

Abstract

GraphDraw—A Tool for the Representation of Graphs Using Inherent Symmetry [†]

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When drawing small graphs (with up to five or six vertices) we can use their underlying symmetry to represent them in a clear and natural way. For example, to draw a graph G with vertex set $V = \{0,1,2,3\}$ and edge set $E = \{(0,1), (1,2), (2,3), (3,0)\}$ it would be natural to use a square, or if $V = \{0,1,2,3,4\}$ and $E = \{(0,2), (0,3), (1,3), (1,4), (2,4)\}$ we might use a star to represent G . Even if the vertex labels were permuted, it would not be difficult to uncover the underlying shape. As the number of vertices increases, it becomes impossible to manually choose a suitable and informative representation, i.e., to choose where on the plane to place each of the vertices in order to produce a clear graph, rather than just a confusing mess. Existing graph drawing applications (like yEd) require the user to decide where to place the vertices.

In this paper, we present a tool—GraphDraw—which uses the underlying automorphism group of a graph ($A(G)$) to draw graphs from an initial index array representation of G . Cycles in the generators of $A(G)$ are used to place the vertices in such a way as to exploit the underlying symmetry in the drawing, thus producing a clearer and more intuitive representation. Parameter selection allows the user to choose from a range of representations and to optimise the graphs in terms of edge crossings or total edge length. We give a description of the tool and present a suite of example graphs, illustrating the effect of different parameter selections.



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