Propositions

accompanying the thesis

Multi-objective Evolutionary Algorithms for Optimal Scheduling

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1. The Pareto order is essential in multi-objective optimization, but becomes less effective with increasing number of objectives. This ineffectiveness can be remedied by using extended cone orders with an obtuse angle for many-objective optimization. [Chapter 3]
2. When adopting the edge-rotated cone order in multi-objective evolutionary algorithms, a hybrid selection strategy could be used to alternate between convergence and diversity oriented search. [Chapter 3]
3. When solving complex real-world scheduling optimization problems, the design of the chromosome representation strongly impacts the feasibility and efficiency of genetic operators in the search process. [Chapter 5]
4. Comparing the fixed-interval maintenance to prediction-based scheduling optimization, the fixed-interval maintenance can achieve good results on only one objective, but the prediction-based scheduling optimization finds a balanced trade-off satisfying all objectives to high extent. [Chapter 6]
5. The definitions of extended Pareto orders based on trade-off constraints are essentially equivalent to the definitions of edge-rotated cone orders. Angles and trade-offs can be mapped onto each other.
6. To achieve automatic decision making, one good strategy is to follow knee points. However, in case of non-convex Pareto fronts this strategy may lead to undesirable solutions.
7. Set-based diversity indicators, such as the geometric mean gap, can assist the search in multi-objective optimization. Pareto-compliance is not required, if the algorithm ensures the preferred selection of non-dominated solutions.
8. Dynamic optimization has its own intrinsic objectives, such as stability. Therefore in dynamic optimization it is more likely to encounter problems with high-dimensional Pareto front.
9. Although the saying is “curiosity killed the cat”, in science, it is rather true that “lack of curiosity killed the cat”.