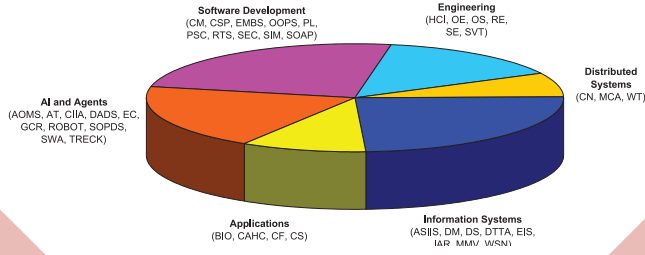


2009

# Symposium on Applied Computing



Association for  
Computing Machinery  
*Advancing Computing as a Science & Profession*

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Hosted by  
**University of Hawaii at Mānoa and  
Chaminade University of Honolulu**

Honolulu, Hawaii, USA  
March 8-12, 2009

# **The 24<sup>th</sup> Annual ACM Symposium on Applied Computing**

Honolulu, Hawaii, USA  
March 8-12, 2009

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# APPLIED COMPUTING 2009

The 24th Annual ACM Symposium on Applied Computing  
Honolulu, Hawaii, USA • March 8-12, 2009

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# About the Sponsoring SIG

## ACM SIGAPP

The ACM Special Interest Group on Applied Computing is ACM's primary applications-oriented SIG. Its mission is to further the interests of the computing professionals engaged in the development of new computing applications and applications areas and the transfer of computing technology to new problem domains. SIGAPP offers practitioners and researchers the opportunity to share mutual interests in innovative application fields, technology transfer, experimental computing, strategic research, and the management of computing. SIGAPP also promotes widespread cooperation among business, government, and academic computing activities. Its annual Symposium on Applied Computing (SAC) provides an international forum for presentation of the results of strategic research and experimentation for this inter-disciplinary environment. SIGAPP membership fees are: \$30.00 for ACM Non-members, \$15.00 for ACM Professional Members, and \$8.00 for ACM Student Members. For further information on SIGAPP, please contact Barrett Bryant at [bryant@cis.uab.edu](mailto:bryant@cis.uab.edu) or visit the SIGAPP website at <http://www.acm.org/sigapp>.

## Message from the Symposium Chairs

On behalf of the Organizing Committee, we welcome you to the 24th Annual ACM Symposium on Applied Computing (SAC 2009) hosted by Chaminade University in Hawaii. This international forum has been dedicated to computer scientists, engineers and practitioners for the purpose of presenting their findings and research results in various areas of computer applications. The organizing committee is grateful for your participation in this exiting international event. We hope that this conference proves interesting and beneficial.

The Symposium is sponsored by the ACM Special Interest Group on Applied Computing (SIGAPP), whose mission is to further the interests of computing professionals engaged in the design and development of new computing applications, interdisciplinary applications areas, and applied research. This conference is dedicated to the study of applied research of real-world problems. This event provides an avenue to discuss and exchange new ideas in the wide spectrum of application areas. We all recognize the importance of keeping up with the latest developments in our current areas of expedites.

SAC 2009 offers Technical Tracks and Posters. The success of the conference can be attributed to the substantial contribution of talented Track Chairs and Co-Chairs. Each track maintains a program committee and a set of highly qualified reviewers. We wish to thank the Track Chairs, Co-Chairs, Committee Members and participating reviewers for their hard work and effort to make the SAC 2009 conference a high quality conference. We also thank our invited keynote speakers, Dr. Vahid Tarokh, Harvard University and Dr. Rolf-Peter Kudritzki, University of Hawaii's Institute for Astronomy for sharing their knowledge with SAC attendees. Most of all, special thanks to the authors and presenters for sharing their experience with the rest of us and to all attendees for joining us in Honolulu, Hawaii this year.

The local organizing committee has always been a central contributor to the success of the SAC 2009 conference. Our gratitude goes to the Conference Vice-Chair Dr. Paulo Martins of Chaminade University and Local Chair Dr. Martha Crosby of University of Hawaii at Mānoa. We also extend our thanks to the Publication Chair, Dr. Dongwan Shin, New Mexico Tech for his tremendous effort in putting together the conference proceedings, Posters Chair Dr. Jiman Hong of Soongsil University for his hard work to make a successful Poster Program, Publicity Chair, Dr. Udo Fritzsche, PUC-Minas for his hard work, and eConference Management Chair, Dr Mathew J. Palakal of Indiana University Purdue University for successfully maintaining the eCMS system. A special thanks goes to our Program Chairs Dr. Mirko Viroli, Università di Bologna and Dr. Ronaldo Menezes, Florida Institute of Technology for coordinating and bringing together an excellent Technical Program.

Again, we welcome you to SAC 2009 and the beautiful city of Honolulu, Hawaii. We hope you enjoy the SAC 2009 conference and your stay in Hawaii. Next year, we invite you to participate in SAC 2010 to be held in Crans Montana, Switzerland. The conference will be hosted by the University of Applied Sciences of Western Switzerland.

Sung Y. Shin and Sascha Ossowski  
SAC 2009 Conference Chairs

# Message from the Program Chairs

*Ronaldo Menezes*

*Florida Institute of Technology, USA*

*Mirko Viroli*

*Alma Mater Studiorum – Università di Bologna, Italy*

It is a pleasure to introduce the Proceedings of the 24th Symposium on Applied Computing (SAC 2009). Over the past 23 years, SAC has been an international forum for researchers and practitioners to present their findings and research results in the areas of computer applications and technology. SAC 2009 consolidates this tradition, and offers a Technical Program with a wide range of tracks covering major areas of computer applications. Published papers have been reviewed by highly qualified referees with strong expertise and special interest in their respective research areas. As part of the Technical Program, this is the sixth year that SAC incorporates poster papers into the Technical Program, carefully selected by Poster Chair Jiman Hong from Soongsil University in Korea.

SAC 2009 would not be possible without contributions from members of the scientific community. It is easy to imagine that many people have dedicated tremendous time and effort over the period of the last 12 months to bring you an excellent program. The success of SAC 2009 relies on the effort and hard work of many volunteers. On behalf of the SAC 2009 Organizing Committee, we would like to take this opportunity to thank all of those who made this year's technical program a reality, including speakers, referees, track chairs, session chairs, presenters, and attendees. We would specially like to thank the local arrangement committee lead by Paulo Pedro from the Chaminade University.

SAC's open Call for Track Proposals resulted in the submission of 60 track proposals. These proposals were carefully evaluated by the conference Program Committee, based on their scientific quality, on available data from previous editions, and on their appropriateness for SAC. In response to the call for papers produced by each track, 1084 papers were submitted from more than 58 countries, and 41 tracks have been eventually established. After a reviewing process where each paper was evaluated by a minimum of three reviewers, 316 papers were accepted as full papers for inclusion in the Conference Proceedings and presentation during the Symposium. This gives SAC 2009 an acceptance rate of 29.2% across all tracks. These numbers make SAC 2009 the most competitive SAC to date. Additionally, 97 posters have been selected to form the Poster Paper Program, and to appear as short papers in the proceedings. Due to the success last year, this year we maintained the idea of organizing the tracks into themes related to 6 main areas in computer science. The themes were used in the preparation of the Proceedings and the schedule of presentations, aiming at forming streams of related track sessions, and at minimizing the overlap of presentations in related fields.

We hope you will enjoy the meeting and have the opportunity to exchange your ideas and make new friends. We also hope you will enjoy your stay in Hawaii, USA and take pleasure from the many entertainments and activities that the city and Honolulu has to offer. We encourage you and your colleagues to submit your research findings to next year's technical program when the conference will be move back to Europe, more specifically to Switzerland. Thank you for being part of SAC 2009, and we hope to see you in Switzerland for SAC 2010.

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Manuela Pereira, University of Beira Interior, Portugal  
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## Mobile Computing and Applications Track

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<i>William Harrison, Trinity College Dublin, Ireland</i>	
<b>Programming Languages Track</b>	
<b>Track Co-Chairs:</b>	Marjan Mernik, University of Maribor, Slovenia
	Barrett Bryant, University of Alabama at Birmingham, United States
<b>Track Editorial</b> .....	1881
<b>Optimizing Techniques for Saturated Arithmetic with First-Order Linear Recurrence</b> .....	1883
<i>Weihua Zhang, Parallel Processing Institute, Fudan University, China</i>	
<i>Lili Liu, Parallel Processing Institute, Fudan University, China</i>	
<i>Chen Zhang, Parallel Processing Institute, Fudan University, China</i>	
<i>Hongjiong Zhang, Parallel Processing Institute, Fudan University, China</i>	
<i>Binyu Zang, Parallel Processing Institute, Fudan University, China</i>	
<i>Chuanqi Zhu, Parallel Processing Institute, Fudan University, China</i>	
<b>Algebraic Specification Techniques for Parametric Types with Logic-Based Constraints</b> .....	1890
<i>David Briggs, University of Southern Maine, United States</i>	
<i>Suad Alagić, University of Southern Maine, United States</i>	
<b>Isomorphisms, Hylomorphisms and Hereditarily Finite Data Types in Haskell</b> .....	1898
<i>Paul Tarau, University of North Texas, United States</i>	
<b>Banzai: A Java Framework for the Implementation of High-Performance Servers</b> .....	1903
<i>Julien Cervelle, Université Paris-Est, France</i>	
<i>Rémi Forax, Université Paris-Est, France</i>	
<i>Gautier Loyauté, Université Paris-Est, France</i>	
<i>Gilles Roussel, Université Paris-Est, France</i>	
<b>Troll, a Language for Specifying Dice-Rolls</b> .....	1910
<i>Torben Ægidius Mogensen, University of Copenhagen, Denmark</i>	
<b>A Practical Solution for Scripting Language Compilers</b> .....	1916
<i>Paul Biggar, Trinity College Dublin, Ireland</i>	
<i>Edsko de Vries, Trinity College Dublin, Ireland</i>	
<i>David Gregg, Trinity College Dublin, Ireland</i>	

<b>TWEAST: A Simple and Effective Technique to Implement Concrete-Syntax AST Rewriting Using Partial Parsing</b> .....	1924
<i>Akim Demaille, EPITA Research &amp; Development Laboratory (LRDE), France</i>	
<i>Roland Levillain, EPITA Research &amp; Development Laboratory (LRDE), France</i>	
<i>Benoît Sigoure, EPITA Research &amp; Development Laboratory (LRDE), France</i>	

<b>Points-to Analysis for JavaScript</b> .....	1930
<i>Dongseok Jang, Korea Advanced Institute of Science &amp; Technology, Korea</i>	
<i>Kwang-Moo Choe, Korea Advanced Institute of Science &amp; Technology, Korea</i>	

## **Poster Papers**

<b>Data Parallel Dialect of Scheme</b> .....	1938
<i>Petr Krajca, SUNY Binghamton, United States</i>	
<i>Vilem Vychodil, SUNY Binghamton, United States</i>	

<b>Kenro: A Virtual Machine Monitor Mostly Described in Haskell</b> .....	1940
<i>Yoshihiro Oyama, The University of Electro-Communications, Japan</i>	
<i>Yoshiki Kaneko, The University of Electro-Communications, Japan</i>	
<i>Hideya Iwasaki, The University of Electro-Communications, Japan</i>	

## **Programming for Separation of Concerns Track**

**Track Co-Chairs:** Emiliano Tramontana, Università di Catania, Italy  
Yvonne Coady, University of Victoria, Canada  
Corrado Santoro, University of Catania, Italy

<b>Track Editorial</b> .....	1942
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<b>An Implementation Substrate for Languages Composing Modularized Crosscutting Concerns</b> .....	1944
<i>Hans Schippers, University of Antwerp, Belgium</i>	
<i>Michael Haupt, Hasso-Plattner-Institut, University of Potsdam, Germany</i>	
<i>Robert Hirschfeld, Hasso-Plattner-Institut, University of Potsdam, Germany</i>	
<i>Dirk Janssens, University of Antwerp, Belgium</i>	

<b>Building a Customizable Embedded Operating System with Fine-Grained Joins Using the AOX Programming Environment</b> .....	1952
<i>Jiyong Park, Seoul National University, Korea</i>	
<i>Seongsoo Hong, Seoul National University, Korea</i>	

<b>Aspect-Oriented Procedural Content Engineering for Game Design</b> .....	1957
<i>Walter Cazzola, Università di Milano, Italy</i>	
<i>Diego Colombo, Microsoft Ireland Research, Ireland</i>	
<i>Duncan Harrison, Realtime Worlds, United Kingdom</i>	

<b>Flexible Features: Making Feature Modules more Reusable</b> .....	1963
<i>Peter Ebraert, Vrije Universiteit Brussel, Belgium</i>	
<i>Jorge Vallejos, Vrije Universiteit Brussel, Belgium</i>	
<i>Yves Vandewoude, Katholieke Universiteit Leuven, Belgium</i>	
<i>Theo D'Hondt, Vrije Universiteit Brussel, Belgium</i>	
<i>Yolande Berbers, Katholieke Universiteit Leuven, Belgium</i>	

## Real-Time Systems Track

**Track Co-Chairs:** Paulo Martins, Chaminade University, United States  
Binoy Ravindran, Virginia Tech, United States

**Track Editorial** ..... 1971

**Resource Sharing in Behavioral based Scheduling** ..... 1972

*Leo Ordinez, Universidad Nacional del Sur, Argentina*  
*David Donari, Universidad Nacional del Sur, Argentina*  
*Rodrigo Santos, Universidad Nacional del Sur, Argentina*  
*Javier Orozco, Universidad Nacional del Sur, Argentina*

**Exploiting Stack Distance to Estimate Worst-Case Data Cache Performance** ..... 1979

*Yu Liu, Southern Illinois University Carbondale, United States*  
*Wei Zhang, Southern Illinois University Carbondale, United States*

**An Implementation of the Earliest Deadline First Algorithm in Linux** ..... 1984

*Dario Faggioli, Scuola Superiore Sant'Anna, Italy*  
*Michael Trimarchi, Scuola Superiore Sant'Anna, Italy*  
*Fabio Checconi, Scuola Superiore Sant'Anna, Italy*  
*Marko Bertogna, Scuola Superiore Sant'Anna, Italy*  
*Antonio Mancina, Scuola Superiore Sant'Anna, Italy*

**An Orthogonal Real-Time Scheduling Architecture for Responsiveness QoS Requirements in SOA Environments** ..... 1990

*F.J. Monaco, University of São Paulo, Brazil*  
*M. Nery, University of São Paulo, Brazil*  
*M.M.L. Peixoto, University of São Paulo, Brazil*

### Poster Papers

**Designing Reliable Real-Time Concurrent Object-Oriented Software Systems** ..... 1996

*Alfredo Capozucca, LASSY-University of Luxembourg, Luxembourg*  
*Nicolas Guelfi, LASSY-University of Luxembourg, Luxembourg*

**Designing a Multi-Core Hard Real-Time Test Bed for Energy Measurement Experiments** ..... 1998

*Tongquan Wei, Michigan Tech University, United States*  
*Xiaodao Chen, Michigan Tech University, United States*  
*Piyush Mishra, Michigan Tech University, United States*

## Computer Security Track

**Track Co-Chairs:** Giampaolo Bella, Dipartimento di Matematica e Informatica –  
Università di Catania, Italy  
Luca Compagna, SAP Research France, France

