Beautifying sketching-based design tool content: issues and experiences

Beryl Plimmer[1] and John Grundy[1, 2]

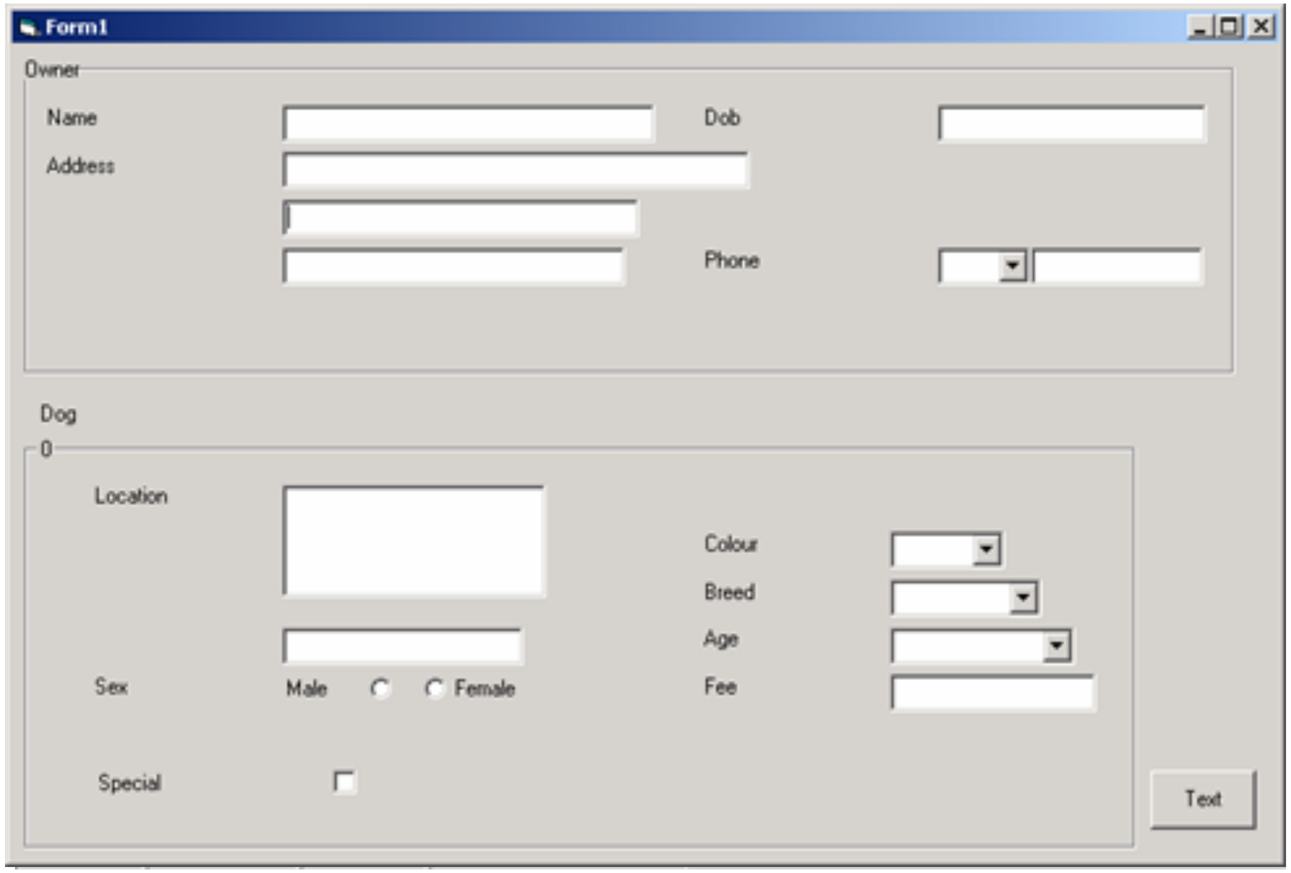
[1]Dept of Computer Science and [2]Dept of Electrical and Computer Engineering
University of Auckland, New Zealand

