New results on edge partitions of 1-plane graphs. (English) Zbl 1386.68117


Summary: A 1-plane graph is a graph embedded in the plane such that each edge is crossed at most once. A NIC-plane graph is a 1-plane graph such that any two pairs of crossing edges share at most one end-vertex. An edge partition of a 1-plane graph G is a coloring of the edges of G with two colors, red and blue, such that both the graph induced by the red edges and the graph induced by the blue edges are plane graphs. We prove the following: (i) Every NIC-plane graph admits an edge partition such that the red graph has maximum vertex degree three; this bound on the vertex degree is worst-case optimal. (ii) Deciding whether a NIC-plane graph admits an edge partition such that the red graph has maximum vertex degree two is NP-complete. (iii) Deciding whether a 1-plane graph admits an edge partition such that the red graph has maximum vertex degree one, and computing one in the positive case, can be done in quadratic time. Applications of these results to graph drawing are also discussed.

MSC:

68R10 Graph theory (including graph drawing) in computer science
05C70 Edge subsets with special properties (factorization, matching, partitioning, covering and packing, etc.)
68Q25 Analysis of algorithms and problem complexity

Keywords:
edge partitions; 1-planarity; NIC-plane graphs; graph drawing

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References:


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