**Track Editorial** ..... 2000

**Privacy-Preserving Linear Programming** ..... 2002

*Jaideep Vaidya, Rutgers University, United States*

<b>On the Practical Importance of Communication Complexity for Secure Multi-Party Computation Protocols</b> .....	2008
<i>Florian Kerschbaum, SAP Research, Germany</i>	
<i>Daniel Dahlmeier, SAP Research, Germany</i>	
<i>Axel Schröpfer, SAP Research, Germany</i>	
<i>Debmalya Biswas, IRISA/INRIA, France</i>	
<b>Open Source vs. Closed Source Software: Towards Measuring Security</b> .....	2016
<i>Guido Schryen, International Computer Science Institute, United States</i>	
<i>Rouven Kadura, RWTH Aachen University, Germany</i>	
<b>Improving Stream Correlation Attacks on Anonymous Networks</b> .....	2024
<i>Gavin O’Gorman, Dublin City University, Ireland</i>	
<i>Stephen Blott, Dublin City University, Ireland</i>	
<b>KvmSec: A Security Extension for Linux Kernel Virtual Machines</b> .....	2029
<i>Flavio Lombardi, Consiglio Nazionale delle Ricerche, Ufficio Sistemi Informativi, Italy</i>	
<i>Roberto Di Pietro, Universitat Rovira i Virgili, Spain</i>	
<b>Bayesian Bot Detection based on DNS Traffic Similarity</b> .....	2035
<i>Ricardo Villamarín-Salomón, University of Pittsburgh, United States</i>	
<i>José Carlos Brustoloni, University of Pittsburgh, United States</i>	
<b>Semi-Supervised Co-Training and Active Learning based Approach for Multi-View Intrusion Detection</b> .....	2042
<i>Ching-Hao Mao, National Taiwan University of Science &amp; Technology, Taiwan</i>	
<i>Hahn-Ming Lee, National Taiwan University of Science &amp; Technology / Academia Sinica, Taiwan</i>	
<i>Devi Parikh, Carnegie Mellon University, United States</i>	
<i>Tsuhan Chen, Carnegie Mellon University, United States</i>	
<i>Si-Yu Huang, National Taiwan University of Science &amp; Technology, Taiwan</i>	
<b>Taking Total Control of Voting Systems: Firmware Manipulations on an Optical Scan Voting Terminal</b> .....	2049
<i>Seda Davtyan, University of Connecticut, United States</i>	
<i>Sotiris Kentros, University of Connecticut, United States</i>	
<i>Aggelos Kiayias, University of Connecticut, United States</i>	
<i>Laurent Michel, University of Connecticut, United States</i>	
<i>Nicolas Nicolaou, University of Connecticut, United States</i>	
<i>Alexander Russell, University of Connecticut, United States</i>	
<i>Andrew See, University of Connecticut, United States</i>	
<i>Narasimha Shashidhar, University of Connecticut, United States</i>	
<i>Alexander A. Shvartsman, University of Connecticut, United States</i>	
<b>SQLProb: A Proxy-Based Architecture towards Preventing SQL Injection Attacks</b> .....	2054
<i>Anyi Liu, George Mason University, United States</i>	
<i>Yi Yuan, George Mason University, United States</i>	
<i>Duminda Wijesekera, George Mason University, United States</i>	
<i>Angelos Stavrou, George Mason University, United States</i>	
<b>Secure Web-Based Retrieval of Documents with Usage Controls</b> .....	2062
<i>Peter Djalaliev, University of Pittsburgh, United States</i>	
<i>José Carlos Brustoloni, University of Pittsburgh, United States</i>	



# Advances in Computer Simulation Track

**Track Co-Chairs:** Giuseppe Vizzari, University of Milano-Bicocca, Italy  
Fabien Michel, Université de Reims Champagne Ardenne, France

**Track Editorial** ..... 2070

**An Extensible Simulation Tool for Overlay Networks and Services** ..... 2072

*Jordi Pujol-Ahulló, Universitat Rovira i Virgili, Spain*  
*Pedro García-López, Universitat Rovira i Virgili, Spain*  
*Marc Sánchez-Artigas, Universitat Rovira i Virgili, Spain*  
*Marcel Arrufat-Arias, Universitat Rovira i Virgili, Spain*

**Simulating Human Intuitive Decisions by Q-Learning** ..... 2077

*Jason Leezer, Trinity University, United States*  
*Yu Zhang, Trinity University, United States*

**Simulation Supporting the Design of Self-Organizing Ambient Intelligence Systems** ..... 2082

*Stefania Bandini, University of Milano-Bicocca, Italy*  
*Andrea Bonomi, University of Milano-Bicocca, Italy*  
*Giuseppe Vizzari, University of Milano-Bicocca, Italy*

**Composing a High Fidelity HLA Federation for Littoral Operations** ..... 2087

*Fawzi Hassaine, Defence R&D, Canada*  
*Russ Moulton, JRM Technologies, United States*  
*Chris Fink, JRM Technologies, United States*

**Simulating Antigenic Drift and Shift in Influenza A** ..... 2093

*Nuno Fachada, LaSEEB-ISR, Portugal*  
*Vitor V. Lopes, INETI - Instituto Nacional de Engenharia, Tecnologia e Inovação, Portugal*  
*Agostinho Rosa, LaSEEB-ISR, Portugal*

## Poster Papers

**Simulating Business Processes with EPML-Sim** ..... 2101

*Davide Rossi, University of Bologna, Italy*  
*Elisa Turrini, University of Bologna, Italy*  
*Fabio Vitali, University of Bologna, Italy*

**Using Probabilistic Model Checking and Simulation for Designing Self-Organizing Systems** ..... 2103

*Matteo Casadei, Università di Bologna, Italy*  
*Mirko Viroli, Università di Bologna, Italy*

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*Edgar F. Esteves, LIACC-FEUP, Portugal*  
*Rosaldo J.F. Rossetti, LIACC-FEUP, Portugal*  
*Paulo A.F. Ferreira, LIACC-FEUP, Portugal*  
*Eugénio C. Oliveira, LIACC-FEUP, Portugal*

**Precise Generalized Contact Point and Normal Determination for Rigid Body Simulation** ..... 2107

*Dylan A. Shell, University of Southern California, United States*  
*Evan Drumwright, University of Memphis, United States*

## Service Oriented Architectures and Programming Track

**Track Co-Chairs:** Claudio Guidi, University of Bologna, Italy  
Ivan Lanese, University of Bologna, Italy  
Manuel Mazzara, Newcastle University, United Kingdom

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#### **CMC-UMC: A Framework for the Verification of Abstract Service-Oriented Properties** ..... 2111

*Maurice H. ter Beek, ISTI-CNR, Italy*

*Franco Mazzanti, ISTI-CNR, Italy*

*Stefania Gnesi, ISTI-CNR, Italy*

#### **Runtime Monitoring of Web Service Choreographies Using Streaming XML** ..... 2118

*Sylvain Hallé, University of California, Santa Barbara, United States*

*Roger Villemaire, Université du Québec à Montréal, Canada*

#### **PRECISO: A Reengineering Process and a Tool for Database Modernisation through Web Services** ... 2126

*Ricardo P. del Castillo, Alarcos Research Group, University of Castilla-La Mancha, Spain*

*Ignacio García-Rodríguez, Alarcos Research Group, University of Castilla-La Mancha, Spain*

*Ismael Caballero, Alarcos Research Group, University of Castilla-La Mancha, Spain*

*Macario Polo, Alarcos Research Group, University of Castilla-La Mancha, Spain*

*Mario Piattini, Alarcos Research Group, University of Castilla-La Mancha, Spain*

#### **Load Management in Model-Aware Execution of Composite Web Services** ..... 2134

*Karolina Zurowska, University of Saskatchewan, Canada*

*Ralph Deters, University of Saskatchewan, Canada*

#### **Using Process Mining to Business Process Distribution** ..... 2140

*Faramarz Safi Esfahani, Islamic Azad University, Najaf Abad Branch, Iran*

*Masrah Azrifah Azmi Murad, University of Putra Malaysia, Malaysia*

*Nasir Sulaiman, University of Putra Malaysia, Malaysia*

*Nur Izura Udzir, University of Putra Malaysia, Malaysia*

#### **Annotating UDDI Registries to Support the Management of Composite Services** ..... 2146

*M. Brian Blake, Georgetown University, United States*

*Michael F. Nowlan, Georgetown University, United States*

*Ajay Bansal, Georgetown University, United States*

*Srividya Kona, Georgetown University, United States*

#### **A General Service Oriented Approach for Managing Virtual Machines Allocation** ..... 2154

*Paolo Auedda, Center for Advanced Studies, Research & Development in Sardinia, Italy*

*Massimo Gaggero, Center for Advanced Studies, Research & Development in Sardinia, Italy*

*Simone Manca, Center for Advanced Studies, Research & Development in Sardinia, Italy*

*Omar Schiaratura, Center for Advanced Studies, Research & Development in Sardinia, Italy*

*Simone Leo, Center for Advanced Studies, Research & Development in Sardinia, Italy*

*Fabrizio Montesi, University of Bologna, Italy*

*Gianluigi Zanetti, Center for Advanced Studies, Research & Development in Sardinia, Italy*

#### **SimSOA – An Approach for Agent-Based Simulation and Design-Time Assessment of SOC-Based IT Systems** ..... 2162

*Stefan Thanheiser, Karlsruhe Institute of Technology (KIT), Institute AIFB, Germany*

*Lei Liu, Karlsruhe Institute of Technology (KIT), Institute AIFB, Germany*

*Hartmut Schmeck, Karlsruhe Institute of Technology (KIT), Institute AIFB, Germany*

## Poster Papers

### **Assessing Complexity of Service-Oriented Computing Using Learning Classifier Systems** ..... 2170

*Lei Liu, Karlsruhe Institute of Technology (KIT), Institute AIFB, Germany*  
*Stefan Thanheiser, Karlsruhe Institute of Technology (KIT), Institute AIFB, Germany*  
*Hartmut Schmeck, Karlsruhe Institute of Technology (KIT), Institute AIFB, Germany*

## Wireless Sensor Networks Track

**Track Co-Chairs:** Julie McCann, Imperial College London, United Kingdom  
Richard Anthony, Greenwich University, United Kingdom

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### **Sink-Oriented Dynamic Location Service for Shortest Path Relay with Energy Efficient Global Grid** .. 2174

*Hyeonjae Jeon, Sungkyunkwan University, Korea*  
*Kwangjin Park, Wonkwang University, Korea*  
*Hyunseung Choo, Sungkyunkwan University, Korea*

### **Lightweight Monitoring of Sensor Software** ..... 2180

*Mustafa Hammad, New Mexico State University, United States*  
*Jonathan Cook, New Mexico State University, United States*

### **Jointly Optimizing Data Acquisition and Delivery in Traffic Monitoring VANETs** ..... 2186

*Antonios Skordylis, University of Oxford, United Kingdom*  
*Niki Trigoni, University of Oxford, United Kingdom*

### **Real-Time Multi-View Vision Systems Using WSNs** ..... 2191

*Paolo Pagano, Scuola Superiore Sant'Anna, Italy*  
*Francesco Piga, Scuola Superiore Sant'Anna, Pisa, Italy*  
*Yao Liang, Indiana University Purdue University Indianapolis, United States*

### **Opportunistic Real-Time Routing in Multi-Hop Wireless Sensor Networks** ..... 2197

*Junwhan Kim, Virginia Tech, United States*  
*Binoy Ravindran, Virginia Tech, United States*

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### **Integrating Standardized Transaction Protocols in Service-Oriented Wireless Sensor Networks** ..... 2202

*Christoph Reinke, Institute of Information Systems, University of Lübeck, Germany*  
*Nils Hoeller, Institute of Information Systems, University of Lübeck, Germany*  
*Jana Neumann, Institute of Information Systems, University of Lübeck, Germany*  
*Sven Groppe, Institute of Information Systems, University of Lübeck, Germany*  
*Volker Linnemann, Institute of Information Systems, University of Lübeck, Germany*  
*Martin Lipphardt, Institute of Telematics, University of Lübeck, Germany*

### **Towards Developing a Trust based Security Solution** ..... 2204

*Sheikh I. Ahamed, Marquette University, United States*  
*Donghyun Kim, Marquette University, United States*  
*Chowdhury S. Hasan, Marquette University, United States*  
*Mohammad Zulkernine, Queen's University, Canada*

# **Track Chairs (Co-Editors)**

## **Computer Networks (CN)**

Mario Freire, University of Beira Interior, Portugal  
Edmundo Monteiro, University of Coimbra, Portugal  
Manuela Pereira, University of Beira Interior, Portugal  
Teresa Vazão Vasques, INESC ID/IST, Portugal

## **Human-Computer Interaction (HCI)**

Brent Auernheimer, California State University, Fresno, United States  
Shih-Hsi Liu, California State University, Fresno, United States

## **Mobile Computing and Applications (MCA)**

Hong Va Leong, The Hong Kong Polytechnic University, Hong Kong, China  
Alvin Chan, The Hong Kong Polytechnic University, Hong Kong, China

## **Organizational Engineering (OE)**

Artur Caetano, IST, Technical University of Lisbon and CODE -  
Center for Organizational Design and Engineering, INOV, Portugal  
Jose Tribolet, IST, Technical University of Lisbon, Portugal  
Robert Winter, Institute of Information Management, University of St. Gallen, Switzerland

## **Operating Systems (OS)**

Jiman Hong, Soongsil University, Korea  
Tei-Wei Kuo, National Taiwan University, Taiwan

## **Requirement Engineering (RE)**

Maria Lencastre, Universidade de Pernambuco, Brazil

## **Software Engineering (SE)**

Sung Y. Shin, South Dakota State University, United States  
Chang Sung, Indiana University Southeast, United States  
W. Eric Wong, University of Texas at Dallas, United States

## **Software Verification and Testing (SVT)**

Tamara Rezk, INRIA, France

## **Web Technologies (WT)**

Davide Rossi, Department of Computer Science - University of Bologna, Italy  
Fabio Vitali, Department of Computer Science - University of Bologna, Italy

## **Agent-Oriented Software Engineering Methodologies and Systems (AOMS)**

Massimo Cossentino, ICAR-CNR Palermo, Italy  
Ambra Molesini, Alma Mater Studiorum – Università di Bologna, Italy  
Andrea Omicini, Alma Mater Studiorum – Università di Bologna a Cesena, Italy  
Valeria Seidita, Università degli Studi di Palermo, Italy

### **Agreement Technologies (AT)**

Juan Rodriguez-Aguilar, IIIA-CSIC, Spain  
Jesus Cerquides, Universitat de Barcelona, Spain  
Peter McBurney, University of Liverpool, United Kingdom  
Pablo Noriega, IIIA-CSIC, Spain

### **Bioinformatics (BIO)**

Mathew Palakal, IUPUI, United States  
Kanagasabai Rajaraman, Institute for Infocomm Research (I2R), Singapore

### **Computer Application in Health Care (CAHC)**

Fátima Nunes, EACH - USP - Universidade de São Paulo, Brazil  
Rosa Maria Costa, Universidade do Estado do Rio de Janeiro, Brazil

### **Computer Forensics (CF)**

Lorie Liebrock, New Mexico Institute of Mining and Technology, United States  
Robert L. Hutchinson, Sandia National Laboratories, United States  
Brajendra Panda, University of Arkansas, United States

### **Computational Intelligence and Image Analysis (CIIA)**

Chih-Cheng Hung, Southern Polytechnic State University, United States  
Agostinho Rosa, LAseeb-IST-UTL, Portugal

### **Computational Sciences (CS)**

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Yang Cao, Virginia Polytechnic Institute and State University, United States

### **Dependable and Adaptive Distributed Systems (DADS)**

Karl M. Goeschka, Vienna University of Technology, Austria  
Svein Hallsteinsen, Sintef, Norway  
Rui Oliveira, University of Minho, Portugal  
Alexander Romanovsky, University of Newcastle, United Kingdom

### **Applications of Evolutionary Computation (EC)**

Bryant Julstrom, St. Cloud State University, United States

### **Geometric Constraints and Reasoning (GCR)**

Dominique Michelucci, CNRS, France  
Robert Joan-Arinyo, Universitat Politècnica de Catalunya, Catalonia  
Xiao-Shan Gao, Chinese Academy of Sciences, China

### **Intelligent Robotic Systems (ROBOT)**

Denis Wolf, University of Sao Paulo, Brazil  
Eduardo Marques, University of Sao Paulo, Brazil  
Fernando Osorio, University of Sao Paulo, Brazil

### **Self-Organization in Pervasive Distributed Systems (SOPDS)**

Marco Mamei, University of Modena and Reggio Emilia, Italy  
Justin Werfel, NECSI/Harvard Med School, United States

### **The Semantic Web and Applications (SWA)**

Hyoil Han, Drexel University, United States

### **Trust, Reputation, Evidence and other Collaboration Know-How (TRECK)**

Jean-Marc Seigneur, University of Geneva, Switzerland

### **Advances in Spatial and Image-Based Information Systems (ASIS)**

Richard Chbeir, LE2I-CNRS, France

Ki-Joune Li, Pusan National University, Korea

Kokou Yetongnon, Bourgogne University, France

### **Coordination Models, Languages and Applications (CM)**

Michael Schumacher, University of Applied Sciences Western Switzerland, Switzerland

Alan Wood, University of York, United Kingdom

### **Constraint Solving and Programming (CSP)**

Eric Monfroy, UTFSM, Valparaiso, Chile and LINA, University of Nantes, France, Chile

Stefano Bistarelli, Universita 'G. d'Annunzio' Chieti-Pescara, IIT-CNR, Pisa, Italy

