An experimental comparison of four graph drawing algorithms

## URL:

* <https://www.sciencedirect.com/science/article/pii/S0925772196000053>

## PDF:

* 01\_four-graph-drawing-algorithmns

Abstract:

* The article compares four graph drawing algorithms using 11,582 general graphs with no connectivity or planarity restrictions. The study evaluates the algorithms' performance in terms of aesthetic properties and running time, highlighting trade-offs between the two.

Introduction:

* The article provides an overview of the current research on graph drawing algorithms and discusses the limitations and strengths of existing approaches.

Compared algorithms:

* The article compares the following four graph drawing algorithms:
  + **Bend-Stretch:** This algorithm uses a force-directed approach to position nodes in a graph. It minimizes the sum of the bending and stretching energy of edges.
  + **Column:** This algorithm separates the graph into layers of nodes, where each layer corresponds to a different distance from the source node.
  + **Giotto:** This algorithm uses a technique called simulated annealing to minimize a cost function that considers the length and angle of edges.
  + **Pair:** This algorithm assigns each node a position on a circle, and then iteratively refines these positions to minimize edge crossings.

Notes:

* The paper verbally describes the steps of the algorithm.
* It contains lot of interesting diagram comparison.

# Graph drawing algorithms

## URL:

## <https://dl.acm.org/doi/abs/10.5555/1882723.1882729>

## PDF:

* 02\_graph-drawing-algorithms

Summary:

* The article covers a range of graph drawing algorithms, including force-directed, hierarchical, tree drawing, 3D, planar, orthogonal, planarization, and symmetric graph drawing methods. Each chapter includes a description of the algorithm and its key features, as well as examples and proofs.

Chapters:

* **Drawing Methods:**
  + This chapter covers four drawing methods, including force-directed, hierarchical, tree drawing, and 3D drawing methods.
  + Hierarchical methods organize nodes into levels based on their distance from the root node.
  + Tree drawing methods create drawings that preserve the tree structure of a graph.
  + 3D drawings use depth to represent additional information.
* **Planar Graph Drawing:**
  + This chapter focuses on algorithms for drawing planar graphs, which are graphs that can be drawn in the plane without any edges crossing.
  + The chapter covers algorithms for finding planar embeddings, as well as techniques for drawing planar graphs with aesthetically pleasing properties.
* **Orthogonal Drawings:**
  + This chapter covers algorithms for creating orthogonal drawings, which are drawings where all edges are horizontal or vertical.
  + The chapter includes techniques for creating orthogonal drawings of planar graphs, as well as non-planar graphs.
* **Planarization:** 
  + This chapter covers algorithms for planarization, which is the process of transforming a non-planar graph into a planar graph.
  + The chapter covers several techniques, including edge insertion and vertex addition.
* **Symmetric Graph Drawing:**
  + This chapter covers algorithms for drawing symmetric graphs.

Notes:

* Doesn't have abstract.
* Algorithms in verbal form -> Probably easily usable
* Contains proofs.

# Optimization Algorithms Study and Implementation on Graph Drawing Based on XML Document

URL:

* <https://www.sciencedirect.com/science/article/pii/S1877050919307768?fbclid=IwAR1IotEok0mQPPzTrKoNe29CvF5IrCM1Fh5ym-Nwc5uCq-fLCX6mhWZpjic>

PDF:

* 03\_impl-from-xml

Summary:

* This short article (7 pages) describes the implementation of three optimization algorithms for graph drawing: the Genetic Algorithm, the SHLA Algorithm, and the FR Algorithm (as well as an improved version of the FR Algorithm). The input and output graphs are represented using XML documents.

Notes:

* The Genetic Algorithm optimizes the layout of a graph using a population-based approach.
* The SHLA Algorithm combines simulated annealing with a genetic algorithm for improved optimization.
* The FR Algorithm uses a force-directed approach to position nodes in a graph, while the improved version of the algorithm incorporates edge clustering to improve the readability of the graph.

The article provides examples of the resulting graphs and discusses the advantages and limitations of each algorithm.

