# 29th International Conference on Computers and Their Applications

(CATA 2014)

Las Vegas, Nevada, USA 24-26 March 2014

**Editor:** 

Les Miller

ISBN: 978-1-63266-513-3

#### 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© (2014) 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: 978-1-880843-95-6 (Out of Print)

Reprint ISBN: 978-1-63266-513-3

Printed by Curran Associates, Inc. (2014)

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

### **International Program Committee**

Conference ChairProgram ChairGordon LeeLes Miller

San Diego State University, USA

Iowa State University, USA

Kevin Anderson Cal Poly Pomona, USA

Behnam Arad California State University, Sacramento, USA
Bernt Askildsen South Dakota School of Mines & Technology, USA
Antoine Bossard Advanced Institute of Industrial Technology, Japan

Sergiu Dascalu

Qin Ding

East Carolina University, USA
Fouad Chedid

Dhofar University, Oman
Stuart Cunningham

Glyndwr University,UK

Christophe Giraud-Carrier Brigham Young University, USA

Bidyut Gupta Southern Illinois University Carbondale, USA
Ramzi Haraty Lebanese American University, Lebanon
Fred Harris University of Nevada-Reno, USA
James Hearne Western Washington University, USA
Wen-Chi Hou Southern Illinois University, Carbondale, USA

Gongzhu Hu Central Michigan University, USA

Ming Hua Central Michigan University, USA

Donna Hudson University of California, San Francisco, USA

Ahmed Kamel Concordia College, USA

Chung-Hong Lee National Kaohsiung University of Applied Sciences, Taiwan

Sushil Louis University of Nevada - Reno, USA Yi Lu Prairie View A & M University, USA

Wenbin Luo St. Mary's University, USA

Eda Marchetti Istituto di Scienza e Tecnologie dell Informazione, CNR, Italy

Susumu Matsumae Saga University, Japan

Kendall Nygard North Dakota State University, USA

Mohammad Owrang American University, USA

Kasi Periyasamy University of Wisconsin-La Crosse, USA

David Pheanis Arizona State University, USA

Stuart Rubin SSC-PAC, USA

Tobias Schubert University of Freiburg, Germany
Stanislav Sedukhin The University of Aizu, Japan
Yong Shi Kennesaw State University, USA
Hsine-Jen Tsai Fu Jen Catholic University, Taiwan
Baoying Wang Waynesburg University, USA

John Weiss South Dakota School of Mines and and Technology, USA

## **Message from Program Chair**

It is with great pleasure that we welcome the participants of the Twenty Nithth International Conference on Computers and Their Applications (CATA-2014), sponsored by the International Society for Computers and Their Applications (ISCA), at Las Vegas, Nevada, March 24–26, 2014.

This year we have fifty five papers included in the proceedings. Four papers are in a special session. The remaining fifty one papers were selected from 72 submitted papers. The papers presented specific contributions in their respective fields, covering a broad range of topics in computer science, software engineering, computer security, intelligent systems, health care and others. To assure the quality of papers selected for presentations and publication, each paper had been evaluated by at least two reviewers based on technical content and accuracy, significance of the results, the conference scope, clarity of ideas, and overall quality.

I thank the CATA–2014 Conference Chair, Dr. Gordon Lee, for his help and advice. I also thank Dr. Narayan Debnath of Winona State University, for organizing the special session at this conference and handling the registration. My thanks go to the Program Committee, especially those who helped with paper reviews and the Session Chairs for their active contributions. I also extend my sincere thanks and appreciation to all the authors, presenters, and participants for their interest in CATA–2014.

I sincerely hope and wish that every participant has a very enjoyable and beneficial time at CATA-2014.

Thank you.

