

Table of Contents

Keynote Address

Info-Bio-Nano Interface: High-Performance Computing & Visualization 3
Priya Vashishta, Rajiv K. Kalia, and Aiichiro Nakano

Session I – Algorithms I

Chair: *Bhabani Sinha*

2-D Wavelet Transform Enhancement on General-Purpose Microprocessors: Memory Hierarchy and SIMD Parallelism Exploitation	9
<i>Daniel Chaver, Christian Tenllado, Luis Piñuel, Manuel Prieto, and Francisco Tirado</i>	
A General Data Layout for Distributed Consistency in Data Parallel Applications	22
<i>Roxana Diaconescu</i>	
A Parallel DFA Minimization Algorithm	34
<i>Ambuj Tewari, Utkarsh Srivastava, and P. Gupta</i>	
Accelerating the CKY Parsing Using FPGAs	41
<i>Jacir L. Bordim, Yasuaki Ito, and Koji Nakano</i>	
Duplication-Based Scheduling Algorithm for Interconnection-Constrained Distributed Memory Machines	52
<i>Savina Bansal, Padam Kumar, and Kuldip Singh</i>	
Evaluating Arithmetic Expressions Using Tree Contraction: A Fast and Scalable Parallel Implementation for Symmetric Multiprocessors (SMPs)	63
<i>David A. Bader, Sukanya Sreshta, and Nina R. Weisse-Bernstein</i>	

Session II – Architecture I

Chair: *Michel Cosnard*

Dead-Block Elimination in Cache: A Mechanism to Reduce I-cache Power Consumption in High Performance Microprocessors	79
<i>Mohan G. Kabadi, Natarajan Kannan, Palanidaran Chidambaram, Suriya Narayanan, M. Subramanian, and Ranjani Parthasarathi</i>	
Exploiting Web Document Structure to Improve Storage Management in Proxy Caches	89
<i>Abdolreza Abhari, Sivarama P. Dandamudi, and Shikharesh Majumdar</i>	

High Performance Multiprocessor Architecture Design Methodology
for Application-Specific Embedded Systems 102
Syed Saif Abrar

LLM: A Low Latency Messaging Infrastructure for Linux Clusters 112
R. K. Shyamasundar, Basant Rajan, Manish Prasad, and Amit Jain

Low-Power High-Performance Adaptive Computing Architectures
for Multimedia Processing 124
Rama Sangireddy, Huesung Kim, and Arun K. Somani

Keynote Address

Field Programmable Systems 137
Patrick Lysaght

Session III – Systems Software I

Chair: *Rajib Mall*

CORBA-as-Needed:
A Technique to Construct High Performance CORBA Applications 141
Hui Dai, Shivakant Mishra, and Matti A. Hiltunen

Automatic Search for Performance Problems in Parallel
and Distributed Programs by Using Multi-experiment Analysis 151
Thomas Fahringer and Clovis Seragiotto, Jr.

An Adaptive Value-Based Scheduler and Its RT-Linux Implementation 163
S. Swaminathan and G. Manimaran

Effective Selection of Partition Sizes for Moldable Scheduling
of Parallel Jobs 174
*S. Srinivasan, V. Subramani, R. Kettimuthu, P. Holenarsipur,
and P. Sadayappan*

Runtime Support for Multigrain and Multiparadigm Parallelism 184
*Panagiotis E. Hadjidoukas, Eleftherios D. Polychronopoulos,
and Theodore S. Papatheodorou*

A Fully Compliant OpenMP Implementation
on Software Distributed Shared Memory 195
Sven Karlsson, Sung-Woo Lee, and Mats Brorsson

Session IV – Networks

Chair: *Abhay Karandikar*

A Fast Connection-Time Redirection Mechanism
for Internet Application Scalability 209
Michael Haungs, Raju Pandey, Earl Barr, and J. Fritz Barnes

