5th ISMM International Conference on Parallel and Distributed Computing Systems 1992

Pittsburgh, Pennsylvania, USA
1-3 October 1992

Editors:

R. Melhem

ISBN: 978-1-61839-819-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (1992) by the International Society for Computers and Their Applications
All rights reserved. Reproduction in any form without the written consent of ISCA is prohibited.

Original ISBN: 1-880843-02-1 (Out of Print)
Reprint ISBN: 978-1-61839-819-2

Printed by Curran Associates, Inc. (2012)

For permission requests, please contact the International Society for Computers and Their Applications at the address below.

International Society for Computers and Their Applications
975 Walnut Street, Suite 132
Cary, NC 27511-4216

Phone: (919) 467-5559
Fax: (919) 467-3430

isca@ipass.net

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

Fifth International Conference on Parallel and Distributed Computing and Systems

October 1-3, 1992
Greentree Marriott
Pittsburgh, Pennsylvania USA

TECHNICAL PAPER INDEX

Session I: Performance Evaluation and Optimization

Session Chair: Taieb Znati, Univ. of Pittsburgh

1. ***Time Cost Analysis of a Parallel Structure with Multi-communication Nodes in Each Branch***
   R. A. Ammar (Univ. of Connecticut), T. Hindam and N. Darwish (Cairo Univ., Egypt) ..... *page 1*

2. ***Prototyping Parallel Systems: A Performance Evaluation Approach***
   I. E. Jelly (Sheffield Hallam Univ., UK) and J. P. Gray (Univ. of Wollongong, Australia) ..... *page 7*

3. ***Hypercube Communication Performance***
   C. L. McCreary, M. E. McArdle and J. D. McCreary (Auburn University) ..... *page 13*

4. ***An Efficient Parallel Algorithm for Performance Evaluation of a Multiprocessor System***
   I. Onyuksel (Northern Illinois Univ.) ..... *page 19*

5. ***Partial Firing - A Strategy for Performance Optimization in Distributed Systems***
   V. I. Ivanov and H. S. Soliman (New Mexico Tech) ..... *page 23*

Session II: Synchronous/Systolic Computation

Session Chair: Yves Robert, Ecole Normale Nat. de Lyon

1. ***The Specification and Verification of Synchronous Concurrent Computation***
   F. Lin, T. Shih, H. Lin and H. Wang (Santa Clara Univ.) ..... *page 29*

2. ***Computing Space Functions for Designing Planar Systolic Arrays from a Sequential Loop Algorithm***
   K. Y. Yoo and S. Kim (Rensselaer Polytechnic Institute) ..... *page 35*

3. ***Fault-Tolerant Computing Structures for Systolic Arrays***
   M. O. Esonu, A. J. Al-Khalili and S. Hariri (Concordia Univ.) ..... *page 40*

4. ***Mapping 4-Dimensional Systolic Arrays onto Hypercube Networks***
   T. Al-Marzooq and F. B. Bastani (Univ. of Houston) ..... *page 46*

Session III: Distributed Operating Systems I

Session Chair: Reda Ammar, Univ.of Connecticut

1. **Characteristics of User File Usage Patterns**
   C. M. Chiang and M. W. Mutka (Michigan State Univ.) ..... page 50

2. **A Correct SQRT(N) Distributed Mutual Exclusion Algorithm**
   Y. I. Chang (National Sun Yat-Sen Univ., Taiwan) and M. Singhal (The Ohio State Univ.) ..... page 56

3. **Empirical Results on the Dynamic Behavior of a Distributed Virtual Memory System**
   M. I. Malkawi, D. L. Knox and M. Abaza (Univ. of Wisconsin-Milwaukee) ..... page 62

4. **A Decentralized Page Allocation Control for Shared Memory Multiprocessors**
   M. Sui (Amdahl Corporation) and Q. Li (Santa Clara Univ.) ..... page 68

5. **Towards an Efficient Deadlock Resolution Technique**
   S. K. Gupta, E. K. Park and Y. Yesha (Univ. of Maryland Baltimore County) ..... page 71

