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Foreword

It gives us great pleasure to introduce this collection of papers to be presented at the 2011 International Conference on Foundations of Computer Science (FCS’11), July 18 through 21, 2011, at Monte Carlo Resort, Las Vegas, USA.

The Academic Co-Sponsors of this year’s conference include:
The Berkeley Initiative in Soft Computing (BISC), University of California, Berkeley, USA; Biomedical Cybernetics Laboratory, HST of Harvard University and Massachusetts Institute of Technology (MIT), USA; Intelligent Data Exploration and Analysis Laboratory, University of Texas at Austin, Austin, Texas, USA; Collaboratory for Advanced Computing and Simulations (CACS), University of Southern California, USA; Minnesota Supercomputing Institute, University of Minnesota, USA; Knowledge Management & Intelligent System Center (KMIS) of University of Siegen, Germany; UMIT, Institute of Bioinformatics and Translational Research, Austria; BioMedical Informatics & Bio-Imaging Laboratory, Georgia Institute of Technology and Emory University, Atlanta, Georgia, USA; Hawkeye Radiology Informatics, Department of Radiology, College of Medicine, University of Iowa, Iowa, USA; NDSU-CIIT Green Computing and Communications Laboratory, USA; Supercomputer Software Department (SSD), Institute of Computational Mathematics & Mathematical Geophysics, Russian Academy of Sciences, Russia; SECLAB (inter-university research groups at University of Naples Federico II, the University of Naples Parthenope, and Second University of Naples, Italy); Medical Image HPC & Informatics Lab (MiHi Lab), University of Iowa, Iowa, USA; Intelligent Cyberspace Engineering Lab., ICEL, Texas A&M University (Com./Texas), USA; and Model-Based Engineering Laboratory, University of North Dakota, North Dakota, USA.

Corporate Co-Sponsors, Co-Sponsors At-Large and Organizers include:
A number of university faculty members and their staff (names appear below and also on the cover of the proceedings); World Academy of Science (www.world-academy-of-science.org); Computer Science Research, Education, and Applications Press; High Performance Computing for Nanotechnology (HPCNano); International Society of Intelligent Biological Medicine; World Academy of Biomedical Sciences and Technologies; The International Council on Medical and Care Compunetics; The UK Department for Business, Enterprise & Regulatory Reform, UK; Scientific Technologies Corporation; and HoIP - Health without Boundaries. Microsoft Research and a number of other corporations sponsored specific tracks of WORLDCOMP’11. In addition, several publishers of computer science and computer engineering books and journals, chapters and/or task forces of computer science associations/organizations from 8 countries, and developers of high-performance machines and systems provided significant help in organizing the conference as well as providing some resources.

An important mission of WORLDCOMP (a federated congress to which this conference is affiliated with) includes "Providing a unique platform for a diverse community of constituents composed of scholars, researchers, developers, educators, and practitioners. The Congress makes concerted effort to reach out to participants affiliated with diverse entities (such as: universities, institutions, corporations, government agencies, and research centers/labs) from all over the world. The congress also attempts to connect participants from institutions that have teaching as their main mission with those who are affiliated with institutions that have research as their main mission. The congress uses a quota system to achieve its institution and geography diversity objectives."

The program committee would like to thank all those who submitted papers for consideration. About 50% of the submissions were from outside the United States. Each paper was peer-reviewed by two experts in the field for originality, significance, clarity, impact, and soundness. In cases of contradictory recommendations, a member of the conference program committee was charged to make the final decision; often, this involved seeking help from additional referees by using a double-blinded review process. In addition, papers whose authors included a member of the conference program committee were evaluated using the double-blinded review process. The only exception to the above evaluation process was for papers that were submitted directly to chairs/organizers of approved sessions/workshops; in these cases, the chairs/organizers were responsible for the evaluation of such submissions. The overall paper acceptance rate for regular papers was 22%; 17% of the remaining papers were accepted as poster papers.
We are very grateful to the many colleagues who helped in organizing the conference. In particular, we would like to thank the members of the FCS’11 Program Committee who we hope will offer their help again in organizing the next year's conference (FCS’12). The FCS’11 Program Committee members were:

