Alam, Md. Jawaherul; Chaplick, Steven; Fijavž, Gašper; Kaufmann, Michael; Kobourov, Stephen G.; Pupyrev, Sergey; Toeniskoetter, Jackson

Threshold-coloring and unit-cube contact representation of planar graphs. (English)

Zbl 1350.05027

Summary: In this paper we study threshold-coloring of graphs, where the vertex colors represented by integers are used to describe any spanning subgraph of the given graph as follows. A pair of vertices with a small difference in their colors implies that the edge between them is present, while a pair of vertices with a big color difference implies that the edge is absent. Not all planar graphs are threshold-colorable, but several subclasses, such as trees, some planar grids, and planar graphs with no short cycles can always be threshold-colored. Using these results we obtain unit-cube contact representation of several subclasses of planar graphs. Variants of the threshold-coloring problem are related to well-known graph coloring and other graph-theoretic problems. Using these relations we show the NP-completeness for two of these variants, and describe a polynomial-time algorithm for another.

MSC:
05C15 Coloring of graphs and hypergraphs
05C10 Planar graphs; geometric and topological aspects of graph theory
68Q17 Computational difficulty of problems (lower bounds, completeness, difficulty of approximation, etc.)

Keywords:
graph coloring; threshold coloring; planar graphs; unit-cube contact representation

Full Text: DOI

References:
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