

Consistent Graph Layouts by Hybrid Genetic Algorithms
Faculty Research Grant Proposal
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Abstract

The main goal of this project is to build consistent graph layouts with special geometrical properties. A graph layout is a geometrical representation of the vertices in the graph as points and of the edges as line segments. The layout is called consistent if the length of the line segments is equal to the weights of the edges they represent. Beside the simple consistency, we would like to build layouts that also satisfy some geometrical properties like maximizing the enclosed volume.

To solve this problem, we intend to implement a combination of a genetic algorithm with a force-based probabilistic method. Our previous research has proven that the force-based algorithm can be successful in building consistent graph layouts, but it would be difficult to ensure any special geometrical properties with this algorithm. On the other hand, the genetic algorithm can easily take geometrical constraints into consideration by including them in the fitness function. We think that a combination of these two methods could yield to solutions that satisfy most of the properties we are interested in, including the consistency.

The algorithm can be used for graph visualization, data compression, and geometrical shape construction or recovery.