

## Master Thesis/ Examensarbete (30 hp)

### Optimization and Search in Model-Based Automotive SW/HW Development (in co-operation with Volvo Technology AB)

Models are increasingly used in the development of embedded HW/SW for the automotive industry. Several industry research projects (AUTOSAR, ATESSST and ModelBus to name a few) have studied and proposed standardized languages, formalisms, data exchange formats, methodology, and platforms for automated tool chains for model-based development. The current state-of-the-art thus enables portions of the development flow to be fully automated, with little or no intervention by designers. There are still many design steps that are hard to automate or cannot be replaced by traditional algorithms. For example design steps that require artistic talent, require experience of the designers that is hard to formalize, or have high computational complexity.

In recent years the increasing computational power has enabled the use of computationally expensive search and optimization algorithms for many different engineering tasks. Machine learning, heuristic optimization and planning algorithms have been combined with guidance and goals from designers to better explore a design space and find optimal solutions. This project will apply these ideas in model-based development of embedded HW/SW in an automotive context. The overall goals are higher quality designs, shorter development time and time to market and lower development costs.

This is an initial project into an area with high potential to be a key component in future automotive development. It is a joint project combining the expertise of Volvo Technology AB, Chalmers University of Technology, and Linköping University. The thesis students will be seated at Volvo Technology's premises in Gothenburg.

#### Steps

The aim of this project is to assess the feasibility of introducing algorithms and techniques for machine learning / search / heuristic optimization in a model-based development tool chain for automotive embedded systems.

1. Study and describe the example case, i.e. the tool/model selected by Volvo.
2. Select a few relevant optimization algorithms to be evaluated.
3. Implement and apply the optimization algorithms.
4. Evaluate and compare results with the existing (human designer-based) solution(s).

#### Prerequisites

Students interested in this topic should preferably have knowledge, experience and interest in: software development, search and optimization algorithms.

#### Application procedure

Apply by emailing a cover letter and a CV describing your background and relevant courses/experience (with grades) to [Petru.Eles@liu.se](mailto:Petru.Eles@liu.se) **NO LATER THAN 10<sup>th</sup> of June 2011**. Contact person at Volvo Technology AB: Daniel Karlsson (tel: +46 31 322 9949).