

Preface

This volume comprises the proceedings of the 10th International Conference on Parallel Processing and Applied Mathematics, PPAM 2013, which was held in Warsaw, Poland, September 8–11, 2013. The jubilee PPAM conference was organized by the Department of Computer and Information Science of the Czestochowa University of Technology, under the patronage of the Committee of Informatics of the Polish Academy of Sciences, in cooperation with the Polish-Japanese Institute of Information Technology. The main organizer was Roman Wyrzykowski.

PPAM is a biennial conference. Nine previous events have been held in different places in Poland since 1994. The proceedings of the last six conferences have been published by Springer-Verlag in the *Lecture Notes in Computer Science* series (Nałęczów, 2001, vol. 2328; Częstochowa, 2003, vol. 3019; Poznań, 2005, vol. 3911; Gdańsk, 2007, vol. 4967; Wrocław, 2009, vols. 6067 and 6068; Toruń, 2011, vols. 7203 and 7204).

The PPAM conferences have become an international forum for exchanging ideas between researchers involved in parallel and distributed computing, including theory and applications, as well as applied and computational mathematics. The focus of PPAM 2013 was on models, algorithms, and software tools that facilitate efficient and convenient utilization of modern parallel and distributed computing architectures, as well as on large-scale applications.

This meeting gathered the largest number of participants in the history of PPAM conferences – more than 230 participants from 32 countries. A strict refereeing process resulted in the acceptance of 143 contributed presentations, while approximately 44 % of the submissions were rejected. Regular tracks of the conference covered such important fields of parallel/distributed/cloud computing and applied mathematics as:

- Numerical algorithms and parallel scientific computing
- Parallel non-numerical algorithms
- Tools and environments for parallel/distributed/cloud computing
- Applications of parallel computing
- Applied mathematics, evolutionary computing, and metaheuristics

The plenary and invited talks were presented by:

- Fran Berman from the Rensselaer Polytechnic Institute (USA)
- Ewa Deelman from the University of Southern California (USA)
- Jack Dongarra from the University of Tennessee and Oak Ridge National Laboratory (USA), and University of Manchester (UK)
- Geoffrey Ch. Fox from Indiana University (USA)
- Laura Grigori from Inria (France)
- Fred Gustavson from the IBM T.J. Watson Research Center (USA)
- Georg Hager from the University of Erlangen-Nuremberg (Germany)
- Alexey Lastovetsky from the University College Dublin (Ireland)

- Miron Livny from the University of Wisconsin (USA)
- Piotr Luszczek from the University of Tennessee (USA)
- Rizos Sakellariou from the University of Manchester (UK)
- James Sexton from the IBM T.J. Watson Research Center (USA)
- Leonel Sousa from the Technical University of Lisbon (Portugal)
- Denis Trystram from the Grenoble Institute of Technology (France)
- Jeffrey Vetter from the Oak Ridge National Laboratory and Georgia Institute of Technology (USA)
- Richard W. Vuduc from the Georgia Institute of Technology (USA)
- Robert Wisniewski from Intel (USA)

Important and integral parts of the PPAM 2013 conference were the workshops:

- Minisymposium on GPU Computing organized by José R. Herrero from the Universitat Politècnica de Catalunya (Spain), Enrique S. Quintana-Ortí from the Universidad Jaime I (Spain), and Robert Strzodka from NVIDIA
- Special Session on Multicore Systems organized by Ozcan Ozturk from Bilkent University (Turkey), and Suleyman Tosun from Ankara University (Turkey)
- Workshop on Numerical Algorithms on Hybrid Architectures organized by Przemysław Stpiczynski from the Maria Curie Skłodowska University (Poland), and Jerzy Waśniewski from the Technical University of Denmark
- Workshop on Models, Algorithms and Methodologies for Hierarchical Parallelism in New HPC Systems organized by Giulliano Laccetti and Marco Lapegna from the University of Naples Federico II (Italy), and Raffaele Montella from the University of Naples Parthenope (Italy)
- Workshop on Power and Energy Aspects of Computation organized by Richard W. Vuduc from the Georgia Institute of Technology (USA), Piotr Luszczek from the University of Tennessee (USA), and Leonel Sousa from the Technical University of Lisbon (Portugal)
- Workshop on Scheduling for Parallel Computing, SPC 2013, organized by Maciej Drozdowski from Poznań University of Technology (Poland)
- The 5th Workshop on Language-Based Parallel Programming Models, WLPP 2013, organized by Ami Marowka from the Bar-Ilan University (Israel)
- The 4th Workshop on Performance Evaluation of Parallel Applications on Large-Scale Systems organized by Jan Kwiatkowski from Wrocław University of Technology (Poland)
- Workshop on Parallel Computational Biology, PBC 2013, organized by David A. Bader from the Georgia Institute of Technology (USA), Jarosław Żola from Rutgers University (USA), and Bertil Schmidt from the University of Mainz (Germany)
- Minisymposium on Applications of Parallel Computations in Industry and Engineering organized by Raimondas Čiegis from Vilnius Gediminas Technical University (Lithuania), and Julius Žilinskas from Vilnius University (Lithuania)
- Minisymposium on HPC Applications in Physical Sciences organized by Grzegorz Kamieniarz and Wojciech Florek from A. Mickiewicz University in Poznań (Poland)

