About the Project

As an energy and data network, a vehicle's electrical system must meet the highest demands for failure and disturbance safety, energy efficiency, and flexibility. Due to the multitude of new intelligent functions and extensive data streams, the future vehicle electrical system will be more than just a wiring harness. Together with new sensors and distributed computing nodes, it forms the nerve and energy system of the vehicle. The KI4BoardNet project is developing architectures, components, and design tools for the future vehicle electrical system.

The digitization of these electrical systems and their development will be a dominant driver of change in the automotive industry. This also means that the development of electronic components and vehicle electrical system architectures will be supported by agile design processes and the goal of maximum automation in the future. Digitization and software expertise make a significant contribution to the future critical work topics addressed in the project: electronic components, wiring harness/vehicle electrical system + AI architectures, and EDA/AI (AI in the development process and agile development). The design of novel semiconductor components as the basis for the development of powerful vehicle electrical systems in conjunction with electrical/electronic (E/E) architectures as part of the overall automotive system is also taken into account. By integrating new concepts in the form of intelligent zone concepts, the computing power is concentrated on a few distributed control units (zone controllers) and central computing units (Central Car Server, ADAS Blade System), turning the vehicle electrical system itself into an intelligent vehicle component. This leads to new requirements for (E/E) development on multiple levels. The project develops new key components in the areas of connectors/cables/energy and data concepts, as well as sensor/IC/actuator/controller algorithms and fault detection and redundancy methods available in zones.

The required new EDA-based development methods and processes (agile development) for electronics components with AI enhancements are also taken into account in KI4BoardNet. Open standards can emerge in the field of simulation and AI models' development and connected AI/AI design methods through digital twins for faster functional verification (Industrial DevOps) and increased agility in the product lifecycle.

The separation of sensor hardware as a data source and the algorithms implemented on the controllers define new challenges for hardware/software co-design, which are considered in new concepts for integral E/E development in the project. To develop new methods for connecting data sources, sensors and algorithms are conceptualized, designed, and validated, leading to novel processors for the next generation of zone controllers. By connecting the vehicle electrical system to CarOS, communication, and cloud services, end-to-end evaluation and demonstration of performance are possible, from the sensor to the zone controller, through design to maintenance and reliability assessment in the field. These new agile design processes improve development efficiency by 15-30%, and the length of installed kilometers of wiring is expected to decrease by 40% compared to the current technology state as functionality increases.

The performance of the components and procedures developed in the project will be demonstrated using a vehicle demonstrator. KI4BoardNet will make a significant contribution to strengthening the automotive industry in Germany and create new jobs as needed. Through the project's work, open and usable concepts and important key components of vehicle electrical systems are developed and made available to market participants outside the project by supporting open standards. Due to the broad consortium, the developed solutions can also be directly transferred from the project to the pre-development departments of Tier 1/Tier 2 partners, thereby significantly enhancing the technological capabilities of E/E solutions and reducing design and development times in the market. This is particularly important for small and medium-sized enterprises, as they often work as suppliers to suppliers under high innovation pressure to compete internationally.

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