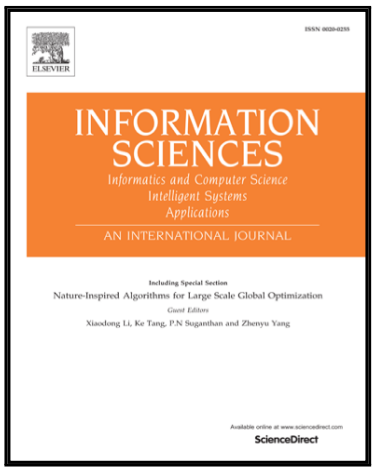

Towards Faster Local Search for Minimum Weight Vertex Cover on Massive Graphs

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PII: S0020-0255(18)30670-4
DOI: https://doi.org/10.1016/j.ins.2018.08.052
Reference: INS 13896

To appear in: *Information Sciences*

Received date: 7 February 2018
Revised date: 16 August 2018
Accepted date: 24 August 2018

Please cite this article as: Shaowei Cai, Yuanjie Li, Wenying Hou, Haoran Wang, Towards Faster Local Search for Minimum Weight Vertex Cover on Massive Graphs, *Information Sciences* (2018), doi: https://doi.org/10.1016/j.ins.2018.08.052

Towards Faster Local Search for Minimum Weight Vertex Cover on Massive Graphs☆

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Abstract

The minimum weight vertex cover (MWVC) problem is a well known NP-hard problem with various real-world applications. In this paper, we design an efficient algorithm named FastWVC to solve MWVC problem in massive graphs. To this end, we propose a construction procedure, which aims to generate a quality initial vertex cover in short time. We also propose a new exchange step for reconstructing a vertex cover. Additionally, a cost-effective strategy is used for choosing adding vertices , which can accelerate the algorithm. Experiments on 102 instances were conducted to confirm the effectiveness of our algorithm. The results show that the FastWVC algorithm outperforms other algorithms in terms of both solution quality and computational time in most of the instances. We also carry out experiments that analyze the effectiveness of the underlying ideas.

Keywords: Minimum weighted vertex cover, Local search, Massive graph

1. Introduction

The minimum vertex cover (MVC) problem is to find a minimum sized vertex cover in a graph, where a vertex cover is a subset of vertices that contains at least one endpoint of each edge. The minimum weight vertex cover (MWVC) problem is a generalization of MVC. In a vertex weighted graph, each vertex has a positive weight and the purpose of the MWVC problem is to find a vertex cover with the minimum weight. The MWVC problem has applications in various fields such as network flow, circuit design, transportation and telecommunication.

The MVC problem is NP hard. Moreover, it is NP-hard to approximate MVC within any factors smaller than 1.3606 [6]. Due to the computational intractability of the MVC problem, various heuristic algorithms have been proposed to find approximate solutions within reasonable time. Among them, the most successful ones share

☆This is an improved and extended version of a conference paper [11].

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