Info Vis Comp5048 lecture August 13

Tutorial: when?

Summary: Force directed methods

1. The general idea
   a. Force model
   b. Energy minimisation
2. The barycentre method (Tutte method)
   a. Equational view
   b. Energy view
   c. Solving the equations; how to compute the locations
   d. Theorem: planarity (3-conn), convexity (delay details)
   e. Problems: resolution
   f. Becker-Hotz methods
3. Spring algorithm
   a. Spring forces; log springs, Hooke’s law springs
   b. Equations
   c. How to compute solutions
   d. Animation with springs
   e. Evaluation
4. Kamada-Kawai method
5. Magnetic springs
6. Constraints with forces
7. Case study: Metro maps
8. More general energy models
   a. Edge crossings and SA
   b. Genetic algorithms
9. Faster force calculations: Barnes-Hutt algorithm
10. Multidimensional scaling

Systems Assignment

HOMEWORK (optional, not assessed)
1. Find minimal energy layouts for the following graphs, using
   a. the barycentre method (nodes in upper case are fixed and spaced regularly around a circle), and
   b. the Hooke’s law spring method.

   \[
   \begin{array}{ccc}
   A & B,C,d \\
   B & A,C,d \\
   C & A,B,d \\
   d & A,B,C \\
   \end{array}
   \quad
   \begin{array}{ccc}
   A & D,E,f \\
   B & D,E,f \\
   c & D,E,f \\
   D & A,B,c \\
   E & A,B,c \\
   f & A,B,c \\
   \end{array}
   \quad
   \begin{array}{ccc}
   A & d \\
   B & e \\
   C & f \\
   d & A,e,f,g \\
   e & B,d,f,g \\
   f & C,d,e,g \\
   g & d,e,f \\
   \end{array}
   \]

2. Find some code that computes force-directed layout. Test in on graphs with 10 nodes, 20 nodes, 30 nodes,
   40 nodes, 50 nodes, 100 nodes, 200 nodes, 300 nodes, 400 nodes, and 500 nodes, and plot the runtimes.

(Note: exam questions could be similar to question 1).