- Dr. Selim Aissi, (Steering Committee - WORLDCOMP), Chief Strategist - Security, Manageability and Virtualization, Ultra Mobile Group, Intel Corporation, USA
- Prof. Hamid R. Arabnia, (Steering Committee - WORLDCOMP), Elected Fellow, ISIBM; Editor-in-Chief, The Journal of Supercomputing; Advisory Board, IEEE TC on Scalable Computing; University of Georgia, Georgia, USA
- Prof. Ruzena Bajcsy (Steering Committee - WORLDCOMP), Member, National Academy of Engineering; IEEE Fellow; ACM Fellow; University of California, Berkeley, California, USA
- Prof. H-P. Bischof, Rochester Institute of Technology, Rochester, New York, USA
- Dr. Junaied Chaudhry, University of Hail, Hail City, Saudi Arabia
- Dr. Long Chen, Senior Engineer, Qualcomm Incorporated, San Diego, California, USA
- Prof. Hyunseung Choo, (Steering Committee - WORLDCOMP), ITRC Director of Ministry of Information and Communication; Director, Korea Information Processing Society; Associate Editor, ACM Transactions on Internet Technology; Sungkyunkwan University (SKKU), Korea
- Prof. Ping-Tsai Chung, Chair, Computer Science Department, Long Island University, Brooklyn, New York, USA
- Prof. Youping Deng, Director of Cancer Bioinformatics, Rush University Cancer Center, Rush University Medical Center, Chicago, Illinois, USA
- Prof. George Dimitoglou, Hood College, Frederick, Maryland, USA
- Dr. Mohsen Dorooodchi, Cardinal Stritch University, Milwaukee, Wisconsin, USA
- Prof. (Winston) Wai-Chi Fang, (Steering Committee - WORLDCOMP), IEEE Fellow; Director, System-on-Chip Research Center; National Chiao Tung University, Hsinchu, Taiwan
- Dr. Haishan Gong, eBay Inc., Sunnyvale, California, USA
- Prof. George A. Gravvanis, (Vice Chair, FCS’11), Democritus University of Thrace, Greece
- Dr. Dongfeng Han, University of Iowa, Iowa City, Iowa, USA
- Prof. Xiangjian (Sean) He, Director of Intelligent Image Processing & Computer Vision; Deputy Director of Research Centre for Innovation in IT Services and Applications (iNEXT); University of Technology, Sydney, Australia
- Dr. Vitus S. W. Lam, The University of Hong Kong, Hong Kong
- Prof. Kun Chang Lee, (Steering Committee - WORLDCOMP), Professor of MIS and WCU Professor of Creativity Science, Sungkyunkwan University, Seoul, South Korea
- Dr. Shaoshan Liu, Microsoft, one Microsoft Way, Redmond, Washington, USA
- Prof. Andy Marsh, (Steering Committee - WORLDCOMP), Director HoIP; Director HoIP Telecom, UK; Secretary-General WABT; Vice-president ICET; Visiting Professor University of Westminster, UK
- Dr. Armin Mehran, Islamic Azad University, Tehran, Iran
- Dr. Nitin, Distinguished Adjunct Professor, University of Nebraska at Omaha, Omaha, Nebraska, USA
- Prof. Yongyuth Permpoontanalarp, King Mongut's University of Technology Thonburi, Bangkok, Thailand
- Dr. R. Ponalagusamy, Professor and Head, Department of Mathematics, National Institute of Technology, Tiruchirappalli, India
- Prof. Junfeng Qu, Clayton State University, Morrow, Georgia, USA
- Prof. Kishore R. Sakarharkar, Professor, Infectious Disease Cluster, Advanced Medical & Dental Institute (AMDI), University Sains Malaysia, Malaysia
- Dr. Akash Singh, IBM, Sacramento, California, USA
- Dr. Brajesh Kumar Singh, Reader, Department of C.S.E, FET, RBS College, Bichpuri, India
- Prof. R. K. Singh, Uttarakhand Technical University, Dehradun, Uttarakhand, India
- Sunil K. Singh, Uttarakhand Technical University, Dehradun, Uttarakhand, India
- Ashu M. G. Solo, (WORLDCOMP Publicity Chair), Fellow of British Computer Society, Principal/R&D Engineer, Maverick Technologies America Inc.
- Prof. K. Subraman, West Virginia University, Morgantown, West Virginia, USA
- Dr. Jie Tang, University of California Irvine, California, USA
- Prof. Dr. Qurat-ul-Ain Tariq, Chairperson, Department of Computer and Information Systems Engineering, NED University of Engineering & Technology, Karachi, Pakistan
- Dr. Vladimir Volkov, The Bonch-Bruevich State University of Telecommunications, Saint-Petersburg, Russia
We express our gratitude to keynote and invited speakers of WORLDCOMP and individual conference/tracks and tutorial speakers - the list of speakers appears on the conference web site.

We would also like to thank the followings: UCMSS (Universal Conference Management Systems & Support, California, USA) for managing all aspects of the conference; Dr. Tim Field of APC for managing the printing of the proceedings; and the staff of Monte Carlo Resort in Las Vegas for the professional service they provided. Last but not least, we would like to thank the Co-editors of FCS’11, Drs. George A. Gravvanis and Ashu M. G. Solo.

We present the proceedings of FCS’11.