Barry O'Sullivan, University College Cork, Ireland

### **Data Mining (DM)**

Chandan Reddy, Wayne State University, United States

Hasan Jamil, Wayne State University, United States

Osmar Zaiane, University of Alberta, Canada

### **Data Streams (DS)**

João Gama, University Porto, Portugal

Pedro Rodrigues, University Porto, Portugal

Jesus Aguilar, University Pablo Olavide, Spain

Andre Carvalho, University of Sao Paulo, Brazil

### **Data Theory, Technology, and Applications (DTTA)**

Junping Sun, Nova Southeastern University, United States

Ramzi Haraty, Lebanese American University, Lebanon

Papadopoulos Apostolos, Aristotle University, Greece

### **Enterprise Information Systems (EIS)**

Maria-Eugenia Iacob, University of Twente, Netherlands

Rogério Atem de Carvalho, Federal Center for Technological Education of Campos, Brazil

Asterio Kiyoshi Tanaka, UniRio, Brazil

### **Embedded Systems (EMBS)**

Alessio Bechini, University of Pisa, Italy

Prete Cosimo Antonio, University of Pisa, Italy

### **Information Access and Retrieval (IAR)**

Gabriella Pasi, University of Milano Bicocca, Italy

Gloria Bordogna, National Research Council, Italy



**Multimedia and Visualization (MMV)**

Maria G. Pimentel, SCC/ICMC/USP, Brazil  
Ethan V. Munson, University of Wisconsin-Milwaukee, United States

**Object Oriented Programming Languages and Systems (OOPS)**

Davide Ancona, Univ. of Genova, Italy  
Alex Buckley, Sun Microsystems, United States

**Programming Languages (PL)**

Marjan Mernik, University of Maribor, Slovenia  
Barrett Bryant, University of Alabama at Birmingham, United States

**Programming for Separation of Concerns (PSC)**

Emiliano Tramontana, Università di Catania, Italy  
Yvonne Coady, University of Victoria, Canada  
Corrado Santoro, University of Catania, Italy

**Real-Time Systems (RTS)**

Paulo Martins, Chaminade University, United States  
Binoy Ravindran, Virginia Tech, United States

**Computer Security (SEC)**

Giampaolo Bella, Dipartimento di Matematica e Informatica - Università di Catania, Italy  
Luca Compagna, SAP Research France, France

**Advances in Computer Simulation (SIM)**

Giuseppe Vizzari, University of Milano-Bicocca, Italy  
Fabien Michel, Université de Reims Champagne Ardenne, France

**Service Oriented Architectures and Programming (SOAP)**

Claudio Guidi, University of Bologna, Italy  
Ivan Lanese, University of Bologna, Italy  
Manuel Mazzara, Newcastle University, United Kingdom

**Wireless Sensor Networks (WSN)**

Julie McCann, Imperial College London, United Kingdom  
Richard Anthony, Greenwich University, United Kingdom

**EDITORIAL MESSAGE**  
**Special Track on Computer Networks**

*Mário M. Freire, University of Beira Interior, Portugal*

*Teresa Vazão, INESC ID/IST, Portugal*

*Edmundo Monteiro, University of Coimbra, Portugal*

*Manuela Pereira, University of Beira Interior, Portugal*

On behalf of the Program Committee of the Track on Computer Networks of the 24th Annual ACM Symposium on Applied Computing (ACM SAC 2009), it is our great pleasure to welcome you to the ACM SAC 2009, held from March 8 to March 12, 2009, in Honolulu, Hawaii, USA. In recent years, significant advances in computer networks have been made throughout the world. This track aims to be a forum for scientists, engineers and practitioners, in academia and industry to share new ideas, experiences and results, and to present their latest findings in any aspects of computer networks.

In response to the call for papers, a total of 46 papers were submitted, from which 14 were carefully selected for presentation in three technical sessions. Each paper was peer reviewed, through a double-blind process, by at least three members of the Program Committee or additional reviewers. The set of papers accepted for this track covers a variety of research topics, which are of current interest, such as grid networks, network security, peer-to-peer networks, multicast, network protocol interoperability, cross-layer cooperation and wireless sensor networks.

We thank all the authors who submitted valuable papers to this track. We are grateful to the members of the Program Committee and to the additional reviewers. Without their support, the organization of such high-quality track sessions would not have been possible. We are also indebted to many individuals and organizations that made this track happen, namely ACM Special Interest Group on Applied Computing (SIGAPP), INESC ID/IST, University of Coimbra and University of Beira Interior. Last but not least, we are grateful to the Symposium Program Chairs and to the Web site manager for their help in all aspects of the organization of this track.

We hope that you enjoy the ACM Symposium on Applied Computing and, in particular, the Track on Computer Networks at Honolulu, Hawaii, if you attend it, and that you find it a useful forum for the exchange of ideas, results and recent findings.

## EDITORIAL MESSAGE

### Special Track on Human Computer Interaction

*Brent Auernheimer, California State University Fresno, USA*

*Shih-Hsi Liu, California State University, Fresno, USA*

#### 1. OBJECTIVES OF THE TRACK

Human Computer Interaction (HCI) is an interdisciplinary study of design, development, and evaluation of user interfaces. On the user side, communications, graphic design, linguistics, anthropology, and cognitive psychology bring techniques relevant to maximizing user productivity, facilitating learning, and minimizing errors. On the computing side, techniques from computer graphics, programming languages, operating systems, and software engineering make possible the realization of these carefully designed interfaces. The HCI track provides researchers and practitioners a forum to present their ideas and experience on both sides, specifically including methodologies, techniques, and tools of software design and development that assist developers and users in absorbing and managing information on a variety of computational devices.

#### 2. STATISTICAL INFORMATION

A total of thirty-four papers were received from 12 countries including Brazil, China, France, Germany, Greek, Italy, Japan, Pakistan, Portugal, Taiwan, the UK, and the USA. Among those, ten regular papers were selected after rigorous reviewing process performed by the program committee. The acceptance rate of the track is thus 29 percent. Additionally, four poster papers were also selected in the Poster Session.

The track program committee consisted of 24 members: Len Bass (Carnegie Mellon Univ., USA), Jessica Bayliss (Rochester Institute of Technology, USA), Roy Bohlin (California State Univ., Fresno, USA), Janet Burge (Miami Univ., USA), Fei Cao (Microsoft, USA), Yu Cao (California State Univ., Fresno, USA), Luis CarriÁo (LaSIGE/Univ. of Lisbo, Portugal), Carlos Duarte (LaSIGE/Univ. of Lisbo, Portugal), Chane Fullmer, (Consultant, USA), Jeff Gray (Univ. of Alabama at Birmingham, USA), Curtis Ikehara (Univ. of Hawaii, USA), Thomas Jewett (California State Univ., Long Beach, USA), James Kiper (Miami Univ., USA), Jun Kong (North Dakota State Univ., USA), Chien-Hung Liu (National Taipei Univ. of Technology, Taiwan), Rui Lopes (LaSIGE/Univ. of Lisbon, Portugal), Kirsten Medhurst (Pelco, USA), Suman Roychoudhury (International Univ. in Germany, Germany), Jungwoo Ryoo (Pennsylvania State Univ., USA), Randy Smith (Univ. of Alabama, USA), Mihran Tuceryan (Indiana Univ. Purdue Univ. Indianapolis, USA), Jean Vanderdonckt (UniversitÈ Catholique de Louvain, Belgium), Chi-Lu Yang (Institute for Information Industry, Taiwan), and Jing Zhang (Motorola, USA).

#### 3. ACKNOWLEDGEMENTS

We would like to express our greatest gratitude to all the authors and program committee members of the HCI track at ACM SAC 2009 for their valuable contributions.

## EDITORIAL MESSAGE

### Special Track on Mobile Computing and Applications

*Hong Va Leong, The Hong Kong Polytechnic University, Hong Kong*

*Alvin Chan, The Hong Kong Polytechnic University, Hong Kong*

#### 1. THE MOBILE COMPUTING AND APPLICATIONS TRACK

Riding on the success of previous Mobile Computing and Applications Tracks spanning from 2003 to 2008, we are delighted to present the 2009 Mobile Computing and Applications Track that features research papers drawn from a highly diversified spectrum of mobile computing. We have been receiving an increasing number of submissions throughout the years. According to the nature of the papers collected in this track, the accepted regular papers are organized into two sessions, covering two different aspects: *supports for mobile applications* operating under different *mobile management protocols*. The track is dedicated to draw upon research efforts and expertise from different areas of research, so as to promote better synergy and to bring forth not only core mobile communications and networking protocols for application development, but also important research applications to realize the benefits of anywhere, any place and anytime pervasive and ubiquitous computing.

#### 2. THE REVIEW PROCESS

It is to our great honor to have invited many well-established researchers with strong track records in the area of mobile computing and mobile data management to serve on the international program committee. We would like to express our deepest gratitude to the program committee members for their dedication to the high quality review process, within a relatively short review cycle. Each paper is sent to at least three independent reviewers in the program committee, under a blind review process. In the end, all papers receive at least three review reports, commenting on their relative merits and shortcomings. Acceptance is based on the scores recommended by the reviewers, their relative level of confidence in the papers, as well as their written comments. We concur that the papers we accept are of high quality and it is unfortunate that many quality papers could not be included in the proceedings. We would especially like to thank the program committee members and additional reviewers for their dedicated efforts and help in reviewing the papers:

*Nabil Adam* from Rutgers University, USA; *Divyakant Agrawal* from University of California at Santa Barbara, USA; *Peter Bertok* from RMIT University, Australia; *Angelo Brayner* from University of Fortaleza, Brazil; *Ming-Syan Chen* from National Taiwan University, Taiwan; *Alfredo Cuzzocrea* from University of Calabria, Italy; *Ling Feng* from Twente University, The Netherlands; *Hakan Ferhatosmanoglu* from Ohio State University, USA; *Abdelkader Hameurlain* from Universite Paul Sabatier, France; *Takahiro Hara* from Osaka University, Japan; *Roger King* from University of Colorado at Boulder, USA; *Dik Lee* from Hong Kong University of Science and Technology, Hong Kong; *Guanling Lee* from National Dong Hwa University, Taiwan; *Wang-Chien Lee* from Pennsylvania State University, USA; *Victor Leung* from University of British Columbia, Canada; *Seng Loke* from La Trobe University, Australia; *Stephane Maag* from Institut Telecom SudParis, France; *Xiaofeng Meng* from Renmin University, China; *Mohamed Mokbel* from University of Minnesota, USA; *Wen-Chih Peng* from National Chiao Tung University, Taiwan; *Sunil Prabhakar* from Purdue University, USA; *Alhaji Reda* from University of Calgary, Canada; *Winston Seah* from Institute for Infocomm Research, Singapore; *Antonio Si* from NASA Ames Research Center, USA; *Makoto Takizawa* from Seikei University, Japan; *Kian-Lee Tan* from National University of Singapore, Singapore; *Zahir Tari* from RMIT University, Australia; *Savio Tse* from Bilkent University, Turkey; *Man Hon Wong* from Chinese University of Hong Kong, Hong Kong; *Jianliang Xu* from Hong Kong Baptist University, Hong Kong; *Arkady Zaslavsky* from Monash University, Australia; *Baihua Zheng* from Singapore Management University, Singapore.

In response to the Call-for-Papers, we received 39 submissions from 17 different countries, spanning across 4 continents. We do miss the Oceania this year. The majority of papers come from Europe and North America, followed by South America and Asia as follows: Europe (13), North America (12), South America (8), and Asia (6). After a rigorous review process, 10 papers are selected for inclusion in the Proceedings, spreading evenly among all continents, with 3 papers from Europe, 3 papers from South America, 2 papers from North America, and 2 papers from Asia. This year we are faced with the toughest selection process in the history of this track, with an acceptance rate of 26%. Three papers with favorable reviewers' comments that might have been accepted as regular papers in the past can only be accepted as poster papers. This completes the profile of the Mobile Computing and Applications Track for SAC 2009.

#### 3. THE CONTRIBUTED PAPERS

We divide the 10 contributed papers into two research paper sessions, with 3 more papers in the poster session.

##### **Session I: Device and Platform for Mobile Applications**

The track begins with an application paper authored by W. Silva and M. Rodrigues, entitled "*A Lightweight 3D Visualization and Navigation System on Handheld Devices*". The work implements a lightweight 3D visualization and navigation system on handheld devices, optimizing on the culling algorithms. Performance is studied for the algorithms with varying levels of octree, with good frame

rates on a contemporary cellular phone. The second paper from the same country is on “*Seamless Access of Home Theater Personal Computers for Mobile Devices*”, by L. Maia, D. Freire, R. Souza, A. Perkusich, and H. Almeida. This paper describes the design in allowing mobile devices to access multimedia content and to control multiple home theater PCs using several technologies in a standardized manner. The MediaPortal system is presented, accessible via an Internet Tablet. The next paper represents a massive collection of effort and coordination from M. Ceruti, V. Dinh, N. Tran, H. Phan, L. Duffy, T. Ton, G. Leonard, E. Medina, O. Amezcua, S. Fugate, G. Rogers, R. Luna, and J. Ellen, on the topic “*Wireless Communication Glove Apparatus for Motion Tracking, Gesture Recognition, Data Transmission, and Reception in Extreme Environments*”. Glove prototypes with and without a haptic-IO capability are constructed. Those with haptic-IO capability have vibro-mechanical devices on the fingertips that allow covert-signal reception and feedback, while those without can only transmit static and dynamic gestures. The paper that follows is on “*Creating a Mobile Web Application Platform: The Lively Kernel Experiences*”, by T. Mikkonen and A. Taivalsaari. In this industrial paper, the authors share with us their experiences in porting the Sun Labs Lively Kernel, an interactive web programming environment, onto a Nokia mobile device, with both direct porting and a native implementation capable of utilizing the device resources. The last paper in this session is entitled “*The Device Service Bus: A Solution for Embedded Device Integration through Web Services*”, authored by G. Araujo and F. Siqueira. In this paper, a middleware infrastructure for integrating heterogeneous embedded devices is proposed, making use of the standard Devices Profile for Web Services, with interconnection devices and software components. A prototype is built and some performance measures are produced.

### **Session II: Mobile Management and Protocols**

The first paper in the second session by K. Tanaka, Y. Kishino, T. Terada, and S. Nishio is entitled, “*A Destination Prediction Method Using Driving Contexts and Trajectory for Car Navigation Systems*”. The paper proposes a new destination prediction method that leverages driving trajectory and contextual information to predicting the destination. The proposed algorithms are evaluated experimentally for their accuracy. The next paper entitled “*A Mobility Management Scheme using SCTP-SIP for Real-time Services across Heterogeneous Networks*” by H. Park, M. Kim, S. Kang, S. Lee, and Y. Kim describes how SIP can be coupled with Stream Control Transmission Protocol (SCTP) to provide a novel mobility management scheme. An evaluation of the approach is discussed and validated to satisfy the QoS requirements of real-time multimedia services. The paper “*Mobility Aware Path Maintenance in Ad hoc Networks*” by S. Philip and V. Anand addresses the issue of route maintenance as opposed to route discovery as a result of route failure. The paper proposes a proactive route maintenance protocol that exercises rapid switching to alternate route when failure occurs. The work is supported with comprehensive simulations and analysis on the proposed approach. A. Cavalli, S. Maag, E. Montes de Oca, and W. Jimenez in their paper entitled “*A Passive Conformance Testing Approach for a Manet Routing Protocol*” proposes a passive conformance testing technique for MANET routing protocol, OLSR. Specifically, their work attempts to address the dynamic changing topology and lack of centralized management of most MANETs. The proposed technique was successfully applied to a real case scenario, which demonstrated reduction in inconclusive verdicts often observed in other methods. The final paper of the session is entitled “*A Flexible QoS-aware Routing Protocol for Infrastructure-less B3G Networks*” by N. Kokash, R. Cardoso, V. Issarny, and P. Raverdy. This paper describes a routing protocol based on OLSR that supports quality-aware routes discovery in a multi-network environments. The challenge lies in designing a protocol that not takes into the account of quality delivery and dynamicity of the network but also to address diverse user’s requirements. Detail discussions on its deployment and experimental results are presented.

### **Poster Session**

The three poster papers interestingly span also across the research themes in the regular paper sessions. The first poster paper on a mobile platform by J. Zheng describes the support of scene maps for navigation based on a PDA equipped with GPS. Continuous images based on 360° panoramic view are used to reduce wireless transmission traffic. The second paper on mobile application query processing algorithm by M. Monjur and S. Ahamed proposes the concept of landmark influence space, which forms the basis for a location cloaking algorithm that can reduce the number of obfuscated candidates to a location-dependent query. The final networking paper by N. Rosa and V. Batista proposes the Spontaneousware, a collection of software architecture, design and implementation artifacts that can assist in the development of middleware applications on mobile ad hoc networks, delineating the functional requirements.

