The tenth Nordic conference on applied parallel computing, Para 2010: State of the Art in Scientific and Parallel Computing, was held in Reykjavík, Iceland during June 6–9, 2010. The topics of the conference were announced to include software, hardware, algorithms, tools, environments, as well as applications of scientific and high-performance computing. The conference was hosted by the School of Engineering and Natural Sciences of the University of Iceland, and the conference venue was in the School of Education of the University of Iceland. Three companies in Reykjavík supported the conference financially: the video game developer CCP, Microsoft Íslandi, and Opin kerfi (Hewlett Packard distributor for Iceland).

The series of Para meetings began in 1994. The Danish Computing Centre for Research and Education (UNI-C) and the Department of Informatics and Mathematical Modelling of the Technical University of Denmark (IMM/DTU) in Lyngby, Denmark, organized a series of workshops on Applied Parallel Computing, named Para94, Para95 and Para96. Jerzy Waśniewski, senior researcher at DTU, initiated these workshops and Jack Dongarra, professor at the University of Tennessee, became involved during an extended visit to Lyngby. He played a key part in promoting the meetings internationally. Since 1998, the workshops have become a Nordic effort, but both Jerzy and Jack have continued to be an integral part of the meetings. In fact Jerzy has been a keen advocate of holding a Para conference in Iceland. The themes and locations of the Para meetings have been:

- PARA94 Parallel Scientific Computing, Lyngby, Denmark
- PARA95 Physics, Chemistry and Engineering Science, Lyngby, Denmark
- PARA96 Industrial Problems and Optimization, Lyngby, Denmark
- PARA 1998 Large Scale Scientific and Industrial Problems, Umeå, Sweden
- PARA 2000 New Paradigms for HPC in Industry and Academia, Bergen, Norway
- PARA 2002 Advanced Scientific Computing, Helsinki, Finland
- PARA 2004 State of the Art in Scientific Computing, Copenhagen, Denmark
- PARA 2006 State of the Art in Scientific and Parallel Computing, Umeå, Sweden
- PARA 2008 State of the Art in Scientific and Parallel Computing, Trondheim, Norway
- PARA 2010 State of the Art in Scientific and Parallel Computing, Reykjavík, Iceland

The Para 2010 conference included five keynote lectures, one tutorial, 11 mini-symposia consisting of a total of 90 presentations, 39 other contributed presentations organized under 10 separate topics, four poster presentations, and eight presentations from industry. Except for the keynote lectures, that were 45 minutes long each, the presentations were organized in five tracks or parallel streams, with 25-minute slots for each presentation, including discussion. The
total number of presentations was thus 147. There were altogether 187 participants from 20 countries:

<table>
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<th>Country</th>
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<tr>
<td>Denmark</td>
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<td>Finland</td>
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<td>Norway</td>
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</tr>
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<td>Turkey</td>
<td>1</td>
</tr>
<tr>
<td>USA</td>
<td>20</td>
</tr>
</tbody>
</table>

There were volcanic eruptions in Eyjafjallajökull in southern Iceland from March until June 2010 disrupting international flights, and these may have had an adverse effect on participation.

Extended abstracts (in most cases four pages long) of all the minisymposium and contributed presentations were made available on the conference website, http://vefir.hi.is/para10, and in addition a book of short abstracts (also available on the website) was handed out at the conference.

After the conference the presentation authors were invited to submit manuscripts for publication in these peer-reviewed conference proceedings. The reviewing process for the articles appearing here was therefore performed in two stages. In the first stage the extended abstracts were reviewed to select contributions to be presented at the conference, and in the second stage the full papers submitted after the conference were reviewed. As a general rule three referee reports per paper were aimed for, and in most cases these were successfully obtained. However, in cases where it proved difficult to find three willing referees, acquiring only two reports was deemed acceptable.

Fred G. Gustavson, emeritus scientist at IBM Research, New York, and professor at Umeå University, and Jerzy Waśniewski gave a tutorial on matrix algorithms in the new many core era. Fred celebrated his 75th birthday on May 29, 2010, and the Linear Algebra Minisymposium was held in his honor. The material of the tutorial is covered in Fred Gustavson’s article in these proceedings.

A conference of this size requires considerable organization and many helping hands. The role of the minisymposium organizers was very important. They reviewed and/or organized reviewing of contributions to their respective minisymposia, both the original extended abstracts and the articles for these proceedings, and in addition they managed the minisymposium sessions at the conference. Several members of the local Organizing Committee helped with the reviewing of other contributed extended abstracts: Elínborg I. Ölafsdóttir, Hjálmtýr Hafsteinsson, Klaus Marius Hansen, Ólafur Rögnvaldsson, Snorri Agnarsson and Sven Þ. Sigurðsson. Other colleagues who helped with this task were Halldór Björnsson, Kristín Vogfjörð and Viðar Guðmundsson.

