

## Optimal Design of Multimachine Power System Stabilizers Using Improved Multi-Objective Particle Swarm Optimization Algorithm

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**Abstract :** In this paper, the concept of a non-dominated sorting multi-objective particle swarm optimization with local search (NSPSO-LS) is presented for the optimal design of multimachine power system stabilizers (PSSs). The controller design is formulated as an optimization problem in order to shift the system electromechanical modes in a pre-specified region in the s-plan. A composite set of objective functions comprising the damping factor and the damping ratio of the undamped and lightly damped electromechanical modes is considered. The performance of the proposed optimization algorithm is verified for the 3-machine 9-bus system. Simulation results based on eigenvalue analysis and nonlinear time-domain simulation show the potential and superiority of the NSPSO-LS algorithm in tuning PSSs over a wide range of loading conditions and large disturbance compared to the classic PSO technique and genetic algorithms.

**Keywords :** multi-objective optimization, particle swarm optimization, power system stabilizer, low frequency oscillations

**Conference Title :** ICEEIT 2016 : International Conference on Electrical Engineering and Information Technology

**Conference Location :** Amsterdam, Netherlands

**Conference Dates :** December 01-02, 2016