Consistent Consistent Weighted Graph Layouts

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A graph layout is a geometrical representation of a graph such that the vertices are assigned points and the edges become line segments. In this paper we present two probabilistic algorithms that build layouts for weighted graphs such that the geometrical distances between the vertices are consistent with the weights of the edges.

Both methods start with a random layout and improve it in a number of iterations to decrease the error between the weight of the edges and the length of the corresponding line segments. In each case, an error force is created on each edge that brings the vertices closer if the distance between them is greater than the weight of the edge, or pushes them farther apart in the opposite case.

For the *Breadth-First Based Algorithm*, in each iteration we choose an arbitrary vertex in the graph, and adjust the adjacent vertices according to the error force on each edge. We continue with the rest of the vertices in the graph following a breadth-first order traversal.

For the *Global Force Algorithm*, in each iteration we start by computing all the forces acting on every edge in the graph and their resulting force in each vertex. Then the entire layout is then modified based on these resulting forces.

The algorithms repeat the described iterations until a certain level of precision is achieved or no significant improvements can be observed anymore. Both methods have been successful in building consistent layouts with precision of over 95%.