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Fáry’s theorem for 1-planar graphs. (English) [Zbl 1364.68308]


Summary: A plane graph is a graph embedded in a plane without edge crossings. Fáry’s theorem states that every plane graph can be drawn as a straight-line drawing, preserving the embedding of the plane graph. In this paper, we extend Fáry’s theorem to a class of non-planar graphs. More specifically, we study the problem of drawing 1-plane graphs with straight-line edges. A 1-plane graph is a graph embedded in a plane with at most one crossing per edge. We give a characterisation of those 1-plane graphs that admit a straight-line drawing. The proof of the characterisation consists of a linear time testing algorithm and a drawing algorithm. Further, we show that there are 1-plane graphs for which every straight-line drawing has exponential area. To the best of our knowledge, this is the first result to extend Fáry’s theorem to non-planar graphs.

For the entire collection see [Zbl 1246.68037].

MSC:

68R10 Graph theory (including graph drawing) in computer science
05C10 Planar graphs; geometric and topological aspects of graph theory
05C62 Graph representations (geometric and intersection representations, etc.)
05C85 Graph algorithms (graph-theoretic aspects)

Full Text: DOI