Interactive, Constraint-based Layout of Engineering Diagrams
Talk overview

• **Motivation**
• **Constrained graph layout**
  – Continuous network layout model
• **Application: Diagram authoring**
  – Interactive demo
• **Application: Network diagram visualisation**
  – Interactive demo
• **Conclusions**
Motivation

• Producing well laid out diagrams is difficult, and tedious for users
Motivation

• “Once-off” layout tools force repeated use
**Motivation**

- **Automatic network layout is an option**
  - Such layout mostly doesn’t allow alteration or fine-tuning by the user
Motivation

• It would be nice for layout tools to help users, rather than hinder them!
Constrained graph layout

• Like force-directed layout but allows separation constraints
Topology preserving constrained layout

• **Topology preserving**
  – Edges and cluster boundaries behave like rubber-bands… shapes cannot cross them
  – Gives the diagram stability during interaction

• **Described in detail in:**

• **Constrained Layout (cola) implementation**
  – http://adaptagrams.sourceforge.net/ (LGPL)
Continuous network layout model

- Run continuously during interaction
- Preserves topology, so is predictable
- Allows separation constraints
- Supports fine-tuning of layout
  - User can alter positions of shapes
  - Tune the goal function via sliders
  - Suspend continuous layout adjustment
    - When user holds down a modifier key
    - Allows adjustment of diagram topology
Layout improvement after user interaction

1. Find initial starting position - “Node repair”
   - E.g. actions: Add new shape, modify cluster

2. Compute poly-line connector routes and cluster boundaries - “Edge routing repair”
   - E.g. action: delete a shape
   - Done with rubber-banding

3. Optimise the layout
   - E.g. action: move/resize a shape
Live demonstration…

• **Application areas:**
  – Diagram authoring
  – Network diagram visualisation

• **Demos shown in Dunnart**
  – a prototype constraint-based diagram editor
Conclusions

• Powerful automatic graph layout
• Provides total layout flexibility to user
• Immediate feedback during direct manipulation for graphs up to 100 nodes
• Can leverage other graph layout research to provide good initial layouts or styles
  – Constraints preserve style during interaction
Questions?

- More information:
  - http://www.dunnart.org/
  - http://adaptagrams.sourceforge.net/