【NSGA2-toZero算法】

Nondominated sorting genetic algorithm (NSGA), is one of first multi-objective evolutionary algorithms which used to find multiple Pareto-optimal solutions in one single simulation run [1]. It retains excellent individuals with the method based nondominated sorting, and maintains diversity in the population by a niche sharing fitness method [2]. However, although NSGA achieves good results, the algorithm has several shortcomings, such as high computational complexity(O(MN^3)), nonelitism approach, and the need for specifying a sharing parameter.

Thus, NSGA-II is proposed which alleviates the previously described difficulties existing in NSGA. It reduces the computational complexity from O(MN^3) to O(MN^2) by a fast nondominated sorting approach. Compared with the previous algorithm, NSGA-II replaces the sharing function approach with a crowded-comparison approach, and the elitist strategy is introduced which makes it be able to find much better spread of solutions and better convergence near the true Pareto-optimal front [1].

In this paper, one of the optimal goals is minimizing the number of non-zero parameters. Therefore, we make an appropriate modification to NSGA-II. In each generation, after the offspring population is created by the operations such as selection, crossover and mutation, we check every individuals in the offspring, and the parameter which less than 1 will be set to 0, then the new offspring will continue to participate in the subsequent operations.

-------------------------------------------------------------------------------

[1] Deb K , Pratap A , Agarwal S , et al. A fast and elitist multiobjective genetic algorithm: NSGA-II[J]. IEEE Transactions on Evolutionary Computation, 2002, 6(2):0-197.

[2] N. Srinivas and K. Deb, “Multiobjective function optimization using nondominated sorting genetic algorithms,” Evol. Comput., vol. 2, no. 3, pp. 221–248, Fall 1995

【CoDE算法参数】

The CoDE approach is implemented in Python, we set the feasible solution space to , the population size and maximal generation are set to 100.

【NSGA2-算法参数】

We implement NSGA-2 based on Geatpy2 which is a genetic and evolutionary algorithm toolbox for Python with high performance. In this algorithm, the feasible solution space is set to , and the population size and maximal generation are set to 100.