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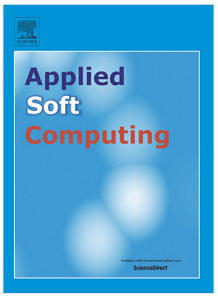

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A multi-objective evolutionary algorithm based on decomposition and constraint programming for the multi-objective team orienteering problem with time windows

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Abstract

The team orienteering problem with time windows (TOPTW) is a well-known variant of the orienteering problem (OP) originated from the sports game of orienteering. Since the TOPTW has many applications in the real world such as disaster relief routing and home fuel delivery, it has been studied extensively. In the classical TOPTW, only one profit is associated with each checkpoint while in many practical applications each checkpoint can be evaluated from different aspects, which results in multiple profits. In this study, the multi-objective team orienteering problem with time windows (MOTOPTW), where checkpoints with multiple profits are considered, is introduced to find the set of Pareto optimal solutions to support decision making. Moreover, a multi-objective evolutionary algorithm based on decomposition and constraint programming (CPMOEA/D) is developed to solve the MOTOPTW. The advantages of decomposition approaches to handle multi-objective optimization problems and those of the constraint programming to deal with combinatorial optimization problems have been integrated in CPMOEA/D. Finally, the proposed algorithm is applied to solve public benchmark instances. The results are compared with the best-known solutions from the literature and show more improvement.

Keywords: multi-objective combinatorial optimization, team orienteering problem, multi-objective evolutionary algorithm, decomposition approach, constraint programming

1. Introduction

The orienteering problem (OP) is an NP-hard combinatorial optimization problem introduced by Tsiligirides [1]. The OP can be defined as follows. Given one specified control point and a set of checkpoints, the travel times between any two points are known and each

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