

Table of Contents

I Keynote Lectures

Enabling Numerical and Software Technologies for Studying the Electrical Activity in Human Heart	3
<i>Xing Cai, Glenn Terje Lines</i>	
Parallel Patient-Specific Computational Haemodynamics	18
<i>J. Cezbral, R. Löhner, P. L. Choyke, P. J. Yim</i>	
High Performance Computing, Computational Grid, and Numerical Libraries	35
<i>Jack Dongarra</i>	
Grid Computing: Enabling a Vision for Collaborative Research	37
<i>Gregor von Laszewski</i>	
HPC - What Might the Future Hold?	53
<i>Jamshed Mirza</i>	
Multi-physics and Multi-scale Modelling of Materials Processing	55
<i>R.M. Nieminen</i>	
Co-array Fortran for Full and Sparse Matrices	61
<i>John Reid</i>	
Measuring the Local Geometry of Valleys in Complex Energy Landscapes by Exhaustive Exploration: The Lid Method	62
<i>P. Sibani, J.C. Schön</i>	
An Overview of an Architecture Proposal for a High Energy Physics Grid	76
<i>A. Wäänänen, M. Ellert, A. Konstantinov, B. Kónya, O. Smirnova</i>	

II Datamining and Knowledge Discovery

A Data Mining Architecture for Clustered Environments	89
<i>Mafruz Zaman Ashrafi, David Taniar, Kate A. Smith</i>	
Automated Fitting and Rational Modeling Algorithm for EM-Based S-Parameter Data	99
<i>Tom Dhaene</i>	

A Proposal of High Performance Data Mining System 106
Zhen Liu, Minyi Guo

A Quasi-Parallel Realization of the Investment Frontier in
 Computer Resource Allocation Using Simple Genetic Algorithm
 on a Single Computer 116
Kwok Yip Szeto, Rui Jiang

Parallelism in Knowledge Discovery Techniques 127
Domenico Talia

III Parallel Program Development

A New Approach to Parallel Debugger Architecture 139
*Susanne M. Balle, Bevin R. Brett, Chih-Ping Chen,
 David LaFrance-Linden*

ALCOR - An Algorithmic Concept Recognition Tool to Support High
 Level Parallel Program Development 150
Beniamino Di Martino

MPIT - Communication/Computation Paradigm for Networks of SMP
 Workstations 160
Pentti Huttunen, Jouni Ikonen, Jari Porras

Code Optimization Techniques of Data-Intensive Tasks onto Statically
 Scheduled Architectures: Optimal Performance on the TigerShare 172
Norbert A. Pilz, Kenneth Adamson

IV Practical Experiences in Parallel Computing

PIT: A Library for the Parallelization of Irregular Problems 185
Fabrizio Baiardi, Paolo Mori, Laura Ricci

Parallel Information Retrieval with Query
 Expansion 195
Yoojin Chung

Reducing Communication Cost for Parallelizing Irregular
 Scientific Codes 203
Minyi Guo, Zhen Liu, Chengfei Liu, Li Li

Implementation of Parallel Collection Equi-Join Using MPI 217
*Nung Kion Lee, David Taniar, J. Wenny Rahayu,
 Mafruz Zaman Ashrafi*

Practical Experiences in Parallelizing Existent Computer Programs	227
<i>Willem Vermin</i>	

V Computer Science

On the Evaluation of the Distributed Objects and Mobile Agents Programming Models for a Distributed Optimization Application	233
<i>Rocco Aversa, Beniamino Di Martino, Thomas Fahringer, Salvatore Venticini</i>	
A Parallel Transitive Closure Computation Algorithm for VLSI Test Generation	243
<i>Seema Bawa, G.K. Sharma</i>	
Space-Efficient First Race Detection in Shared Memory Programs with Nested Parallelism	253
<i>Keum-Sook Ha, Eun-Kyung Ryu, Kee-Young Yoo</i>	
A Practical Method for On-the-Fly Data Race Detection	264
<i>Eun-Kyung Ryu, Keum-Sook Ha, Kee-Young Yoo</i>	
Parallelisms in MPEG and Its Applications to 3-D Visualization	274
<i>Samuel Moon-Ho Song, Gunho Lee, Sunghyun Kim, Manhee Lee, Hyeokman Kim, Dong-Sik Jang</i>	

VI Numerical Algorithms with Hierarchical Memory Optimization

A Recursive Formulation of the Inversion of Symmetric Positive Definite Matrices in Packed Storage Data Format	287
<i>Bjarne S. Andersen, John A. Gunnels, Fred Gustavson, Jerzy Waśniewski</i>	
Parallel Two-Sided Sylvester-Type Matrix Equation Solvers for SMP Systems Using Recursive Blocking	297
<i>Isak Jonsson, Bo Kågström</i>	
Performance Optimization of 3D Multigrid on Hierarchical Memory Architectures	307
<i>Markus Kowarschik, Ulrich Rüde, Nils Thürey, Christian Weiß</i>	