Session IV: Parallel Compiler Techniques

Session Chair: Rajiv Gupta, Univ. of Pittsburgh

1. **Scheduling Uniform Loop Nests**
   A. Darte and Y. Robert (Ecole Normale Superieure de Lyon) ..... page 75

2. **Scheduling Parallel Loops with Variable Iteration Execution Times on Parallel Computers**
   J. Liu, V. A. Saletore, and T. G. Lewis (Oregon State Univ.) ..... page 83

3. **Dependence Analysis & Automatic Restructuring: A Formal Study of Do Loops**
   V. Konda (nCUBE Corporation) and A. Kumar (Univ. of Louisville) ..... page 89

4. **Comparison of Scheduling Algorithms for Nested Loops on Multiprocessor Systems**
   Y. H. Chou and C. H. Tung (Univ. of Connecticut) ..... page 97

5. **The Efficient Compilation, Loading, and Execution of Mutated Programs on SIMD Computers**
   C. E. Slusher, P. A. Wilsey, D. A. Hensgen and D. Y. Hollinden (Univ. of Cincinnati) ..... page 100

Session V: Distributed Operating Systems II

Session Chair: Donald Chiarulli, Univ. of Pittsburgh

1. **State Spans: A Methodology for Determining Real Simultaneity of Event Component States**
   M. Spezialetti (Lehigh Univ.) ..... page 104

2. **Performance of Scheduling Algorithms for Multi-Server Imprecise Systems**
   W. Zhao (Texas A&M Univ.), S. Vrbsky (Univ. of Alabama) and J. Liu (Univ. of Illinois - Urbana) ..... page 111

3. **Performance Evaluation of Dynamic Scheduling Strategies for Distributed Real-Time Systems**
   H. Moiin and P. Mellia-Smith (Univ. of California - Santa Barbara) ..... page 117

4. **Designing a Multicast Facility for Real-Time and Interactive Systems**
   M. J. Teixeira, A. L. O. Filho and R. E. H.-B. de Amorim (CEPEL, Brasil) ..... page 121

5. **An Efficient Global Virtual Time Computation on the Hypercube Multiprocessor**
A. I. Concepcion (California State Univ. at San Bernardino) ..... page 124

Session VI: Task Assignment and Scheduling
Session Chair: Alois Fercha, Univ. of Vienna

1. **Coarse-Grain Partitioning of Software with Deadline Constraints for Tandem Structures**
Y. Ding and H. Sholl (Univ. of Connecticut) ..... page 127

2. **Scheduling Algorithms and Their Performance on Shared Memory Multiprocessors**
K. DiBella and K. Ramamritham (Univ. of Massachusetts), P. Chrysanthis (Univ. of Pittsburgh) and S. Raghuram (Univ. of Massachusetts) ..... page 133

3. **Load Balancing and Execution Control - An Approach to Classification**
A. Winckler (Univ. of Stuttgart, Germany) ..... page 140

4. **Processor Resource Management on a Heterogeneous Distributed System**
K. J. Danhof, M. S. Wainer and V. Prasad (Southern Illinois Univ.) ..... page 147

5. **A Decentralized Adaptive Task Assignment Protocol for Distributed Computer Systems**
S. Ramakrishnan and S. M. Srireddy (Bowling Green State Univ.) ..... page 151

Session VII: Parallel/Distributed Algorithms I
Session Chair: Tarek El-Ghazawi, George Washington Univ.

1. **A Parallel Cryptography Algorithm Using Cellular Automa**
Y. Liu (Savannah State College) ..... page 155

2. **Hough Transform on Arrays with an Optical Bus**
Y. Pan (Univ. of Dayton) ..... page 161

3. **Optimal Distributed Algorithm for Most Vital Arc in a Shortest Path**
A. Kazmerczak and S. Radhakrishnan (The Univ. of Oklahoma) ..... page 167

4. **Distributed Parallel Algorithms for Edge Coloring of Graphs**
S. H. Hosseini, B. Litow, M. Malkawi, S. Nadella and K. Vairavan (Univ. of Wisconsin - Milwaukee) ..... page 170

5. **Neural Network Computing with Distributed Connection Objects**
W. Jia and G. Libert (Faculte Polytechnique de Mons, Belgium) ..... page 173

Session VIII: Fault Tolerance I
Session Chair: H. Pham, Idaho National Engr. Lab.

