

# **6th ISCA International Conference on Parallel and Distributed Computing Systems 1993**

**Louisville, Kentucky, USA  
14-16 October 1993**

**Editors:**

**A. Kumar**

**K. Kamel**

**ISBN: 978-1-61839-822-2**

**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© (1993) 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: 1-880843-06-4 (Out of Print)  
Reprint ISBN: 978-1-61839-822-2

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](mailto: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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# INTERNATIONAL SOCIETY FOR COMPUTERS AND THEIR APPLICATIONS

Sixth International Conference on  
Parallel and Distributed Computing Systems  
Louisville, Kentucky USA    October 14-16, 1993

## TECHNICAL PAPER INDEX

### **Session I: Distributed Systems I**

1. **Performance Modelling of Adaptive Routing Strategies for Locally Distributed Systems**  
S. Dandamudi (Carleton University) ..... 1
2. **Scheduling Process and File Migrations in a Distributed System**  
W. Klostermeyer (West Virginia University) ..... 9
3. **Symmetric Deadlock-free Routing in 3-D Binary Cubes**  
Q. Li (Santa Clara University) ..... 14

### **Session II: Interconnect Networks**

1. **Broadcasting in Banyan-Hypercubes and Cross-Cubes**  
A. Bellaachia (Qatar University) and A. Youssef (The George Washington University) ..... 18
2. **A Simple Fault-Tolerance Technique for Interconnection Networks**  
H. Nassar (University of Suez) and J. D. Carpinelli (New Jersey Inst. of Technology) ..... 25
3. **Conflict Resolution in the C2SC Interconnection Network**  
A. Abonamah, F. Sibai (University of Akron) and N. Sharma (LaTrobe University) ..... 31

### **Session III: Fault Tolerance**

1. **Functional Programming for Fault-Tolerance in Parallel Computing Systems**  
D. R. Avresky and J. Arlat (LAAS-CNRS) ..... 38
2. **Simple and Fast Algorithms for System Level Fault Diagnosis**  
S. H. Hosseini and R. R. Prasad (Univ. of Wisconsin - Milwaukee) ..... 46
3. **Analysis and Randomized Design of Algorithm-Biased Fault Tolerant Multiprocessor Systems under the Extended Graph-Theoretic Model**  
S. Yajnik and N. K. Jha (Princeton University) ..... 52

## **Session IV: Distributed Systems II**

<b>1. A Dynamic-tree Based Distributed Mutual Exclusion Algorithm Incorporating the 'Least Recently Used' Fairness Criterion</b> R. Satyanarayanan and C. R. Muthukrishnan .....	58
<b>2. A Self-Stabilizing Deadlock Prevention Algorithm</b> M. Flatebo and A. K. Datta (University of Nevada, Las Vegas) .....	64
<b>3. Specification and Analysis of Distributed Systems</b> A. I. Concepcion (California State University) .....	70

## **Session V: Potpourri I**

<b>1. CORE: A Solution to the Inheritance Anomaly in Concurrent Object-Oriented Languages</b> S. Kumar and D. P. Agrawal (North Carolina State University) .....	75
<b>2. Load Balancing with Server Breakdowns and Repairs</b> C. Evequoz (Ecole Polytechnique de Montreal) .....	82
<b>3. Performance of Distributed Applications Under Dynamic Load Sharing</b> S. A. Banawan (University of Houston) .....	87
<b>4. Neighbor Scheduling of Statically Allocated Parallel Programs</b> L. Lundberg (Lund University) .....	92

## **Session VI: Communication Network**

<b>1. On the Behavior of Synchronous Networks in the Presence of Real-Time Constraints</b> P. Raja, K. Vijayananda, L. Ruiz, J. Hernandez, J. Decotignie (Swiss Federal Inst. of Technology) .....	97
<b>2. An ATM Based Hypercube Distributed System</b> B. Lu and S. Hariri (Syracuse University) .....	106
<b>3. The Colored STMT Net: An Analysis Model for Parallel Systems</b> T. Takemoto, T. Kimura (Toshiba Corporation), O. Yamamoto, H. Amano (Keio University) .....	112
<b>4. Alternate Algorithms for Leader Election on Reliable and Unreliable Complete Networks</b> S. P. Kanchi and J. L. Kim (Texas A & M University) .....	118

## **Session VII: Parallel Systems**

<b>1. All-to-All Broadcasting in Wormhole-Routed Hypercube Multicomputers with Link Faults</b> S. Park (Oregon State University) .....	122
<b>2. Partitioning of Arrays for High Performance</b> J. Liu, V. A. Saletore and Y. B. Lam (Oregon State University) .....	128
<b>3. Generalization of the Looping Algorithm</b> A. Abdennadher (The Pennsylvania State University) .....	132
<b>4. Analysis of Dedicated Hardware Interconnection for Parallel Systems</b> D. M. Goodeve and A. M. Tyrrell (University of York) .....	137

