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Master Thesis

„Applying Model-Based Engineering Techniques and Tools Supporting Change Impact Analysis for the Maintenance of the Columbus Data Management System"

Airbus is a global leader in aeronautics, space and related services. In 2015, it generated revenues of €64.5 billion and employed a workforce of around 136,600. Airbus offers the most comprehensive range of passenger airliners from 100 to more than 600 seats. Airbus is also a European leader providing tanker, combat, transport and mission aircraft, as well as Europe's number one space enterprise and the world's second largest space business. In helicopters, Airbus provides the most efficient civil and military rotorcraft solutions worldwide.

Our people work with passion and determination to make the world a more connected, safer and smarter place. Taking pride in our work, we draw on each other's expertise and experience to achieve excellence. Our diversity and teamwork culture propel us to accomplish the extraordinary - on the ground, in the sky and in space.

Scope:
The Data Management System (DMS) of the European Module of the International Space Station, i.e. Columbus, comprises heterogeneous software components working together to control and monitor the life sustaining and mission specific sub-systems of the module.

The Data Management System Software (DMSS) was developed in the 1990s using a specific method, i.e. HOOD (Hierarchical Object Oriented Design) and tools supporting the Ada coding language. Due to various programmatic and technical constraints the design model is no longer maintained since years. The long-term utilization of Columbus requires at least until 2024 maintenance activities ranging from refactoring, reconfiguration and extensions for supporting new equipment to redesign of components.

One of the major tasks of the maintenance engineers is to analyse and identify the impact any changes to the DMSS may have on the requirements baseline, the overall functionality and on other components. The impact analysis results into an estimation of effort for implementing these changes and is used for the update of related test procedures and documentation. Currently, this analysis is a manual activity based on information provided in the form of the source code and partially outdated documentation.

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Tasks:

This thesis shall explore how model-based engineering techniques can help represent the system related information in a way, which will allow more efficient and precise change impact analysis and effort estimation. As such the task shall cover:

- Selection of the DMSS Software coding parts to be exemplary modelled depending on the capabilities of a tool used for extracting functional dependencies from C and Ada source code.
- Automatic extraction of functional dependencies from the Ada and C source code.
- Defining a method for modelling the extracted functional dependencies in UML.
- Automation of the mapping of the functional dependencies to UML according to the defined method.
- Demonstrate how the UML model can be used for impact analysis.

Results:

The Master thesis shall provide the following

- A UML model of DMSS parts, which can be used for impact analysis.
- A description of the method used to transfer existing SW systems into an MBSE model.
- An assessment, if the reverse engineering towards MBSE is useful and may increase efficiency in the long term.
- All documentation has to be written in English.

Required skills:

You offer:

- Enrolled student (m/f) within Informatics, Engineering/Telecommunication or similar field of study
- Interested in applying engineering methods and tools for the development of software and in gaining experience in the Unified Modelling Language (UML)
- English: fluent
- German: would be a plus
- You are a good team player, have excellent communication skills, and are able to work independently.

Contact:

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