Hamid R. Arabnia
General Chair & Coordinator, FCS’11
Contents

**SESSION: NOVEL ALGORITHMS AND APPLICATIONS + METHODOLOGIES**

Optimization of Out-of-core Data Preparation Methods Identifying Runtime Determining Factors  
*Tamas Schradi, Akos Dudas, Sandor Juhasz*

Effect of Cache Lines in Array-Based Hashing Algorithms  
*Akos Dudas, Sandor Kolumban, Tamas Schradi*

Performance and Quality of Random Number Generators  
*Victor Du Preez, Mitchell Johnson, Arno Leist, Ken Hawick*

Crafting a Lightweight Search Engine  
*Feng-Jen Yang*

A 4 out of n Secret Sharing Scheme in Visual Cryptography without Expansion  
*Ying-Yu Chen, Justie Su-Tzu Juan*

Presenting the Test Cell Algorithm for Solving Sudoku Puzzles  
*Tom Kigezi*

Three Heuristic Algorithms for Generation of Random Polygons by a Given Set of Vertices  
*Ali Nourollah, Laya Mohammadi*

Minimum Pseudo-Triangulation Using Convex Hull Layers  
*Fahimeh Taherkhani, Ali Nourollah*

Generating Sunflower Random Polygons on a Set of Vertices  
*Laya Mohammadi, Ali Nourollah*

The Generation of Pseudo-Triangulated Spiral Polygon Using Convex Hull Layers  
*Fahimeh Taherkhani, Ali Nourollah*

Dynamic LZW for Compressing Large Files  
*Chung-E Wang*

**SESSION: THEORY + PROOF + VERIFICATION METHODS + INTERESTING RESULTS**

Formal Verification of DES Using the Mizar Proof Checker  
*Hiroyuki Okazaki, Kenichi Arai, Yasunari Shidama*
Reasoning about Hybrid States
Angel Rivera

An Automated Deduction of Two Alternate Axiomatic Bases for Lukasiewicz's Sentential Calculus
Jack Horner

An Automated Derivation of Lukasiewicz's CN from the Sentential Calculus of Principia Mathematica
Jack Horner

An Automated Derivation of the Sentential Calculus of Principia Mathematica from Lukasiewicz's CN
Jack Horner

SESSION: GRAPH BASED METHODS AND RELATED ISSUES

Graph Representation of Hierarchical Alvis Model Structure
Leszek Kotulski, Marcin Szpyrka

Inapproximability of Maximum r-Regular Induced Connected Subgraph Problems
Yuichi Asahiro, Hiroshi Eto, Eiji Miyano

Formal Specification of Semantics of UML 2.0 Activity Diagrams by Using Graph Transformation Systems
Somayeh Azizi, Vahid Panahi

SESSION: PROGRAMMING ISSUES AND TOOLS + OS + CONCURRENCY + MODEL CHECKING

Towards a Multi-Formalism Model Checker Based on SDES Description
Behrang Mehrparvar, Mohammad Abdollahi Azgomi

A Higher-Order Computational Model for Cooperative Constraint Programming
Rafael del Vado Virseda, Fernando Perez Morente

On Compilation of Higher-Order Concurrent Programs into First Order Programs Preserving Scope Equivalence
Masaki Murakami

Adding Autonomy into Object
Jamil Ahmed, Sheng Yu
Type Disjointness in the Language of Effective Definitions
Jarred Blount, J. Nelson Rushton

Performance Evaluation of the EXT4 File System A Comparative Study Against EXT3, ReiserFS and JFS
Alireza Ghobadi, Amir Hesam Yaribakht, Sanam Maham, Mohammad Hossein Ghods

SESSION: QUANTUM COMPUTING + AUTOMATA

On the Power of Distributed Bottom-up Tree Automata
Kamala Krithivasan, Ajeesh Ramanujan

Quantum Algorithm for Decomposing Black-Box Finite Abelian Groups
Yong Zhang

Tree Insertion Systems
Kamala Krithivasan, Sunil K. Sukumaran

Avalanche in States; Combination of Sanpile and Cellular Automata for Generate Random Numbers
Seyed Morteza Hosseini, Hossein Karimi, Majid Vafaie Jahan

The Role of Orthomodularity in the Marsden-Herman Theorem in Quantum Logic
Jack Horner

Requiring Multiplicity for Nondeterministic Automata
Jeffrey Holcomb

An Automated Deduction of the Gudder-Schelp-Beran Theorem from Ortholattice Theory
Jack Horner

SESSION: NOVEL ALGORITHMS + DNA BASED COMPUTING + GAME THEORY + TURING MACHINES

Molecular Solutions for the Maximum K-Facility Dispersion Problem on DNA-based Supercomputing
Nozar Safaei, Babak Dalvand, Saeed Safaei, Vahid Safaei

An Inclusion-Exclusion Algorithm for the k-tour Problem
Haseeb Baluch, Andrzej Lingas

Sub-Exponential Algorithms for 0/1 Knapsack and Bin Packing
Thomas O'Neil
On the Computing Power of Statecharts
Hanlin Lu, Sheng Yu

Playing Challenging Iterated Two-Person Games Well: A Case Study on the Iterated Traveler’s Dilemma
Philip Dasler, Predrag Tosic