Model Based Systems Engineering

Development of a system model for research and training purposes

Diplomand

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Einleitung: Model-based systems engineering is a development approach invented in the early 2000s and has found widespread application in complex engineering disciplines such as aerospace engineering and the automotive industry. The basic principle is to build a model of a system consisting of diagrams. The benefit comes from a more transparent developmental process, which significantly gains collaborative abilities and traceability in a project.
Due to the significant effort required to create such a model, and given that currently, the usability of model data outside of the MBSE platform is very limited. The widespread application of MBSE has yet to occur.

Ziel der Arbeit: The goal is to develop a model for educational and research purposes that lets students interact and understand the MBSE approach in an applied manner. The exemplary model is supposed to be comprehensive and complete but still basic enough to be manageable and easy to understand.

Another aspect of this thesis is the collaborative work on such a model. Based on Cameo, a tool to create System models, an evaluation is needed to assess the collaborative possibilities.

In addition, a second version of the MBSE model is needed for a case study regarding the combination of MBSE and PLM systems to enhance the value created with the model data.
The research project to fill the gap between MBSE and PLM is a collaboration between UTC Compiègne, Skoltech Moscow, ISAE-SUPAERO (Institut Supérieur de l'Aéronautique et de l'Espace, Toulouse), and the Eastern Switzerland University of Applied Sciences OST and is expected to produce a paper for the PLM Conference by February 2024

Ergebnis: Many relevant insights were gained in dealing with model-based systems engineering, both in terms of the creation process and in how model data can be reused and implemented outside of the MBSE tool, thereby enhancing the benefits derived from adopting the MBSE approach.
A classic vending machine was selected for the example model because it is well-suited due to its diverse yet simple subsystems.
SysML, one of the most well-known modeling languages, was utilized to abstract the vending machine. Cameo was used to create the model. A cloud-based collaboration solution called Teamwork Cloud was implemented to enable collaborative modeling.
Finally, recommendations and training materials were created that provide a novel way to teach MBSE.

The Thesis has been written at Université de Technologie de Compiègne
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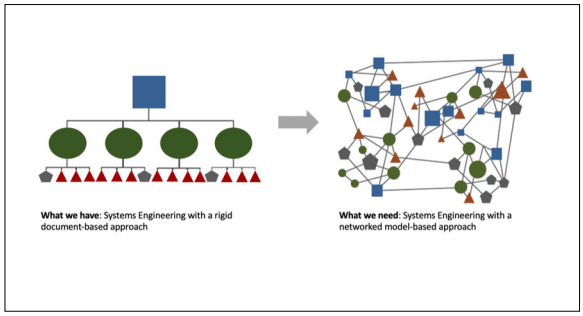
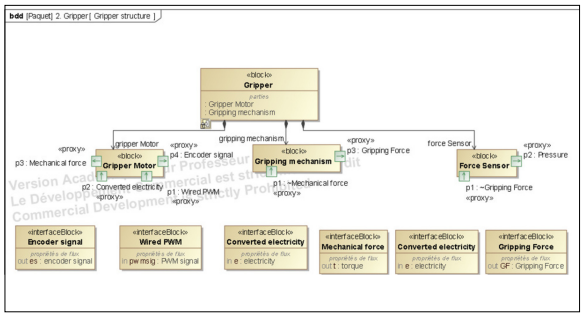


Basic Block diagram used in SysML
Eigene Darstellung



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