoot (US). The suggested controller outperforms competing controllers found in the literature, as evidenced by the comparison of the major performance indices and the

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