Greedy Algorithm: Degree of Saturation (DSATUR)

Tsai-Chen Du

December 11, 2013

Abstract

DSATUR is the most widely-used greedy algorithm for solving GCP (Graph Coloring Problem). The idea behind DSATUR is to color a vertex having the largest number of colors used by its adjacent vertices, with the aim of making the total number of colors used as small as possible. DSATUR iteratively colors vertices from the assignment perspective.

1 Introduction of Greedy algorithm

Greedy algorithms play an important role in the practical resolution of NP-hard problems. A greedy algorithm is a basic heuristic that builds a solution by iteratively adding the locally best element into the solution according to certain criteria. A greedy algorithm can either be used on its own to obtain a good solution, or it can be integrated into global optimization methods, for example, to limit the search space in branch and bound algorithms, or to generate initial solutions in metaheuristics.

2 Another Section

2.1 Configuration of Greedy algorithm

At the outset of a greedy algorithm, the initial configuration represents a partial coloring where zero or more vertices are colored. During the execution of the algorithm, the configuration changes and represents a partial coloring in which more and more vertices are colored. Finally, at the termination of the algorithm, the final configuration represents a complete coloring. The initial configuration will influence the result of the algorithm. In order to minimize this impact and focus on the algorithm’s behavior, we start from an empty initial configuration and let the algorithm choose the first vertex to be colored.

2.2 Greedy rule

A greedy rule is a rule for choosing the locally best candidate vertex according to certain criteria. A criterion is an information or property about candidate vertices. The effectiveness of the greedy rule greatly depends on the quality of the criteria. A good criterion comes from an insight into the problem.
3 Conclusions

Greedy method is the simplest which takes an ordering of nodes of a graph and colors these with the smallest color satisfying the constraints that no adjacent nodes are assigned same colors. However, the Greedy method performs poorly in practice. DSATUR uses a heuristic which changes the ordering of nodes and then uses the Greedy method to color these nodes.