The editor of these proceedings organized the reviewing of manuscripts falling outside minisymposia, as well as manuscripts authored by the minisymposium organizers themselves. There were 56 such submissions. The following people played a key role in helping him with this task: Sven Þ. Sigurðsson, Julien...
Langou, Bo Kågström, Sverker Holmgren, Michael Bader, Jerzy Waśniewski, Klaus Marius Hansen, Kimmo Koski and Halldór Björnsson. Many thanks are also due to all the anonymous referees, whose extremely valuable work must not be forgotten.

The conference bureau Your Host in Iceland managed by Inga Sólnes did an excellent job of organizing and helping with many tasks, including conference registration, hotel bookings, social program, financial management, and maintaining the conference website. Apart from Inga, Kristjana Magnúsdóttir of Your Host was a key person and Einar Samúelsson oversaw the website design. Ólafia Lárusdóttir took photographs for the conference website. The baroque group Custos and the Tibia Trio, both led by recorder player Helga A. Jónsdóttir, and Helgi Kristjánsson (piano) provided music for the social program. Ólafur Rögnvaldsson helped to secure financial support from industry. Jón Blöndal and Stefán Ingi Valdimarsson provided valuable TeX help for the editing of the proceedings.

Finally, I wish to devote a separate paragraph to acknowledge the help of my colleague Sven Þ. Sigurðsson, who played a key role in helping with the conference organization and editing of the proceedings through all stages.

October 2011

Kristján Jónasson
PARA 2010 was organized by the School of Engineering and Natural Sciences of the University of Iceland.

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**Sponsoring Companies**

CCP, Reykjavík – video game developer  
Microsoft Íslandi, Reykjavík  
Opin kerfi, Reykjavík – Hewlett Packard in Iceland
PARA 2010 Scientific Program

Keynote Presentations

Impact of Architecture and Technology for Extreme Scale on Software and Algorithm Design

*Jack Dongarra*, University of Tennessee and Oak Ridge National Laboratory

Towards Petascale for Atmospheric Simulation

*John Michalakes*, National Center for Atmospheric Research (NCAR), Boulder, Colorado

Algorithmic Challenges for Electronic-Structure Calculations

*Risto M. Nieminen*, Aalto University School of Science and Technology, Helsinki

Computational Limits to Nonlinear Inversion

*Klaus Mosegaard*, Technical University of Denmark

Efficient and Reliable Algorithms for Challenging Matrix Computations Targeting Multicore Architectures and Massive Parallelism

*Bo Kågström*, Umeå University

Tutorial

New Algorithms and Data Structures for Matrices in the Multi/Many Core Era

*Fred G. Gustavson*, Umeå University and Emeritus Scientist at IBM Research, New York, and *Jerzy Waśniewski*, Danish Technical University

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HPC Algorithms (7 presentations and 1 poster)

HPC Programming Tools (4 presentations)

HPC in Meteorology (3 presentations)

Parallel Numerical Algorithms (8 presentations and 1 poster)

Parallel Computing in Physics (2 presentations and 1 poster)

Scientific Computing Tools (10 presentations)

HPC Software Engineering (2 presentations and 1 poster)

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Tools and Environments for Accelerator-Based Computational Biomedicine (6 presentations)
Organized by Scott B. Baden, University of California, San Diego

GPU Computing (9 presentations)
Organized by Anne C. Elster, NTNU, Trondheim

High-Performance Computing Interval Methods (6 presentations)
Organized by Bartlomiej Kubica, Warsaw University of Technology

Real-Time Access and Processing of Large Data Sets (6 presentations)
Organized by Helmut Neukirchen, University of Iceland and Michael Schmelling, Max Planck Institute for Nuclear Physics, Heidelberg

Linear Algebra Algorithms and Software for Multicore and Hybrid Architectures, in honor of Fred Gustavson on his 75th birthday (10 presentations)
Organized by Jack Dongarra, University of Tennessee and Bo Kågström, Umeå University

Memory and Multicore Issues in Scientific Computing – Theory and Practice (6 presentations)
Organized by Michael Bader, Universität Stuttgart and Riko Jacob, Technische Universität München

Multicore Algorithms and Implementations for Application Problems (9 presentations)
Organized by Sverker Holmgren, Uppsala University

Fast PDE Solvers and A Posteriori Error Estimates (8 presentations)
Organized by Jan Valdman, University of Iceland and Talal Rahman, University College Bergen

Scalable Tools for High-Performance Computing (12 presentations)
Organized by Luiz DeRose, Cray Inc. and Felix Wolf, German Research School for Simulation Sciences

Distributed Computing Infrastructure Interoperability (4 presentations)
Organized by Morris Riedel, Forschungszentrum Jülich
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Abramson, David: Scalable parallel debugging: Challenges and solutions
Agnarsson, Snorri: Parallel programming in Morpho
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Aliaga, José I.: Parallelization of multilevel ILU preconditioners on distributed-memory multiprocessors
Anzt, Hartwig: Mixed precision error correction methods for linear systems – Convergence analysis based on Krylov subspace methods
Aqrawi, Ahmed Adnan: Accelerating disk access using compression for large seismic datasets on modern GPU and CPU
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