Lecture 8.2 (11:00-11:15)

Adaptive Weighted Indicator-based Mating Selection for Multi-objective Evolutionary Algorithm to Solve Path Planning of UAV

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Decomposition-based Multi/Many-Objective Evolutionary Algorithms (DMOEAs) employ uniformly spaced reference vectors which may be appropriate for Multi-objective Optimization Problems (MOPs) with continuous Pareto Fronts (PFs). However, when solving MOPs that are characterized by discontinuous and/or degenerated PFs or the problem has constraints, it is essential to identify the regions where no solutions are bound to exist and identify the corresponding reference vectors referred to as ineffective reference vectors. In literature, various frameworks were proposed to classify the reference vectors into effective and ineffective during the process of evolution based on their association with the solutions in the population. However, due to the stochastic nature of the evolutionary process, some of the effective weight vectors may fail to associate with the solutions in the population and are misclassified as ineffective. Therefore, the region corresponding to the particular reference vector should be thoroughly explored before labeling it as ineffective. In this work, the reference vectors are divided into three classes, namely, effective, possible ineffective and true ineffective vectors. Then, the regions corresponding to the possible ineffective reference vectors are thoroughly explored before finally classifying them as effective or ineffective. In order to facilitate the exploration corresponding to the different regions, an adaptive mating selection based on weighted ISDE+ is proposed. In addition, the adaptive mating selection also facilitates the exploration of sparser regions once all the reference vectors are classified as effective or ineffective. The performance of the algorithm is significantly outperforms or comparable with the state-of-the-art algorithms. Finally, a constrained multi-objective UAV path planning problem is successfully addressed to show the superiority of the proposed algorithm.