Outline

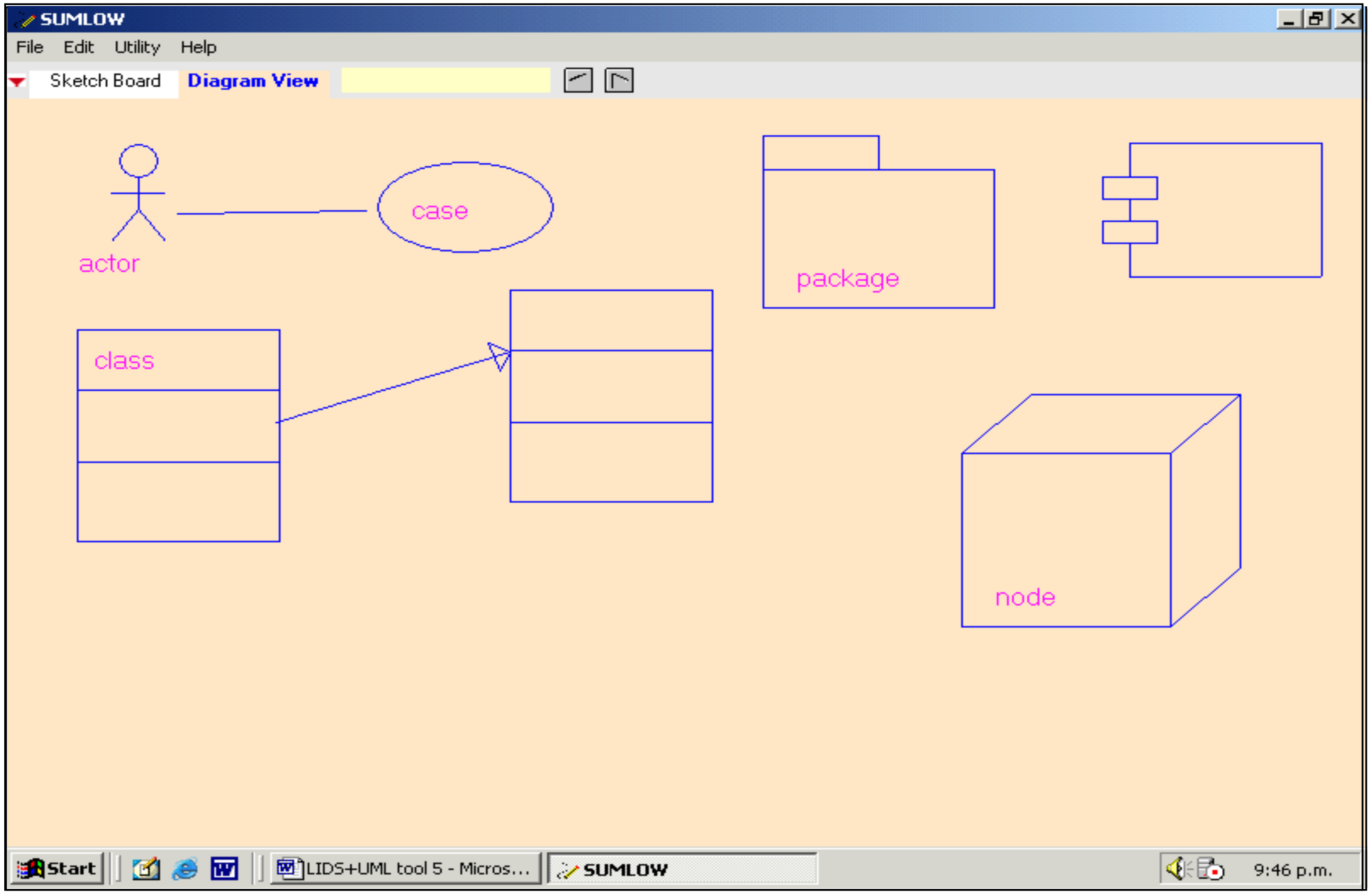
- Motivation
  - Why do we need to “beautify” sketched input?
- Requirements
  - What kinds of sketching tools are there?
  - Do they have different beautification needs?
- Examples
  - UML sketching and User Interface sketching
- Experiences
  - What works well? What doesn’t…
- Conclusions

Motivation

- An example:



Another Example…



Why do this?

