

On Beyond Tutte's Graph Drawing Algorithm

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Tutte's algorithm from 1963 draws any planar graph with straight-line edges when the outer face is a prescribed convex polygon. For a 3-connected graph the drawing will have convex faces.

We first show that the following generalization of Tutte's problem is computationally hard, in particular, hard for existential theory of the reals: Given a planar graph and a polygonal region, with some vertices of the graph assigned to fixed positions on the region boundary, find (if possible) a straight line planar drawing of the graph in the region, respecting the fixed vertices.

Secondly, and more positively, we show how Tutte's result can be used to give an algorithm for the following problem: Given a planar straight-line drawing of a 3-connected graph, morph it to a drawing with convex faces. Here, "morph" means to move continuously, maintaining straight-line planarity.