

A steady-state grouping genetic algorithm for the rainbow spanning tree problem

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Abstract

Given a connected, undirected and edge-colored graph, the rainbow spanning tree (RSF) problem aims to find a rainbow spanning forest with the minimum number of rainbow trees, where a rainbow tree is a connected acyclic subgraph of the graph whose each edge is associated with a different color. This problem is NP-Hard and finds several applications in distinguishing among various types of connections. Being a grouping problem, this paper proposes a steady-state grouping genetic algorithm (SSGGA) for the RSF problem. To the best of our knowledge, this is the first work on steady-state grouping genetic algorithm for this problem. While keeping in view of grouping aspects of the problem, each individual, in the proposed SSGGA, is encoded as a group of rainbow trees, and accordingly a problem-specific crossover operator is designed. Moreover, SSGGA uses the idea of two steps in its replacement scheme. All such elements of SSGGA coordinate effectively and overall help in finding high quality solutions. Computational results obtained over a set of benchmark instances show that overall SSGGA, in terms of solution quality, is superior to all other existing approaches in the literature for this problem.

Full Text

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