

# **Workshop „Adaptive and Organic Systems“**

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Organic Computing has emerged recently as a challenging vision for future information processing systems. Organic Computing is based on the insight that we will soon be surrounded by large collections of autonomous systems, which are equipped with sensors and actuators, aware of their environment, communicating freely, and organizing themselves in order to perform the actions and services that seem to be required. The presence of networks of intelligent systems in our environment opens fascinating application areas but, at the same time, bears the problem of their controllability. Hence, we have to construct such systems - which we increasingly depend on - as robust, safe, flexible, and trustworthy as possible. In particular, a strong orientation towards human needs as opposed to a pure implementation of the technologically possible seems absolutely central. In order to achieve these goals, our technical systems will have to act more independently, flexibly, and autonomously, i.e. they will have to exhibit life-like properties. We call those systems “organic”. Hence, an “Organic Computing System” is a technical system, which adapts dynamically to the current conditions of its environment. It will be self-organizing, self-configuring, self-optimizing, self-healing, self-protecting, self-explaining, and context-aware.

The vision of Organic Computing and its fundamental concepts arose independently in different research areas like Neuroscience, Molecular Biology, and Computer Engineering. Self-organizing systems have been studied for quite some time by mathematicians, sociologists, physicists, economists, and computer scientists, but so far almost exclusively based on strongly simplified artificial models. Central aspects of Organic Computing systems have been and will be inspired by an analysis of information processing in biological systems. The focus of this OC workshop will be, however, the technical application.

As an introduction to the industrial relevance of the topic, Dr. Burghardt Schallenberger from Siemens AG, Corporate Technology, will give an invited talk on "Autonome Systeme in industrieller Praxis - über angewandte Software Agenten und Roboter Technologien".

The workshop is organized in two sessions, focusing on the behavior of organic computing systems in general and on special properties of embedded real-time systems, respectively.

In the first session, *Cakar et al.* investigate various implementations of a generic observer/controller architecture and the related collaboration and communication patterns in a traffic scenario. *Gerdes et al.* analyze complex systems in order to decide, whether the system shows self-organizing behavior. In the third paper of this session, *Salzmann et al.* investigate organization of large wireless sensor networks with respect to energy efficiency.

In the second session, *Rosemann et al.* examine embedded real-time systems with self-optimizing capabilities, focusing on the avoidance of safety critical states. The second and third papers in this session deal with autonomic Systems-on-Chip. *Bernauer et al.* evaluate the feasibility of using the learning classifier XCS to control a System-on-Chip. *Zeppenfeld et al.* investigate concepts of reinforcement learning for the run-time reliability, power, and performance optimization of future generations of Systems-on-Chip.