TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Elektrotechnik und Informationstechnik

Institut für Automatisierungstechnik

Aufgabenstellung zur Diplomarbeit

für

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Bidirectional transformation between Dual-graph Error Propagation models and AltaRica-based languages

Aufgabenstellung:
Dual-graph Error Propagation Model (EPM) describes the probabilities of error propagation through and between system components taking into account the structure of control and data flows, reliability properties of components, and system operational profile. The central idea of the EPM is synchronous examination of two directed graphs: a control flow graph with probabilities of control flow transitions and a data flow graph extended with reliability properties of system components. A discrete time Markov chain is applied for the modeling of faults activation, errors propagation, and errors detection during operation of the system. A state graph of this Markov chain is generated automatically using the EPM. A specific approach to computation of this Markov chain makes it possible to obtain the probabilities of erroneous and error-free system execution scenarios.
"AltaRica is a high-level language designed for the modeling of dependability aspects of systems. A model describes a hierarchy of nodes; each component can embed several sub-nodes. These latter describe behaviors of components of the system. The semantics of AltaRica is based on the Arnold-Nivat model but applied to Constraint Automata. Synchronization of constraint automata is made up of:

- The Arnold-Nivat strong synchronization of events
- Boolean constraints on variables shared by automata
- A weakest synchronization mechanism of events that is similar to a broadcast mechanism"

[altarica.labri.fr]

Different "dialects" of the AltaRica language is used in a number of research projects like AlaRica 3.0 and BioRica and by industrial software tools including Compass, SimFia, and Cecilia OCAS.
The task of this diploma work is to find the most suitable AltaRica "dialect" for bidirectional transformation with EPM and implement transformation algorithms.

Arbeitsetappen:

1) Preliminary work (Sate of the Art):
    a. Get familiar with EPM models and tools
    b. Get familiar with AltaRica language and tools
    c. Find a suitable AltaRica dialect for bidirectional transformation
2) Structural analysis
3) Develop a formal AltaRica-based model for bidirectional transformation
4) Develop and implement a transformation algorithm from AltaRica to EPM
5) Develop and implement a transformation algorithm from EPM to AltaRica
6) Integrate algorithms into the existing VAI software tool for EPM analysis

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