

JARVIS For MBSE

The advances in the field of information- and communication technologies pave the way for the development of so-called intelligent technical systems (ITS). ITS integrate mechanical, electrical, and software components in order to realize adaptive, robust, anticipatory, and user-friendly behavior. Typical examples for ITS are modern driver assistance systems, which support the driver of a car in order to increase safety and comfort.

The development of ITS requires a close interaction and a common understanding of the system between engineers from different engineering disciplines (e.g. mechanics, electronics, and software). Model-based Systems Engineering (MBSE) utilizes models in order to achieve this goal. These models are used for the coordination of the involved engineering disciplines and serve as input for the domain-specific development. The main advantages of formal models are their unambiguity and the potential to process these models by means of information systems.

Albeit the advantages of MBSE are widely recognized in science as well as in industry, there is still a lack of a systematic application of MBSE in many manufacturing industries. One of the main reasons is the complexity of current MBSE tools. The initial training required for the adoption of these tools in a company leads to remarkable costs and the cumbersome operation of the tools causes an additional overhead during system design. In order to overcome these problems, the project group will develop a new MBSE tool, which enables a more intuitive system design and supports the engineers by means of a build-in artificial intelligence (AI) assistant. In particular, the project group will pursue the following two goals.

New methods for user interaction: In order to enable an intuitive system design, the project group will explore modern concepts for user interaction (e.g. touch, voice, gestures), analyze them for their suitability for MBSE, and provide a prototypical implementation of the identified concepts. We plan to implement these concepts in the Microsoft Environment as Apps for the Microsoft SurfaceHub. However, the selection of appropriate frameworks, development environments, and algorithms is a task of the project group.

MBSE Assistance: The second approach is the development of a build-in AI-based assistant that supports the engineers during MBSE. To this end, the project group will analyze common MBSE processes in order to identify potentials for AI support. The identified potentials will then be used for the design and prototypical implementation of an assistant that provides context-sensitive support during MBSE.

Learning Outcomes

- Practical experiences in software design and development
- Practical experiences in systems engineering and model-based systems engineering
- Expertise in modern concepts for user interaction and AI design
- Project management, presentation, and team working skills

Desired Prerequisites

- Good programming skills
- Prior knowledge in modeling and modeling languages (e.g. UML, SysML)
- Interest in systems engineering and model-based systems engineering
- Interdisciplinary and analytical thinking