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Preface

Technological progress is one of the driving forces behind the dramatic development of computer system architectures over the past three decades. Even though it is quite clear that this development cannot only be measured by the maximum number of components on a chip, Moore's Law may be and is often taken as a simple measure for the non-braked growth of computational power over the years. The more components are realizable on a chip, the more innovative and unconventional ideas can be realized by system architects. As a result, research in computer system architectures is more exciting than ever before.

This book covers the trends that shape the field of computer system architectures. The fundamenatal trade-off in the design of computing systems is between flexibility, performance, power consumption, and chip area. The full exploitation of future silicon capacity requires new architecture approaches and new design paradigms such as multiple computers on a single chip, reconfigurable processor arrays, extensible processor architectures, and embedded memory technologies. For a successful use in practical applications, it is not enough to solve the hardware problems but also to develop platforms that provide software infrastructure and support effective programming.

A quantum jump in complexity is achieved by embedded computing systems with an unprecedented level of connectivity linking together a growing number of physical devices through networks. Embedded systems will become more and more pervasive as the component technologies become smaller, faster, and cheaper. Their complexity arises not only from the large number of components but also from a lack of determinism and a continual evolution of these systems. The research effort needed to design systems so that they can be developed, deployed, maintained, configured, managed, and trusted will be a key issue for many years. Pervasive computing is therefore much more than an Internet access by mobile devices. The papers presented in this book set out the broadness of the research area established by pervasive computing approaches: input devices for wearable systems, mobile collaborative applications, measurement data acquisition, location awareness, QoS awareness, and context awareness.

One possibility to cope with the growing complexity of computing systems is to make them organic or autonomous, that is, to make them self-learning, self-organizing, self-configuring, self-optimizing, self-healing, self-protecting, and proactive.

In this context, completely new problems arise that should be addressed by an interdisciplinary effort. Natural organic and self-organizing systems have been studied in other scientific discplines such as philosophy and biology, and their results should now be considered by architects of organic computing systems. Some of the key questions are:

1. Do organic systems feature properties that cannot be derived from the properties of its components? Is this emergent behavior desirable in any case or not?
2. Can we really expect to completely control systems with an emergent behavior?
3. Which mathematical formalisms can help in constructing and analyzing this type of system?
4. How is user privacy maintainable?
5. What is the role of trust?

These questions were discussed during the conference stimulated by two keynote and three invited speeches. Two of the speakers have taken the opportunity to present their ideas in this book.

Organic computing is a research area initiated by the special interest group ARCS of the German computer societies (GI and ITG) that are responsible for the organization of the ARCS conference series. Future ARCS conferences will therefore continue to give a platform to revolutionary ideas for a new generation of organic computing systems.

The great interest of the research community in the research field of this conference is expressed in a large number of submitted papers. Altogether, we received 174 papers, 32 of them were accepted and are presented in this book. We were especially pleased by the wide range of countries represented at the conference. We thank all the members of the Program Committee, who did a great job. Many additional reviewers supported us in selecting the best papers. We thank all reviewers for their elaborated reviews which greatly helped the authors to further improve their papers. Readers will appreciate this effort yielding a book with high quality.

The organization of this conference was done at two different locations. Organizational tasks were performed at the University of Frankfurt a.M., while the work on the program was done at the University of Passau. We thank all staff members for their excellent work making this conference a success. Special thanks for their excellent work go to: Markus Damm, Diana Firnges, Jan Haase, Johannes Herr, Wilhelm Heupke, Joachim Höhne, Alexander Hofmann, Andreas Hofmann, Eva Kapfer, Anita Plattner, Franz Rautmann, Rüdiger Schroll.

March 2006

Werner Grass
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Organization

ARCS 2006 was jointly organized by GI (German Informatics Society) and ITG (Information Technology Society).

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