

Internes Kolloquium

Am **Montag**, dem **21. November 2011**, um **16:15 Uhr** hält

Dipl.-Inform. Matthias Büker
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im Rahmen seiner beabsichtigten Dissertation einen Vortrag mit dem Titel

An Automated Semantic-Based Approach for Creating Task Structures

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

Zusammenfassung:

For the design of safety-critical embedded systems many different aspects have to be considered to guarantee the correctness of the system. Beside functional correctness these systems also have to meet real-time constraints expressed in terms of end-to-end deadlines which state that certain system events must occur within a given time interval. For example, the actuator triggering the airbags of a car has to be activated within a time bound of 15 to 30 milliseconds after a collision has been detected by a crash sensor to guarantee that the airbags inflate in time to protect the passengers. This means that all computation and communication processes have to be finished within this time bound. To verify such time bounds different techniques may be used as analytical methods like scheduling analysis and computational methods like model-checking. For this step the software parts of the model are typically represented as a task network. A task network is a directed graph of task nodes representing operating system processes and signals that indicate data dependencies between processes.

In practise, there is a gap between the specification model the designer creates in high level modelling tools like Matlab Simulink and the task network representation used for timing analysis. On the one hand the designer has to decide manually which parts of the model should form a task and on the other hand the semantics of the specification model have to be preserved when creating the task network. Otherwise it cannot be assured that the timing analysis really verified the specified system. Additionally, tools such as Matlab Simulink abstract from any concrete target hardware architecture and how the different software parts are mapped to hardware resources for execution.

The approach proposed in this PHD-thesis is called *Task Creation* and forms the first part of a framework addressing the complete design flow from specification models of new automotive functions captured in Matlab Simulink to their distributed execution on hierarchical bus-based electronic architectures. During the *Task Creation* step first a task structure is derived automatically from a given Matlab Simulink model by a set of translation rules. To be able to represent this class of models the formalism of task networks was extended to so-called *Function Networks*. As the obtained network is typically unbalanced in the sense of computational node-weights, nodes are melted following an optimization metric called *Cohesion*, where nodes are attracted by high communication density and repelled by high node weights. This reduces task switching times by avoiding too lightweight tasks and relieves the bus by keeping inter-task communication low. To obtain tasks correctly we define formal composition operations for nodes in a function network and prove for each operation its semantic correctness in terms of causality (partial order) of node executions.

Betreuer: Prof. Dr. Werner Damm

Weitere Kolloquiumstermine sind im WWW abrufbar.