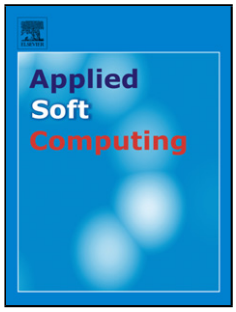

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An evolutionary algorithm with directed weights for constrained multi-objective optimization

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Abstract

When solving constrained multi-objective optimization problems (CMOPs), keeping infeasible individuals with good objective values and small constraint violations in the population can improve the performance of the algorithms, since they provide the information about the optimal direction towards Pareto front. By taking the constraint violation as an objective, we propose a novel constraint-handling technique based on directed weights to deal with CMOPs. This paper adopts two types of weights, i.e. feasible and infeasible weights distributing on feasible and infeasible regions respectively, to guide the search to the promising region. To utilize the useful information contained in infeasible individuals, this paper uses infeasible weights to maintain a number of well-diversified infeasible individuals. Meanwhile, they are dynamically changed along with the evolution to prefer infeasible individuals with better objective values and smaller constraint violations. Furthermore, 18 test instances and 2 engineering design problems are used to evaluate the effectiveness of the proposed algorithm. Several numerical experiments indicate that the proposed algorithm outperforms four compared algorithms in terms of finding a set of well-distributed non-domination solutions.

Keywords: Constraint-handling technique, Constrained multi-objective optimization, Decomposition, Evolutionary algorithm

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