Evolutionary Optimization Under Uncertainty: The Strategies to Handle Large-Scale Energy Resource Management Problems in Smart Grids

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Motivation

The ideas of single individual outstanding algorithms used to solve discrete problems are also applicable to the energy field [1]. For example, Iterative greedy (IG) algorithm for solving flow-shop scheduling problems [2, 3]. Moreover, the DE strategy provided by the competition is also very useful in perturbing solutions and adjusting values [4]. In addition, the strategy of Ring Cellular Encode Decode UMDA is also effective [5]. In spired by above algorithms, we proposed a Self-adaptive Collaborative Differential Evolutionary Algorithm (SADEA) to solve the ERM problem.

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[3] H. X. Qin, Y. Y. Han, Y. T. Wang, Y. P. Liu, J. Q. Li, and Q. K. Pan, Intelligent optimization under blocking constraints: A novel iterated greedy algorithm for the hybrid flow shop group scheduling problem, Knowledge-Based Systems, vol. 258, p. 109962, 2022.

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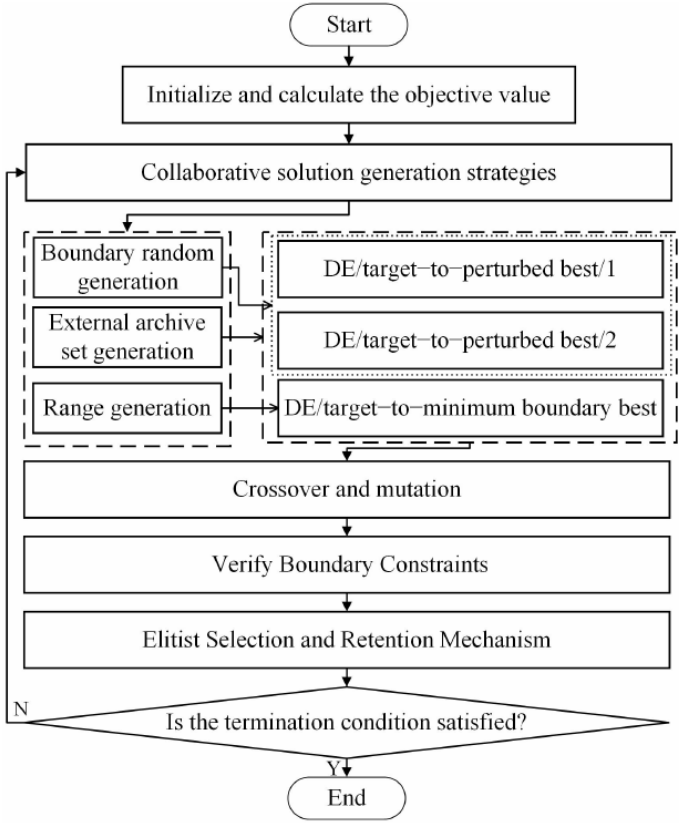
[5] Rodríguez-González, A. Y., Aranda, R., Álvarez-Carmona, M.Á., Martínez-López, Y., Quintana, J. M. (2022, July). Applying Ring Cellular Encode-Decode UMDA to Risk-based Energy Scheduling. In Proceedings of the 2021 Genetic and Evolutionary Computation Conference Companion. doi: 10.1145/3520304.3534055.

SADEA



The flowchart shows the overall framework of the SADEA algorithm, which consists of the following main parts:

1. The generation method of collaborative solutions (depending on the stage);
2. DE search strategies;
3. The crossover and mutation strategy;
4. The boundary validation;
5. The elite selection and retention mechanism.

THANK YOU