Algorithms for Switch-Scheduling in the Multimedia Router for LANs	219
<i>Indrani Paul, Sudhakar Yalamanchili, and Jose Duato</i>	
An Efficient Resource Sharing Scheme for Dependable Real-Time Communication in Multihop Networks	232
<i>Ranjith G and C. Siva Ram Murthy</i>	
Improving Web Server Performance by Network Aware Data Buffering and Caching	242
<i>S. Sen and Y. Narahari</i>	
WRAPS Scheduling and Its Efficient Implementation on Network Processors	252
<i>Xiaotong Zhuang and Jian Liu</i>	
Performance Comparison of Pipelined Hash Joins on Workstation Clusters	264
<i>Kenji Imasaki, Hong Nguyen, and Sivarama P. Dandamudi</i>	

Keynote Address

Computational Science and Engineering – Past, Present, and Future	279
<i>N. Radhakrishnan</i>	

Session V – Algorithms II

Chair: *Rajendra Bera*

Iterative Algorithms on Heterogeneous Network Computing: Parallel Polynomial Root Extracting	283
<i>Raphaël Couturier, Philippe Canalda, and François Spies</i>	
Efficient Tree-Based Multicast in Wormhole-Routed Networks	292
<i>Jianping Song, Zifeng Hou, and Yadong Qu</i>	
Parallel Algorithms for Identification of Basis Polygons in an Image	302
<i>Arijit Laha, Amitava Sen, and Bhabani P. Sinha</i>	
Range Image Segmentation on a Cluster	313
<i>Mary Ellen Bock and Concettina Guerra</i>	
Detection of Orthogonal Interval Relations	323
<i>Punit Chandra and Ajay D. Kshemkalyani</i>	
An Efficient Parallel Algorithm for Computing Bicompatible Elimination Ordering (BCO) of Proper Interval Graphs	334
<i>B.S. Panda and S. K. Das</i>	

Session VI – Mobile Computing and Databases

Chair: *Nalini Venkatasubramanian*

Router Handoff: An Approach for Preemptive Route Repair
in Mobile Ad Hoc Networks 347
P. Abhilash, S. Perur, and S. Iyer

A 2-D Random Walk Based Mobility Model for Location Tracking 357
Srabani Mukhopadhyaya and Krishnendu Mukhopadhyaya

Data Placement in Intermittently Available Environments 367
Yun Huang and Nalini Venkatasubramanian

RT-MuPAC: Multi-power Architecture for Voice Cellular Networks 377
K. Jayanth Kumar, B.S. Manoj, and C. Siva Ram Murthy

Asynchronous Transaction Processing for Updates by Client:
With Elimination of Wait-for State 388
Subhash Bhalla

Active File Systems for Data Mining and Multimedia 398
S.H. Srinivasan and P. Singh

Session VII – Applications

Chair: *Shahrouz Aliabadi*

Simulating DNA Computing 411
Sanjeev Baskiyar

Parallel Syntenic Alignments 420
Natsuhiko Futamura, Srinivas Aluru, and Xiaoqiu Huang

XS-systems: eXtended S-Systems and Algebraic Differential Automata
for Modeling Cellular Behavior 431
Marco Antoniotti, Alberto Policriti, Nadia Ugel, and Bud Mishra

A High Performance Scheme for EEG Compression
Using a Multichannel Model 443
D. Gopikrishna and Anamitra Makur

Scalability and Performance of Multi-threaded Algorithms
for International Fare Construction on High-Performance Machines 452
*Chandra N. Sekharan, Krishnan Saranathan, Raj Sivakumar,
and Zia Taherbhai*

Session VIII – Systems Software II

Chair: *P. Sadayappan*

A Resource Brokering Infrastructure for Computational Grids 463
Ahmed Al-Theneyan, Piyush Mehrotra, and Mohammad Zubair

On Improving Thread Migration: Safety and Performance	474
<i>Hai Jiang and Vipin Chaudhary</i>	
Improved Preprocessing Methods for Modulo Scheduling Algorithms	485
<i>D.V. Ravindra and Y.N. Srikant</i>	
Dynamic Path Profile Aided Recompile in a JAVA Just-In-Time Compiler	495
<i>R. Vinodh Kumar, B. Lakshmi Narayanan, and R. Govindarajan</i>	
Exploiting Data Value Prediction in Compiler Based Thread Formation ...	506
<i>Anasua Bhowmik and Manoj Franklin</i>	

