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Memetic Algorithm for Solving the One-To-One Shortest Path Problem

Authors : Omar Dib, Alexandre Caminada, Marie-Ange Manier

Abstract : The purpose of this study is to introduce a novel approach to solve the one-to-one shortest path problem. A directed connected graph is assumed in which all edges' weights are positive. Our method is based on a memetic algorithm in which we combine a genetic algorithm (GA) and a variable neighborhood search method (VNS). We compare our approximate method with two exact algorithms Dijkstra and Integer Programming (IP). We made experimentations using random generated, complete and real graph instances. In most case studies, numerical results show that our method outperforms exact methods with 5% average gap to the optimality. Our algorithm's average speed is 20-times faster than Dijkstra and more than 1000-times compared to IP. The details of the experimental results are also discussed and presented in the paper.

Keywords : shortest path problem, Dijkstra's algorithm, integer programming, memetic algorithm
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