EMPHYSIS

Enhanced production code for improved system performance

The major goal of the ITEA project EMPHYSIS (EMbedded systems with PHYSical models in the production code Software) is to enhance the production code of embedded systems in automotive vehicles with advanced algorithms based on physical models to improve the performance of the underlying automotive system and to increase the productivity of embedded software development.

ADDRESSING THE CHALLENGE

There is a growing demand for road vehicles to be safe, clean and efficient. At the same time, engineers have to cope with a growing complexity of systems and software due to new trends (e.g. electrification), the increasing variability and the demand for advanced functionalities towards minimized real driving emissions, optimal operation strategies and automated driving. Physical models in control and diagnosis functions enable the realization of advanced algorithms. However, the integration of physical models in the embedded software poses technological limitations and is therefore a bottleneck to making system operations more efficient and embedded software more scalable.

PROPOSED SOLUTIONS

One approach to solving these limitations is to reduce the manual operations and specific implementations, moving towards a generic way of integrating physical models into embedded systems, across the industry. To achieve that, the EMPHYSIS project will investigate and develop a generic eFMI approach by providing physics-based functions in an automated way on electronic control units (ECU), micro controllers, or other embedded systems. The physics-based functions will be able to predict the behaviour of the system in its whole operation space to achieve significantly better vehicle performance. The developed technology solutions will include a new, open standard “FMI for Embedded Systems” (eFMI). This is based on the very successful Functional Mock-up Interface (FMI, fmi-standard.org/) standard and seamless interoperability of eFMI with the automotive embedded system standard AUTOSAR. New code generation techniques will transform physics-based functions to low-level eFMI production code that fulfils the requirements of ECU software and hardware.

PROJECTED RESULTS AND IMPACT

EMPHYSIS will boost the use of physical modelling and simulation tools for the design of advanced control and diagnosis functions within ECU software. Since the consortium partners have very good market access, it is expected that the developed technology will be widely accepted and boost the technological development in the automotive embedded software field and strengthen the market position of the participating companies. Results of the EMPHYSIS project, such as the eFMI specification and some tool chains, will be applicable outside of the automotive domain by utilising eFMI components in non-automotive embedded systems.

Seamless workflow from a physical model of the real system to an advanced physics-based ECU function in the vehicle on the road
ITEA is a transnational and industry-driven R&D&I programme in the domain of software innovation. ITEA is a EUREKA Cluster programme, enabling a global and knowledgeable community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society.

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