Ribbon graphs, partial duals and Eulerian partial duals of plane graphs

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Abstract

In this talk, I shall first give several (equivalent) definitions of ribbon graphs and their partial duals, a generalization of geometrical dual of a cellularly embedded graph from the set of edges of the graph to all subsets of the set of edges of the graph. A ribbon graph with $m$ edges has $2^m$ (not necessarily distinct) partial duals. In the paper [Bipartite partial duals and circuits in medial graphs, Combinatorica 33(2) (2013) 231-252] Huggett and Moffatt characterized bipartite partial duals of a plane graph (i.e. when a partial dual of a plane graph is bipartite?) using all-crossing directions of its medial graph and remained the characterization of Eulerian partial duals of a plane graph (i.e. when a partial dual of a plane graph is Eulerian?) as an open problem. We shall solve this problem by considering half-edge directions and allowing inconsistent edges. I also plan to give more recent results on bipartite and Eulerian partial duals of ribbon graphs, instead of plane graphs. This is a joint work with Metrose Metsidik.