Automotive software – the silent revolution

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Abstract
Taking into account the current extent of software in premium cars, a comprehensive software perspective on the infrastructure and functions of automobiles is mandatory. Whereas today software is developed for and tailored to the delivered electronic control unit, a main paradigm shift is expected: software in cars will become much more independent from specific hardware – a similar development as started in the computer industry 30 years ago. Automotive software will be one of the most challenging application domains for software engineering and computer science in the years to come.

Why is automotive software development and maintenance so challenging? The presentation will discuss essential characteristics of automotive software systems like reliability and availability, as well as major drivers for complexity like non-functional heterogeneity, configuration diversity or functional interdependence. The current status in terms of onboard domains, networks and architectures and their limitations will be outlined.

It is argued that new solutions are required to master the demanding requirements on automotive software systems encountered in the future, e.g. reduced, mechanic and hardware-independent development cycles, commutability across product lines, a wider variety of variants, new functions enabled by advanced sensors/actuators and external connectivity, improved system stability as well as cost effective life cycle support and maintenance.

Therefore, potential approaches for the development of advanced architectures, the incorporation of new onboard concepts and the adoption of software processes and associated engineering methods will be discussed. Those can address e.g. well-defined software reuse and relocation, consistent version, configuration and compatibility management or safe and secure software system access or modification.

Finally, the impact of a global, high-resolution time concept for the vehicle is proposed as a new research topic.