RECENT ADVANCES IN MULTI-OBJECTIVE AND MANY-OBJECTIVE EVOLUTIONARY ALGORITHMS

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In the last decade, the framework which has attracted the most attention of researchers in the evolutionary multi-objective optimization community is the decomposition-based framework. Decomposition is a well-known strategy in traditional multi-objective optimization. However, the decomposition strategy was not widely employed in evolutionary multi-objective optimization until Zhang and Li proposed multi-objective evolutionary algorithm based on decomposition (MOEA/D) in 2007. MOEA/D proposed by Zhang and Li decomposes a multi-objective optimization problem into a number of scalar optimization subproblems, and optimizes them in a collaborative manner using an evolutionary algorithm. Each subproblem is optimized by utilizing the information mainly from its several neighbouring subproblems. Since the proposition of MOEA/D in 2007, several studies have been conducted in the literature to: a) overcome the limitations in the design components of the original MOEA/D, b) improve the performance of MOEA/D, c) present novel decomposition-based MOEAs, and d) adapt decomposition-based MOEAs for different type of problems.

Investigations on the decomposition-based framework have been undertaken in several directions, including use of new decomposition approaches, efficient allocation of computational resources, modifications in the reproduction operators, mating selection and replacement mechanism, hybridizing decomposition- and dominance-based approaches, etc. Furthermore, several attempts have been made at extending the decomposition-based framework to many-objective optimization. This tutorial will present a comprehensive survey of the decomposition-based MOEAs proposed in the last decade for multi-objective and many-objective optimization. Apart from decomposition-based MOEAs, we will also discuss other recent significant works in the field of evolutionary multi-objective and many-objective optimization.

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