- User adds elements, want modified e.g. sketch actor figure and want text edit area added
- User needs constraints enforced e.g. if put text box over another text box, move one of them or resize
- Want layout implemented e.g. UML sequence diagram
- When move/resize something, flow-on effects e.g. resize class icon => move enclosed text/connectors
- When formalise elements, need to apply standard formatting rules e.g. UI text label's font, size, colour, style, …
- Layout rules on formalising diagram content e.g. align radio buttons; auto-layout UML class diagram

How do we do this??

Sketch-time Beautifications:

- Recognize shape & modify appearance/location/size
- Auto-clustering related elements
- Element overlap removal
- Auto resize/move of related elements
- Alignment to grid

Formalisation-time Beautifications:

- Apply heuristics to sketched elements to convert to computer-rendered forms
- Apply grids, auto-layout algorithms
- Apply consistent formatting styles to elements

Different tools require different mix…

Examples: Draw and change

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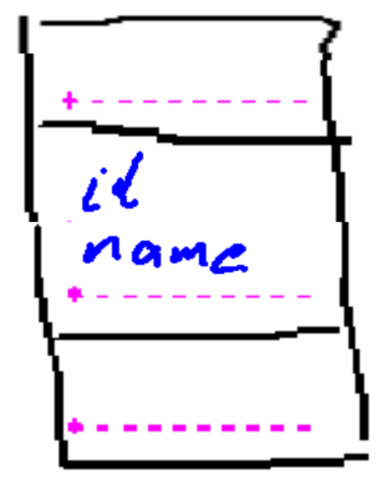
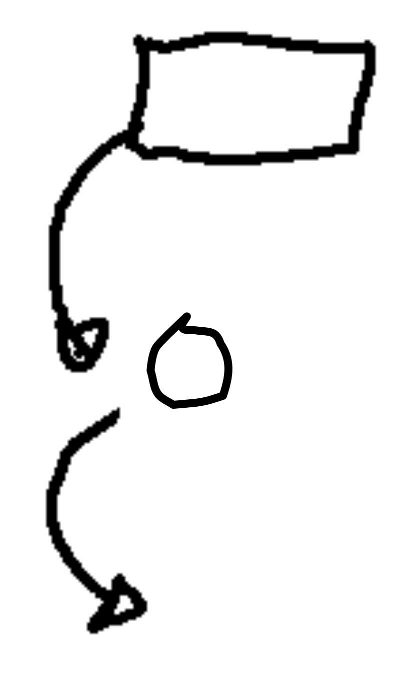
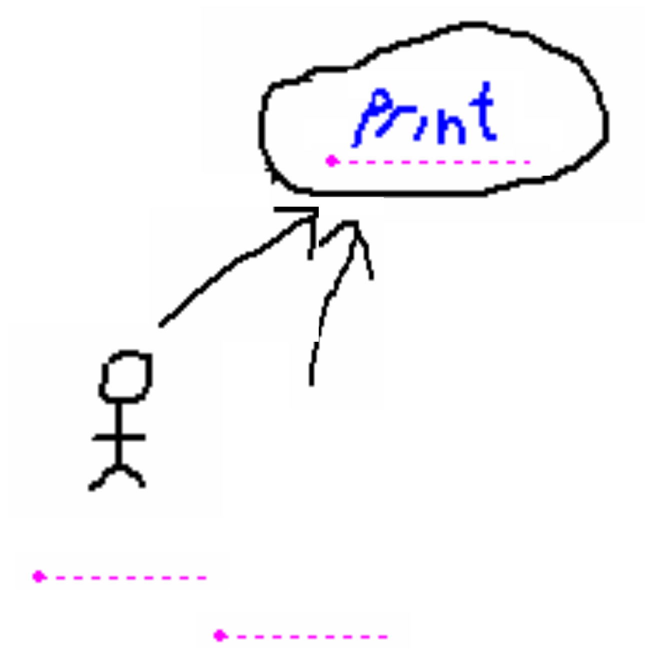


