Model based Requirements Engineering for Embedded Software

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Abstract

Software and systems development within the embedded area is dominated by model based design techniques. These techniques are commonly aligned to standard modeling languages such as UML. Along with software and systems design techniques the concern of requirements management methodologies has continuously being increased in the last years, aiming at an improvement of the overall development process. As a merger of both, model based design techniques and requirements management methodologies, a new kind of requirements engineering methodology has been established. However, due to the complexity of this methodology and the high degree of informal aspects a unique and integrated methodology for requirements engineering is still missing.

This presentation gives a survey on existing requirements classifications and motivates the use of a model based requirements classification techniques. With an example at hand the transition of informal requirements to first models is illustrated. The presented work is carried out within the FORSOFT II research project AUTOMOTIVE (see www.forsoft.de/automotive).

The model based requirements engineering approach we use is based on the metamodel of the Automotive Modeling Language (AML). The metamodel describes the abstract syntax of the AML notations. As a concrete syntax we use textual description techniques, a subset of the UML, and a subset of the ASCET-SD notations.

In our approach we distinguish between three major steps (s. Fig. 1) to manage the transition from informal requirements to a model based specification. First, we assume the existence of informal requirements which are usually unstructured and are not aligned to a specific syntax. With the help of structuring rules we can create formal requirements. This process can only be done manually and results in a loose coupling between informal requirements and formal requirements. Several structuring rules have been elaborated by different organizations, such as VDMA, IEEE, or DOD. As a result some parts are now aligned to a given formal syntax. The last step deals with the integration of the model based requirements specification where the complete syntax of all notations is considered. By using our AML based structuring rules we finally achieve a tight "1:1" integration of formal requirements with the model based system specification.

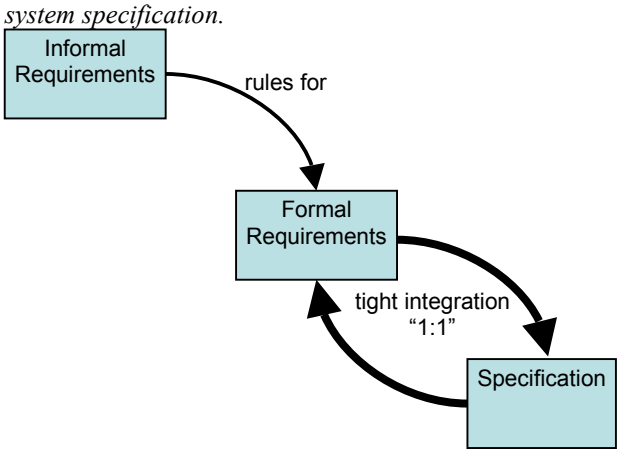

Figure 1: From informal requirements to a model based specification

The AML metamodel is used to transfer model specifications between the UML Suite and ASCET-SD. DOORS is used for enriching graphically oriented specifications with informal and formal requirements. Together these tools form a conceptually tightly integrated chain. One goal of the project Automotive is to develop a prototype of this tool chain for demonstration purposes.

In summary, our model based requirements engineering approach leads to an enrichment of already existing standardized structuring rules by the use of model based functional structuring rules.

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