## **4. THE TRACK CHAIRS**

Hong Va Leong received his PhD from the University of California at Santa Barbara, and is currently an associate professor at the Hong Kong Polytechnic University. He is the program co-chairs of several conferences, including IMMCN, HS@I, CIC, and the track chair of SAC 2003 to 2008. He has served on the organizing committees for SIGMOD and VLDB and on the program committees of VLDB, ICDCS, MDM, DOA and many others. He is a reviewer for ACM Transactions on Computer Systems, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Knowledge and Data Engineering, on Mobile Computing, on Multimedia, and on Computers, Information Systems, and other journals. His research interests are in mobile computing, internet computing, distributed systems, distributed databases, and digital libraries. He is a member of the ACM, IEEE Computer Society and IEEE Communications Society.

Alvin Chan is currently an associate professor at the Hong Kong Polytechnic University. He graduated from the University of New South Wales with a Ph.D. degree in 1995 and was subsequently employed as a Research Scientist by the CSIRO, Australia. From 1997 to 1998, he was employed by the Centre for Wireless Communications, National University of Singapore as a Programme Manager. He is an active consultant and has been providing consultancy services to both local and overseas companies. In 2003, he was awarded the Most Active New Consultant and Highest Overseas Consultancy awards by the university. In addition, he was the recipient of the 2005 Faculty of Engineering’s Teaching award.

## Editorial Message

# The 6<sup>th</sup> ACM SAC Track on Organizational Engineering

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<http://ceo.inesc.pt/sac2009/>

## 1. THE 6<sup>TH</sup> ORGANIZATIONAL ENGINEERING SPECIAL TRACK

Dominated by the behavioral science approach for a long time, information systems research increasingly acknowledges design science as a complementary approach. The systematic design of artifacts is not restricted to information systems components. Being the conceptual foundations for information systems requirements, artifacts on the strategic and organizational levels have to be engineered as well.

Organizational Engineering aims at researching concepts, methods and technology in order to understand, model, develop and analyze all important aspects of changing businesses. As a whole, it focuses on understanding the relationships and dependencies between strategy, business processes and the supporting information systems. It encompasses several multi-disciplinary topics, including modeling business goals and processes, formalizing enterprise ontologies, representing information system services and identifying best practices and patterns. Of these topics, business process modeling is probably the one which has received most attention from researchers and practitioners in the last few years since it targets one of this area's core concepts. Business process modeling has been widely used for different means, such as facilitating human understanding and communication, supporting process improvement through business processes analysis and simulation, supporting business process re-engineering, automating the execution of business processes and supporting the analysis and design of process-oriented software implementations.

The importance of organizational engineering has been increasing with the widespread usage of internet-based communications and technologies such as web services, which facilitate business processes to be executed and orchestrated using computer technology inside the organization and across organizational boundaries. These technologies allow to integrate enterprise applications and to automate business processes, thereby allowing the organization to adapt to a changing environment and to realize a real return on investment due to a reduction on integration and development costs. However, this requires that technological and business concepts must be tightly integrated and understood and its complex relationships fully explored.

The focus of this track is on the application of both well-known and original techniques to the organizational engineering area. Special attention is dedicated to approaches which deal with relating both business and technological aspects of an organization and to service orientation as an emerging design paradigm. The organizational engineering track provides an opportunity for researchers, academics or practitioners interested in organizational modeling, methodologies and tools to present their solutions, exchange their ideas and discuss open issues and future directions.

The 6<sup>th</sup> edition of the Organizational Engineering track is part of the 24<sup>th</sup> ACM Symposium on Applied Computing and will take place at Waikiki Beach, Honolulu, Hawaii, USA, from 8 to 12 March 2009. Eight full papers and three short papers were selected for presentation and publication, which corresponds to an acceptance rate of 28%. The most popular topics were enterprise architecture, business architecture, business process modeling and reference models. Further information on the 6<sup>th</sup> Organizational Engineering track can be found at <http://ceo.inesc.pt/sac2009/>

## 2. ABOUT THE PAPERS

The 6<sup>th</sup> OE track includes two full-paper sessions. In Session 1, **Martin Op 't Land** from the Delft University of Technology, the Netherlands, **Hans Zwitser** and **Paul Ensink** from KLM and **Quentin Lebel** from Air France describe an enterprise ontology based method for deciding on and implementing organizational splits and mergers. Next, **Diana Heckl** and **Jürgen Moormann** from the Frankfurt School of Finance & Management, Germany, present a modularization technique for the operational control of service processes. **Artur Caetano**, **António Rito Silva** and **José Tribolet**, from IST, Technical University of Lisbon, Portugal, describe a role-based architecture framework to represent the business, information, application and technological perspectives of an organization. The first session concludes with **Kai M. Hüner**, **Martin Ofner** and **Boris Otto**, from the Institute of Information Management, University of St. Gallen, Switzerland, who propose a reference model for the maturity assessment of corporate data quality management.



Session 2 opens with **Stephan Kurpjuweit** and **Robert Winter** from the Institute of Information Management, University of St. Gallen, Switzerland, who present an integrated approach for business architecture engineering that combines a stakeholder-oriented procedure model with reference meta-models. Next, **Joe Bolinger**, **Greg Horvath**, **Jay Ramanathan** and **Rajiv Ramnath** from CETI, Ohio State University, USA, discuss the impact of knowledge-intensive workflow enactment on the performance of collaborative organizational processes. **Peter Rittgen** from the Vlerick Leuven Gent Management School, Belgium, describes a comparative case study focusing on the collaborative modeling of business processes with respect to the impact of tool support on the modeling process. Finally, **Jay Ramanathan**, **Rajiv Ramnath** from CETI, the Ohio State University, USA, and **Randall Glassgow** from Cardinal Health, USA, describe how the Adaptive Complex Enterprise framework contributes to the improvement of services in complex enterprises.

In the short papers, **Rafael Paim**, **Vanessa Nunes**, **Bruno Pinho**, **Flávia Santoro**, **Claudia Capelli** and **Fernanda Baião** from GEOS, Federal Center for Technological Educational Celso Suckow da Fonseca and NP2Tec, Federal University of the State of Rio de Janeiro, Brazil, propose an organizational structure and the main business processes related to managing a process center of excellence. **Viara Popova** from the De Montfort University, United Kingdom, and **Alexei Sharpanskykh** from the Vrije Universiteit Amsterdam, the Netherlands, describe a framework for the formal specification of constraints to ensure the consistency and validity of organizational specifications. Finally, **Wilco Engelsman** and **Henry M. Franken** from BiZZdesign, the Netherlands and **Maria E. Jacob**, from the University of Twente, the Netherlands, discuss a case study that addresses the impact of enterprise architecture on requirements engineering.

### 3. ACKNOWLEDGMENTS

Organizing this track would not have been possible without the collaboration and support of many people. Our thanks to the ACM SAC organization and to all the authors who made this track possible. The track chairmen are especially grateful to the effort of everyone who directly served in the Organizational Engineering track Program Committee, namely:

**Alexander Schwinn** – University of St. Gallen , Switzerland  
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**Stephan Kupjuweit** – University of St. Gallen , Switzerland  
**Steven Bleistein** – NICTA , Australia

### 4. TRACK CHAIRS SHORT BIOGRAPHY

**José Tribolet** is full professor of Computer Engineering at Instituto Superior Técnico, Technical University of Lisbon, Portugal. He obtained his PhD from the MIT, USA. In 1998 he was a visiting fellow at the Center for Coordination Sciences in MIT's Sloan School of Management. He leads the Center for Organizational Design and Engineering (CODE) at the Institute for Systems and Computer Engineering (INESC), a contract-based research organization, which he co-founded in 1980. He currently plays an active role in the organizational engineering area, being involved in several research and consultancy projects. His main research interests are organizational modeling, business process engineering and information systems architecture.

**Robert Winter** is director of the Institute of Information Management, University of St. Gallen (HSG), Switzerland, and academic director of HSG's Executive Master of Business Engineering program. He received Master degrees in business administration and business education as well as a doctorate in social sciences from Goethe University, Frankfurt, Germany. After eleven years as a researcher and deputy chair in information systems, he was appointed full professor of information management at HSG in 1996. His research interests include business engineering methods and models, information systems architectures/architecture management, and integration technologies/integration management (particularly data warehousing and enterprise application integration).

**Artur Caetano** is assistant professor of Information Systems at Instituto Superior Técnico, Technical University of Lisbon, Portugal and researcher at the Center for Organizational Design and Engineering (CODE), INESC INOV. He holds a PhD degree in Computer Engineering from the Technical University of Lisbon and his research interests include business process modeling, role modeling, information systems architecture, service-oriented architecture and object-oriented frameworks.

# EDITORIAL MESSAGE

## Special Track on Requirements Engineering

*Maria Lencastre, Universidade de Pernambuco, Brazil*

### 1. NATURE OF THE TRACK

Requirement Engineering is defined as the branch of Software Engineering concerned with the real-world goals, functions, and constraints on software systems; it is also concerned with the relationship of these factors to the precise specification of software behaviour, their evolution over time and across software families. Requirements Engineering is increasingly recognized as a critically important activity in any systems engineering. Independently of the nature of the software, the elicitation, analysis, negotiation, specification, validation and management of requirements are fundamental for the development of quality in complex software. Only by fully understanding stakeholders' needs, and documenting them in a concise, unambiguous way, one can consistently deliver quality products designed to meet the complexities of our advanced information society.

The objective of this track is to explore different advances in requirements engineering at large, its relation with different areas, reducing the gap between software engineering solutions and the way one specific domain of knowledge was seen up to given point.

These are the main areas of concern in Requirements Engineering:

- Requirements engineering for scientific areas
- Requirements elicitation, analysis, and documentation
- Requirements specification languages, methods, processes, and tools
- Requirements management, traceability, and viewpoints
- Modelling of requirements, goals, and domains
- Non-functional requirements
- Requirements engineering and Software architecture
- Aspect-oriented requirements engineering
- Agent-oriented requirements engineering
- Requirements for COTS-based systems
- Case studies and experiences based on requirements engineering
- Social, cultural, and cognitive factors in requirements engineering
- Requirements engineering: education and training
- Requirements and autonomic systems
- Requirements and simulation

### 2. CONTENTS OF THE TRACK

The Requirements Engineering track of ACM-SAC 2009 received 31 (thirty one) submissions from 20 (twenty) different countries, spread over the America, Asia and Europe. A board of 33 specialists reviewed all submissions and selected 8 (eight) papers and 4 (four) posters, covering different areas of the field.

The University of Texas at Dallas (USA) contributes with the paper "Extending Problem Frame to deal with stakeholder Problems: An Agent- and Goal-Oriented Approach", which presents a framework that extends the problem diagram to represent stakeholder problems using "soft-problem", a notion referring to an undesirable situation that negatively affects stakeholder goals and may have less clear-cut resolution criteria. The analysis of UML diagrams is the focus of 3 other selected papers. The paper entitled "LTS Semantics for Use Case Models" from Concordia University (Canada), proposes a formal semantics for use case models, allowing for various semantic checks and also introduces "Use Case Model Analyzer" tool. The article "A Method for Developing UML State Machines", from Université Paris XIII (France) together with colleagues from Università di Genova (Italy), concentrates on the development of state machines describing the behaviour of a class; the authors show how relevant information can be searched for in the textual description and organized to obtain a behaviour description from which the state machine can be derived. Finally, the paper entitled "Mapping UML Sequence Diagram to Time Petri Net for Requirement Validation of Embedded Real-Time Systems with Energy Constraints", from Federal University of Pernambuco (Brazil), presents the mapping process of UML Sequence diagram into a Time Petri Net with Energy constraints so as to validate timing and energy requirements in early phases of the embedded system development life-cycle.

Considering the theme  $i^*$ , there is the paper " $i^*$ -prefer: Optimizing Requirements Elicitation Process based on Actor Preferences", from Tsinghua University (Beijing, China), which proposes to take the preferences of actors into consideration when making design decisions, and use such preference information to help optimize the elicitation process. The other paper is entitled "Mapping Semantically Enriched Formal Tropos to

Business Process Models” and is from Ghent University (Belgium), it proposes an extension of the existing Formal Tropos specification, originating from early phase requirements engineering, to embed semantic annotations. Furthermore, detailed mappings are proposed to translate semantically enriched Formal Tropos scripts into Business Process Modelling Ontology (BPMO). Researchers from the North Carolina State University (USA), present “Identifying Vulnerabilities and Critical Requirements Using Criminal Court Proceedings”. This paper reports on an exploratory case study to identify legal vulnerabilities and provides guidance to practitioners in the analysis of court documents. As legal violations occur after system deployment, court records reveal vulnerabilities that were likely overlooked during software development. Another paper is “Eliciting Required Characteristics for Usable Requirements Engineering Approaches”, from The University of California at Irvine describes a market study intended to elicit a set of characteristics that could improve the usability of requirements engineering approaches.

Four posters were accepted to the Requirements Engineering track. The first one entitled “Early Phase Requirements Assessment of a Teletreatment Trial”, from the University of Twente (Netherlands) together with the University of Gothenburg (Sweden), addresses an early phase requirements elicitation of a teletreatment trial and the assessment of the requirements in respect of their importance to the trial and the feasibility of the corresponding adaptations of the telemedicine system within the trial project constraints. The second poster, entitled “Architectural Requirements Prioritization and Analysis Applied to Software Technology Evaluation”, from ABB Corporate Research (USA) presents an industrial project applied the Attribute Hierarchy-based Evaluation of Architectural Designs (AHEAD) method for selecting a software technology to form the basis for the next-generation architecture of a complex commercial software application.; the authors found that using AHEAD brought greater objectivity to prioritization of architectural requirements and to the technical judgments of the software technology options. The third poster entitled “Requirements modelling and evaluation for digital preservation: A COTS selection method based on controlled experimentation”, from Vienna University of Technology (Austria), describes a based empirical methodology for COTS component selection in digital preservation through controlled experimentation. Finally the fourth poster entitled “A Systematic Method for Generating Quality Requirements Spectrum”, from Shinshu University (Japan), introduces domain knowledge called term-characteristic map to improve current spectrum analysis for quality requirements.

### 3. THE PROGRAMME COMMITTEE

The experts of all areas of requirements engineering from all over the world that composed the program committee of the ACM-SAC 2009 track on Requirements Engineering are presented below:

Alberto Silva ( <i>Technical University of Lisbon, Portugal</i> )	Jon Hall ( <i>The Open University, UK</i> )
Amador Durán Toro ( <i>Universidad de Sevilla, Spain</i> )	Juan Hernández ( <i>University of Extremadura, Spain</i> )
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Christine Choppy ( <i>Université Paris XIII, France</i> )	Maria Lencastre ( <i>Universidade de Pernambuco, Brazil</i> )
Daniel M. Berry ( <i>University of Waterloo, Canada</i> )	Mariitta Heisel ( <i>Duisburg-Essen University, Germany</i> )
Didar Zowghi ( <i>University of Technology Sydney, Australia</i> )	Mehmet Aksit ( <i>Univ. Twente D. Enschede, The Netherlands</i> )
Eric Yu ( <i>University of Toronto, Canada</i> )	Oscar Pastor ( <i>Universitat Politècnica de València, Spain</i> )
Guilherme Horta Travassos ( <i>COPPE/UFRJ, Brazil</i> )	Pankaj Jalote ( <i>Indian Institute of Technology Delhi, Indian</i> )
Giancarlo Guizzardi ( <i>UFES, Brazil-Lab.Applied Ontology, Italy</i> )	Paolo Giorgini ( <i>University of Trento, Italy</i> )
Gustavo Rossi ( <i>Universidad Nacional de La Plata, Argentina</i> )	Robin Laney ( <i>The Open University, UK</i> )
Guttorm Sindre ( <i>IDI/NTNU, Norway</i> )	Rosana Braga ( <i>Universidade de Sao Paulo, Brazil</i> )
Jaelson Castro ( <i>Universidade Federal de Pernambuco, Brazil</i> )	Vincenzo Gervasi ( <i>University of Pisa, Italy</i> )
Jean-Michel Bruel ( <i>Univ. de Pau et des Pays de l'Adour, France</i> )	Xavier Franch ( <i>Universitat Politècnica de Catalunya, Spain</i> )
João Araújo ( <i>Universidade Nova de Lisboa, Portugal</i> )	Yijun Yu ( <i>Open University, UK</i> )
John Mylopoulos ( <i>University of Toronto, Canada</i> )	

### 4. THE TRACK CHAIR

Maria Lencastre finished her B.Sc in 1988, M.Sc in 1992 and D.Sc. in 2004 all in Computer Science at Federal University of Pernambuco. Currently, she is associate professor of the University of Pernambuco, Recife, Brazil and visiting professor at Universidade Nova de Lisboa, Portugal, for the 2008 academic year. Maria Lencastre was the general chair of 11th Ibero-American Workshop on Requirement Engineering (IDEAS'08). She was the chair of the First Requirement Engineering Track of ACM-SAC'08. She was a member of the local organizer committee of 6th Latin American Conference on Pattern Languages of programming (SugarLoafPLOP'07).

