



Aufgabenstellung für die Diplomarbeit

Für: Herrn Yu Zhou

Studiengang: Elektrotechnik

Thema: Prototype of LLVM-based Tool for Transformation of C-code into Dual-graph Error Propagation Model

Stochastic error propagation analysis is an important research direction of the Institute of Automation. Error propagation models are generated using an underlying model-base system representation e.g. UML/SysML or SIMULINK/StateFlow. However, even within a model-based system development process, some software parts are coded manually e.g. SIMULINK S-Functions. In order to estimate probabilities of error propagation through these parts we require error propagation analysis on source code level. LLVM compiler infrastructure provides a wide range of instruments for extensive source code analysis. We plan to use it for transformation of the source code into a Dual-graph Error Propagation Model (DEPM). Development of a prototype of an LLVM-based transformation tool is the key task of this DA.

The next tasks should be accomplished:

1. Structural requirements definition (UML Use Case Diagrams)
2. Pre-work: understanding basic principles of DEPM models and XML storage format, deep understanding of LLVM technologies
3. Design of the transformation tool (UML Activity and Class Diagrams)
4. Implementation of the transformation tool (LLVM pass in C/C++)
5. Testing and verification of the tool using a simple control algorithm implemented in C
6. Documentation: *doxygen*-style documentation of the code, user manual (installation and application guides)
7. Optional: short video introduction

The relevant results of the other works that will be used in the DA must be clearly and fully stated in the written part using appropriate citations.

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