# CACSD Plenary Speeches

## New challenges in the development of automotive control systems

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The traditional development of electronic control systems in cars is based on a bilateral partnership between OEM and supplier for each subsystem: The supplier develops a complete control subsystem consisting of sensors, actuators, a dedicated ECU and the control software. This approach has been viable as long as an accumulation of individual subsystems is economically justifiable and the subsystems are only loosely coupled. These premises are currently changing: New functions and services in modern and future cars require the connection of distributed components in a car-wide network, cost considerations result in the need to share resources and to integrate control software from different sources on common hardware platforms. As a consequence, the perspective on the development of automotive control systems is changing: It will become insufficient to focus on a single control system and develop an optimal solution. Instead, issues like the integration of the control software into an only partly known environment must be considered from the outset. The OEMs need to specify properly and check early that all the elements from the different sources will interact properly not only with respect to the control requirements but also regarding so-called non-functional properties like reliability, performance, memory and power consumption, maintainability, system cost, etc. To address these challenges, the automotive industry is currently investigating new architectural concepts (e.g. Autosar, EAST-EEA). It is foreseeable that this will not solve the complete problem. To be able to explore all design alternatives and forecast the implications of design decisions (like a particular distribution

of control functions over an ECU network) to the functional and non-functional properties, a model-based approach is needed throughout the development process. The talk will discuss current initiatives and research directions of this kind.

- Stefan Kowalewski obtained a Dipl.-Ing. degree in Electrical Engineering from the University of Karlsruhe, Germany, in 1990. He received his Dr.-Ing. degree (Ph.D.) in Control Engineering and his habilitation in Automation and Safety Engineering from the University of Dortmund, Germany, in 1995 and 2003, respectively.
- From 1995 to 2000 Dr. Kowalewski was a senior researcher and lecturer at the University of Dortmund where he conducted research in the field of formal methods for control systems design and hybrid systems theory. In May 2000 he joined the Corporate Research and Advanced Engineering of Robert Bosch GmbH where he became a group manager in the Software Technology department. Since November 2003 he is professor for embedded software at RWTH Aachen University. His research focus is on model-based design and analysis methods for software-intensive embedded systems.

Note: All questions and comments should be sent to secretary04@csie.ntu.edu.tw.