Optimal power flow using hybrid firefly and particle swarm optimization algorithm

ABSTRACT

In this paper, a novel, effective meta-heuristic, population-based Hybrid Firefly Particle Swarm Optimization (HFPSO) algorithm is applied to solve different non-linear and convex optimal power flow (OPF) problems. The HFPSO algorithm is a hybridization of the Firefly Optimization (FFO) and the Particle Swarm Optimization (PSO) technique, to enhance the exploration, exploitation strategies, and to speed up the convergence rate. In this work, five objective functions of OPF problems are studied to prove the strength of the proposed method: total generation cost minimization, voltage profile improvement, voltage stability enhancement, the transmission lines active power loss reductions, and the transmission lines reactive power loss reductions. The particular fitness function is chosen as a single objective based on control parameters. The proposed HFPSO technique is coded using MATLAB software and its effectiveness is tested on the standard IEEE 30-bus test system. The obtained results of the proposed algorithm are compared to simulated results of the original Particle Swarm Optimization (PSO) method and the present state-of-the-art optimization techniques. The comparison of optimum solutions reveals that the recommended method can generate optimum, feasible, global solutions with fast convergence and can also deal with the challenges and complexities of various OPF problems.