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Multi-objective PSO-TVAC for Environmental/Economic Dispatch Problem

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Abstract

In this paper a variant named time varying acceleration based particle swarm optimization (PSO-TVAC) proposed to enhance the solution of the combined environmental economic dispatch problem. The performances of the standard PSO are improved by adjusting dynamically the acceleration coefficient during process search to balance the exploitation and exploration capability. The proposed method is validated on IEEE 30-bus with quadratic cost function considering transmission losses and to 10 unit considering both valve point effect and total power losses. The simulation results are compared with those obtained by particle swarm optimization (PSO), no dominating sorting genetic algorithm (NSGA-II), and strength Pareto evolutionary algorithm (SPEA). The results demonstrate the efficiency of the proposed approach and show its simplicity and robustness to solve the environmental/economic dispatch problem.

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1. Introduction

The economic dispatch problem (EDP) in a power system is to determine the optimal combination of power outputs for all generating units which will minimize the total cost while satisfying the constraints. When the environmental concerns that arise from the emissions produced by fossil-fueled electric power plants are combined with the EDP then the problem becomes Combined Economic and Emission Dispatch (CEED) problem [1].

The objective of emission dispatch is to minimize the total environmental degradation or the total pollutant emission due to the burning of fuels for production of power to meet the load demand. The emission function can be expressed as the sum of all types of emissions as NO_x, SO_x particulate materials and thermal radiation with suitable pricing for each pollutant emitted [2]. The multi-objective environmental/economic dispatch problem is to minimize