

Embedded Computer Systems

Participating Researchers

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- Prof. Dr. Dr. Wolfgang A. Halang, Chair of Information Technology
- Prof. Dr. Helmut Hoyer, Chair of Control Systems Engineering
- Prof. Dr. Jürgen Jahns, Chair of Optical Information Technology
- Dr. Reinhart Job, apl. Professor for the Technology of Electronic Devices
- Prof. Dr. Firoz Kaderali, Chair for Communications Systems
- Prof. Dr.-Ing. Bernd J. Krämer, Chair for Data Processing Technology
- Prof. Dr. Jens Krinke, Junior Professor for Software Technology
- Dr. Zhong Li, Junior Professor for Embedded Systems

Brief Summary of the Research Area

The field of “embedded computing systems” is a HDA research area driven by groups from mathematics, computer science, and engineering at the University of Hagen (FernUniversität). More and more, society depends on computers, which pervade all areas of life. They are found in cars, in household appliances, in automatic teller machines, in aircraft and trains, in air-traffic and railway control systems, and in medical systems, allowing for higher productivity and flexible adaptation. This list, which is by no means exhaustive, shows that a large number of these “embedded computing systems”, in which 98% of all microprocessors produced are incorporated, and whose installed software base is doubling in less than 18 months, performs functions critical for human and environmental safety, security of data, and economic success. What makes it so hard to build embedded systems with a high degree of dependability is their extreme complexity. This is caused by the inflationary increase of requirements which has occurred in the last 40 years. Typically, such systems have life spans measured in decades, during which components evolve, and interconnections, interfaces and operational semantics change. Among other factors affecting complexity, important ones are the geographic distribution of processing and databases, interaction with humans, the unpredictability of such things as external events or software execution behaviour. In conclusion, the field of “embedded computing systems” has not only great economic importance, but it also lends itself to interdisciplinary and application-oriented research. As research area of HDA, it will attract students who are working in industrial positions. In return, the results of this research area will flow back to industry and thus benefit a variety of advanced computer and engineering products.

Over the past five years, the participating scientists have acquired an average third-party of approximately 117,000 Euros (i.e., per scientist and per year). For the planned graduate school it is relevant that significant experience has been gained in the area of structured graduation through projects such as, the DAAD-funded project, “International Quality Network on Self-organising Communication Networks and Applications”, a research collaboration with Chinese universities, and an EU-US cooperation in higher education entitled “Graduate Educational Technology Studies”. Furthermore, it must be pointed out that extensive experience exists in the supervision of external doctoral students who are working in the industry. A total number of 15 doctoral students for the five-year period is expected.