Validating Graph Drawing Aesthetics

Helen C. Purchase[1] and Robert F. Cohen[2] and Murray James[1]

[1] Department of Computer Science, University of Queensland,
St. Lucia, Queensland, 4072, Australia.
[2] Department of Computer Science, University of Newcastle,
Callaghan, New South Wales, 2308, Australia

Abstract. Designers of graph drawing algorithms and systems claim to illuminate application data by producing layouts that optimize measurable aesthetic qualities. Examples of these aesthetics include *symmetry* (where possible, a symmetrical view of the graph should be displayed), *minimize edge crossings* (the number of edge crossings in the display should be minimized), and *minimize bends* (the total number of bends in polyline edges should be minimized).
The aim of this paper is to describe our work to validate these claims by performing empirical studies of human understanding of graphs drawn using various layout aesthetics. This work is important since it helps indicate to algorithm and system designers what are the aesthetic qualities most important to aid understanding, and consequently to build more effective systems.

1 Introduction

The visualization produced by a graph drawing subsystem should *illuminate* application data. That is, it should help the user to understand and remember the information being visualized. A good layout can be a picture worth a thousand words; a poor layout can confuse or mislead. Designers of graph drawing algorithms and systems claim to illuminate application data by producing layouts that optimize measurable aesthetic qualities. Examples of these aesthetics include *symmetry* (where possible, a symmetrical view of the graph should be displayed, see e.g. [4, 7]), *minimize edge crossings* (the number of edge crossings in the display should be minimized, see e.g. [5]), and *minimize bends* (the total number of bends in polyline edges should be minimized, see e.g. [10, 11]).

The aim of this paper is to describe our work to validate these claims by performing empirical studies of human understanding of graphs drawn using various layout aesthetics. This work is important since it helps indicate to algorithm and system designers what are the aesthetic qualities most important to aid understanding, and consequently to build more effective systems.

There has been very little work in this area. This is the first study to address the effect of aesthetics on general understanding of graphs. Prior work has focused on specific applications [1, 3] and comparisons of two- and three-dimensional layouts [12].