CD-Edit

a constraint diagrams editor

Yan Sorkin
Supervisor: Dr. Joseph (Yossi) Gil
Outline

- Introduction
- Constraint diagrams
- Human factor aspects of CD-Edit
- CD-Edit implementation
- A short demo
What are Constraint Diagrams?

- A visual language, dealing with sets
  - Intuitive: replaces textual notations
  - Familiar: based on Venn diagrams and Euler circles
  - Expressive: solve many of the topological restrictions of Venn diagrams
- Scope: system and class invariants

FOR MORE INFO...

www.cs.technion.ac.il/users/ssdl
CD-Edit as an editing tool

CD-Edit does syntactical checking (not semantics)
Just like a syntax directed editor, but for a visual language

Used for documentation and/or checking purposes
Objectives

- Develop a useful and practical editing tool
- Language-driven user interface
- Support as many language features as possible
- Provide for future syntax extensions
- Support conversion to common graphic formats
- Interface with external tools
Constraint Diagrams

- Defined by J. Gil, J. Howse and S. Kent
- Divided into three sub-languages in order of increasing of diagrams’ complexity:
  - Venn diagrams (contours and zones)
  - Spider diagrams (spiders, ties and strands)
  - Constraint diagrams (arrows and wildcards)
- Before CD-Edit were created using Visio
A Constraint Diagram...

Rectangular contours are **classes**
- **containment** means *inheritance*
- **intersection** means *common derivatives*

This, and all other drawings, were generated, and embedded into the PowerPoint presentation as an OLE with CD-Edit!
Another Constraint Diagram...

- Rounded rectangles are **states**
  - identified with the set of all objects in this state

- All stacks are either empty, full or half-way.
King Henry VIII marriage...

King: henri_viii

Queen: (executed)

married
Components of the Notation

- **Contours**: classes, states, ad-hoc, projections
- **Spiders**: existential, universal, Schroedinger, given
- **Ties and strands**
- **Zones**: connected, unconnected
- **Arrows**
- **Null link (ground) symbol**
- **Labels**: for zones, contours, spiders, arrows
Ties and Strands

Denote the relationship of elements

- In $d$, $a$ and $b$ may be the same
- In $h$, $d$ and $c$ must be the same
The Multiple Perspectives Dilemma: Visual vs. Topological vs. Logical

- Visual objects:
  - Editing is *visual*: each shape is manipulated by itself
  - Semantics is *topological*: topology is determined by the inter-relationships between shapes
  - Semantics is *logical*: binding of labels to objects, the definition of zones, etc.

- Examples
  - A zone is a logical, not a topological entity
  - Moving a contour may invalidate a zone
  - What is the label of a spider created out of two?
  - Can we create an arrow emanating from nothing and then reconnect it?
Meeting the challenge

- Adhere to a small set of principles
- **Lots of experimentation**: extensive user feedback
- **Analysis of existing tools**: Visio and Office
- **Literature**...
CD-Edit Implementation

- Object Oriented Design
- C++
- Windows NT
- Microsoft Visual Studio
- Microsoft Foundation Classes (MFC)
- Object Linking and Embedding (OLE)
Data Structures
\( \forall Doc, Doc.\text{CurrentPage} \in Doc.\text{Pages} \)

\( \forall View, View.\text{Page} = Doc.\text{CurrentPage} \)

\( \forall Page, Page.\text{Undo} \uplus Page.\text{Redo} = \emptyset \)
Optimal Spiders Algorithm

- Spider is a tree
- **Optimal spider** is the minimal spanning tree of spider’s graph
Automatic Label Placing

بيانات اسلوب لوضع ملصقات تلقائياً:

- Spider is a tree
- The label is placed near the foot for which the sum of the distances to all other feet is minimal
- Three phases:
  - prepare-dist, sum-dist, find-min
- Space complexity: O(n)
- Time complexity: O(n)
Automatic Label Placing (2)

After prepare-dist phase

children: 7
distances: 
4*3+8+5*4+7=47

children: 3
distances: 7

Root

children: 2
distances: 8

children: 0
distances: 0
After sum-dist phase

Automatic Label Placing (3)

Minimum

8 + 27 + 4x5 = 55
52 + 3x7 = 73

7 + 20 + 5x4 = 47

46 + 1x7 = 53
43 + 4x7 = 71
45 + 2x7 = 59

50 + 5x7 = 85
A short demo of CD-Edit...