Session IX – Scientific Computation

Chair: *R.K. Shyamasundar*

High Performance Computing of Fluid-Structure Interactions in Hydrodynamics Applications Using Unstructured Meshes with More than One Billion Elements	519
<i>S. Aliabadi, A. Johnson, J. Abedi, and B. Zellars</i>	
An Efficient and Exponentially Accurate Parallel <i>h-p</i> Spectral Element Method for Elliptic Problems on Polygonal Domains – The Dirichlet Case	534
<i>S.K. Tomar, P. Dutt, and B.V. Rathish Kumar</i>	
Fast Stable Solver for Sequentially Semi-separable Linear Systems of Equations	545
<i>S. Chandrasekaran, P. Dewilde, M. Gu, T. Pals, and A.-J. van der Veen</i>	
Dynamic Network Information Collection for Distributed Scientific Application Adaptation	555
<i>Devdatta Kulkarni and Masha Sosonkina</i>	
Adaptive Runtime Management of SAMR Applications	564
<i>Sumir Chandra, Shweta Sinha, Manish Parashar, Yeliang Zhang, Jingmei Yang, and Salim Hariri</i>	
Mobile Agents – The Right Vehicle for Distributed Sequential Computing	575
<i>Lei Pan, Lubomir F. Bic, Michael B. Dillencourt, and Ming Kin Lai</i>	

Session X – Architecture II

Chair: *Siva Ram Murthy*

Using Dataflow Based Context for Accurate Branch Prediction	587
<i>Renju Thomas and Manoj Franklin</i>	

Rehashable BTB: An Adaptive Branch Target Buffer
to Improve the Target Predictability of Java Code 597
Tao Li, Ravi Bhargava, and Lizy Kurian John

Return-Address Prediction in Speculative Multithreaded Environments ... 609
Mohamed Zahran and Manoj Franklin

HLSpower: Hybrid Statistical Modeling
of the Superscalar Power-Performance Design Space 620
Ravishankar Rao, Mark H. Oskin, and Frederic T. Chong

Efficient Decomposition Techniques for FPGAs 630
Seok-Bum Ko and Jien-Chung Lo

Keynote Address

Protocols for Bandwidth Management
in Third Generation Optical Networks 643
Imrich Chlamtac

Invited Session I – Embedded Systems

Chair: *Viktor K. Prasanna*

Memory Architectures for Embedded Systems-On-Chip 647
Preeti Ranjan Panda and Nikil D. Dutt

Structured Component Composition Frameworks
for Embedded System Design 663
Sandeep K. Shukla, Frederic Doucet, and Rajesh K. Gupta

Low Power Distributed Embedded Systems:
Dynamic Voltage Scaling and Synthesis 679
Jiong Luo and Niraj K. Jha

The Customization Landscape for Embedded Systems 693
Sudhakar Yalamanchili

Keynote Address

Parallel Computations of Electron-Molecule Collisions
in Processing Plasmas 697
B. Vincent McKoy and Carl Winstead

Invited Session II – BiocomputationChair: *Vijay Kumar*

Computing Challenges and Systems Biology	701
<i>Srikanta P. Kumar, Jordan C. Feidler, and Henrietta Kulaga</i>	
Visual Programming for Modeling and Simulation of Biomolecular Regulatory Networks	702
<i>Rajeev Alur, Calin Belta, Franjo Ivančić, Vijay Kumar, Harvey Rubin, Jonathan Schug, Oleg Sokolsky, and Jonathan Webb</i>	
Framework for Open Source Software Development for Organ Simulation in the Digital Human	713
<i>M. Cenk Cavusoglu, Tolga Goktekin, Frank Tendick, and S. Shankar Sastry</i>	
Reachability Analysis of Delta-Notch Lateral Inhibition Using Predicate Abstraction	715
<i>Inseok Hwang, Hamsa Balakrishnan, Ronojoy Ghosh, and Claire Tomlin</i>	
A Symbolic Approach to Modeling Cellular Behavior	725
<i>Bhubaneswar Mishra</i>	
Author Index	733