Preface

The key challenge for future computer system is dealing with complexity. On one hand this involves internal system complexity which has increased exponentially over recent years. Here the main objectives are to maintain system reliability and to keep the design and maintenance effort manageable, while at the same time continuing to provide new functionality and increasing system performance. This has been the focus of so-called autonomous computing, which aims to bring self-configuration and repair to a wide range of computing systems.

On the other hand future computer systems are more and more becoming integrated into the fabric of everyday life and thus have to deal with the complexities of the real world. They will become smaller, more appropriate for their use, integrated into everyday objects, and often virtually or physically invisible to the users. They will also be deployed in a much higher quantity and penetrate many more application areas than traditional notions of computer systems. This requires computer systems to be adaptable within a much wider range of possible tasks, subjected to much harsher conditions.

To provide such features and functionality, computer devices will become tinier yet still increase in system complexity; they must consume less power, while still supporting advanced computation and communications, such that they are highly connected yet still operate as autonomous units. Pervasive and ubiquitous computing research addresses such issues by developing concepts and technology for interweaving computers into our everyday life. The principal approach is to enhance system functionality and adaptability by recognizing context and situations in the environment.

Organic computing deals with high system complexity by drawing analogies from complex biological systems, with the human-centered goal of self-organization. It addresses both internal system complexity of conventional systems and the complexity involved in pervasive environments dealing with the real world. Thus organic computing investigates the design and implementation of self-managing systems that are self-configuring, self-optimizing, self-healing, self-protecting, context aware, and anticipatory. It touches upon a number of exciting research topics including ultra-low power consumption, scalability and complexity of devices and systems, self-awareness, adaptive networking, and smart behavior of systems.

Many papers submitted to the Architecture of Computing Systems Conference (ARCS) address these aspects of adaptable, self-organizing systems. For computer system hardware, reconfigurable hardware allows us to optimize the system performance based on the application context, relieving software developers from detailed consideration of the inherently inflexible hardware constraints. Adaptive methods for managing resources and tasks enable (embedded) microprocessor systems to be both real-time aware but also very low in their power consumption. In software, middleware agents are able to cope with changes in

application and environment, thus still providing a minimum of functionality even under difficult and changing conditions.

Adaptive ad hoc communication networks and context-aware pervasive systems and applications provide the functionality mostly visible to the end user of such systems. To achieve this extent of adaptivity a large variety of methods were used – many of them borrowed from nature. The papers in this book present a good profile of such novel methods and their application in the area of computing systems.

This year the ARCS conference selected 18 papers from a competitive field of 52 submissions from 12 countries. All papers accepted for presentation were peer reviewed and discussed in the first step in an online discussion among members of the international Program Committee. In the PC Meeting then the final decisions were made based on these reviews and the online discussions. Care was taken to avoid any conflict of interest by handing out papers and discussion papers only to PC members not involved in or related to the work.

We would like to take the opportunity to thank the numerous people who supported us in organizing the paper program and the conference: the Program Committee members for their efforts in reviewing many papers; Uwe Brinkschulte for supporting us by serving as the Workshops and Tutorials Chair; and the General and Program Chairs, Christian Müller-Schloer and Theo Ungerer, for sharing their experience with us and helping us to organize the paper program and the conference.

We extend our gratitude to several organizations that provided financial and organizational support for the ARCS conference. Volker Schanz from the ITG provided the legal framework and the ARCS Fachausschuss, the organizational body of the conference. Financial and organizational support came from the APS+PC group, which organized and funded a special session with several interesting invited talks. Donations also came from our benefactor, Siemens AG. We would also like to thank Christian Decker and Michael Biebl for their help during the electronic submission process, and the University for Health Sciences, Medical Information and Technology in Innsbruck, Austria for hosting the conference.

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