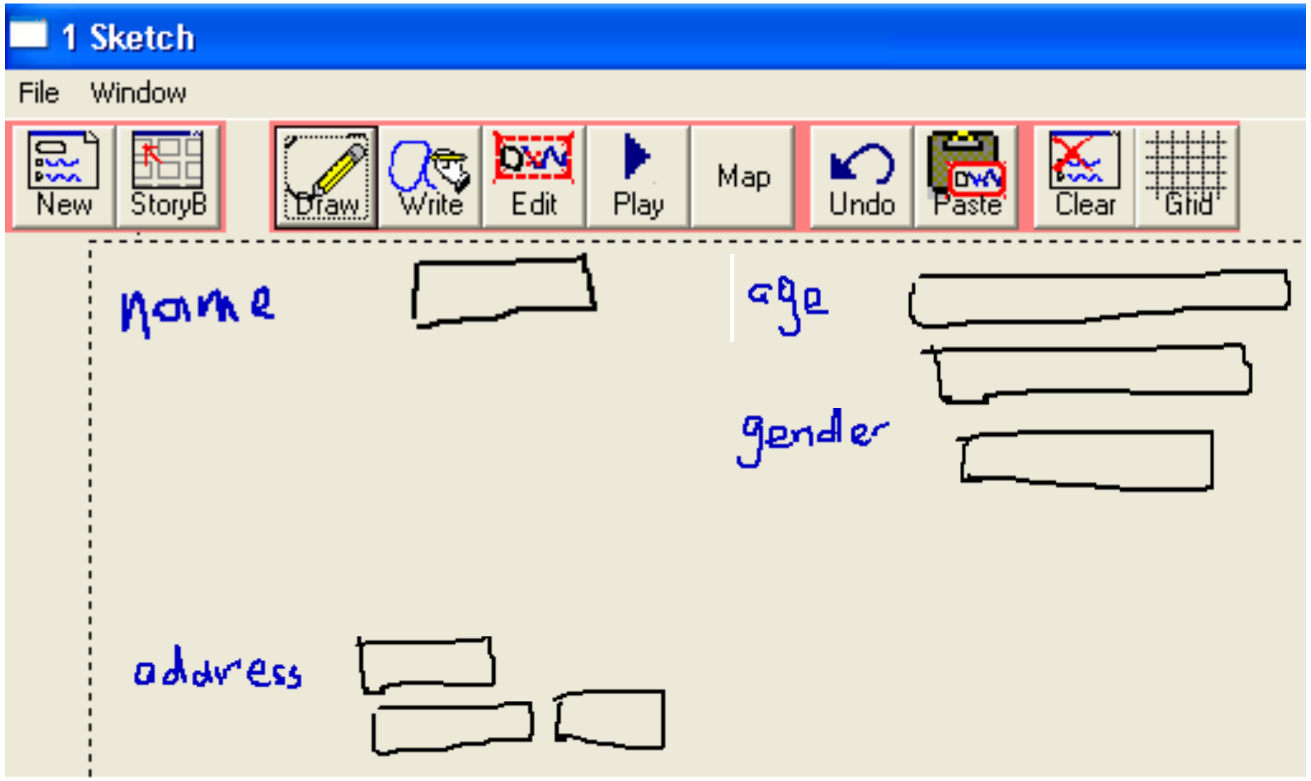
Remove and replace



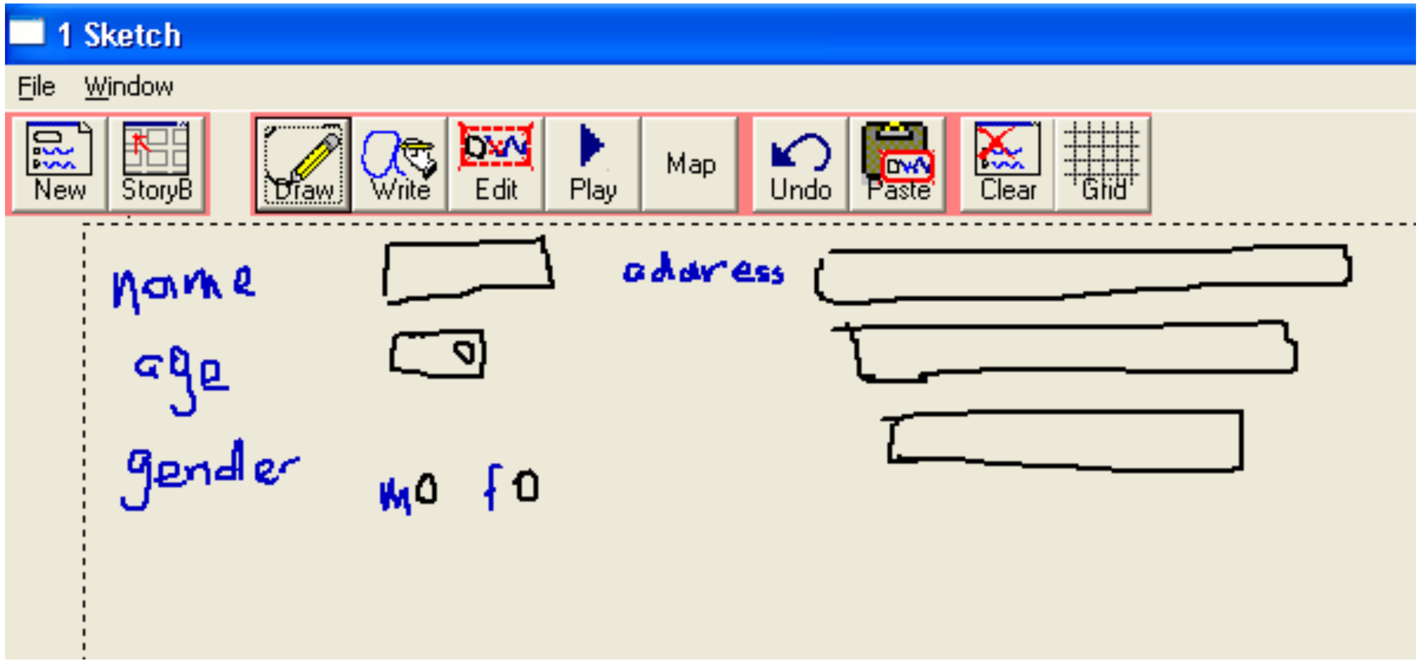
Move and resize

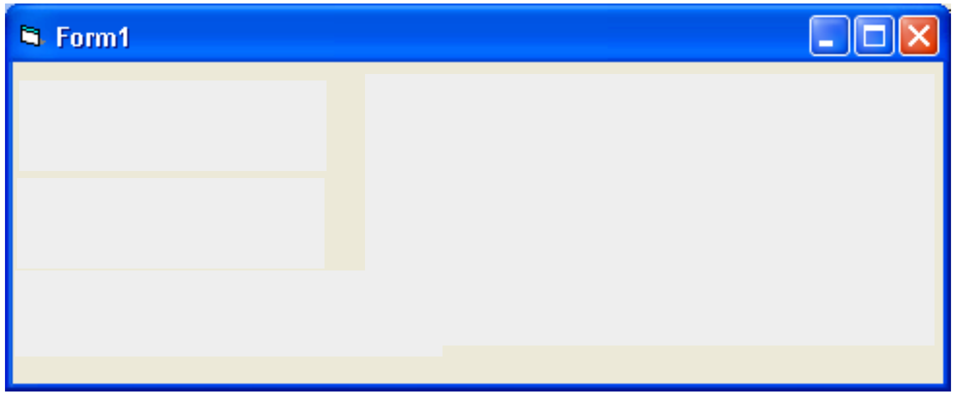


Move and resize group



Apply styles during formalise





Experiences

- In FreeForm:
  - Concrete layout & layout constraints v. important
  - Removing overlaps v. important; determining element groups important
  - Auto-placement, resize during sketch not always desired by user
  - Applying standard styles during formalisation v. important – user needs control over how these are done
- In SUMLOW:
  - Abstract design so user-defined layout/overlaps OK
  - Auto-adding text areas, auto-moving connectors v. important
  - Determining relevant groups during sketching necessary
  - Layout of sequence diagrams necessary during sketching; others auto-layout not needed during sketching
  - Can apply standard styles and layout algorithms during formalisation, but less necessary than in FreeForm

Conclusions & Future Research

- Beautification during sketching and formalisation important for usability of sketching-based UIs
- Different kind of design important – concrete vs abstract models; importance of layout/element interaction
- Users need adequate control over these however

- User configuration of beautification algorithms
- Implementation of beautification in different tools
- Taxonomy of diagramming-based tools to aid in development, including beautification strategies

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