

## Graduiertenkolloquium Angewandte Informatik

### From Data Modeling to Knowledge Engineering in Space System Design

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#### Abstract:

The principle of Systems Engineering has been established as an important approach in ensuring the successful design of complex systems, such as automobiles, airplanes, or spacecraft. During the last years, Systems Engineering activities have become more and more model-based, utilizing a digital representation of the system to be designed as point of origin for performing engineering activities.

However, the models and processes revolving around these digital system representations still exhibit numerous shortcomings. On the one hand, the content of the Conceptual Data Models (CDMs) used in this process neglects to address a number of aspects. On the other hand, the processes used to design these CDMs are rather established ad-hoc and have not yet become to genuine engineering activities. Furthermore, the semantics underlying the data represented by the System Models are more oriented towards implementation, and less towards actual domain semantics, falling short of fully exploiting available engineering data. In order to improve these aspects of the Model-Based Systems Engineering (MBSE) process, an improvement on the underlying specification language can be made. For this purpose, the usage of OWL 2 ontologies in conjunction with an object-oriented description of system data is proposed. The ontological part of the system model enables a semantically strong definition of system design data, also enabling classification and inference, while the object-oriented part retains the ability to perform consistency checks and closed world queries. Furthermore, an improvement on the methodology of the underlying data specification can be made by providing a model design process that derives the CDM directly from elementary facts of the domain to be modeled, using specific guidelines to ensure model exhaustiveness, and using sample facts for CDM validation.

This talk elaborates on the semantic shortcomings of current engineering data descriptions, the improvements made, and what possibilities these open up for fully exploiting available engineering data. Furthermore, the fundamental implications between having an object-oriented system model and having an ontological system model are discussed, elaborating on what use cases a more semantic representation of engineering data opens up in the domain of space system design. In addition, an answer will be provided towards the question of which engineering problems are best solved in an object-oriented setting, and which are better suited to be solved in the ontological world.

Termin: Mittwoch, 30. November 2016, 15.45 Uhr

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Veranstalter: Institut AIFB, Forschungsgruppe Wissensmanagement

Zu diesem Vortrag lädt das Institut für Angewandte Informatik und Formale Beschreibungsverfahren alle Interessierten herzlich ein.

A. Oberweis, H. Schmeck, R. Studer (Org.), Y. Sure-Vetter