Modified Particle Swarm Optimization Based Proportional-Derivative Power System Stabilizer

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Abstract

ð During a change in operating condition, oscillations of small magnitude and low frequency often persist for long periods of time and in some cases even present limitations on power transfer capability. Generators in power systems are equipped with automatic voltage regulator (AVR) to control terminal voltage. It is known that AVR has a detrimental impact upon the dynamic stability of the power system. Power system stabilizers (PSS) are widely used to generate supplementary control signals for the excitation system in order to damp out low-frequency oscillations (LFOs). In this paper proportionalderivative power system stabilizer (PD-PSS) used to damping LFO after tuning the gains of the PSS by using PSO. The damping boundary condition of PSO technique is modified to improve its performance in the tuning and optimization process. Simulation studies performed on a typical single-machine infinite-bus (SMIB) system used in MATLAB Simulink program. Assessing the performance of the proposed modified PSO based PD-PSS with Speed deviation (æ) as an input signal using eigenvalue analysis. The proposed PSO based PDPSS is evaluated and examined under different operating conditions and inertia constant each one of them applied with two test cases small disturbance and short circuit. A comparative study between the proposed PSO based PD-PSS, original PSO based PD-PSS, and lead-lag PSS is done in this work. The results ensure the superiority, the effectiveness, and the robustness of the proposed PSS over the other techniques.

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