Invited Talk

Semantics Preservation Issues in the Design and Optimization of SW Architectures for Automotive Systems

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Abstract. Architecture selection and design optimization are critical stages of the Electronics/Controls/ Software (ECS) -based vehicle design flow. In automotive systems design, complex functions are deployed onto the physical HW and implemented in a SW architecture consisting of a set of tasks and messages.

The talk will present work performed in cooperation with GM R&D and UC Berkeley, in which we optimized several aspects of the software architecture design, including the definition of the task periods, the task placement and the signal-to-message mapping and we automated the assignment of priorities to tasks and messages in order to meet end-to-end deadlines and minimize latencies.

Architecture selection can be accomplished by leveraging worst case response time analysis within an optimization framework and we provide hints on how to use stochastic or statistical analysis to further improve the approach. However, current work has only scantly addressed the issues of preserving the semantics of functional models during implementation. Semantics preservation issues impose additional constraints on the optimization problem, but also reveal very interesting tradeoffs between memory and time/performance. In addition, the need to deal with heterogeneous models and standards (like AUTOSAR in the automotive business) further complicates the scenario.