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Geometric simultaneous embeddings of a graph and a matching. (English) Zbl 1284.68448


Summary: The geometric simultaneous embedding problem asks whether two planar graphs on the same set of vertices in the plane can be drawn using straight lines, such that each graph is plane. Geometric simultaneous embedding is a current topic in graph drawing and positive and negative results are known for various classes of graphs. So far only connected graphs have been considered. In this paper we present the first results for the setting where one of the graphs is a matching.

In particular, we show that there exists a planar graph and a matching which do not admit a geometric simultaneous embedding. This generalizes the same result for a planar graph and a path. On the positive side, we describe algorithms that compute a geometric simultaneous embedding of a matching and a wheel, outerpath, or tree. Our proof for a matching and a tree sheds new light on a major open question: do a tree and a path always admit a geometric simultaneous embedding? Our drawing algorithms minimize the number of orientations used to draw the edges of the matching. Specifically, when embedding a matching and a tree, we can draw all matching edges horizontally. When embedding a matching and a wheel or an outerpath, we use only two orientations.

For the entire collection see [Zbl 1185.68005].

MSC:

68R10 Graph theory (including graph drawing) in computer science
05C10 Planar graphs; geometric and topological aspects of graph theory
05C70 Edge subsets with special properties (factorization, matching, partitioning, covering and packing, etc.)
05C85 Graph algorithms (graph-theoretic aspects)

Full Text: DOI