# An algorithm for constructing star-shaped drawings of plane graphs

## URL:

* https://www.sciencedirect.com/science/article/pii/S0925772109000947?fbclid=IwAR3ylhD0409INNgfZVJ0YHjUOs\_rjTdGZUMVsBO9anH9gtZR4C-pm5u2bFk

## PDF:

* 04\_star-shaped-drawings

Notes:

* The article concentrates on the problem of constructing star-shaped drawings of plane graphs, specifically focusing on convex drawings.
* Provides detailed descriptions of the algorithms as programs.
* The algorithm presented in the article is based on a constructive proof, and the article provides examples of the resulting graphs. The article discusses the advantages and limitations of the algorithm and highlights the potential of star-shaped drawings for improving the readability and aesthetic appeal of graphs.

A framework and algorithms for circular drawings of graphs

## URL:

* <https://www.sciencedirect.com/science/article/pii/S1570866705000031?fbclid=IwAR3ViTqcCMknnRdjgVlBF4hx8r0OZjJ7SuMypK5qjRyjYXfWV4wIb_L2Uc4>

## PDF:

* 05\_angorithms-for-circular-drawings

Notes:

* The article presents a framework and algorithms for creating circular drawings of graphs, with an emphasis on minimizing the number of crossings.
* The algorithms are presented as programs.
* Provides examples of the resulting graphs and discusses the advantages of circular drawings for graph visualization.
* The algorithms presented in the article help to order the nodes in the graph to have the least number of crossings in a circular graph or subgraph. This can be particularly useful when drawing trees of a graph, or when dealing with graphs that contain cycles.
* Highlights the importance of minimizing the number of crossings in graphs, as this can significantly improve the readability and aesthetic appeal of the graph.

# Untangling circular drawings: Algorithms and complexity

## URL:

* <https://www.sciencedirect.com/science/article/pii/S0925772122001183?fbclid=IwAR3sRNOXxnD9M-8t7lQ_9d4vVUsGmpPM5JI1lGt165PKFPYnMPgYoATKm8A>

## PDF:

* 06\_untangling-circular-drawings

Notes:

* The article focuses on the problem of untangling circular drawings of graphs, specifically addressing how to place nodes on a circle while eliminating edge crossings.
* Discusses algorithms and complexity related to this problem, providing lemmas and proofs to support the discussion.
* Does not provide algorithms as programs, it provides lemmas and proofs that can be used to develop practical solutions to the problem of untangling circular drawings.
* (Maybe connected to 05.)

# Crossing minimization in extended level drawings of graphs

## URL:

* <https://www.sciencedirect.com/science/article/pii/S0166218X09003552?fbclid=IwAR1VlSRHuzYLNtIl8Y_7UogkZWysja23gbxUZ0IQZF7qLdiEvsi8Cel7X8Y>

## PDF:

* 07\_level-drawings-crossing-minimization

Notes:

* This article focuses on the problem of crossing minimization in extended level drawings of graphs. Specifically, the article discusses horizontal and radial drawings and provides algorithms as programs.
* Presents a shifting method to shift levels onto a circle, which can be used to improve the aesthetics of a graph drawing.
* Discusses circle crossing minimization techniques, which are used to minimize the number of edge crossings in a circular drawing of a graph. These techniques are important for improving the readability and aesthetics of a graph drawing.

# Towards Visualizing Big Data with Large-Scale Edge Constraint Graph Drawing

URL:

* <https://www.sciencedirect.com/science/article/pii/S2214579616301277?fbclid=IwAR2RalBpX8QQWpGlsnJdEYwNS3tW1tDaGupA8uXvtFWEGD40_zZUFHcFYBc>

PDF:

* 08\_large-scale-edge-constraint-graph-drawing

Notes:

* Published in 2017, discusses large-scale edge constraint graph drawing as a technique for visualizing big data. May not provide as much practical guidance as some of the others, it does offer an overview of the state of the art in this area.
* Discusses the challenges of visualizing large-scale graphs, particularly those with many edges. It then introduces large-scale edge constraint graph drawing as a potential solution to this problem. The article provides examples of the technique and discusses its advantages and limitations.