

## Fail Safety in Medical Cyber-Physical Systems (FS-MCPS)

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Medical cyber-physical systems (MCPSs) extend the notion of conventional medical devices to more complex technical systems in close connection to humans, e.g., acquiring sensor data, controlling a treatment, or monitoring recovery. Typically, these systems include the patient in the loop and require a high degree of dependability and fail safety. One challenge is the complex nature of physiological processes, which are often patient-specific and less deterministic than in, e.g., engineering scenarios. Another challenge is the growing complexity of medical systems and devices themselves. Hence, fail safety of a MCPS cannot be achieved within a single component or layer — neither the software layer nor any other isolated layer —, but requires an interdisciplinary effort addressing different aspects, including patient modeling, hardware, software, and communication.

The workshop covers these aspects and discusses software-engineering issues of MCPS. Intended as a platform for interdisciplinary exchange the topics range from theoretical foundation of fail safety to actual applications of MCPS. Interoperability and integration of different devices has been an active research field, particularly as computer assistance for decision support and guidance of interventional procedures requires an aggregation of data provided by different systems. The design of interfaces and emerging standards for interoperability must consider the safe operation of the overall system. This includes meeting temporal constraints, e.g., when illustrating organ movements during image guidance or for automated motion compensation. Moreover, consistent, fail safe, and secure data exchange on the hardware and software level are essential for connecting devices, particularly when longer distances are covered, e.g., for remote and ambient assistance scenarios. The latter also require reliable network protocols and resource management.

Clearly, the move towards more complex systems in clinical practice is gradual and requires compliance with existing regulations and integration with existing devices. Bringing together researchers and practitioners in the field of MCPS we summarize the state of the art and discuss obstacles and challenges on the way to fail-safe MCPS. We are grateful for two keynote talks by Wolfgang Reisig (Humboldt Universität zu Berlin) and Jürgen Stettin (PROSYSTEM AG, HAW Hamburg), who present theoretical and practical aspects of software engineering for medical applications. We would also like acknowledge the members of our program committee members Christian Hansen, Martin Leucker, Klaus Radermacher, Asarnusch Rashid, Wolfgang Reisig, Stefan Schlichting, and Jürgen Stettin.

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