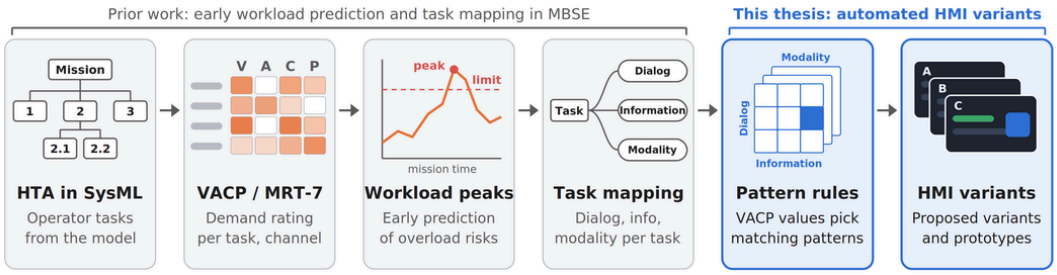
Thesis Project

„Digital Human Factors Engineering (DHFE): Channel-Aware HMI Design in MBSE“



Email

Research Project:

Workload problems in cockpits are usually discovered in the simulator, when the design is largely fixed. In the DHFE research project, we detect them much earlier: directly inside MBSE models in CATIA Magic, using VACP ratings and Multiple Resource Theory. Our predictions reveal when workload peaks occur and which channel is overloaded. In this thesis, you will use these predictions and the underlying task sequences to derive concrete HMI variants. Beyond the cockpit, you help shape a new way of doing HFE in MBSE: workload analysis and interface design merge into one continuous process, and reusable design patterns significantly reduce design and modelling effort.

Purpose of the Project:

Your goal is to develop the method behind this step: a rule-based approach that links workload findings to HMI design requirements and variants. At its heart is a catalog of HMI design patterns, each describing its expected effect on VACP values; for example, replacing a numeric readout with a color-coded status bar lowers visual load. Integrated into the MBSE model, the catalog keeps every design decision traceable to the workload finding that motivated it.

Tasks:

- Review the literature on workload prediction (VACP, MRT, GOMS) and HMI design principles
- Build a catalog of HMI design patterns with their expected VACP changes
- Model workload-based HMI requirements in SysML using Catia Magic
- Apply the method to a simple mission scenario and derive HMI variants
- Evaluate the variants through simulation and, for a Master’s thesis, a user study with prototypes

Your Profile:

- Interest and Knowledge in human factors and HMI design
- Basic knowledge of SE or MBSE (SysML)
  e.g. from system engineering course, experience with Catia Magic is a plus
- Basic scripting experience (Javascript, Groovy)

Interested? Send a short CV and your current transcript of records to Frederik!

Period:	Effective immediately, by arrangement
Location:	Technische Hochschule Ingolstadt
Responsible:	Frederik Rüb & Prof. Dr. Simon Schwerd
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