She is member of the program committee of several international events on this area including SugarLoafPLOP'07, the 10th Workshop on Requirements Engineering (WER'08), 13th Conference on Software Engineering and Databases (JISBD'08), the Ibero-Americana WWW/Internet (IADIS'08), VI SulComp 2008, the 12th Ibero-American Workshop on Requirement Engineering (IDEAS'09).

## Message from the Software Engineering Track Chairs

Welcome to the Software Engineering Track of ACM SAC 2009 – The 24th Annual ACM Symposium on Applied Computing. The objective of the Software Engineering Track is to provide researchers and practitioners with a platform for presenting and discussing their ideas and experiences with technologies, theories, and tools used for producing highly dependable software more effectively and efficiently. The Software Engineering Track allows in-depth discussion and exchange of ideas on major software engineering topics, In particular, it gives the academic community an opportunity to learn about, understand, and respond to the needs of the software industry as expressed by current practitioners.

This year we received 68 submissions. Each paper was carefully evaluated by at least three reviewers. These reviews were then used for selecting papers to be presented at the conference. Twenty papers were accepted as regular papers with a 29% acceptance rate. In addition, we have recommended seven papers for the poster session. These papers cover a broad spectrum including software testing, validation and verification, formal method, models, metrics, requirements, architecture, design, UML, risk assessment, web applications, embedded systems, and component-based software.

We extend our thanks to all the individuals that contributed to the success of the Software Engineering Track: the authors for providing many high-quality submissions, and the Program Committee and evaluators who ensured the selection of the best papers.

On behalf of the Software Engineering Track, we welcome you to the conference and hope you enjoy the program that has been prepared.

W. Eric Wong  
Department of Computer Science  
University of Texas at Dallas, USA  
SE Track Co-Chair

Chang-Oan Sung  
Department of Computer Science  
Indiana University Southeast  
SE Track Co-Chair

Sung Shin  
Department of Computer Science & Software Engineering  
South Dakota State University  
SE Track Co-Chair

## EDITORIAL MESSAGE

# Special Track on Software Verification and Testing

*Tamara Rezk*, INRIA Sophia Antipolis Méditerranée, *France*

These are the proceedings of the Software Verification and Testing (SVT) track at the 2009 ACM Symposium on Applied Computing. The SVT track aims at contributing to the challenge of improving the usability of formal methods in software engineering. We accepted 10 papers out of 39 submissions. The decision was based on the reviews and the electronic discussion among PC members. I am grateful to the members of the program committee for their hard, expert, and generous work:

Ana Almeida-Matos, Instituto Superior Tecnico, Portugal

Karthik Bhargavan, Microsoft Research, UK

Laura Brandan-Briones, LRI University Paris-Sud, CNRS, France

Francisco Matias Cuenca-Acuña, Intel, Argentina

Amy Felty, University of Ottawa, Canada

Holger Hermanns, Saarland University, Germany

Jay Ligatti, University of South Florida, USA

MohammadReza Mousavi, Eindhoven University of Technology, The Netherlands

David Naumann, Stevens Institute of Technology, USA

Tamara Rezk (track chair), INRIA Sophia Antipolis Méditerranée, France

Fausto Spoto, University of Verona, Italy

Vugranam Sreedhar, IBM Research, USA

Marielle Stoelinga, University of Twente, The Netherlands

Jan Tretmans, Radboud University Nijmegen; Embedded Systems Institute, Eindhoven, The Netherlands

I am also grateful to the external reviewers of the track: Suzana Andova, Pedro Baltazar, Jasper Berendsen, Nicolas Bruno, Eduardo Casanovas, Jan Cederquist, Rohit Chadha, Marcelo F. Cuadrado, Pieter Cuijpers, Alessandro Di Bucchianico, Carla Ferreira, Marie-Claude Gaudel, Domingo Gonzalez, Nataliya Guts, Jerry den Hartog, Sylvain Heraud, Christian Hofmann, Georgeta Igna, Gabriel Infante-Lopez, César Kunz, Alexander Lazovik, Zhengqin Luo, Patricio Maller, Ricardo Medel, Paulo Mateus, Jun Pang, Pablo P. Passera, Gustavo Petri, Eric Piel, Matthias Raffelsieper, Michel Reniers, Peter van Rossum, Jorge Sacchini, Julien Schmaltz, Ana Solokova, Mark Timmer, Frits Vaandrager, Tim Willemse, Nicolas Wolovick, Burkhart Wolff, Santiago Zanella

Finally, I am grateful to the organizing committee, authors, and participants that contribute to the success of the SVT track.

**Tamara Rezk**  
**SVT track chair, ACM SAC 2009**

## EDITORIAL MESSAGE

# Special Track on Web Technologies

*Davide Rossi, Università di Bologna, Italy*

*Fabio Vitali, Università di Bologna, Italy*

With the advent of new powerful and exciting concepts, protocols and languages, such as Web Services, Semantic Web, Ajax, etc. , Web-related technologies are becoming more and more pervasive and powerful. They lay the ground to novel kinds of applications and application frameworks, such as Service Oriented Architectures or Web 2.0 applications, and an increasing number of critical applications make use of them. At the same time Web applications evolve. They are not just the easiest path to zero client install software but are becoming the founding elements of an emerging class of ubiquitous software systems that foster the evolution of new cooperation paradigms among people. Novel approaches and techniques, new tools and frameworks are needed to address the increasing complexity of these applications.

This track aims at bringing together researchers and practitioners from industry and academia working on practical and foundational aspects related to Web technologies and existing technologies that in the Web framework have found new and unexpected application fields.

Following the success of the first two editions, the 2009 edition of the Web Technologies received more than thirty submissions from countries as diverse as Australia, Brazil, Belgium, Canada, China, Czech Republic, Finland, France, Germany, Greece, Italy, Japan, Korea, Portugal, Spain, Switzerland, UK and USA. At the end of the review process ten papers were accepted as full papers, with an acceptance ratio less than one third. As the reader will be able to appreciate, the coverage of the selected papers is extremely ample and nor simply technical, spanning from advanced technologies to innovative social applications.

The reviewing process has been possible thanks to the hard work of the members of the program committee:

- Helen Ashman - University of South Australia - Australia
- Marco Brambilla - Politecnico di Milano - Italy
- Vanessa Camilleri - University of Malta - Malta
- Alfredo Cuzzocrea - ICAR-CNR and University of Calabria - Italy
- Ernesto Damiani - Università degli Studi di Milano - Italy
- Antonina Dattolo - University of Udine - Italy
- Angelo Di Iorio - Università di Bologna - Italy
- Silvia Duca - Università di Bologna - Italy
- Enrico Francesconi - ITTIG - CNR - Italy
- Martin Gaedke - Chemnitz University of Technology - Germany
- Vic Grout - Glyndwr University - United Kingdom
- Giorgia Lodi - Università di Bologna - Italy
- John Lumley - Hewlett-Packard Laboratories - United Kingdom
- Paolo Marinelli - Università di Bologna - Italy
- Noah Mendelsohn - IBM Corporation – United States of America
- Matthew Montebello - University of Malta - Malta
- Harri Oinas-Kukkonen - University of Oulu - Finland

- Nick Russel - Eindhoven University of Technology - The Netherlands
- Corrado Santoro - University of Catania - Italy
- Fabrizio Silvestri - ISTI - CNT - Italy
- Stéphane Sire - Ecole Polytechnique Fédérale de Lausanne - Switzerland
- Henry Thompson - University of Edinburgh, United Kingdom
- Elisa Turrini - Università di Bologna - Italy
- Stefano Zacchiroli - Université Paris Diderot - France

At last, we would like to thank all the authors for their contribution, without whom this workshop would not have been possible. Special thanks also go to the ACM SAC 2009 General Chairs, Sung Y. Shin and Sascha Ossowski, and Program Chairs, Mirko Viroli and Ronaldo Menezes, for their support and guidance.



## EDITORIAL MESSAGE

### ***Special Track on***

### ***Agent-Oriented Software Engineering Methodologies and Systems***

*Massimo Cossentino, ICAR-CNR Palermo, Italy*

*Ambra Molesini, Alma Mater Studiorum – Università di Bologna, Italy*

*Andrea Omicini, Alma Mater Studiorum – Università di Bologna a Cesena, Italy*

*Valeria Seidita, Università degli Studi di Palermo, Italy*

AOSE methodologies have been studied since 2000 and traditionally the focus was only onto one of the methodologies' features: workproducts. Investigations on another fundamental characteristic – the process - have been proposed only recently.

The aims of this track are the deeper investigations of AOSE methodologies and their underpinned processes. The investigation has started from the idea that an ideal general-purpose AOSE methodology and an ideal general-purpose AOSE process do not exist.

The AOSE methodologies proposed in literature in the last years are typically special-purpose methodologies with the aim of engineering specific kinds of complex system, and no general-purpose AOSE methodology was proposed. Now there is the need to build new methodologies for new kinds of applications domain (like for example the self-\* domain), but the constructions of a new methodology from scratch is a very complex and time-consuming task. So, the reuse of portions of well-tested and well-known methodologies has become very important.

Moreover, key factors for the success of new methodologies can often be found in the clear definition of their scope, in the identification of a precise application and development context and in the adoption of a proper formalisation of the approach.

In this track we aim at presenting works dealing with all the elements that affect the construction of a new design process from the features it aims at exhibiting to the final evaluation of the result also including adopted modelling languages, techniques and specific methods.

The contributions received deal with important and interesting arguments such as: methodologies for agent-oriented analysis and design, Agent-Oriented Software Engineering, tools supporting AOSE methodologies construction and enactment, standardisation for AOSE methodologies. The total number of submitted paper was 10 and four of these papers have been accepted for presentation at the conference track. This positions the acceptance rate of this track in line with the general results of the whole conference. Another two papers have been invited to the conference poster session. The success of this meeting is due to the work and effort of several people, we would like to express our sincere thanks to the Conference Chairs, Program Chairs, Poster Chairs and all the members of the Organizing Committee. We would also like to thank the members of the Program Committee and the external reviewers for the high quality and timely review work.

## **Program Committee:**

Federico Bergenti - Università degli Studi di Parma, Italy  
Carole Bernon - Institut de Recherche en Informatique de Toulouse, France  
Olivier Boissier - ENS Mines Saint-Etienne, France  
Giacomo Cabri - Università di Modena e Reggio Emilia, Italy  
Luca Cernuzzi - Universidad Católica Nuestra Señora de la Asunción, Paraguay  
Scott A. DeLoach - Kansas State University, United States  
Oguz Dikenelly- Ege University, Turkey  
Michael Dr. Berger -Siemens AG, Germany  
Giancarlo Fortino - Università della Calabria, Italy  
Salvatore Gaglio - ICAR-CNR, Italy  
Stéphane Galland - University of Technology of Belfort-Montbéliard, France  
Alessandro F. Garcia - Lancaster University, United Kingdom  
Nicolas Gaud - University of Technology of Belfort-Montbéliard, France  
Paolo Giorgini - Università di Trento, Italy  
Marie-Pierre Gleizes - Institut de Recherche en Informatique de Toulouse, France  
Jorge J. Gomez-Sanz - Universidad Complutense de Madrid, Spain  
Zahia Guessoum -Université Pierre & Marie Curie, France  
Salima Hassas - Université Claude Bernard Lyon 1, France  
Brian Henderson-Sellers - University of Technology, Sydney, Australia  
Vincent Hilaire - University of Technology of Belfort-Montbéliard, France  
Tom Holvoet - Katholieke Universiteit Leuven, Belgium  
Marc-Philippe Huget - University of Savoie, France  
Slinger Jansen - Universiteit Utrecht, Netherlands  
Abder Koukam - University of Technology of Belfort-Montbéliard , France  
Vito Morreale - ENGINEERING Ingegneria Informatica S.p.A, Italy  
James Odell - James Odell Associates, United States  
Sascha Ossowski - University Rey Juan Carlos, Spain  
Julian Padget - University of Bath, United Kingdom  
Van Parunak – NewVectors, United States  
Juan Pavón - Universidad Complutense de Madrid, Spain

## EDITORIAL MESSAGE

### Special Track on Agreement Technologies (AT)

*Jesús Cerquides, University of Barcelona, Spain*

*Peter McBurney, University of Liverpool, UK*

*Pablo Noriega, IIIA-CSIC, Spain*

*Juan A. Rodríguez-Aguilar, IIIA-CSIC, Spain*

Nowadays, most transactions and interactions for both business and leisure applications are mediated by computers and computer networks. From email to virtual worlds, the way people work and enjoy their free time has changed dramatically in less than a generation. The greater impact of this pervasive use has been on the way that applications are conceived and developed. These applications require components to which more and more complex tasks can be delegated, components that show increasing levels of intelligence, and components that are capable of sophisticated modes of interacting with one another and with human users, as increasingly these components are massively distributed, sometimes embedded in all sort of appliances and sensors.

There is therefore a need for the development of models, frameworks, methods and algorithms for constructing large-scale open distributed computer systems where autonomy, interaction and mobility are the key characteristics. We envision that such technologies can be structured around the concept of agreement among computational agents. The notion of agreement as the glue that binds together computational agents in an open system is based on three fundamental concepts: (1) a normative context, that determines “the rules of the game”, i.e. how the interactions between agents are intended to take place; (2) the establishment of an agreement for action between the agents that respects the normative context; and (3) the fulfilment of any agreements reached by the participants.

This first special track on Agreement Technologies received ten submissions that were rigourously reviewed. Finally, four of the submissions were accepted as full papers. The papers represent different perspectives, and visions, and consider different relevant problems on agreement, such as MAS adaption and organization, market-based coordination and software infrastructure for MAS.

In “Multi-Agent System adaptation in a Peer-to-Peer scenario”, Jordi Campos Miralles and colleagues propose a two layer MAS architecture to adapt the agreements on social conventions in dynamic MAS. They illustrate the benefits of their approach by modeling a Peer-to-Peer system proving that the addition of the adaption layer pays off in terms of network usage.

In “Organising MAS: A Formal Model Based on Organisational Mechanisms”, Roberto Centeno and colleagues propose a general formal framework to organize multiagent systems based on the idea of organizational mechanism. Thus, they focus on mechanisms to structure organizations wherein the interactions between agents are intended to take place. Along this line, they define and explore the properties of informative and regulative mechanisms and classify different organizational paradigms as informative or regulative mechanisms.

In “Market-based coordination for intersection control”, Matteo Vasirani and Sascha Ossowski study the application of market-based mechanisms for managing future urban road traffic infrastructures, where drivers safely cross intersections by reserving the necessary time-space slots. They design market rules to align the infrastructure owner revenue with the average travel time. Therefore, the way drivers agree on their coordination is mediated by a market-based mechanism.

In “Towards Organizational Agent-Oriented Operating Systems”, Javier Palanca and colleagues develop a design framework for a new generation of Operating Systems based on the underlying principles of multi-agent systems and agreement technologies. Their approach integrates organizational principles, web services and interaction-based communication as services for an Operating System and explores the mechanisms for such services to be globally offered to every Operating System user. This work illustrates how to endow an operating system with an organizational structure as a first step towards an operating system architecture that supports the dynamic establishment of agreements.

The Agreement Technologies track organizers are grateful to the SAC program chairs, Ronaldo Menezes and Mirko Viroli for their encouragement, support and organization. We would also like to thank the members of the AT program committee for an excellent reviewing work. Finally and foremost, we would like to thank the authors for submitting their work to this special track.

