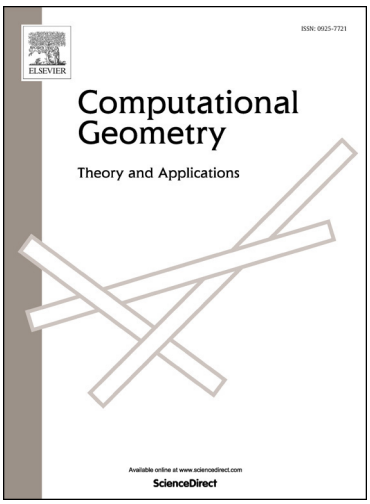
# Accepted Manuscript




Orthogonal layout with optimal face complexity

Md. Jawaherul Alam, Stephen G. Kobourov, Debajyoti Mondal

PII: S0925-7721(17)30015-9
DOI: http://dx.doi.org/10.1016/j.comgeo.2017.02.005
Reference: COMGEO 1465

To appear in: *Computational Geometry: Theory and Applications*

Received date: 6 August 2016
Revised date: 28 January 2017
Accepted date: 17 February 2017

Please cite this article in press as: Md. Jawaherul Alam et al., Orthogonal layout with optimal face complexity, *Comput. Geom.* (2017), http://dx.doi.org/10.1016/j.comgeo.2017.02.005

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

# Orthogonal Layout with Optimal Face Complexity[☆]

Md. Jawaherul Alam

*Department of Computer Science, University of California, Irvine, USA*

Stephen G. Kobourov

*Department of Computer Science, University of Arizona, USA*

Debajyoti Mondal[1,*]

*Cheriton School of Computer Science, University of Waterloo, Canada*

**Abstract**

We study a problem motivated by rectilinear schematization of geographic maps. Given a biconnected plane graph $G$ and an integer $k \geq 0$, does $G$ have a strict-orthogonal drawing (i.e., an orthogonal drawing without edge bends) with at most $k$ reflex angles per face? For $k = 0$, the problem is equivalent to realizing each face as a rectangle. We prove that the strict-orthogonal drawability problem for arbitrary reflex complexity $k$ can be reduced to a graph matching or a network flow problem. Consequently, we obtain an $\widetilde{O}(n^{10/7}k^{1/7})$-time algorithm to decide strict-orthogonal drawability, where $\widetilde{O}(r)$ denotes $O(r\ log^c r)$, for some constant $c$. In contrast, if the embedding is not fixed, we prove that it is NP-complete to decide whether a planar graph admits a strict-orthogonal drawing with reflex face complexity 4.

*Keywords:* Graph Drawing, Orthogonal Drawing, Face Complexity.

## 1. Introduction

Map schematization is a problem of interest in geography, cartography, information visualization and computational geometry. Rectangular and rectilinear schematizations have been studied for over 80 years; see the comprehensive survey of Tobler [2], and by Nusrat and Kobourov [3]. While rectangular schematizations sometimes must distort the topology of the map (e.g., no four mutually

[☆]A preliminary version of the paper appeared in the Forty-First International Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM 2016) [1].

[*]Corresponding author

*Email addresses:* alamm1@uci.edu (Md. Jawaherul Alam), kobourov@cs.arizona.edu (Stephen G. Kobourov), dmondal@uwatreloo.ca (Debajyoti Mondal)

[1]Work of the author is supported in part by the Natural Sciences and Engineering Research Council of Canada (NSERC).

Download English Version:

https://daneshyari.com/en/article/4949124

Download Persian Version:

https://daneshyari.com/article/4949124

Daneshyari.com