1. **Byzantine General Problems That Are Not Too Weak**
Y. Zhao and F. Bastani (Unif. of Houston) ..... page 176

2. **Improved Lower Bounds on the Reliability of Hypercube Architectures**
S. Soh, S. Rai and J. Trahan (Louisiana State Univ.) ..... page 182

3. **Reliability and Cost Analysis of a Class of Software Fault Tolerant Systems**
H. Pham (Idaho National Engr. Lab.) ..... page 188

4. **Effect of Network Delays on Rollback Recovery**
A. Ranganathan, P. Dowd and S. Upadhyaya (State Univ. of New York - Buffalo) ..... page 193

5. **Using Modeling to Design Highly Reliable Software Systems**
R. Gantenbein (Univ. of Wyoming) and S. Shin (South Dakota State Univ.) ..... page 199

Session IX: Communication Networks and Protocols
Session Chair: Richard Hall, Univ. of Pittsburgh

1. **Enhancing Protocol Specifications to Include Orthogonal Functions**
P. Y. M. Chu (AT&T Bell Laboratories) ..... page 204

2. **A Congestion Management Scheme for Real Time Packet Switched Networks**
K. Danielson and T. Znati (The Univ. of Pittsburgh) ..... page 210

3. **Applying Authentication Protocols: A Cast Study of Amoeba's Software F-box Protection**
D. L. Sims, D. A. Charley and D. A. Hensgen (Univ. of Cincinnati) ..... page 216

4. **Real-Time Visual Traffic Monitoring and Automatic Incident Detection**
A. T. Ali and E. L. Dagless (Univ. of Bristol) ..... page 221

Session X: Parallel/Distributed Algorithms II
Session Chair: Gabriel Silverman, IBM Yorktown Hights

1. **Sorting with Comparison-Exchange Operations in Multistage Networks**
B. G. Douglass (Texas A&M Univ.) ..... page 224

2. **Influence of the SIMD Programming Mode on Sorting and Extracting the Roots of a Polynomial**
P. Fraigniaud and M. Gastaldo (Ecole Normale Superieure de Lyon, France) ..... page 230

3. **Counterpropagation Network for Image Data Compression: An Experiment**
W. Chang, H. S. Soliman and A. H. Sung (New Mexico Institute of Mining & Technology) ..... page 238

4. **Optical Interconnects in the 3-D Computer for Fast Parallel Sorting**
T. M. Pinkston, U. Efron and M. Campbell (Hughes Research Laboratories) ..... page 241

5. **A Comparison of Some Parallel Game-Tree Search Algorithms**
J. Rezaie and R. Finkel (Univ. of Kentucky) ..... page 244

Session XI: Reconfigurable Networks
Session Chair: Fadi Sibaii, Univ. of Akron

1. **Distributed Simulation on a Reconfigurable Network Using Non-Uniform Message Passing**
D. Charley, T. McBrayer, D. Hensgen, P. A. Wilsey and M. Ankola (Univ. of Cincinnati) ..... page 247

2. **RENNS - A Reconfigurable Computer System for Simulating Artificial Neural Network Algorithms**
O. Landsverk, J. Greipsland, J. A. Mathisen, J. G. Solheim and L. Utne
(The Norwegian Institute of Technology) ..... page 251

3. **A Simple Selection Algorithm for Reconfigurable Meshes**
S. Olariu, J. L. Schwing, W. Shen, L. Wilson and J. Zhang (Old Dominion Univ.) ..... page 257

4. **Running ASCEND, DESCEND & FAN-IN Algorithms on a Reconfigurable Multibus Network**
A. Ali (Avance Logic Corporation) and R. Vaidyanathan (Louisiana State Univ.) ..... page 262

