# Preface

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**Biographical notes:** Xing Cai received his PhD in Scientific Computing from the University of Oslo in 1998. He is now taking an 80% leave from his full professor position at the University of Oslo and working as a research scientist at the Simula Research Laboratory. His main research topics include generic PDE software, parallel computing, and numerical methods for solving PDEs.

H. Martin Bücker received his PhD Degree in Electrical Engineering from RWTH Aachen University in 1997. He worked at the Central Institute for Applied Mathematics, Research Center Jülich, from 1993 to 1998, participating in the design of parallel algorithms for sparse matrix problems. Since 1998 he has been with the Institute for Scientific Computing, RWTH Aachen University, where he received his Habilitation in 2003. His current areas of research include high-performance computing, numerical linear algebra, and automatic differentiation.

The difficulty in solving hard computational problems arising from real-world applications in science and engineering spawned a surge of activities in the area of High Performance Computing (HPC) during the last decades. In its early days, the focus was mainly on computer architectures, programming models, and compiling technologies. Today, HPC is gradually becoming a crucial methodology helping researchers from various scientific and engineering disciplines. This noticeable and rapid transition is witnessed by the emergence of several international conferences and workshops on HPC and closely related fields. The international workshop series on *High Performance Scientific and Engineering Computing* (HPSEC) is such an annual forum. Since its first meeting in 1999, the HPSEC workshops have brought together computer scientists, engineers, applied mathematicians, researchers in other applied fields, and industrial professionals for presenting results and exchanging ideas.

The present special issue of the *International Journal of Computational Science and Engineering* (IJCSE) is a collection of selected papers that were presented at the 7th HPSEC workshop, which was held in conjunction with the 2005 International Conference on Parallel Processing, June 14–17, Oslo, Norway. Initially, 39 research papers representing 14 different countries were submitted. After a careful reviewing process by members of the program committee as well as by external reviewers, 13 high-quality papers were accepted and presented at the workshop.

Selected presentations from the workshop were thereafter given invitation to deepen and extend the presented work by submitting a full-length paper for consideration of publication in this special issue. Finally, six papers were accepted for publication after scrutinising reviews by anonymous referees and careful revisions by the authors.

The guest editors believe that the six accepted papers address some of the recent trends in HPC and its applications in science and engineering. The majority of papers is concerned with parallel and grid computing with some emphasis on areas in which HPC is traditionally not widely used. To be more specific, Jacob et al. describe a grid computing enabled software toolkit for astronomical image mosaicking. Barrachina et al. report how large-scale algebraic Bernoulli equations can be solved via the Newton iteration for the matrix sign function using parallel computers. Leykin and Verschelde discuss two approaches to parallelising algorithms for decomposing a positive dimensional solution set of polynomial equations into irreducible components. Although the topic of the fourth paper, written by Long and Fursin, touches upon the traditional HPC subject of compiling technologies, the focus is on the programming language Java that, today, is not routinely used in large-scale computing. The paper by Drosinos and Koziris deals with the increasingly popular topic of hybrid parallelisation combining the two programming paradigms OpenMP and MPI. In particular, the emphasis of this paper is devoted to parallelising tiled

algorithms, while closely discussing the issue of load balancing for this particular type of application. Last but not least, Elmroth et al. report on their experience in building a user portal for cluster and grid computing, a more and more important topic facing scientists who crave for ever-increasing cost-effective computing power.

It has been a demanding task to select and edit the above mentioned six papers for this special issue. At the same time, it has been an extremely rewarding process as it provides us with a lot of inspiring new ideas on a wide range of different topics. We thus hope that these papers also give similar satisfaction to the readers of IJCSE.

Each paper appearing in this special issue was carefully reviewed by at least two experts in the corresponding field. We would like to thank all anonymous referees whose time and effort spent in preparing the review reports helped to significantly improve the quality of the papers.