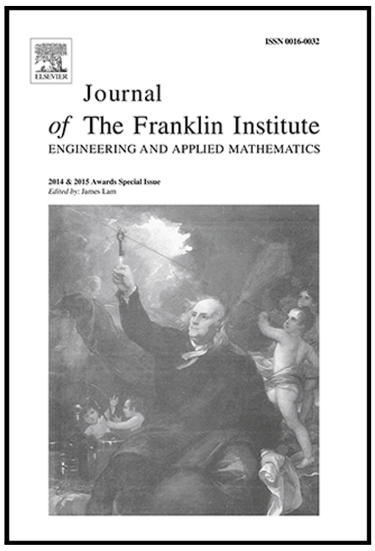

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Automatic generation control of two-area electrical power systems via optimal fuzzy classical controller

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Keywords: Two-area power system, fuzzy logic controller, automatic generation control, GRC, PV system

Abstract

The interconnected large-scale power systems are liable to performance degradation under the presence of sudden small load demands, parameter ambiguity and structural changes. Due to this, to supply reliable electric power with good quality, robust and intelligent control strategies are extremely requisite in automatic generation control (AGC) of power systems. Hence, this paper attempts to present an output scaling factor (SF) based fuzzy classical controller to enrich AGC conduct of two-area electrical power systems. A maiden implementation of imperialist competitive algorithm (ICA) is made to optimize the output SF of fuzzy proportional integral (FPI) controller employing integral of squared error criterion. Initially the study is conducted on a well accepted two-area non-reheat thermal system with and without considering the appropriate generation rate constraint (GRC). The advantage of the proposed controller is illustrated by comparing the results with fuzzy controller and bacterial foraging optimization algorithm (BFOA)/genetic algorithm (GA)/particle swarm optimization (PSO)/hybrid BFOA-PSO algorithm/firefly algorithm (FA)/hybrid FA-pattern search (hFA-PS) optimized PI/PID controller prevalent in the literature. The proposed approach is further extended to a newly emerged two-area reheat thermal-PV system. The superiority of the method is depicted by contrasting the results of GA/FA tuned PI controller. The proposed control approach is also implemented on a multi-unit hydrothermal power system and its advantage is established by contrasting its results with GA/hFA-PS tuned PI, hFA-PS/grey wolf optimization (GWO) tuned PID and BFOA tuned FPI controllers. Finally, a sensitivity analysis is