Session XII: Distributed Programming Models
Session Chair: Adel Elmaghrabi, Software Engr. Institute

1. **High-Level Statecharts and Distributed Computing**
D. B. Mulcare (SAIC) ..... page 268

2. **Encapsulation Parallel Objects in CSP: A Model and Proof System**
W. Jia and G. Libert (Faculte Polytechnique de Mons, France) ..... page 274

3. **A Structured Distributed-Programming Paradigm**
R. C. Salley (American Univ. in Bulgaria) ..... page 280

4. **The Denotational Semantics of the Distributed Language Model MDC**
M. H. Wang (Zycad Corporation) and T. W. Christopher (Illinois Institute of Techcnology) ..... page 285

5. **A Distributed Software Development Environment Based on the Virtual Machine Integration Technique**
J. M. Lin and S. R. Tsai (National Cheng-Kung University),
and L. M. Tseng (National Central Univ., Taiwan) ..... page 288

Session XIII: Invited Session (Distributed Supercomputing)
Session Chair: Ralph Roskies, Pittsburgh Supercomputing Center

1. **Experiences with The Cray Research MMP Programming Model**
R. Kent Koeninger and Kevin Ling (Cray Research) ..... page *

2. **Distributed Metacomputing with PVM**
Peter A. Rigsbee (Cray Research) ..... page *

3. **Distributed File Systems in a Supercomputing Environment**
Chris Maher (Pittsburgh Supercomputing Center) ..... page *

4. **National Storage Laboratory: A Collaborative Research Project**
Fred McLain (General Atomic Discos Division)
Robert Coyne (IBM Federal Systems Company)
Harry Hulen (IBM Federal Systems Company)
Richard Watson (Lawrence Livermore Laboratories) ..... page *

Session XIV: Work in Progress
Session Chair: Susanna Donatelly, Universita di Torino, Italy

1. **Automation of Complex Systems with Petri Net Technique**
F. Fadul (The Pennsylvania State Univ. - Erie) ..... page 291

2. **Effectiveness of Join Processing Techniques on Parallel and Distributed Architectures**
E. Kwatny (Temple Univ.) and Z. S. Khan (Bloomsburg Univ.) ..... page 292

3. ***Simulation of a Partitionable-Bus Shared Memory Multiprocessor System***
T. Ramesh and T. C. Lee (Saginaw Valley State Univ.), and S. Ganesan (Oakland Univ.) ..... *page 293*

4. ***A Nearest-First (NF) Router for Hypercube Interconnection Networks***
C. A. Bergman (State Univ. of New York - Binghamton) ..... *page 294*

5. ***A Reconfigurable FIFO Based Interprocessor Communication System***
M. S. Nikuie and J. M. Jagadeesh (Ohio State Univ.) ..... *page 295*

6. ***Parallel Programming Environments for High Performance Computing Systems***
T. Rus and R. Marciano (The Univ. of Iowa) ..... *page 296*

7. ***Programming Primitives for MIMD Computing***
A. Hoppe (Louisiana State Univ.) ..... *page 297*

8. ***Performance Comparisons of Diagonal Mesh and Toroidal Mesh Networks***
K. W. Tang and S. A. Padubidri (State Univ. of New York - Stony Brook) ..... *page 298*

Session XV: Parallel Scientific Computing

Session Chair: Yi Pan, Univ. of Dayton

1. ***Parallel Finite Element Methods***
W. Layton, P. Rabier, J. Baubach, and A. Sunmonu (Univ. of Pittsburgh) ..... *page 299*

2. ***R3IT: Supercomputing Efficiency for a 3-D Dual Variable Fluids Solver***
M. Raymund (Univ. of Pittsburgh) ..... *page 305*

3. ***Enhancements to a Heterogeneous Supercomputing Environment***
J. Mahdavi, G. L. Huntoon and M. Mathis (Pittsburgh Supercomputing Center) ..... *page 308*

4. ***Parallel Local Bisection Refinement for N-Dimensional Simplicial Grids***
J. M. Maubach (Univ. of Pittsburgh) ..... *page 310*