### **Session VIII: Task Allocation I**

<b>1. Subcube Allocation Strategies in a K-ary N-Cube</b> V. Gautam and V. Chaudhary (Wayne State University) .....	141
<b>2. Processor Allocation Using a Reservation Technique in Hypercube Computers</b> C. Yu, P. Mohapatra, and C. R. Das (The Pennsylvania State University) .....	147
<b>3. An Optimal Software Pipelining Scheduling Algorithm</b> C. Gong and C. Lee (University of Pittsburgh) .....	153
<b>4. Mapping General Trees and Graphs into the Hypercube</b> W. W. White (University of North Dakota) .....	157

### **Session IX: Application Specific Systems**

<b>1. A Transputer-based PROFIBUS-Implementation for Hard-Real-Time Requirements in Distributed Industrial Control</b> E. Brenner and R. Weiss (Graz University of Technology) .....	162
<b>2. Performance Measurement of Hypercube Processors for Vision Applications</b> M. Celenk (Ohio University) .....	167
<b>3. Constant Time Algorithms for Computational Geometry Problems on a Reconfigurable Mesh</b> M.-J. Sheng and T.-H. Lai (The Ohio State University) .....	173
<b>4. On Finding Medial Curves of Digital Images</b> Z. Guo (Louisiana Tech University) .....	177

### **Session X: Architecture**

<b>1. An Evaluation of SLID and its Related Cache Coherence Schemes</b> G. Chen (New York University) .....	181
<b>2. A Modified and Parallelized Viterbi Algorithm on Hypercube Machines for Seeking a Set of Best State Sequences</b> C. Tao and M.-Y. Wu (SUNY at Buffalo) .....	188
<b>3. Performance Analysis of a Class of Fault-Tolerant Multistage Interconnection Networks</b> C.-J. Huang and I. Mahgoub (Florida Atlantic University) .....	194
<b>4. Estimates of Effective Memory Bandwidth for Crossbar Multiprocessor Systems by Decomposition</b> Y.-C. Liu (University of Texas - El Paso) and S.-W. Chao .....	199

## **Session XI : Task Allocation II**

1. **Optimal Data Assignment in a Distributed Environment to Minimize the Communication Time**  
H. A. Sholl (Univ. of Connecticut), S. Garg (Univ. of Delaware) and R. A. Ammar (Univ. of Connecticut) ..... 204
2. **Comparing the Efficiency of Various Genetic Algorithms for Task Scheduling**  
N. Adar and H. Barada (Lehigh University) ..... 210
3. **A New Task Mapping Model Supporting Partitioning and Merging of Tasks**  
J. C. Jacob and S.-Y. Lee (Cornell University) ..... 216

## **Session XII: Parallel and Distributed Algorithms**

1. **A New Parallel Approximation Algorithm for Solving the Steiner Minimal Tree in Graphs**  
K. Makki (Univ. of Nevada - Las Vegas) ..... 222
2. **Domain Dependent Evaluation of Cayley Graph Topologies**  
M. Hitz and T. A. Mueck (University of Vienna) ..... 228
3. **Fast Distributed Algorithms for Disjoint Paths and Connectivity**  
A. Kazmierczak and R. Sridhar (University of Oklahoma) ..... 236

## **Session XIII: Distributed Algorithms I**

1. **Improving the Speed of a Distributed Checkpointing Algorithm**  
S. Garg and K. F. Wong (Washington University) ..... 242
2. **Bounding Logical Clocks in Distributed Systems**  
A. Gahlot and M. Singhal (The Ohio State University) ..... 250
3. **The N-Body Problem: Distributed System Load Balancing and Performance Evaluation**  
M. Franklin and V. Govindan (Washington University) ..... 256
4. **A Distributed Algorithm for Finding a Fault-Free Cycle in a De Bruijn Network**  
R. Rowley and B. Bose (Oregon State University) ..... 263

## **Session XIV: Distributed Database System**

1. **Intelligent Environment Design for Schema Integration in Object-Oriented Heterogeneous Guru DDBMS**  
G. Varma, R. Joshi, I. Singh (University of Roorkee) ..... 267
2. **An Optimistic Concurrency Control Algorithm in Real-Time Database Systems**  
C.-M. Chen and S. K. Tripathi (University of Maryland) ..... 275
3. **Parallelizing Probabilistic Inference in Belief Networks**  
Z. Li and B. D'Ambrosio (Oregon State University) ..... 281

### **Session XV: Task Allocation III**

1. **Static Scheduling Using Linear Clustering with Task Duplication**  
H. B. Chen, B. Shirazi, K. Kavi (Univ. of Texas-Arlington) and A. R. Hurson (Pennsylvania State Univ.) ..... 285
2. **Parallel Execution of Declarative Programs Using Template Matching and Heterogeneous Scheduling Strategies**  
X. Tian, D. Wang, W. Zheng and M. Shen (Tsinghua Univ.) ..... 291
3. **Efficient Execution of Multiple Groups of Parallel Processes within a Parallel Structure by a Limited Number of Processors**  
R. A. Ammar, M. R. Dardashti (University of Connecticut), and T. Fergany (Univ. of New Haven) ..... 297

