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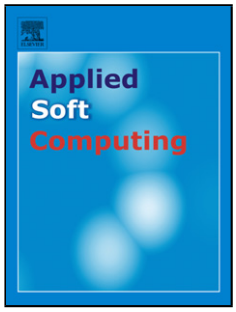

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Author: Yangming Zhou Béatrice Duval Jin-Kao Hao

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Improving probability learning based local search for graph coloring

Yangming Zhou [a,b], Béatrice Duval [b], Jin-Kao Hao [b,c,*]

[a] *Glorious Sun School of Business and Management, Donghua University, No.1882, Yan'an Road (West), Shanghai, China*

[b] *LERIA, Université d'Angers, 2 boulevard Lavoisier, 49045 Angers, France*

[c] *Institut Universitaire de France, 1 rue Descartes, 75231 Paris, France*

Abstract

This paper presents an improved probability learning based local search algorithm for the well-known graph coloring problem. The algorithm iterates through three distinct phases: a starting coloring generation phase based on a probability matrix, a heuristic coloring improvement phase and a learning based probability updating phase. The method maintains a dynamically updated probability matrix which specifies the chance for a vertex to belong to each color group. To explore the specific feature of the graph coloring problem where color groups are interchangeable and to avoid the difficulty posed by symmetric solutions, a group matching procedure is used to find the group-to-group correspondence between a starting coloring and its improved coloring. Additionally, by considering the optimization phase as a black box, we adopt the popular tabu search coloring procedure for the coloring improvement phase. We show extensive computational results on the well-known DIMACS benchmark instances and comparisons with state-of-the-art coloring algorithms.

Key words: Graph coloring; grouping problems; learning-based optimization; tabu search; heuristics.

* Corresponding author.
Email addresses: zhou.yangming@yahoo.com (Yangming Zhou), beatrice.duval@univ-angers.fr (Béatrice Duval), jin-kao.hao@univ-angers.fr (Jin-Kao Hao).

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