In this paper, two evolutionary algorithms- Invasive Weed Optimization (IWO) based power system stabilizer (PSS) and particle swarm optimization (PSO) based power system stabilizer is designed for multi-machine power system to compare their tuning performances. IWO is a derivative-free real parameter optimization technique that mimics the ecological behavior of colonizing weeds. PSO is also a derivative-free and flexible optimizer which is powered by the behavior of organism, such as bird flocking. Eigen-value based objective function is considered for the tuning of PSSs to enhance system damping of electromechanical mode. The performance of proposed IWO-based PSS and PSO-based PSS is tested and demonstrated under different disturbances for a four machine example power system. The Eigen value analysis and non-linear time domain simulation results shows that both IWO-based PSS and PSO-based design can successfully damp out the oscillations and thus improve the stability of the system. However, the abilities like faster convergence and greater shifting of critical modes to the left of s-plane keeps the choice of IWO based design in front of PSO based design for the system under consideration.

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