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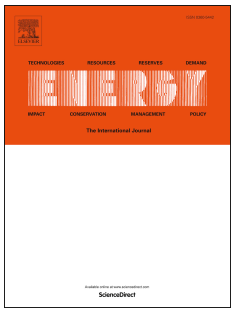

Solving the dynamic economic dispatch by a memory-based global differential evolution and a repair technique of constraint handling

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Solving the dynamic economic dispatch by a memory-based global differential evolution and a repair technique of constraint handling

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Abstract

In this paper, we propose a memory-based global differential evolution (MGDE) algorithm and a repair technique of constraint handling for the dynamic economic dispatch problems. On the one hand, MGDE modifies the mutation of DE/best/1, and uses a memory pool to provide more candidate solutions for this operation. Moreover, it adopts a randomly generated scale factor in the modified mutation to enhance its exploration capacity. In the crossover, a dynamical crossover rate is introduced to balance MGDE's global and local search capacities. On the other hand, a repair technique is designed for handling three kinds of constraints associated with generator capacity, power balance and generating unit ramp-rate. Moreover, a commonly used penalty function method is subsequently employed to handle the possible constraint violations associated with power balance and prohibited operation zones (POZs). To judge the performance of MGDE and the efficiency of the repair technique, we have solved six well-known DED problems taken from different sources. According to the experimental results, MGDE shows a superior performance in comparison with other improved DEs which also solve these problems. In the mean time, the repair technique of constraint handling has a high efficiency in eliminating or reducing the constraint violations.

Key words: Memory-based global differential evolution; Repair technique of constraint handling; Dynamic economic dispatch; Modified mutation; Memory pool; Dynamical crossover rate;

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