Les Miller Program Chair, ISCA CATA-2014

Gordon Lee Conference Chair, ISCA CATA-2014

March 2014

# **Table of Contents**

KEYNOTE	1
Purposeful Systems: A Conceptual Framework for System Design, Analysis, and Operation  Maximilian M. Etschmaier	1
LEARNING APPLICATIONS	3
On the Selection of the Threshold Value for a Fault Diagnosis System Based on Decision Trees and Neural Networks  In Soo Lee, Jung Hwan Cho, Gordon Lee	3
A Virtual Environment Framework for Embedding Neural Models  Corey Thibeault, Narayan Srinivasa, Frederick Harris Jr	9
Temporal Discretization Method and Naïve Bayes Classifier for Classifying Car Driver's Cognitive Load  Yutaka Yoshida, Hayato Ohwada, Fumio Mizoguchi	15
An Implementation of Triangle-Triangle Intersection for Qualitative Spatial Reasoning  Chaman Sabharwal, Jennifer Leopold	23
COMMUNICATIONS AND NETWORKS I	29
A High-Versatility Hierarchical Interconnection Network Visualisation System  Antoine Bossard	29
Modifying Network Assortativity with Degree Preservation  *Rong Yang	35
Optimization Modeling for Scheduling and Coverage in Wireless Sensor Networks  Srujan Kumar Raju Chekuri, Jingpeng Tang, Kendall E. Nygard	41
Using Mobile Agent Framework for Studying Fault Management of Distributed Network  Kawther Moria, Mohamed Madkour, Fathy Eassa, Kamal Jambi	47
COMMUNICATIONS AND NETWORKS II	55
Approaches to Multicast Routing with Byzantine Robustness  Debdatta Mukherjee, Jorge Merced-Goire, Deepinder Sidhu	55
Dynamic Cluster Head Node Election (DCHNE) Model over Wireless Sensor Networks (WSNs)  Abeer Alabass, Khaled Elleithy, Abdul Razaque	61
Toward GPU-Accelerated Network Traffic Analysis Framework Using Wireshark	<i>(</i> 5
Wei-Da Hao, Chung Leung  Enhancement Orthogonal Frequency Division Multiplexing (OFDM) in Wireless Communication Network by Using PTS (Partial Transmit Sequences) Technique	07
	73
DATABASES	79
Histogram and Sample Revisited: Estimation Error Analysis for Multidimensional Range Selection Queries  Feng Yu, Wen-Chi Hou, Cheng Luo	79
Horizontal Database Partitioning in NoSQL Databases Using Data Cluster Analysis  **Brian Sauer, Wei Hao	85
Exponential Hashing of Arbitrary Table Sizes  Wenbin Luo	91

Enriching Fuzzy Ontology for Querying Orthopedics Knowledge  Harold Vásquez, Ana Aguilera, Leonid Tineo, Ramon Mata-Toledo	97
SYSTEMS	103
Using Mobile Agent Framework for Studying the Performance Management of Distributed Network  Kawther Moria, Mohamed Madkour, Fathy Eassa, Kamal Jambi	103
A Scrum Support Component Integrated to a Web Project Management Environment  Letícia Thaís Mendonça, Antonio Marcos Neves Esteca, Rogéria Cristiane Gratão de Souza, Adriana Barbosa Santos, Carlos Roberto Valêncio	
Parametric Identification of an LTI System Using the Evolutionary Spectrum  Abdullah Al-Shoshan	
Channel Estimation Using Multi-Rate Barker Codes for Wavelet-OFDM Based Systems  Radwa K. Hamad, Ehab F. Badran, Amira I. Zaki, Said E. El-Khamy	
ARCHITECTURE	127
Quantifying Wasted Write Energy in the Memory Hierarchy  Charles Shelor, James Buchanan, Krishna Kavi, Ron Cytron	127
Experiments with Massively Parallel Matrix Multiplication  Timothy W. O'Neil	135
An Evaluation of Game Theory for Rip-Up and Re-Routing in Global Routing  Umair F. Siddiqi, Yoichi Shiraishi, Shuji Takahashi, Sadiq M. Sait	141
SCADA Security Preprocessor Utilizing a Verified Micro-Kernel Architecture  Kevin C. Kurtz, James Graham, Jeffrey Hieb, John Naber	147
SOFTWARE DEVELOPMENT	153
Enhanced Instruction Register Files for Embedded Software Obfuscation  Naoki Fujieda, Shuichi Ichikawa	153
A Writing Discipline for Improving Code Generation Based on OCL Contracts  Lucas Postal, Raul S. Wazlawick	159
A Framework for Verification of UML Statechart Diagrams  Kasi Periyasamy, Yiwei Zou, Sachin Padhye	167
Repurposing User Oriented Artifacts as Outside-In Refactoring Tools  Mike Wainer	
SOFTWARE APPLICATIONS I	181
Energy Usage Patterns in Fielded Smart Appliances  Michael McIntyre, William Burke, Joseph Latham, James Graham	181
A Japanese Characters Cartography System for Efficient Memorisation  Antoine Bossard	189
An Android Travel App for the City of Cheng Du  Yuan Liu, Chang-Shyh Peng, Daisy F. Sang	195
A Real Time Arabic Sign Language Recognition Using PCA  Ibrahim Al Saihati, Mohamed Deriche	201
SOFTWARE APPLICATIONS II	211
Representation of a Relationship Model for a User in a Social Networking Site  Debrup Banerjee, Baisakhi Chakraborty, Anita Pal, Narayan Debnath	211
Design and Development of a Web-Based Computer Science Job Board  Haesun Lee Marguerite Kahore Ilhyun Lee	217

