

# Internes Kolloquium

Am **Mittwoch, dem 06. April 2011**, um **16.15 Uhr** hält

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im Rahmen seiner beabsichtigten Dissertation einen Vortrag mit dem Titel

## **Reasoning on Domain Knowledge and Technical Standards to Support the Development of Safety-Critical Automotive Systems**

**Der Vortrag findet im OFFIS, Escherweg 2, Konferenzraum F02 statt.**

### **Zusammenfassung:**

The development of safety-critical systems in the automotive domain, e.g. *Advanced Driver Assistance Systems* (ADAS), is exposed to an increasing product and process complexity. Assisting the driver and automating driving manoeuvres imply a complex functionality which demands an elaborated design process to guarantee the functional safety of such systems. Representing the state of the art of the application domain, technical standards define complex development procedures and thus play a major role in automotive engineering activities. One example is the forthcoming introduction of the safety standard ISO 26262 for functional safety of road vehicles. However, these standards comprise an informal representation in natural language text. As a consequence, inconsistencies and flaws regarding the use of technical terms as well as concerning the dependencies between the elements of the standard become evident and may lead to a misinterpretation of the standard's content. With respect to a specific system under development, manually extracting the relevant requirements and development activities out of the standard is error-prone and time-consuming. This also refers to performing analysis methods imposed by the standards. Heavily relying on domain knowledge (e.g. environmental conditions or general system properties), these methods – especially the *Hazard Analysis and Risk Assessment* (HARA) of ISO 26262 – can be automated as far as a computer-readable (thus formal) and generic (thus independent within a specific domain) representation is available. Using semantic technologies, knowledge models specified by the *Web Ontology Language* (OWL) are appropriate to handle generic domain concepts and methods in a formal way. Using OWL's logical base, reasoning engines can be applied checking the consistency of the ontology models (ensuring an unambiguous and consistent modelling of concepts) as well as performing knowledge deduction (for automating analysis techniques). By means of the OWL, example domain concepts of the automotive domain and related domain standards – such as ISO 26262 – have been formalised to automatically conduct a preliminary HARA in order to derive product-relevant measures compliant to the ISO standard. The proposed methodology of modelling domain knowledge and technical standards with OWL ontologies is further integrated into a heterogeneous development process for automotive systems to be applied to an example ADAS, the *Adaptive Cruise Control* system. In terms of technical efficiency, lessons learned refer to modelling and performance issues involving semantic rule and query languages. Although the automotive domain is mainly represented on a conceptual level by the knowledge models, the proposed methodology provides an early and objective assessment of an automotive system under development, while generating standard-compliant development artefacts that may support related qualification processes of these safety-critical systems.

**Betreuer: Prof. Dr. Werner Damm**

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