### **Session XVI: Distributed Algorithms II**

1. **Name Boarders: An Architecture for Heterogeneous Naming Systems**  
A. Shaheen and L. Loucks (IBM Corporation) ..... 303
2. **Parallel Algorithms for Solving Fractal Equations**  
Y. Liu (Savannah State College) ..... 312
3. **A Distributed Convex Hull Algorithm**  
S.-N. Yang (National Tsing Hua University) and M.-S. Cheng (Industrial Technology Research Institute) ..... 318
4. **A Synchronized Dynamic Load Balancing Method for Multiprocessor Task Scheduling**  
M.-F. Wang (University of Central Arkansas) ..... 322

### **Session XVII : Parallel Compiler Techniques I**

1. **An Exact Dependence Test for Restructuring Nested Loops for Parallel Execution**  
R. K. Ghosh (IIT-Kanpur), H. R. Sudheer (Bharat Electronics Ltd.) and P. Gupta (IIT-Kanpur) ..... 326
2. **Compiler Algorithms for Minimal Reordering of the Statements in DO Loops**  
V. Konda (nCUBE) and A. Kumar (University of Louisville) ..... 332
3. **Minimum Completion Time Reordering for Parallel Sparse Submatrix-Cholesky Factorization**  
W.-Y. Lin and C.-L. Chen (National Taiwan University) ..... 339

### **Session XVIII: Neural Networks**

1. **Handwritten Numeral Recognition Using Syntactic-Semantic Recognition Methods and Neural Network**  
X. Cheng, K. A. Kamel and A. Desoky (University of Louisville) ..... 344
2. **Data Mapping for Neural Network Error Back-Propagation Training on MasPar**  
B. Liu, M. J. Cassaro, D. J. Chang and R. Ragade (University of Louisville) ..... 350
3. **Preserving Auditory Perception by Natural Clustering**  
W. Chang, H. S. Soliman and A. H. Sung (New Mexico Inst. of Mining and Technology) ..... 357

## **Session XIX: Routing**

1. **Algorithms for Broadcasting in Faulty Hypercubes**  
S. Park, B. Bose and B. Broeg (Oregon State University) ..... 361
2. **Diameter and Routing on Semi-direct Product Graphs**  
R. N. Draper (Supercomputing Research Center) ..... 367
3. **Analysis of Reliable Multicast for Hypercubes**  
S. Lee and Y. J. Nam (Pohang Institute of Science and Technology) ..... 375

## **Session XX: Parallel Compiler Techniques II**

1. **Mapping For-Loop Algorithms into Grid-Connected Systolic Arrays**  
P.-Z. Lee and C.-F. Chen (Academia Sinica) ..... 381
2. **Combining Different Loop Scheduling Schemes Under Faulty Processors**  
J. Liu, J. Marsaglia (Western State College), B. Broeg and V. A. Saletore (Oregon State University) ..... 387
3. **On Exploiting Parallelism through Synchronization Fusion**  
C. Tung and Q. Gan (The University of Connecticut) ..... 393

## **Session XXI: Neural Network and Genetic Algorithm**

1. **Training a Neural Network into a Turing Machine**  
L. Wang, H. D. Cheng and D. H. Cooley (Utah State University) ..... 399
2. **Genetic Algorithms: Some Applications to Electric Power Systems**  
A. Chandramouli, R. K. Ghosh, P. Kalra, S. Srivastava, and D. K. Mishra  
(Indian Institute of Technology) ..... 405
3. **Time Enhancement in Training Neural Networks**  
F. Vijai M. N. and T. K. E. Alvager (Indiana State University) ..... 411

## **Session XXII: Performance Evaluation**

1. **Performance of an Asynchronous Packet-Switched Generalized Bus Multiprocessor System**  
S. A. Alles and S. M. Mahmud (Wayne State University) ..... 415
2. **Performance Analysis of Parallel Computations**  
R. Katti (North Dakota State University) ..... 421
3. **Intrusion Compensation for Performance Evaluation of Parallel Programs on a Multicomputer**  
J. C. Yan (NASA Ames Research Center) and S. Listgarten (Stanford University) ..... 427



**Session XXIII: Potpourri II**

<b>1. Modified Odd-Even Sorting Network for High Performance</b> H. Y. Youn, K. O. Lee and V. K. Raj (The University of Texas at Arlington) .....	432
<b>2. Algebraic Techniques for the Reconstruction of a Correct File Copy</b> A. Abdennadher and J. J. Metzner (The Pennsylvania State University) .....	438
<b>3. Low Cost Complexity of k-bits Bitonic Sorting Network</b> M. Z. Al-Hajery and K. E. Batcher (Kent State University) .....	443
<b>4. Tolerating Link Failures Using Sense of Direction</b> G. Singh (Kansas State University) .....	448

**Session XXIV: Synchronous and Systolic Computation**

<b>1. Multiple Simultaneous Entries to a Critical Section in Distributed Systems</b> N. S. Dement (AT&T) and P. K. Srimani (Colorado State University) .....	452
<b>2. Pipelining and Full Parallelism for Long Integer Arithmetic in Encryption Devices</b> R. Posch (Institute for Applied Information Processing) .....	458
<b>3. Generalized Systolic Priority Queue</b> S. A. Fedyschyn (Lehigh University) .....	463