Understanding and Supporting Software Design in Model-Based Software Engineering

Rodi Jolak

Presentation:
March 2nd, 2020, 13:00
Room 243, Jupiter Building
Hörselgången 5, 417 56, Göteborg
University of Gothenburg, Campus Lindholmen

Opponent:
Prof. André van der Hoek (University of California Irvine, USA)

Grading Committee Members:
Prof. Kurt Schneider (Leibniz Universität Hannover, Germany)
Prof. Juan de Lara (Universidad Autónoma de Madrid, Spain)
Prof. Maryam Razavian (Eindhoven University of Technology, Netherlands)

Supervisors:
Prof. Michel R.V. Chaudron (Main supervisor)
Prof. Morten Fjeld (Co-supervisor)
Prof. Eric Knauss (Co-supervisor)

Examiner:
Prof. Ulf Assarsson

Model-Based Software Engineering (MBSE) is a software development approach in which models can serve a multitude of purposes. On the one hand, models can be used for ideation, to stimulate creative thinking, and facilitate communication. On the other hand, models can be used as guidelines for documentation, implementation, and code-generation.

There is a discrepancy between empirical findings and developers' beliefs about MBSE. In this research, we address this discrepancy by contributing to the empirical understanding of software design. Moreover, we explore how to better support software design in MBSE.

Our endeavor to understand design activities in MBSE resulted in the following:

- Creating models while designing prompts significant thinking about the design.

- Developers that work on different locations have fewer discussions about design decisions than co-located developers.

- In MBSE projects, coordinating and knowledge sharing take more effort than technical engineering activities.

- Graphical software design representations (GSD) promote more active discussion of design decisions between developers than textual software design representations (TSD). Also, developers have better recall of design details when using GSD than TSD.

In our experience, usability and learning-effort of tools are the most encountered challenges in MBSE. Therefore, we research how to better support the design activities in MBSE by creating two software design environments: OctoUML and OctoBubbles. These tools implement new ways of transitioning from informal- to formal design representations, and novel ways to navigate between implementation-level and design-level in order to ease understanding of systems. Evaluations show enhanced efficiency of the design activities and positive perception of the usability of these environments.