

The Knight Project

Collaborative UML Modelling using Gestures on an Electronic Whiteboard

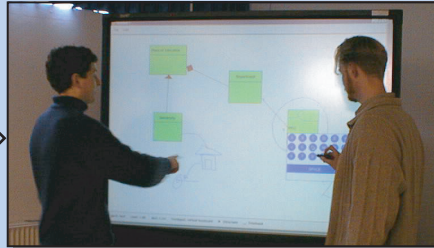
Christian Heide Damm, Klaus Marius Hansen, Michael Thomsen & Michael Tyrsted * University of Aarhus, Denmark

Abstract

Model building is crucial in object-oriented development (Madsen et al., 1993). We believe that current tools are not adequate for model building and, thus, the Knight project investigates new ways of supporting this activity.

CASE tools and whiteboards are often used for modelling. CASE tools capture the semantics of models, but are slow to use and do not support collaboration. The large size and ease of use of whiteboards enables efficient collaboration and communication, but they are technically insufficient.

Based on user studies, we have designed and implemented a prototype of an alternative tool. This tool, Knight, is based on a large electronic whiteboard around which collaboration can take place. Drawings, in the form of gestures, are automatically and incrementally turned into UML diagrams (Rumbaugh et al., 1999) that can thereafter be manipulated by gestures. Furthermore, we are working on integrating the tool with CASE tools (currently, only one is supported).

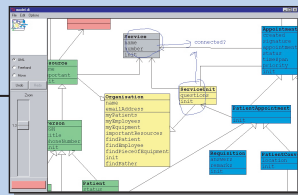


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The Knight Tool

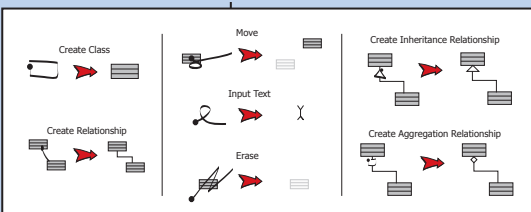
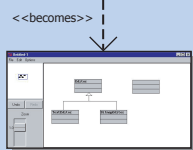
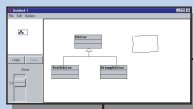
Knight

We have built and evaluated a prototype of a tool called Knight. The tool uses an electronic whiteboard - a large, touch sensitive computer screen (currently a SMART Board - <http://www.smart-tech.com>). The large drawing space resembles a traditional whiteboard: Pens are used as input devices and several persons can work around it. Thus, it naturally supports collaborative work. Furthermore, the Knight tool is designed to use gestures as input, which makes the interaction similar to on a traditional whiteboard (see other box).



Interacting with Knight

The Knight tool uses gestures as the primary input mechanism. Using gestures for input is perhaps best known from palmtop computers. In the Knight tool, gestures are used for text input as well as for creating and modifying other diagram elements. By sketching boxes and lines on the screen, elements of UML class diagrams can quickly be created and manipulated. This interaction is very lightweight and should retain much of the ease of use of a whiteboard combined with CASE tool functionality. The idea of using gestures in modelling is also useful with other input devices. At the moment we are experimenting with using a graphics tablet on a traditional workstation.



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<<justifies>>

Conclusion

The Knight tool supports collaborative modelling using gestures. So far this approach seems promising: Our preliminary evaluations with using the tool have been positive and have shown that the basic idea of supporting collaborative modelling by combining an electronic whiteboard and input using gestures provides an interaction form that is both effective and intuitive. However, the tool will have to be evaluated further in real development contexts before further conclusions can be made. Other current and future work focuses on technical aspects and usability of the prototype. Technically, we will experiment with component technology for CASE tool integration and dynamic compilation for extension of the set of available gestures. Together with a fuller support for the UML, informal and incomplete diagrams are at focus with respect to usability.

Acknowledgements

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References

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Background

Current Tool Support

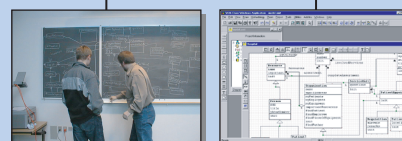
CASE tools and whiteboards are commonly used in modelling activities.

CASE tools capture the semantics of models and, ideally, provide a bi-directional link between code and model. However, they are designed to support single users working at traditional workstations, which makes them unsuitable for collaboration and slow to use in collaborative work situations. Moreover, it requires in-depth knowledge use them efficiently.

Traditional whiteboards, on the other hand, are excellent in collaborative work situations. Their large physical size, ease of use, and general availability enables efficient collaboration and communication in modelling situations. However, since whiteboards do not have computational power, they are problematic as tools for modelling. Often diagrams will have to be drawn and redrawn since saving, moving and restoring of models is not supported.

Studies of Modelling

We have made continuous studies of actual modelling practice (Greenbaum & Kyng, 1991), and we have learned a number of lessons. First, designers combine formal drawings with informal elements such as "freshhand" drawings and semi-formal additions to the used notation. Second, filtering of information is used to show only important elements of a diagram. Third, we have found that all modelling is inherently collaborative and that collaborative construction of models has been coordinated as turn taking.



Email: knight@daimi.au.dk * Homepage: <http://www.daimi.au.dk/~knight>