## EDITORIAL MESSAGE

### Special Track on Bioinformatics

*Mathew J. Palakal, Indiana University Purdue University Indianapolis, USA*

*Rajaraman Kanagasabai, Institute for Infocomm Research, Singapore*

Advances in bioinformatics are providing the foundations for the convergence of agribusiness, healthcare, pharmaceuticals, computing and other fields, into what promises to be the largest industry in the world, the life sciences industry. Much of the information to support biology research is available across the rapidly growing online databases in a multitude of formats. The challenge is to obtain information and knowledge from these databases using innovative computational approaches to predict and explain phenomena in many application fields. One example of this computational challenge is to identify biological pathways using data, information, and knowledge scattered over heterogeneous databases. Computational tools using system-theoretic approaches are needed to model metabolic pathways, signal-transduction pathways, genetic regulatory circuits and biological systems modeling. By identifying conserved genomes and pathways across several species at a high level, we hope to understand how stable biological systems have evolved. Over the last few years, very high throughput techniques, such as microarray analysis, have provided many insights into genomes, metabolomes and transcriptomes and into cellular function. These data are now increasingly complemented by mass spectrometry technology, providing insights into proteomes. This computational analysis technique poses many new challenges.

The primary goal of the Bioinformatics Track is to provide an opportunity for biological and computer scientists to share ideas related to these computational challenges.

This is the eighth year for the Bioinformatics Track and we received 31 submissions this year. All submitted papers were reviewed by at least three reviewers and all reviews were done anonymously. Nine full papers and three poster papers were accepted for an acceptance rate of 29 %.

We wish to thank all of the reviewers and all of the authors for making this a track of excellent quality.

## EDITORIAL MESSAGE

### Special Track on Computer Applications in Health Care

*Rosa M. E. M. da Costa, Universidade do Estado do Rio de Janeiro, Brazil*

*Fátima L. S Nunes, Escola de Artes, Ciências e Humanidades - Universidade de São Paulo, Brazil*

The evolution and a growing interest in the application of computer systems in the health care area is a reality in the last years. These applications have opened new possibilities of information systems, visualization of medical images, manipulation of medical data, interaction and communication among professional and patients, besides new ways for training and updating professional's knowledge.

The ACM Symposium on Applied Computing (SAC) has been a primary gathering forum for applied computer scientists, computer engineers, software engineers, and application developers from around the world. The track "Computer Applications in Health" aims at providing a space for discussion and experience exchange for researchers, students, professors and industry professionals that are interested in the development of the health care area.

The ACM-CAHC2009 follows the success of previous editions, aiming at presenting recent results of the research on several areas of health care, developed by professionals coming from several researches' centers from different countries.

The CAHC2009 Call for Papers generated considerable interest with high-quality contributions from researchers across many countries, from Europe, Latin America and Asia. We received 29 full papers submissions from which we selected 9 full papers and 2 posters. Experts in the area evaluated all the submitted papers.

We would like to emphasize our gratitude to all program committee members, the organizing committees and the authors of all submitted papers. On behalf of CAHC2009, we welcome all delegates and sincerely hope that you enjoy the symposium and the beauty of Honolulu, Hawaii !!!

## **EDITORIAL MESSAGE**

### **Special Track on Computer Forensics**

*Lorie M. Liebrock, New Mexico Institute of Mining and Technology, USA*

*Brajendra Panda, University of Arkansas, USA*

*Robert L. Hutchinson, Sandia National Laboratories, USA*

With the exponential growth of computer users, the number of criminal activities that involves computers has increased tremendously. The field of Computer Forensics has gained considerable attention in the past few years. It is clear that in addition to law enforcement agencies and legal personnel, the involvement of computer savvy professionals is vital for any digital incident investigation. Unfortunately, there are not many well-qualified computer crime investigators available to meet this demand. An approach to solve this problem is to develop state-of-the-art research and development tools for practitioners in addition to creating awareness among computer users.

The primary goal of this track is to provide a forum for researchers, practitioners, and educators interested in Computer Forensics to advance research and educational methods in this increasingly challenging field. People from academia, industry, government, and law enforcement are sharing their previously unpublished ideas on research, education, and practice through this track. The track encouraged original, previously unpublished papers in the following general (non-exhaustive) list of topics.

- Incident Response and Live Data Analysis
- Operating System and Application Analysis
- File System Analysis
- Network Evidence Collection
- Network Forensics
- Data Hiding and Recovery
- Digital Image Forensics
- Event Reconstruction and Tracking
- Forensics in Untrusted Environments
- Hardware Assisted Forensics
- Legal, Ethical and Privacy Issues
- Attributing Malicious Cyber Activity
- Design for Forensic Evaluation
- Visualization for Forensics

Papers accepted for the track include work on: use of a fuzzy-matching clustering algorithm to group spam email generated by malware, use of data mining on image spam to identify common sources of unsolicited email, reconstruction of documents destroyed with strip-shredders, detecting and tracing plagiarism in digital documents, use of text classification for off-topic search detection, analysis of fragmentation of deallocated blocks in deleted Windows registry data structures, use of a layered trust management framework to improve accountability in Internet email, and development of a multiagent system for case-based reasoning in computer forensics.



## **Reviewing Process**

A total of 17 submissions from Brazil, Canada, Ireland, Italy, , South Korea, Singapore, and USA were received. Each paper was reviewed by at least 3 blind reviewers and provided careful and thoughtful reviews on which the selection process was based. After thorough review process for each submission by the Program Committee members, only 4 papers were accepted as full papers with an acceptance paper of 24%. In addition to full papers, there were 4 poster papers accepted for the track. All accepted full papers will be invited for a special issue of the Journal of Digital Forensics Practice after the SAC'09 conference. All reviewing was done by the technical program committee:

Sudhir Aggarwal (Florida State University)  
Brian Carrier (Basis Technology)  
David Dampier (Mississippi State)  
Ron Dodge (United States Military Academy)  
David Duggan (Sandia National Laboratory)  
Heather Dussault (SUNY Institute of Tech.)  
Rajni Goel (Howard University)  
Yong Guan (Iowa State University)  
Warren Harrison (Portland State University)  
Wayne Jansen (National Institute of Standards)  
Gary Kessler (Champlain University)

Nasir Memon (Brooklyn Poly. University)  
Kara Nance (University of Alaska Fairbanks)  
Gilbert Peterson (Air Force Inst. of Technology)  
Gerald Quirchmayr (University of Vienna)  
Indrajit Ray (Colorado State University)  
Marc Rogers (Purdue University)  
Jill Slay (University of South Australia)  
Craig Valli (Edith Cowan University)  
Ray Vaughn (Mississippi State)  
Yanjun Zuo (University of North Dakota)

## **Acknowledgement**

We would like to thank all of the authors who contributed to the ACM SAC'09 CF Track. We also like to thank all of the reviewers for their time and hard work. Finally, we offer special thanks to the SAC organizing committee and the ACM SigAPP.

## **Track Chairs**

Lorie M. Liebrock is an Associate Professor and Associate Chair of Computer Science at New Mexico Institute of Mining and Technology in Socorro, New Mexico. She is also Interim Education Director for the New Mexico Computing Applications Center. Her research interests include foundations of computer science, computer forensics, information assurance, parallel processing, and visualization..

Brajendra Panda is a Professor in the department of Computer Science and Computer Engineering at the University of Arkansas in Fayetteville Arkansas. His research interests include database systems, computer security, computer forensics, and information assurance.

Robert L. Hutchinson is the manager of Network Systems Survivability and Assurance at Sandia National Laboratories in Albuquerque New Mexico. His research interests include distributed and wireless systems, digital forensics, and network assurance and survivability.

# EDITORIAL MESSAGE

## Special Track on Computational Sciences

*Adrian Sandu and Yang Cao*

*Department of Computer Science, Virginia Tech, Blacksburg, VA 24060*

*sandu, ycao@cs.vt.edu*

### **The Special Track on Computational Sciences**

The aims of this Track are to draw attentions to new developments in computational sciences; to promote the exchange of ideas across disciplinary boundaries; and to foster the education of young computational scientists. Computational science is an interdisciplinary area where computational theories and techniques are tightly linked with application problems. In this track we emphasize on the strong connections between the computational algorithms, software packages and the real applications. Major topics of interest for the track of Computational Sciences include, but are not limited to: Numerical and Non-Numerical Algorithms of interest in applications; Parallel and High-Performance Algorithms; Computational Applications in all Scientific and Engineering fields (e.g. Biology, Chemistry, Mechanics, Statistics, Geosciences, etc); New Computational Application Areas (e.g. Arts, Finance, etc.); Optimization and Data Assimilation; Problem-Solving Environments.

### **Statistical Information**

The Special Track on Computational Sciences has received this year 31 submissions from United States, Russia, Brazil, Japan, Switzerland, Italy, New Zealand, Taiwan, Germany, Sweden, Slovenia, and China. Each paper has been reviewed by at least three independent experts in the field. Based on the feedback 10 papers were selected for proceedings publication, and another 3 for poster publication. The accepted papers are briefly introduced below.

### **Proceedings papers**

Parallel computation is obviously the hottest topic for this computational sciences track. Among the 10 accepted proceeding papers, four of them are directly related to parallel computation with applications in areas of astrophysics, geophysics, chemistry and biology. [CS-108] introduces *Sunfall*, a distributed, parallel scientific workflow system and its application in observational astrophysics. [CS-125] introduces a strategy to apply parallel computation and corresponding packages in geophysics computation. [CS-128] presents a 3D chemical transport module optimized for the Cell Broadband Engine Architecture (CBEA). [CS-129] presents a new scalable parallel program that is one to two orders of magnitude faster than standard algorithm when applied in the prediction of the structures of large RNAs.

Uncertainty is another hot topic within this track. Here we combine areas such as inverse problem, parameter estimation and stochastic simulation all in this direction. Five papers then have overlaps with this category, also with a wide range of applications. [CS-110] explores the polynomial chaos method for uncertainty quantification and proposes an uncertainty apportionment approach applied to weather forecast

model. [CS-125] and [CS-136] are both related to inverse problems. [CS-136] introduces various techniques necessary for the solution of nonlinear inverse problems, outline an adaptive algorithm, and demonstrate results using a realistic example from optical tomography. [CS-125] emphasizes more on the parallel computation side. [CS-134] and [CS-135] are related to stochastic simulations. [CS-134] proposes an interlacing scheme to combine large implicit Euler steps with a sequence of small explicit Euler steps applied to numerical solution of stochastic differential equations (SDEs). [CS-135] presents a modular approach to develop adaptive decisions with its application to biochemical discrete stochastic simulations.

We also have two interesting proceeding papers not related to the above two hot topics. [CS-115] presents an convergence acceleration scheme of Preconditioned Conjugate Gradient (PCG) type eigensolvers and its application in quantum dot computations. [CS-124] proposes a novel lattice model with its application in mathematical finance to achieve better accuracy, speed, and generality.

### **Poster papers**

We have accepted three poster papers, all of which have got pretty high scores in the review process but could not be accepted as proceeding papers due to our limited slots. [CS-106] is about parallel computation. It confirms the effectiveness of the reduced parallel Pairwise Nearest Neighbor codebook generation algorithm by the evaluation of the computational complexity of the algorithm and the experiment executed on a PC cluster system and a PC Grid system. [CS 127] presents a first attempt to an analytical method, based on a piecewise linear model for dominating execution limitations and black-box observations, to discover and understand how the available resources influence the execution time in industrial engineering. [CS 105] presents a general algorithm for finding optimal comma-free codes and deriving upper bounds on the minimum redundancy of comma-free codes, together with tables with bounds on the minimum redundancy computed by using this algorithm.

### **The Track Chairs**

Adrian Sandu obtained the Diploma in Electrical Engineering – Control Systems from the Technical University Bucharest, Romania, M.S. in Computer Science and Ph.D. in Applied Mathematical and Computational Sciences from The University of Iowa. Between 1998–2003 he served as a Computer Science faculty in the at Michigan Technological University, and since 2003 he is a faculty in the Department of Computer Science at Virginia Tech. Sandu's research interests are in the area of computational science and engineering.

Yang Cao obtained his Ph.D. in computer Science from the University of California, Santa Barbara (UCSB) in 2003. He stayed in UCSB as a postdoc and a project scientist until 2006. Since Jan. 2006, he joined the Department of Computer Science at Virginia Tech as an assistant professor. Cao's research interests are in the area of computational science and engineering, with special emphasis on multiscale modeling and simulation, uncertainty analysis and stochastic simulation for biochemical systems.

## EDITORIAL MESSAGE

### Special Track on Dependable and Adaptive Distributed Systems

*Karl M. Goeschka, Vienna University of Technology, Austria*

*Svein O. Hallsteinsen, SINTEF ICT, Norway*

*Rui Oliveira, Universidade do Minho, Portugal*

*Alexander Romanovsky, University of Newcastle, United Kingdom*

#### Introduction

Dependability is no longer restricted to critical applications, but rather becomes a cornerstone of the information society. Dependability clearly is a holistic concept: Contributing factors are not only technical, but also social, cultural (i.e. corporate culture), psychological (*perceived dependability*), managerial (information management and processes), and economical. Fostering learning is a key, and simplicity is generally an enabler for dependability.

Unfortunately, heterogeneous, large-scale, and dynamic software systems that typically run continuously often tend to become inert, brittle, and vulnerable after a while. The key problem is, that the most innovative mobile and pervasive systems and applications are the ones that also suffer most from a significant decrease in (deterministic) dependability when compared to traditional critical systems, where dependability and security are fairly well understood as complementary concepts and a variety of proven methods and techniques is available today. In accordance with Laprie we call this effect the *dependability gap*, which is widened in front of us between demand and supply of dependability, and we can see this trend further fueled by an ever increasing cost pressure.

Future systems need to close the dependability gap in face of challenges such as cross-organisational heterogeneity, massive scale, and mobility. Of course, dependability and adaptiveness can not simply be added to a system like a plug-in module. Rather, for databases, services, middleware, and software development, application developers need tools, sound methodologies, common practices, standards, architectural principles, and middleware services, to tackle the inherent complexity and emerging behavior of distributed systems and to ensure trustworthy services. Therefore, the *vision of this track* is on the convergence of software development tools with middleware, traditional dependability, fault tolerance, security, and adaptivity concepts, together with social and psychological aspects, to compensate for dependability degradation of running software and services.

This is the fourth year for the DADS track and 30 submitted papers show the importance of the topic. 40 reviewers performed our double-blind review process, where each paper has been reviewed by three reviewers. Finally, ten regular papers have been accepted resulting in an acceptance rate of 33%. One more submission has been accepted as poster paper.

## Overview of the Sessions and Papers

The DADS track provides a forum for scientists and engineers in academia and industry for their latest research findings on selected topics in dependable and adaptive distributed systems. The track is structured in two sessions: The **first session** focuses on the adaptivity, dependability, and security properties of complex systems. In particular, the following papers comprise this session:

1. A framework for dynamic adaptation of server clusters.
2. Adaptive Resource Management Architecture for Distributed Real-time Embedded Systems.
3. Formalizing the notion of adaptive system behavior.
4. ATM: Automatic Trust Monitoring of Service-Based Software Systems.
5. Supporting Recovery, Privacy and Security in RFID Systems Using a Robust Authentication Protocol.

The **second session** focuses on performance, quality of service, and optimization of dependable and adaptive systems. In detail, the following papers are part of this session:

6. Adaptive Optimal Checkpoint Interval and Its Impact on System's Overall Quality in Soft Real-time Applications
7. Latency-aware Leader Election
8. Boosting the Performance of Computing Systems through Adaptive Configuration Tuning
9. Efficient Maintenance of Distributed Data in Highly Dynamic Opportunistic Grids
10. Dynamic Planning and Weaving of Dependability Concerns for Self-Adaptive Ubiquitous Services

Finally, a poster paper has been accepted:

- An Approach to Preserving Consistency of Service-Oriented System during Dynamic Evolution

## Acknowledgements

We would like to thank our reviewers as well as our authors for their work and support for making this an interesting track for research and industry. Special thanks go to our organizational chair, Lorenz Frohofer (Vienna University of Technology, Austria), who did a great job during the whole paper submission and review process.

## EDITORIAL MESSAGE

### Special Track on Applications of Evolutionary Computation

*Bryant A. Julstrom, St. Cloud State University, USA*

Three mechanisms drive biological evolution: reproduction with variation, selection according to fitness, and repetition. Evolutionary computation abstracts and simplifies these mechanisms and applies them to optimization problems. In an evolutionary algorithm, data structures called chromosomes encode candidate solutions of the target problem instance. The EA maintains a population of such chromosomes, each with numerical fitness that indicates the quality of the solution it represents. Operators inspired by genetic recombination and mutation generate new chromosomes from existing ones, and chromosomes of better fitness—that is, that represent better solutions—are more likely to become parents in their turn. As generations of these chromosomes succeed each other, representations of better and better solutions evolve.