VII Numerical Methods and Algorithms A

- Parallel and Blocked Algorithms for Reduction of a Regular Matrix
Pair to Hessenberg-Triangular and Generalized Schur Forms 319
Björn Adlerborn, Krister Dackland, Bo Kågström
- Enhanced Services for Remote Model Reduction of Large-Scale Dense
Linear Systems 329
*Peter Benner, Rafael Mayo, Enrique S. Quintana-Ortí,
Gregorio Quintana-Ortí*
- HUTI: Framework for Iterative Solvers 339
Harri Hakula, Juha Ruokolainen, Jouni Malinen

VIII Numerical Methods and Algorithms B

- A Block Fourier Decomposition Method 351
Hsin-Chu Chen
- New Parallel Architecture for Modular Multiplication and Squaring
Based on Cellular Automata 359
Kyo-Min Ku, Kyeong-Ju Ha, Hyun-Sung Kim, Kee-Young Yoo
- A Parallel Implementation of the Tree-Structured Self-Organizing Map . . . 370
Anssi Lensu, Pasi Koikkalainen
- A Blocking Algorithm for Parallel 1-D FFT on Shared-Memory
Parallel Computers 380
Daisuke Takahashi

IX Numerical Methods and Algorithms C

- A Technique for Parallel Loop Execution 393
Volodymyr Beletskyy
- A Self-Adaptable Distributed Evolutionary Algorithm to Tackle
Space Planning Problems 403
Xavier Bonnaire, María-Cristina Riff
- Efficient Parallel Solution to Calculate All Cycles in Graphs 411
*G. Cerruela García, E. López Espinosa, I. Luque Ruiz,
M.A. Gómez-Nieto*

X Experiences with Cluster Computing A

Scheduling Strategies for Master-Slave Tasking on Heterogeneous Processor Grids	423
<i>C. Banino, O. Beaumont, A. Legrand, Y. Robert</i>	
High-Performance Computing: Past, Present, and Future	433
<i>Anne C. Elster</i>	
Fast MPI Broadcasts through Reliable Multicasting	445
<i>Paul Sack, Anne C. Elster</i>	
A Framework for Building Distributed Data Flow Chains in Clusters	454
<i>Timm M. Steinbeck, Volker Lindenstruth, Dieter Röhrich, Anders Strand Vestbo, Arne Wiebalck</i>	

XI Experiences with Cluster Computing B

Performance of an IBM Pwr4 Node for the GEMS TD Codes and Parallacs	467
<i>Ulf Andersson, Fredrik Hedman</i>	
A Cluster-Based Solution for a High Performance Air Quality Simulation	476
<i>José Carlos Mouriño, Patricia González, María J. Martín, Ramón Doallo</i>	
Compiler-Controlled Parallelism-Independent Scheduling for Parallel and Distributed Systems	484
<i>Kirilka Nikolova, Sou Pei You, Masahiro Sowa</i>	
Optimization of Parallel Algorithms on Cluster of SMP's	494
<i>Xiangzhen Qiao</i>	

XII Grid and Network Technologies

Reliability Bounds for Large Multistage Interconnection Networks	507
<i>Nasser S. Fard, Indra Gunawan</i>	
Grid Technology with Dynamic Load Balancing for Monte Carlo Simulations	515
<i>Y.P. Galyuk, V.P. Memnonov, S.E. Zhuravleva, V.I. Zolotarev</i>	

A Parallel Grid Based PSE for EHL Problems 521
Christopher Goodyer, Jason Wood, Martin Berzins

A “Single-Box” Re-routing Architecture for a 3-Stage
Rearrangeable CLOS Interconnection Networks 531
Mohammad R. Salehnamadi, Mehdi N. Fesharaki

Enhancing Load Balancing in a Data-Parallel GSM Network
Simulation through Application-Specific Information 542
Pentti Huttunen, Jouni Ikonen, Jari Porras

XIII Physics and Applications

Automated Tracking of 3-D Overturn Patches in Direct Numerical
Simulation of Stratified Homogeneous Turbulence 557
Peter Diamessis, William Kerney, Scott B. Baden, Keiko Nomura

Improving Load Balance in a Weather Code: Asynchronous Output in
HIRLAM with MPI 567
Jussi Heikonen, Kalle Eerola

Parallel Simulation of Photorefractive Material for the Design of
All-Optical Components 578
*Frédéric Lhommé, Delphine Wolfersberger, Stéphane Vialle,
Nicolas Fressengeas*

Scalable Sparse Matrix Techniques for Modeling Crack
Growth 588
P. Raghavan, M.A. James, J.C. Newman, B.R. Seshadri

Parallelization of a Lattice Boltzmann Suspension Flow Solver 603
Tommi Suviola

Author Index 611