Splitting: A Power Optimizing Technique for Multicasting in WDM Mesh Network  Subhendu Barat, Narayan Debnath, Tanmay De	223
Knowledge Provider System With Natural Language Data Modeling  Prasenjit Mukherjee, Baisakhi Chakraborty, Narayan Debnath	. 229
MEDICAL APPLICATIONS	237
Foundations for Automated Medical Diagnosis  Donna Hudson, Maurice Cohen	. 237
Performance Assessment of the Use of the RGB and LAB Color Spaces for Non-invasive Skin Cancer Classification  Nikhil J. Dhinagar, Mehmet Celenk	. 243
Integrated 3g and 802.11 Architecture for Medical Services Provision  Petros Belsis, Dimitris Vassis, Vassilis Zafeiris, Christos Skourlas	249
Investigating Stress Propagation in Group Project Social Networks  Bryan Knowles, Rong Yang	. 255
DATA STRUCTURES	261
Rate-Optimal Unfolding of Balanced Synchronous Data-Flow Graphs  Timothy W. O'Neil	. 261
Parallel Algorithms to Recognize Strict 2-Threshold Graphs in Constant Time  Wei-Da Hao, Lin-Yu Tseng	267
Representing Primary and Secondary Features in Survey Maps with Objects  Saravana Chellappan, Les Miller	. 273
ROBOTICS	279
A Formal Grammar for Topology Description of Modular Robot Organisms  Lutz Winkler, Heinz Wörn	279
Dealing with Noise in the Robotic Planning of Collision-Free Paths  Cabral Lima, Paulo Brandt, Kleber Aguiar, Felipe Franca	287
Accurate Controlling of Velocity on a Mobile Robot  Tobias Schubert, Marc Pfeifer, Bernd Becker	293
TUTORIAL	299
Social Optimization with Computational Methods Satoshi Takahashi, Tokuro Matsuo	. 299
NAVIGATION AND IMAGE PROCESSING	301
Reliable Multi-Baseline Stereovision Filter for Navigation in Unknown Indoor Environments  Khalid Al-Mutib, Muhammad Emaduddin, Mansour Alsulaiman, Hedjar Ramdane, Ebrahim Mattar	. 301
Trajectory Generation of a Vehicle Using Differential Flatness Theory  Vishal Solanki, Lillie Dewan	. 309
Effective Solutions for the Split Delivery Vehicle Routing Problem with Time Windows  Nathalie Helal, Haidar Harmanani	. 315
Modern To Historic Image Matching: ORB/SURF an Effective Matching Technique  Heider K. Ali, Anthony Whitehead	. 321
A New Approach to Video Compression using Wavelet Transform  Ahmed Suliman Robert Li	327

EDUCATION	333
Recent Evolution of MIM Based Microtext as Seen in Educational Applications in Africa  Laurie Butgereit	333
A Comparison of Student Performance: Traditional versus On-line in a Skills Based Computer Applications Course Nathan A. Barker, Laurie Harris, Connie Nyman	339
An Examination of Teachers' Integration of WEB 2.0 Technologies in Secondary Classrooms: A Phenomenological Study  Ling Wang	.345
Evaluating Several Different Web Prediction Algorithms  Randy Appleton, Josh Thompson, Matt Menze	
Author Index	353