The Applications of Evolutionary Computation track allows researchers to share recent developments in the application and related theory of evolutionary computation. This track has been part of SAC since the first Symposium in 1986. This year, researchers in eleven countries submitted twenty-one papers to the track, the largest number of submissions in at least three years. Nineteen reviewers from nine countries reviewed the submissions, of which five were accepted as full papers and one as a poster.

As is the case every year, the papers present a variety of applications and techniques. Among the papers, Gao, Zhang, and Lu describe a particle-swarm-based algorithm for bilevel decision-making in the case where the second-level decisions share common constraints. Chen and Jiang present a recombination mechanism for evolution strategies that interpolates the local objective function from the current population and applies the gradient of that function in iterative local search. Basgalupp, Barros, de Carvalho, Freitas, and Ruiz offer a lexicographic multi-objective technique in a genetic algorithm for the induction of decision trees. Moallem and Ludwig apply ant colony optimization and particle swarm optimization to the problem of load balancing in a distributed grid. Park, Park, and Ryu use cooperative coevolutionary algorithms to address the remarshalling (rearranging) of cargo containers for efficient loading onto ships. In the poster, Masaru and Satoshi use a genetic algorithm to determine the parameters of a diffusion model used in turn to estimate daily demand for new products.

The time, effort, and thoughtful consideration of its reviewers allow the EC track to consistently identify and present good and interesting papers. This year, the following members of the program committee read and evaluated the submitted papers. My thanks to all the authors who submitted their work to the EC track and to the reviewers who read and evaluated the submissions.

Leandro Maciel Almeida  
Helio J. C. Barbosa  
Thang Bui  
Federico Divina  
Omar El-Gayar  
V. Scott Gordon  
Graham Kendall

Walter A. Kusters  
Shih-Hsi Liu  
Worthy Martin  
Helmut Mayer  
Lawrence Merkle  
Lawrence J. Osborne  
Jakob Puchinger

Günther R. Raidl  
André Luis Debiase Rossi  
Konsta Sirvio  
Jorge Tavares  
Claudio Toledo

## EDITORIAL MESSAGE

### Special Track on Geometric Constraints and Reasoning

*Xiao-Shan Gao, Key Laboratory of Mathematics Mechanization, China*

*Robert Joan-Arinyo, Universitat Politècnica de Catalunya, Spain*

*Dominique Michelucci, Université de Bourgogne, LE2I, France*

21 articles were submitted to GCR 2009, and 5 were selected, which gives a rate of acceptance smaller than 24 per cent. Besides, 3 more papers were selected for the poster session.

In the full article "Body-and-cad geometric constraint systems", Kirk Haller, Audrey Lee-St. John, Meera Sitharam, Ileana Streinu and Neil White initiate a rigidity theory for 3D rigid bodies assembled with pairwise coincidence, angle and distance constraints. A new, necessary but not sufficient, counting condition for minimal rigidity of such assemblies is explicated: nested sparsity, which is a slight generalization of the well-known sparsity condition of Maxwell.

In the full article "Formalizing Desargues' theorem in Coq using ranks", Nicolas Magaud, Julien Narboux and Pascal Schreck present a mechanized proof of one of the fundamental theorems of the projective space, namely Desargues' theorem, using the Coq proof assistant. The proof relies only on ranks and their combinatorial properties as explicated in Matroid theory. The notion of ranks homogeneously describe incidence and non-incidence relations in 3D such as equality, collinearity and coplanarity, in generic or degenerate configurations, and, together with the Coq proof assistant, permit to carry out proofs in a systematic way.

In the full article "Infinite Bar-Joint Frameworks", by John C. Owen and Stephen C. Power, some aspects of a mathematical theory of rigidity and flexibility are developed for general infinite frameworks and two main results are obtained. In the first sufficient conditions, of a uniform local nature, are obtained for the existence of a proper flex of an infinite framework. In the second it is shown how continuous paths in the plane may be simulated by infinite Kempe linkages.

In the full article "Characterizing 1-Dof Henneberg-I Graphs with Efficient Configuration Spaces", Heping Gao and Meera Sitharam define and study exact and efficient representations of realization spaces of a natural class of under-constrained 2D Euclidean Distance constraint systems (Linkages or Frameworks) based on 1-dof Henneberg-I graphs. Each representation corresponds to a choice of parameters and yields a different parametrized configuration space. Significantly, this article gives purely combinatorial characterizations that capture (i) the class of graphs that have efficient configuration spaces and (ii) the possible choices of representation parameters that yield efficient configuration spaces for a given graph.

In the full article "Origami Fold as Algebraic Graph Rewriting", Tetsuo Ida and Hidekazu Takahashi formalize paper fold (origami) by graph rewriting. Origami construction is abstractly described by a rewrite system  $(O, R)$ , where  $O$  is the set of abstract origami's and  $R$  is a binary relation on  $O$ , called fold. An abstract origami is a triplet  $(F, A, S)$ , where  $F$  is a set of faces



constituting an origami, and  $A$  and  $S$  are binary relations on  $F$ , each representing adjacency and superposition relations between the faces. The article then addresses representation and transformation of abstract origami's and further reasoning about the construction for computational purposes. It presents an hypergraph of origami and define origami fold as algebraic graph transformation. The algebraic graph-theoretic formalism enables to reason about origami in two separate domains of discourse, i.e. pure combinatoric domain and geometric domain, and thus helps to further tackle challenging problems in computational origami research.

In the poster "Topology Determination and Isolation for Implicit Plane Curves", by Jin-San Cheng, Xiao-Shan Gao and Jia Li, a method is proposed to generate an isolation for a plane curve, which is a set of boxes covering the curve, having the same topology as the curve, and approximating the curve to any given precision. The method uses symbolic computation to guarantee correctness and uses interval analysis whenever possible to enhance efficiency. This leads to a quite effective hybrid method for plane curve isolation.

In the poster "Multivariate Root Finding with Search Space Decomposition and Randomisation", Markus Färber presents a method for multivariate root finding that uses adaptive search space decomposition by generalised quad-trees and non-linear Lagrange polynomials to interpolate the function inside the tree nodes. The method applies randomisation to achieve robustness. Selection of start points for the Newton-Raphson like search is based on a heuristic rating of the decomposition cells. The algorithm tunes out found roots to find all solutions. Although developed for geometric constraint solving, where functions are only partially defined and no derivatives are available, the root finding method is applicable to a wider range of problems.

In the poster, "The Unique Solution for P3P Problem", Jianliang Tang and Nengzeng Liu study the relevant problem of the unique solution for the P3P problem. After partitioning the space into several regions, the parametric function and target function for each region are presented. Under the condition of knowing the approximate relative position between the center of the perspective and control points, the unique solution can be obtained. This method may be helpful for setting up the initial relative position between the center perspective and control points.

We thank all authors who submitted articles to GCR 2009. We thank the Program Committee members for promoting the event, suggesting ideas to improve it as well as timely reviewing the manuscripts. We thank the SAC organizers for reconducting the GCR track.

A special issue on Geometric Constraints and Reasoning, in the journal "Computational Geometry: Theory and Applications" will follow GCR-2009.

Xiao-Shan Gao, Robert Joan-Arinyo, Dominique Michelucci  
Track chairs of GCR 2009

## EDITORIAL MESSAGE

### Special Track on Intelligent Robotic Systems (Robot Track)

*First Track Chair, Denis F. Wolf - ICMC-USP, Brazil*

*Second Track Chair, Eduardo Marques - ICMC-USP, Brazil*

*Third Track Chair, Fernando S. Osório - ICMC-USP, Brazil*

Welcome to the ACM SAC Robot, the Special Track on Intelligent Robotic Systems of the ACM SAC 2008 conference. For the past twenty-three years, the ACM Symposium on Applied Computing has been a primary gathering forum for applied computer scientists, computer engineers, software engineers, and application developers from around the world. For the second year, the ACM SAC will have a specific track on robotics. It aims to be a forum for researchers to share experiences, expose issues, and discuss about this exciting research field.

The proceedings of the Robot Track contain the 8 full papers accepted for the ACM SAC Robot track, out of 27 submitted papers, with an acceptance ratio of 29%. We hope this track still continue in the next editions of ACM SAC Conference, increasing the visibility of the applied research work being developed by the robotic community.

The selection process was double blind, and each paper was reviewed by at least 3 experts, enforcing the quality of the reviewing process. The Program Committee was composed by an international committee of well known researchers and experts in the domain of knowledge of this conference track. Also, the best papers of this conference were indicated to be published (an extended version) into a special edition of the JBCS – Journal of the Brazilian Computer Society.

We would like to thank all authors, whose work and dedication made possible to put together an exciting program. Next, we would like to thank all members of the technical program committee and reviewers, for their time helping us to achieve the high quality of this conference program.

We would like to wish all attendees an exciting symposium!

Honolulu - Hawaii, March 2009,

Denis F. Wolf , Eduardo Marques, Fernando S. Osório  
Track Chairs – ACM SAC Robot Track

## EDITORIAL MESSAGE

# Special Track on Self-Organization in Pervasive Distributed Systems

*Marco Mamei, University of Modena and Reggio Emilia, Italy*

*Justin Werfel, New England Complex Systems Institute/Harvard Medical School, USA*

Increasingly inexpensive processors and sensors have made truly pervasive computing systems possible. These can range from active sensor networks monitoring a facility to passive tags storing location-based information. As these systems become more common, and increase in size and complexity, challenges arise for their programming and control. A key challenge is to provide powerful programming models to facilitate the development of applications in dynamic and heterogeneous environments. The main conceptual difficulty is that we typically have direct control only over the local activities of individual components, while the application task is often expressed at the global scale. Bridging the gap between local and global activities is not easy, but it is possible: distributed algorithms have been designed for many tasks in both sensor networks and MANET (mobile ad-hoc networks), from tracking to information routing. However, most of these algorithms are closely tied to the application task and domain, making them difficult to generalize to solve other tasks.

One promising framework is that of self-organization, where control is widely distributed, and the many separate components act and interact in such a way as to produce a desired global result. Although this approach is potentially very powerful, with numerous examples of biological and social systems that robustly work in this way, there are many aspects of designing such systems that are not yet well understood.

There are two main classes of problems that must be addressed to fulfill the power of self-organization in pervasive computing:

### **How can self-organization become an engineering methodology?**

1. Most work in self-organization starts by reverse-engineering a given self-organizing biological or social system (e.g., ant foraging), and applies the result to a specific application scenario (e.g., routing in sensor networks). Although this approach produces powerful results for a specific application scenario, it is very difficult to generalize it to other scenarios, and to derive general engineering methodologies from it.
2. Other work starts by directly engineering distributed algorithms that rely on a few basic mechanisms (e.g., broadcast and localization), and, by exploiting local interactions and local computations, can provably lead a system to a final coherent global state. Unlike traditional distributed algorithms, self-organizing algorithms disregard micro-level issues such as ordering of events, process synchronization, and structure of the underlying network (issues for which no possibility of control is assumed). Rather, they require that the algorithm will eventually converge despite micro-level contingencies (e.g., network dynamics, failure of some components). Although this approach produces the desired system functionalities by design, it is difficult to apply the mechanism to complex and articulated applications with several partners involved.

3. Some work achieves self-organization by carefully designing and engineering the local interactions among individual components: glider-guns and other cellular-automata constructions are remarkable examples of this practice. Such systems may lack desirable features of those discussed above, such as robustness to perturbations. As in the previous case, the construction of such algorithms is not driven by sound engineering principles, instead being more of a trial-and-error procedure that is not easily generalizable. Moreover, it is very difficult to find concrete applications for such systems.

### **How can we apply self-organization to pervasive computing?**

1. Many self-organizing systems revolve around a multitude of easily expendable agents repetitively interacting according to some pattern. However, in many pervasive computing scenarios, individual devices are not so disposable (e.g., PDAs), and interactions have to comply with strict energy budgets (as in sensor networks). Accordingly, the application of self-organizing ideas has to be carefully tuned to such characteristic scenario requirements.
2. Many self-organizing systems consider a homogeneous set of components (e.g., ants, cells, etc.). Most pervasive computing scenarios, by contrast, involve considerable heterogeneity. Components can differ both in terms of resources available (e.g., Internet servers vs. wireless sensors) and in terms of functionalities (e.g., client, service provider, broker, etc.). How can we apply and possibly take advantage of such heterogeneity in the self-organizing mechanisms?
3. Self-organizing systems typically assume that their components will follow specified behaviors even if they have no knowledge of the global task or of their role in achieving it (e.g., ants are hard-wired to carry out a given foraging algorithm, and there is nothing they can do about it). To apply self-organization to concrete pervasive computing scenarios, it may be important to encourage users to participate by giving them explicit knowledge of the global process, e.g., developing applications allowing them to see and understand what they are achieving collectively.

The aim of this track is to foster research and discussion on the above two sets of problems. In particular, the goal is to bring together researchers and practitioners working on both the theory and the deployment of self-organizing pervasive systems, with the goal of cross-pollination between different fields and approaches.

## **EDITORIAL MESSAGE**

### **Special Track on the Semantic Web and Applications**

*Hyoil Han, Drexel University, USA*

The technical track “The Semantic Web and Applications (SWA)” focuses on the topics related to Semantic Web Technologies and their Applications. The Semantic Web is a next generation web. The current web content is not easy to be processed by machines. On the other hand, the web content in the Semantic Web can be processed easily by machines. The techniques to realize and/or utilize the Semantic Web are discussed in this track.

The focus of this track is to present research concerning issues such as: 1) learning/constructing ontologies for Semantic Web applications; 2) utilizing ontologies for data management, integration and interoperability in Semantic web applications; 3) architectures for achieving Semantic Web goals for specific application domains; and 4) improving search techniques (or engines) with Semantic Web technologies.

This track aims to tackle research problems and practical applications for the Semantic Web. Researchers and practitioners are invited to submit papers on the theoretical, technical and practical issues of Semantic Web and its Applications. We are particularly interested in applying Semantic Web technologies to specific application domains (e.g., the e-business, medical informatics and bioinformatics).

Topics include, but are not limited to Semantic interoperability, Ontology-enabled interoperability among e-sources, Emergent semantics, Ontology, Taxonomy, and Folksonomy Schema mapping/matching and integration, Learning structures from the Web for Semantic Web-enabled applications, Ontology generation/learning, Building/utilizing ontologies and knowledge bases, Semantics and ontologies in data integration, Semantic Web-enabled search (engines), Semantic web-enabled question answering system, Ontology-enabled information retrieval, Semantic Web-enabled information retrieval, Semantic Web-enabled Information extraction, Full-text search in XML and/or Semantic Web documents, Data management and integration for Semantic Web-enabled applications, Semantic annotation, Semantic Web personalization, Semantic Web-enabled user modeling, Semantic Web services Reasoning, Querying the Semantic Web, Semantic Web mining, and Question Answering over the Semantic Web.

**EDITORIAL MESSAGE**  
**Special Track on Trust, Reputation, Evidence and other  
Collaboration Know-how (TRECK'09)**

*Jean-Marc Seigneur, University of Geneva and Venyo, Switzerland*

Computational trust and online reputation services have reached the mass market with pioneering startup reputation companies such as Venyo (<http://www.venyo.org>). The trust models and metrics used in those reputation services can again benefit from the TRECK track contributions, especially regarding their combination with recommender systems and their context-awareness aspects.

The TRECK track in Hawaii will surely foster exciting collaborations and technology transfers, especially for the growing realm of Web 2.0 applications and services. It may be the reason that the applied computational trust community is also growing fast. Further TRECK tracks (<http://www.trustcomp.org/treck/>) will continue to sustain its development.

The trustcomp online community (<http://tech.groups.yahoo.com/group/trustcomp/>) has been set up for the participants of the track and every person working in a field related to TRECK in mid-2004. The trustcomp mailing list now counts more than 230 members composed of a panel of experts from both the academic and the industrial world, with competences from various fields such as security, human computer interface, Semantic Web, risk management, user centric identity management, PKI, Grid computing, mobile phones programming, law, psychology, social software and sensor networks...

We would like to thank all the authors for submitting their 19 proposal contributions to the ACM SAC'09 TRECK track. We are grateful to the many external reviewers for their time and hard work to select the best 5 full papers and 1 poster paper. We thank the European Union who funds the FP7 PERIMETER project ([www.ict-perimeter.eu/](http://www.ict-perimeter.eu/)) on reputation-based telecom provider selection and sponsors the TRECK'09 track. Many thanks to the SAC organising committee, who believes in the potential of the TRECK track, as well as to the ACM SIGAPP!

