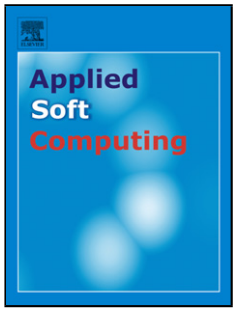

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Solving non-convex/non-smooth economic load dispatch problems via an enhanced particle swarm optimization

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Abstract

Economic load dispatch (ELD) problems have been an important issue in optimal operation and planning of power system. Characterized by non-convex/non-smooth properties and various practical constraints, the ELD problems are difficult to solve using conventional optimization techniques. In this paper, an improved orthogonal design particle swarm optimization (IODPSO) algorithm is presented for solving the single-area and multi-area ELD problems with nonlinear characteristics of the generators, such as valve-point effects, prohibited operating zones, ramp rate limits and multiple fuels. In the IODPSO algorithm, an orthogonal designed method is used to construct a promising exemplar. Multiple auxiliary vector generating strategies are proposed to enhance the efficiency and effectiveness of orthogonal design operations. A tent chaotic map is employed for the adaptation of the acceleration coefficients, thus improving the proposed algorithm's robustness and global search capabilities. In addition, we designed a repair method to handle the practical constraints. Six cases of ELD problems with different characteristics are utilized to benchmark the proposed algorithm. Experimental results demonstrate that IODPSO algorithm is a promising approach for solving the non-convex/non-smooth ELD problems.

Keywords: Economic load dispatch; Multi-area economic load dispatch; Orthogonal design; Particle swarm optimization; Valve-point effects

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