

Supporting Software Modeling Activities Through Novel Interaction and Visualization Techniques

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Motivation

Software models are created in digital editors but can also exist as sketches on paper or whiteboards. Though there is a multitude of software modeling tools available, the handling of diagrams is still difficult.

Shortcomings of digital modeling tools:

- Workspace is often too small.
- Dependencies between diagrams are not visualized.
- Interaction techniques are limited.

Problems with diagram sketching:

- Drawing areas are often too small.
- Recreation of sketches in modeling tools is tedious.
- Digital sketching tools on devices such as TabletPCs lack the flexibility of paper.

Approach and Research Methodology

This PhD project addresses these problems by applying and adopting visualization and interaction techniques to the domain of software modeling.

Research questions

- How can interactive surfaces with multi-touch and pen input improve software modeling?
- How can information visualization techniques make huge software models easier to navigate?
- How can sketching of software diagrams be improved with digital pens & paper technologies?

Research Methodology

- Conduction of qualitative studies to underpin requirements.
- Creation of prototypes as basis for user studies.
- Conduction of user studies.

Current State and Future Work

- Conduction of a questionnaire-based qualitative study which questions software modeling activities in companies.
- Implementation of prototypes to support diagram sketching with digital pens & paper [1].
- Concepts of semantic zooming techniques for UML diagrams [2].
- Implementation of a multi-touch diagram editor for activity diagrams.

Next steps

Conduction of user studies concerning effectiveness and efficiency for multi-touch & pen interaction:

- Pre-studies to find most promising techniques.
- Comparison of different interaction techniques.
- Comparison of multi-touch & pen interaction with mouse input.

Interactive Surfaces



Multi-touch editor for activity diagrams

- Arranging nodes on the canvas
- Connecting nodes by tapping and dragging
- Zooming and panning with gestures.

Goal: Identification of most promising touch and pen gestures for efficient creation and navigation of diagrams.

Software Model

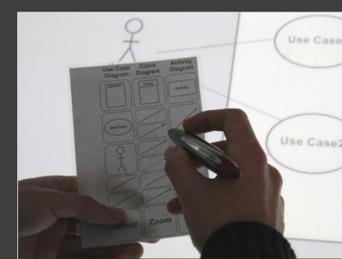
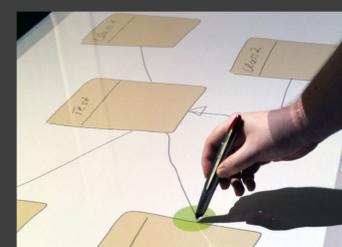
Digital Pens & Paper

Digital pens capture what is drawn. The content is transferred to an application, where the sketches are converted to formal diagrams.

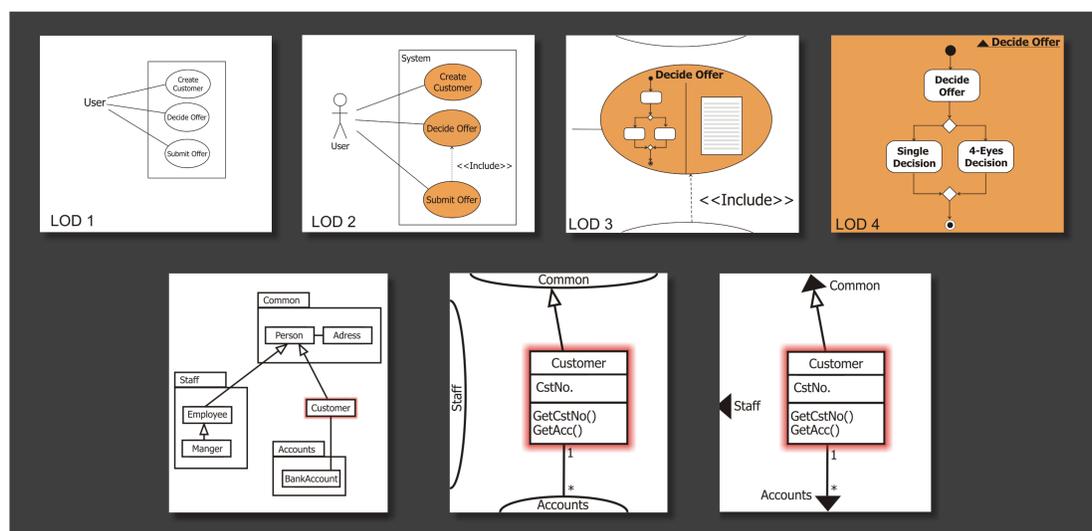
Connections can be drawn across different sheets of paper and solve the problem of lacking space.

Multi-pen enabled displays can be used to draw like on electronic whiteboards.

Diagram elements are printed on paper palettes. By tapping on an element, it is "picked up" and can be placed on the display [1].



Visualization Techniques



Semantic Zooming applied to UML diagrams to visualize diagram refinements [2].

Halos or similar techniques can provide a quick navigation to off-screen elements when zoomed in.

[1] Dachzelt, R., Frisch, M., and Decker, E. 2008. Enhancing UML sketch tools with digital pens and paper. In Proceedings of the 4th ACM Symposium on Software Visualization (Ammersee, Germany, September 16 - 17, 2008).

[2] Frisch, M., Dachzelt, R., and Brückmann, T. 2008. Towards seamless semantic zooming techniques for UML diagrams. In Proceedings of the 4th ACM Symposium on Software Visualization (Ammersee, Germany, September 16 - 17, 2008).