5. ***A Versatile Algorithm for Linear System Problems Using Adaptive Pivoting***
J. I. Khan, W. Lin and D. Y. Y. Yun (Univ. of Hawaii at Manoa) ..... *page 313*

Session XVI: Application Specification Systems

Session Chair: Steven Levitan, Univ. of Pittsburgh

1. ***Using Replicated Basic Data for Load Balancing in Parallel Database Systems***
R. J. Richter and D. P. Mallon, Der Universitat Karlsruhe (TH), Germany) ..... *page 316*

2. ***An Efficient Dictionary Machine Using Hexagonal Processor Arrays***
J. Y. Lee, H. Y. Youn and V. K. Raj (The Univ. of Texas at Arlington) ..... *page 322*

3. ***A Parallel Approach to Long Integer Register Oriented Arithmetic***
R. Posch (Graz Univ. of Technology, Austria) ..... *page 328*

4. ***A Parallel Approach to VLSI Standard Cell Placement***
E. I. Horvath (Florida Atlantic Univ.) ..... *page 331*

Session XVII: Potpouri

Session Chair: Debra Hensgen, Univ. of Cincinnati

1. **An Efficient Parallel Simulated Annealing Strategy for Graph Partitioning**
   W. K. Lee, K. A. Hua and S. D. Lang (Univ. of Central Florida) ..... page 335

2. **Debugging Tools for a Multi-Processor System Under Development**
   E. Barria, J. M. Jagadeesh and D. Jayasimha (Ohio State Univ.) ..... page 341

3. **Partitioning in Token-Driven Simulation**
   K. M. Ku and P. P. K. Chiu (Hong Kong Polytechnic) ..... page 345

4. **Optimizing Fortran Loops for RISC-based Parallel Processing Systems**
   G. Jin and F. Chen (Changsha Inst. of Technology, China) ..... page 349

5. **Systolic Generation of Combinations from Arbitrary Elements**
   Hassanelhage and I. Stojmenovic (Univ. of Ottawa) ..... page 352

Session XVIII: Interconnection Networks

Session Chair: M. Sultan Alam, AT&T Laboratories

1. **A Simulation-Based Analysis of the Connectivity of Fault-Tolerant Networks Under Faults**
   N. K. Sharma, A. A. Abonamah and F. N. Sibai (The Univ. of Akron) ..... page 355

2. **Design of Scalable Electrooptical and Optical Interconnection Networks**
   A. Guha and J. Bristow (Honeywell Sensor & Systems Development Center) ..... page 361

3. **A Scheme to Improve Fault-Tolerant Capabilities of Multistage Interconnection Networks**
   I. Mahgoub and C. Huang (Florida Atlantic Univ.) ..... page 367

4. **Hypercube is Better Than De Bruijn for Connectionist**
   T. Ae, S. Fujita, T. Yamanaka and R. Aibara (Hiroshima Univ.) ..... page 370

5. **Contention-Free Simulations of Cylindrical Networks**
   A. Dingle and H. Barada (Lehigh Univ.) ..... page 373

Session XIX: Fault Tolerance II

Session Chair: Shambhu Upadhyyaya, SUNY at Buffalo

1. **Reconfigurable Multipipelines with Minimum Interprocessor Delay**
   R. Libeskind-Hadas and C. L. Liu (Univ. of Illinois at Urbana) ..... page 377

2. **A Fault-Tolerant Array Processor Architecture**
   P. M. Melliar-Smith, L. E. Moser, A. Das and C. Ye (Univ. of California - Santa Barbara) ..... page 382

3. **Error Detection and Recovery in Fault-Tolerant Processor Systems Using Caches**
   C. H. Chen and A. K. Somani (Univ. of Washington - Seattle) ..... page 388

4. **A Parallel Fault-Detection Scheme for Matrix Inversion**
   W. Lin (Univ.of Hawaii at Manoa), T. L. Sheu (IBM), and J. Khan (Bangladesh Univ.) ..... page 394