CrESt

Embedded systems are an integral part of our daily lives. For example they control the airbag in our car, ensure the safety of airplanes and that the production in a modern factory runs as planned. However, the current state of technology limits the using potential: Existing systems are capable of autonomous task management, but generally a superior control and coordination is indispensable. In addition, it is only possible to use it in familiar and stable environments because the software can not react flexibly to unforeseeable changes.

Objectives and project structure of CrESt

The CrESt project (Collaborative Embedded Systems) is looking to further develop classical embedded systems to collaborative embedded systems. In cooperation with 22 research and business partners, Fraunhofer FOKUS creates a methodological framework for enabling dynamic alliances to fulfill tasks in intelligent cooperation: Each system of a network is independent. At the same time, the system is able to coordinate individual decisions with the overall system.

The research work is divided into two clusters: The Cluster *Architectures of Collaborative Embedded Systems* is focused on the development of flexible and adaptive as well as dynamic systems. At the center of the *Open Context* cluster is the use of system inter-connections in environments not yet fully known at the design time. Research focuses on a dynamic context, uncertainty and context awareness.

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Fraunhofer FOKUS accompanies the development of methods for analyzing adaptive systems, the design of methods for run-time validation as well as the creation of requirements for procedures for taking uncertainties into account, for verification and validation.

Practical research

The developed methods will be applied to selected case studies:

Cooperative vehicle automation
Development of an environmental model for longitudinal and transverse guidance of a vehicle convoy. The environmental model is using radar information, a digital map, car2car communication and various sensors.

Convertible factories
Development of methods for the planning of flexible production facilities. The collaborative system of largely independent production units is intended to ensure an individualized production with optimal production utilization.

Distributed power generation
Development of dynamic software and system architectures. The highest amount of reliability of an intelligent power supply will be ensured along with minimal cost.

Cooperating transport robots
Development of a collaborative fleet management for highly automated transport robots. Each robot will be able to handle orders by intelligent cooperation, thus ensuring better utilization and higher reliability.

The software for the construction of the case study systems is designed model-based. It is the long-term goal of the project to develop modeling methods and tools which are able to generate the systems automatically. Furthermore, Fraunhofer FOKUS assumes the lead for the case studies as a subproject coordinator.

Application areas
– Manufacturing engineering
– Power generation
– Infrastructure solutions
– Medical technology
– Avionics
– Smart Mobility
– Smart Home
– Smart Farming

Project partners
– 12 research institutes
– 11 business partners, including six companies from Berlin and Brandenburg

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