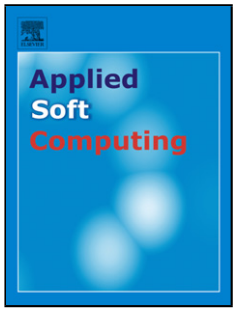

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Particle swarm optimization with an aging leader and challengers algorithm for the solution of optimal power flow problem

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Abstract

Solution of optimal power flow (OPF) problem aims to optimize a selected objective function such as fuel cost, active power loss, total voltage deviation (TVD) etc. via optimal adjustment of the power system control variables while at the same time satisfying various equality and inequality constraints. In the present work, a particle swarm optimization with an aging leader and challengers (ALC-PSO) is applied for the solution of the OPF problem of power systems. The proposed approach is examined and tested on modified IEEE 30-bus and IEEE 118-bus test power system with different objectives that reflect minimization of fuel cost or active power loss or TVD. The simulation results demonstrate the effectiveness of the proposed approach compared with other evolutionary optimization techniques surfaced in recent state-of-the-art literature. Statistical analysis, presented in this paper, indicates the robustness of the proposed ALC-PSO algorithm.

Keywords: Aging, leader, optimal power flow, optimization, particle swarm optimization, power system.

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1. Introduction

Optimal power flow (OPF) problem is an optimization tool through which secure and economic operating conditions of a power system is determined [1-7]. The goal of OPF is to find out the optimal settings of a given power system network that optimize a certain objective function while satisfying its power flow equations, system security and equipment operating limits. Different control variables (some of which are generators' real power outputs and voltages, transformer tap changing settings, phase shifters, switched capacitors and reactors) are manipulated to achieve an optimal network setting based on the problem