- Minisymposium on Applied High-Performance Numerical Algorithms in PDEs organized by Piotr Krzyżanowski and Leszek Marcinkowski from Warsaw University (Poland), and Talal Rahman from Bergen University College (Norway)
- Minisymposium on High-Performance Computing Interval Methods organized by Bartłomiej J. Kubica from Warsaw University of Technology (Poland)
- Workshop on Complex Collective Systems organized by Paweł Topa and Jarosław Wąs from AGH University of Science and Technology in Kraków (Poland)

The PPAM 2013 meeting began with five tutorials:

- Scientific Computing on GPUs, by Dominik Göddeke from the University of Dortmund (Germany), and Robert Strzodka from NVIDIA
- Design and Implementation of Parallel Algorithms for Highly Heterogeneous HPC Platforms, by Alexey Lastovetsky from University College Dublin (Ireland)
- Node Level Performance Engineering, by Georg Hager from the University of Erlangen-Nuremberg (Germany)
- Delivering the OpenCL Performance Promise: Creating and Optimizing OpenCL Applications with the Intel OpenCL SDK, by Maxim Shevtsov from Intel (Russia)
- A History of A Central Result of Linear Algebra and the Role of that Gauss, Cholesky and Others Played in Its Development, by Fred Gustavson from the IBM T.J. Watson Research Center (USA)

The PPAM Best Poster Award is granted to the best poster on display at the PPAM conferences, and was established at PPAM 2009. This award is bestowed by the Program Committee members to the presenting author(s) of the best poster. The selection criteria are based on the scientific content, and on the quality of the poster presentation. The PPAM 2013 winners were Lars Karlsson, and Carl Christian K. Mikkelsen from Umea University, who presented the poster “Improving Perfect Parallelism.” The Special Award was bestowed to Lukasz Szustak, and Krzysztof Rojek from the Częstochowa University of Technology, and Pawel Gepner from Intel, who presented the poster “Using Intel Xeon Phi to Accelerate Computation in MPDATA Algorithm.”

A new topic was introduced at PPAM 2013: *Power and Energy Aspects of Computation (PEAC)*. Recent advances in computer hardware rendered the issues related to power and energy consumption as the driving metric for the design of computational platforms for years to come. Power-conscious designs, including multicore CPUs and various accelerators, dominate large supercomputing installations as well as large industrial complexes devoted to cloud computing and the big data analytics. At stake are serious financial and environmental impacts, which the large-scale computing community has to now consider and embark on careful re-engineering of software to fit the demanding power caps and tight energy budgets.

The workshop presented research into new ways of addressing these pressing issues of energy preservation, power consumption, and heat dissipation while attaining the best possible performance levels at the scale demanded by modern scientific challenges.

The PEAC Workshop, as well as the conference as a whole, featured a number of invited and contributed talks covering a diverse array of recent advances, including:

- Cache-aware roofline model for monitoring performance and power in connection with application characterization (by L. Sousa et al.)
- Resource scheduling and allocation schemes based on stochastic models (by M. Oxley et al.)
- A comprehensive study of iterative solvers on a large variety of computing platforms including modern CPUs, accelerators, and embedded computers (by Enrique S. Quintana-Ortí et al.)
- Energy and power consumption trends in HPC (by P. Luszczek)
- Sensitivity of graph metrics to missing data and the benefits they have for overall energy consumption (by A. Zakrzewska et al.)
- Cache energy models and their analytical properties in the context of embedded devices (by K. de Voeleer et al.)
- Predictive models for execution time, energy consumption, and power draw of algorithms (by R. Vuduc)

The organizers are indebted to the PPAM 2013 sponsors, whose support was vital to the success of the conference. The main sponsor was the Intel Corporation. The other sponsors were: IBM Corporation, Hewlett-Packard Company, Rogue Wave Software, and AMD. We thank to all the members of the international Program Committee and additional reviewers for their diligent work in refereeing the submitted papers. Finally, we thank all of the local organizers from the Częstochowa University of Technology, and the Polish-Japanese Institute of Information Technology in Warsaw, who helped us to run the event very smoothly. We are especially indebted to Grażyna Kołakowska, Urszula Kroczevska, Łukasz Kuczyński, Adam Tomasz, and Marcin Woźniak from the Częstochowa University of Technology; and to Jerzy P. Nowacki, Marek Tudruj, Jan Jedliński, and Adam Smyk from the Polish-Japanese Institute of Information Technology.

We hope that this volume will be useful to you. We would like everyone who reads it to feel invited to the next conference, PPAM 2015, which will be held September 6–9, 2015, in Kraków, the old capital of Poland.

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