Abstract

The satisfiability problem (SAT) is one of the most prominent problems in theoretical computer science for understanding of the fundamentals of computation. It is first known NP-Complete problem. Graph k-Colorability (for k \geq 3) Problem (GCP) is also an well known NP-Complete problem. We can reduce any NP-Complete problem to/from SAT. Reduction from satisfiability problem to graph k-colorability problem or vice versa is an important concept to solve one of the hard scheduling problem, frequency assignment in cellular network. The frequency assignment problem is very similar to the graph k-colorability problem. In this paper, we are presenting a polynomial reduction from any instance of 3-CNF-SAT formula to k-colorable graphs. Moret [2] gave an reduction approach from 3-SAT to 3-colorable graph. According to Moret, reduced
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3-colorable graph having \((2n + 3m + 1)\) vertices and \((3n + 6m)\) edges, where \(n\) is the number of variables and \(m\) is number of clauses contained by 3-SAT formula. Here, we generalized the reduction approach to reduce any instance of 3-CNF-SAT formula to a k-colorable graph in polynomial time with mathematical proof. Our reduction approach generate a k-colorable graph with \(|V| = (2n + 3m + (k-2))\) vertices and \(|E| = (3n + 6m)\) edges for \(k = 3\) and \(|E| = (|E| of (k-1)-colorable graph + (|V|-1))\) edges for \(k > 3\) corresponding to any instance of 3-CNF-SAT. Further, we give the formulation of graph k-colorability to frequency assignment problem in cellular network.

References

- S. A. Cook, “The P versus NP problem”, April 2000, Computer Science Department, University of Toronto.

Index Terms

Computer Science
Keywords
3-SAT  CNF  graph k-colorability  NP-Complete  chromatic number  frequency assignment