Summary: Given an undirected simple graph $G$, a set of vertices is an $r$-clique transversal if it has at least one vertex from every $r$-clique. Such sets generalize vertex covers as a vertex cover is a 2-clique transversal. Perfect graphs are a well-studied class of graphs on which a minimum weight vertex cover can be obtained in polynomial time. Further, an $r$-clique transversal in a perfect graph is also a set of vertices whose deletion results in an $(r-1)$-colorable graph. In this work, we study the problem of finding a minimum weight $r$-clique transversal in a perfect graph. This problem is known to be $\text{NP}$-hard for $r \geq 3$ and admits a straightforward $\frac{r+1}{2}$-approximation algorithm. We describe two different $\frac{r+1}{2}$-approximation algorithms for the problem. Both the algorithms are based on (different) linear programming relaxations. The first algorithm employs the primal-dual method while the second uses rounding based on a threshold value. We also show that the problem is APX-hard and describe hardness results in the context of parameterized algorithms and kernelization.

MSC:

- 68Q25 Analysis of algorithms and problem complexity
- 05C17 Perfect graphs
- 05C85 Graph algorithms (graph-theoretic aspects)
- 68Q17 Computational difficulty of problems (lower bounds, completeness, difficulty of approximation, etc.)
- 90C05 Linear programming

Keywords:

- $r$-clique transversal
- odd cycle transversal
- perfect graphs
- approximation algorithms
- linear programming

Full Text: DOI

References:
