Planar straight-line graphs with free edge lengths Filip Morić (École Polytechnique Fédérale de Lausanne)

Abstract

We study straight-line embeddings of planar graphs subject to metric constraints. A planar graph G is *free* in a planar "host" graph $H, G \subseteq H$, if the edges of G have arbitrary positive lengths, that is, for any choice of positive lengths for the edges of G, the host H has a straight-line embedding that realizes these lengths. A planar graph G is *extrinsically free* in H, $G \subseteq H$, if any constraint on the edge lengths of G depends on G alone, irrespective of any additional edges of the host H.

We characterize all planar graphs G that are free in any host $H, G \subseteq H$. We also give an almost complete characterization of the planar graphs G that are extrinsically free in any host $H, G \subseteq H$; the status of the cycles C_k , $k \geq 5$, remains open, leading to a new variant of the celebrated carpenter's rule problem. Separating triangles, and separating cycles in general, play an important role in our arguments. We show that every star is free in a 4-connected triangulation, which has no separating triangle. (Joint work with Radoslav Fulek, Yoshio Okamoto, Tibor Szabó and Csaba D. Tóth)