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1-Fan-Bundle-Planar Drawings of Graphs[☆]

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Abstract

Edge bundling is an important concept, heavily used for graph visualization purposes. To enable the comparison with other established nearly-planarity models in graph drawing, we formulate a new edge-bundling model which is inspired by the recently introduced fan-planar graphs. In particular, we restrict the bundling to the end segments of the edges. Similarly to 1-planarity, we call our model *1-fan-bundle-planarity*, as we allow at most one crossing per bundle.

For the two variants where we allow either one or, more naturally, both end segments of each edge to be part of bundles, we present edge density results and consider various recognition questions, not only for general graphs, but also for the outer and 2-layer variants. We conclude with a series of challenging questions.

Keywords: graph drawing, beyond planarity, edge bundling, edge density, recognition

1. Introduction

Edge bundling is a powerful tool used in information visualization to avoid visual clutter. In fact, when the edge density of the network is too high, the traditional techniques of graph layouts and flow maps become unusable. In this case, grouping together parts of edges that flow parallel to each other within a single bundle allows us to reduce the clutter and improve readability; see Fig. 1 for an example. Among the many, we mention here only the seminal papers of Holten [25] and Telea and Ersoy [35], which focus on radial layouts, as well as works on flow maps [11] and parallel coordinates [37]. For a comprehensive

[☆]A preliminary extended abstract of the results contained in this paper has been presented at the 25th International Symposium on Graph Drawing and Network Visualization, GD 2017.

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