Introduction

Overview

This layout provides a graph layouting algorithm to Vanted. The algorithm is based on the concept of minimising an objective value of the network, its so-called *stress* [1] [2]. It tries to assign positions to nodes such that the distances in the drawing between two node matches their graph-theoretical distance [3].

For the stress measure, one can derive a (convex) quadratic form T that majorizes it. Optimising T yields an improved layout. The algorithm iteratively optimises majorants until the stress reduction falls below a given threshold.

The algorithm implements the formulation of Mader et al.

The algorithm can configured to compute a full optimisation or an approximation using a landmark strategy.

[1] Gansner, Koren, North: *Graph Drawing by Stress Majorization*

[2] Mader: *Drawing Dynamic Graphs by Stress Minimization*

[3] i.e. the number of edges one has to walk to get from node to the other

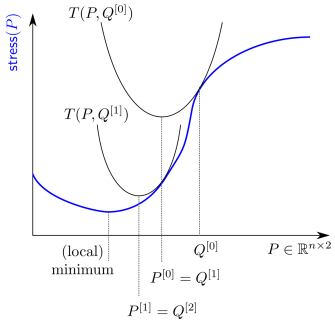

Figure 1: Iterative optimisation by finding majorants of increasing quality.

Dependencies

- Apache Commons Math 3.0 API (packaged with the Add-On).
- The plugin requires Vanted 2.6.5, including the libraries it is based upon.

License

This software is licensed under *GNU General Public License, version 3* [4].

[4] `https://github.com/xnhp/vanted-addon-sm/blob/master/LICENSE.txt`

Working with the Stress Minimization Add-On

Auto Redraw If checked, after each iteration of the optimiser, the view will be updated with the current layout. Note that this may introduce significant lag. This option can be toggled on and off during the execution of the algorithm.

Preprocessing Whether the currently displayed layout or a random layout should be used as an inital layout for the iterative optimisation.

Method Whether to consider the full set of nodes for calculating and optimising the stress measure or to follow a landmark strategy. In the latter case, landmarks are selected using the MaxMin strategy. [5] After an optimised layout for the landmarks has been found, other nodes are placed around the landmarks in barycentric fashion.

[5] The next landmark is the one with the maximum shortest distance to any other previously selected landmark. The first landmark is the node with the highest degree.

Weight exponent Dissimilarities between the current layout and the shortest-path distance can be weighted by $d_{ij}^{-\alpha}$ where d_{ij} is the shortest-path distance between nodes i and j. $\alpha = 0$, also called *absolute stress*, results in a layout that emphasises larger distances. Local structures might not be clearly distinguised. $\alpha \in \{-1, -2\}$, also called *semi-proportional* and *proportional* stress, resp., will not

represent large dissimilarities faithfully but down-weight them. However, local structures will be more clearly revealed.

Stress change threshold If the total stress change in an iteration falls below this amount, the computation terminates.

Node movement threshold If the maximum movement of a node falls below this value, the computation terminates.

Maximum number of iterations The maximum number of optimisation cycles to perform.