

Interactive Task Execution for Operator Training Simulators

Bachelor's or Master's Thesis

Design of an operator training interface for executing knowledge-graph-based training tasks in an FMU-based simulation environment.

Motivation

With Operator Training Simulators operators in the control room of process plants can train their skills also in face of potentially hazardous scenarios. Knowledge-graph-based scenario generation can provide semantic descriptions of training scenarios, including faults, operating phases, and learning-related tasks, such as to practice fault diagnosis or decision-making. However, these descriptions must be made executable in a training environment so that operators can receive tasks, observe process behavior, interact with the simulation, and provide responses during scenario execution.



Abbildung 1: Operator training on an Operator Training Simulator (OTS).

Goals & Tasks

The goal of this thesis is to design and prototypically implement an operator training interface that connects semantic scenario descriptions with an FMU-based simulation environment, e.g., in the form of a web-based application. The focus lies on demonstrating how selected task types can be represented, executed, and evaluated in a simplified training runtime setting.

- 📖 Research on operator training simulators, HMI concepts, and task-based training interfaces.
- 🖥️ Develop a concept for representing, displaying, and executing training tasks during simulation.
- 🖱️ Implement a prototype interface for live visualization of simulations and enabling of operator interaction.
- 🔗 Demonstrate the approach using different task types, e.g., deviation detection and faulty component selection.

Disclaimer: The scope of this thesis can be adjusted depending on whether the student aims for a Bachelor's or Master's thesis. A Master's thesis could focus more on modeling and generalizing task execution, while a Bachelor's thesis could focus more on the implementation of 1-2 specific task types.

Interests & Useful Prior Knowledge

- Interest in modeling and translating abstract scenario descriptions into executable interactions
- Programming experience and enthusiasm for software development
- Experience with Python, FMUs, or web-based interfaces is advantageous



Supervisor

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Available starting: now

Tags: *FMU Simulation, Operator Training, Task Execution, Training Interface*