

## *Interactive Visual Steering Analysis of Complex Engineering-Simulation Ensembles*

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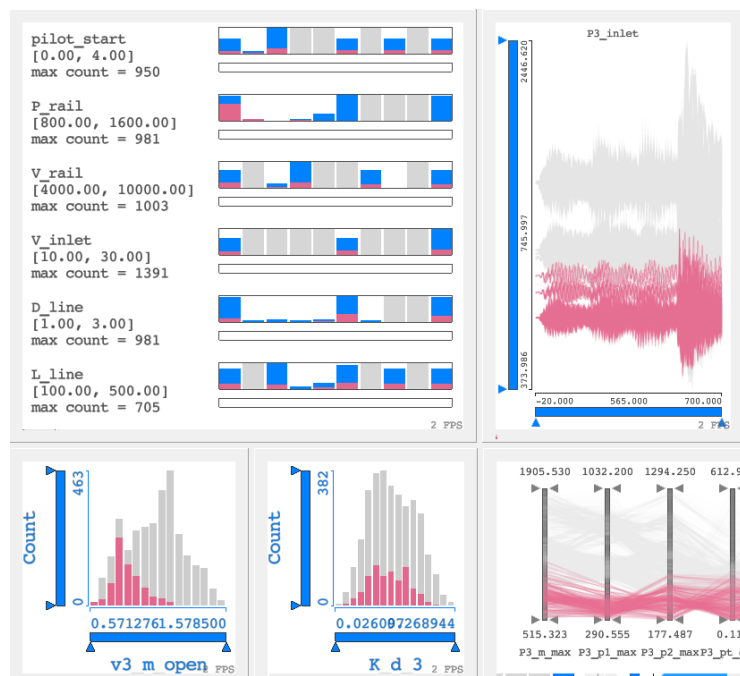
**Friday October 31, 2014, from 10.00**

Room 3137, 3<sup>rd</sup> floor, HiB (d. blokk)

### Abstract

In this talk we propose a novel approach to interactive visual steering of simulation ensembles. A simulation ensemble is a collection of simulation runs of the same simulation model using different sets of control parameters. Due to increasing pressure on car manufacturers, for example, to meet new emission regulations, to improve efficiency, and to reduce noise, both simulation and visualization are pushed to their limits. We describe a successful realization of a tightly coupled steering loop, integrating new simulation technology and interactive visual analysis in a prototyping environment for automotive industry system design. By coupling interactive visualization with the simulation back-end - computational steering, it is now possible to quickly prototype a new system, starting from a non-optimized initial prototype and the corresponding simulation model. We introduce two kinds of simulation steering: a model refinement approach, and a hybrid visual steering.

The ability to early see the first results from a multidimensional simulation space - thousands of simulations are run for a multidimensional variety of input parameters - and to quickly go back into the simulation and request more runs in particular parameter regions of interest significantly improves the prototyping process and provides a deeper understanding of the system behavior. The hybrid steering adds an automatic optimization in order to support a region of interest selection in the high-dimensional parameter space. The excellent results and a very positive feedback from domain experts which we achieved for the common rail injection system strongly suggest that our approach has a great potential of being generalized to other, similar scenarios.



## *Master Defense: Interactive Visual Analysis of Streaming Data*

**Geir Smestad**

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**Friday October 31, 2014, from 11.00**

Room 3137, 3<sup>rd</sup> floor, HiB (d. blokk)

### **Abstract**

Interactive Visual Analysis (IVA) has proven to be a robust set of methods for visually exploring complex data sets and generating hypotheses from data. Datasets and techniques where the temporal aspect is central has been an important area of study, both for the visualization field in general and for research on IVA. However, the challenge of handling streaming data sources for the purposes of decision support and analysis in real time, has been given comparatively little attention. This thesis presents a summary of the visualization literature addressing time-oriented and streaming data, with emphasis on Interactive Visual Analysis and its related techniques.

We then explain the contemporary distinction between real-time data monitoring and retrospective data analysis, explore challenges that occur when a human user attempts to visually analyze data in real time, and use these observations to extend the scope of IVA such that it can be used to analyze streaming data in real time.