# Editorial message: special track on Advances in Spatial and Image-based Information Systems (ASIIS)

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## 1. INTRODUCTION

Spatial and Image based information systems are increasingly at the heart of novel applications, raising new challenges in complex spatial data modelling, spatial data and image sharing, emergent geo spatial data semantics. The ACM SAC track on Advances in Spatial and Image-based Information Systems (ASIIS) aims to foster interdisciplinary discussions and research in various aspects of spatial and image based information systems. The focus is on both original research contribution and practical design solutions. More details can be found at <http://www.u-bourgogne.fr/Dbconf/ASIIS>. In this edition, 12 papers were submitted from several countries (USA, South Korea, Spain, Japan, Czech Republic, China, Italy, Spain, and Brazil) from which only 4 papers were accepted for inclusion in the conference Proceedings.

## 2. STRUCTURE OF THE TRACK

An interesting variety of recent research papers on various aspects of Spatial and Image based information systems are presented here.

The first paper, titled “*GPU-based Computation of Distance Functions on Road Networks with Applications*”, addresses algorithm for computing discretized distance functions on road networks. As applications, the authors provide algorithms for computing discrete Order-k Network Voronoi diagrams and for approximately solving k-Nearest Neighbor queries and Aggregate k-Nearest Neighbor queries on road networks. They also present experimental results obtained with the implementation of proposed algorithms.

In the second paper titled “*Similarity measures for trajectory of moving objects in cellular space*”, the authors study the properties of moving object in cellular space as most GIS are based on Euclidean space, cellular space can be used as an alternative type of space for a large number of GIS applications. In order to analyze the pattern of moving objects in cellular space, there is a need for new definitions of similarity between their trajectories since the trajectories in cellular space significantly differ from those in Euclidean space. Based on these observations, the authors propose several similarity measures between trajectories in cellular space and analyze the differences of the proposed measures by experiments.

The aim of the paper “*Labeled Images Verification Using Gaussian Mixture Models*” is to propose an automated system to

verify that images are correctly associated to labels. The novelty of the system is in the use of Gaussian Mixture Models (GMMs) as statistical modeling scheme as well as in several improvements introduced specifically for the verification task. The provided approach is evaluated using the Caltech 101 database. Starting from an initial baseline system providing an equal error rate of 30%, the authors show that the rate of errors can be reduced down to 13% by introducing several optimizations of the system. The advantage of the approach lies in the fact that basically any object can be generically and blindly modeled with limited supervision. A potential target application could be a post-filtering of images returned by search engines to prune out or reorder less relevant images.

In the last paper titled “*A Spatial Bitmap-based Index for Geographical Data Warehouses*”, the authors propose the Spatial Bitmap Index (SB-index), which is an index based on Bitmap and Minimum Bounding Rectangle (MBR) to provide efficient query processing in Geographical Data Warehouses. The SB-index is built on the primary key of a spatial dimension table, and maintains the MBR of a given spatial attribute. Query processing requires a scan on the index, which compares both the query spatial predicate and the current MBR. This scan supplies a set of candidate solutions to a refinement step that evaluates each candidate. Finally, only the index entries from objects that satisfy the spatial predicate must be accessed, in order to answer the submitted query. Comparisons between the SB-index and the star-join indexed with R-tree and GiST showed significantly improvement of 25% up to 95% with regards to the query processing time. This performance gain occurs since SB-index restricts a set of candidates and avoids the star-join calculation.

## 3. CONCLUSION

We hope this track motivates researchers to take the next step beyond building models to implementing, evaluating, comparing, and extend proposed approaches.

Many people worked long and hard to help this issue become a reality. We would first like to gratefully acknowledge and sincerely thank all the PC members and reviewers for their timely and insightful valuable comments and evaluations of the manuscripts that greatly improved the quality of the final versions. Of course, thanks are due to the authors, who provided excellent articles and timely extended revisions. Finally, we are grateful to the organizers of SAC for their trust in ASIIS, their efforts, patience, and painstaking editorial work during the production of these proceedings.



# EDITORIAL MESSAGE

## Special Track on Coordination Models, Languages and Applications

*Michael Ignaz Schumacher, University of Applied Sciences Western Switzerland*

*Alan Wood, University of York, UK*

For the eleventh edition of the Special Track on Coordination Models, Languages and Architectures, *interaction* and *coordination* are among the main dimensions characterizing any modern notion of computing, deeply affecting the engineering of concurrent and distributed applications. There, the issue about how to put several heterogeneous components (processes, objects, services, agents, humans) together within a working system to integrate them fruitfully in an open and dynamic environments can be considered today among the most important and challenging issues.

In these years then we have seen a progressive maturation of coordination models, languages, and architectures in all the various fields when the notion of coordination showed to be of primary importance, such as Multi-Agent Systems, distributed software architectures, middleware platforms, and workflow management. Such maturation more and more lead research works in the coordination field to affect and be affected by advanced themes that currently characterize the state-of-the-art of fields like software engineering, (distributed) artificial intelligence, business processes, and information systems: main examples are self-organisation, autonomic systems, semantic-oriented systems, automated composition of services in open scenarios. Such a maturity is reflected by the content of the papers submitted this year to the special track, both with theoretical and practical contributions.

### STATISTICS

In response to the call for papers, 19 submissions were submitted, and fed into the reviewing process. Altogether, there were 23 reviewers, and about 63 reviews were submitted by them, with at least 3 reviews for each paper. Based on reviewers' reports, the general ACM SAC guidelines for acceptance and rejection of submissions, it was possible to select only 5 of these submissions as regular papers for presentation at the track and 1 poster, resulting in a 26% acceptance ratio for the regular session.

### THE CONTRIBUTED PAPERS

*On-line Adaptation of Sequential Mobile Processes Running Concurrently* by Massimiliano de Leoni, Giuseppe De Giacomo, Yves Lespérance and Massimo Mecella discusses how Process Management Systems can automatically cope with deviations, proposing a technique for sequential processes running concurrently.

*A Framework for Modelling and Implementing Self-Organising Coordination* by Mirko Viroli, Matteo Casadei and Andrea Omicini discusses a framework of self-organising coordination, where coordination media spread over the network are in charge of managing interactions solely

according to local criteria.

*Situated Tuple Centres in ReSpecT* by Matteo Casadei and Andrea Omicini studies how to govern interactions between agents and their environment, using a generalized event model to support the management of environment events, making tuple centres situated.

*Decomposing Port Automata* by Christian Koehler and Dave Clarke presents decomposition theorems for port automata, namely that all (finite) port automata can be generated from a small set of primitive port automata.

*Knowledge-Based Coordination with a Reliable Semantic Subscription Mechanism* by Martin Murth and Eva Kühn presents an integrated coordination model which combines logic-based reasoning with a reliable semantic subscription mechanism.

Besides the regular papers, one contribution has been accepted as short paper, presented as poster. *Applying Reo to Service Coordination in Long-Running Business Transactions* by Natallia Kokash and Farhad Arbab presents an approach to formal modeling of longrunning business transactions, basing on a channel-based exogenous coordination language.

## EDITORIAL MESSAGE

# Special Track on Constraint Solving and Programming

*Stefano Bistarelli, Università degli studi "G. D'Annunzio" di Pescara  
and C.N.R. Pisa, Italy*

*Eric Monfroy, Universidad Técnica Federico Santa María, Valparaíso, Chile,  
and Université de Nantes, France*

*Barry O'Sullivan, Cork Constraint Computation Centre  
and University College Cork, Ireland*

Constraints have emerged as the basis of a representational and computational paradigm that draws from many disciplines and can be brought to bear on many problem domains. Given the increasing importance of the research field of constraints, organizing a special track dedicated to the topic was an ideal opportunity to showcase research from the field at ACM SAC-2009.

The track was concerned with all aspects of computing with constraints including algorithms, applications, environments, languages, models, and systems. Contributions were welcome from any discipline concerned with constraints, including artificial intelligence, combinatorial algorithms, computational logic, concurrent computation, databases, discrete mathematics, operations research, programming languages, and symbolic computation. We also solicited papers from any domain employing constraints, including computational linguistics, configuration, decision support, design, diagnosis, graphics, hardware verification, molecular biology, planning, qualitative reasoning, real-time systems, resource allocation, robotics, scheduling, software engineering, temporal reasoning, vision, visualization, and user interfaces. Papers that bridged disciplines, combined theory and practice, or discussed novel reasoning methods were especially welcome.

The special track was very successful. An excellent Programme Committee was assembled to help with the review process. A total of 15 papers were submitted for anonymous review. Each paper was reviewed by 4 members of the Programme Committee. From the submissions received, 5 full length technical papers and 2 poster papers were accepted and appear in the proceedings. The rate of acceptance for the track is in line with that of the conference as a whole.

As special track co-chairs, we would like to express our thanks to all those whose hard work made this track such a success. We express a very special word of thanks to all the authors who submitted papers to the special track. We also sincerely acknowledge the hard work of the Programme Committee for reviewing the papers in

such a detailed and timely fashion. Finally, we would like to thank the organizers of SAC-2009 for providing so much help and assistance in supporting this special track.

#### The Special Track Co-Chairs

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## **EDITORIAL MESSAGE**

### **Special Track on Data Streams**

*João Gama, LIAAD/INESC Porto, University of Porto, Portugal*

*André Carvalho, ICMC, University S. Paulo, Brasil*

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The rapid growth in information science and technology, in particular in the complexity and volume of data, has introduced new challenges for the research community. Several of these challenges are related with the nature of data generation, since most of the data sources produce data continuously. Examples include sensor networks, wireless networks, radio frequency identification (RFID), customer click streams, telephone records, multimedia data, scientific data, sets of retail chain transactions, etc. These sources are called data streams. A data stream is an ordered sequence of instances that can be read only once or a small number of times using limited computing and storage capabilities. These sources of data are characterized by being open-ended, with data flowing at high-speed, and generated by non stationary distributions. Data streams are increasingly important in the research community, as new algorithms are needed to efficiently process this streaming data in reasonable time. Many researchers coming from different areas (Data Bases, Data Mining, Machine Learning, OLAP, etc.) are designing new approaches or adapting some of the traditional algorithms to deal with data streams. The goal of this workshop is to convene researchers who work with, or have interest in, Data Streams models, processing continuous queries, sampling techniques and/or mining decision rules, decision trees, association rules, clustering, filtering, preprocessing, post processing, feature selection, visualization techniques, etc. from data streams and related issues.

This year, we received 18 submissions from 10 different countries: Canada, France, China, USA, Portugal, Germany, Greece, United Kingdom, Australia, and Italy. After a rigorous review process, where each paper was reviewed by 3 PC members, only 5 papers were accepted as full papers, which give an acceptance rate of 27%, and 4 poster papers. The topics cover outlier detection, evaluation, change and burst detection, clustering, and continuous queries over multidimensional streams.

The Program Committee was comprised of several experts from the Data Streams field. We would like to thank all of them: Jose Avila, University Malaga, Spain; Albert Bifet, Polytecnic Cataluna, Spain; Nitesh Chawla, University of Notre Dame, United States; Antoine Cornuéjols, Institut National Paris, France; Alfredo Cuzzocrea, University of Calabria, Italy; Mohamed Gaber, Monash University, Australia; Auroop Ganguly, ONRL, United States; Ricard Gavaldà, Polytecnic Cataluna, Spain; Geoff Holmes, University Waikato, New Zealand; Eamonn Keogh, University California, United States; Miroslav Kubat, University Miami, United States; Mark Last, University Ben Gorion, Israel; Rodrigo Mello, University S. Paulo, Brazil; Rosa Meo, University of Torino, Italy; Josep Roure, Polynetic Cataluna, United States; Elaine Sousa, University S. Paulo, Brazil; Eduardo Spinosa, University S. Paulo, Brazil; Min Wang, IBM, United States; Sean Wang, University Vermon, United States; Jiong Yang, Case Western Reserve University, United States; Ying Yang, Australian Taxation Office, Australia; Philip Yu, IBM, United States.

We wish also to thank all the authors, the reviewers and the Program Chairs of SAC09 for making this a successful meeting point for those interested in Data Streams.

# Editorial Message: Special Track on Database Theory, Technology, and Applications

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The world nowadays revolves around dealing with data presented in various formats. So it is inevitable that researchers focus their work on advancing the state of managing information. From here, the importance of database technology ranks amongst the hottest areas of research. This year the track has received many papers covering different areas of databases.

A total of 35 papers were submitted to the Database Theory, Technology, and Applications track. The track received papers from many countries – from Asia, Australia, Europe, North America, and South America – making this track a forum to share technical ideas and experiences relating to implementation and application of database theory and technology and to exchange ideas among international researchers in the area of database systems. Each paper was sent out to at least three reviewers, all are experts in their respective fields. The papers were of high quality and the refereeing process was difficult. At the end a total of 10 regular papers were selected on the basis of quality, originality, significance of work, and appropriateness to the conference. This makes the acceptance rate a respectable 29%. In addition, four papers were accepted to be presented in a poster session.

The selected papers cover a wide range of topics including: active databases, world-wide web-based databases, multimedia databases, temporal databases, object-oriented databases, data mining, data warehouses, advanced applications, and document management in digital libraries

We would like to take this opportunity to thank the officials of SAC 2009 for making this possible. Our special thanks go to all the authors and referees who all contributed to the success of this track. We are very encouraged by the positive response received for the Database Theory, Technology and Applications track. We look forward to your participation and cooperation in SAC 2010.

## **EDITORIAL MESSAGE**

### **Special Track on Enterprise Information Systems**

*Maria-Eugenia Iacob, University of Twente, The Netherlands*

*Rogério Atem de Carvalho, CEFET Campos, Brazil*

*Asterio Kiyoshi Tanaka, UniRio, Brazil*

Enterprise Information Systems (EIS) are those intended to support business in the contemporary knowledge-based global economy. Therefore, developing and deploying these systems means to deal with complex and cross-disciplinary enterprise integration issues. EIS area embraces a plethora of subjects that range from Enterprise Resources Planning (ERP), Enterprise Content Management (ECM) and Customer Relationship Management (CRM) to Decision Support Systems and Business Intelligence. This track complements conferences like IEEE EDOC and IFIP Confenis by exploring the interactions between technology and business concerns in EIS development, deployment, and management. This track also complements other SAC tracks such as Organizational Engineering, Document Engineering, Databases, Data Mining, e-Commerce, Requirements Engineering, Software Engineering, and Computer Security by stressing technology and business integration issues.

In its second edition, the EIS track received 15 submissions from authors from 11 countries, covering the following topics:

- Techniques for ERP, CRM, and ECM modeling, development and deployment (4)
- Enterprise Architecture and Service-Oriented Architectures (6)
- Business Process Management (2)
- Model Driven Development (1)
- Trust, security, and privacy issues in enterprise computing (2)

After the reviewing process that has involved 21 reviewers, 5 papers were selected for presentation as full papers and 2 as posters.

Full papers:

- “Model Based Reasoning on the Achievement of Business Goals”, by Sebastian Höhn, presents an approach for the automated reasoning (based on semantic congruence relations) on the achievement of business goals of a specific business process.
- “Policy Management Architecture Based on Provisioning Model and Authorization Certificates”, by Arlindo L. Marcon Junior, Altair O. Santin, Luiz A. de Paula Lima Jr, and Maicon Stihler, proposes a loosely coupled policy management scheme and prototype, using a serverless public key infrastructure and the Web Services technology.
- “Cross-organizational ERP Management: How to Create a Successful Business Case?”, by Silja Eckartz, Maya Daneva, Roel Wieringa, and Jos van Hilleegersberg, addresses the development and use of business cases in support of cross-organizational enterprise resource



planning (ERP)-enabled e-business integration initiatives and focuses in particular on pre-implementation activities, such as benefits management during ERP implementations.

- “Management of Requirements in ERP development: A Comparison between Proprietary and Open Source ERP”, by Björn Johansson, and Rogério Atem de Carvalho, analyses whether the existing problems of requirements management are the same or if they differ according to the type of development: closed source (proprietary) or open source ERP.
- “Privacy Preserving Churn Prediction”, by Shuting Xu, Shuhua Lai, and Manying Qiu, provide a strategy to protect customers’ privacy using data distortion on customer datasets on which churn prediction methods are applied, without compromising the accuracy of the churn prediction. The performance of several data distortion methods is evaluated.

Posters:

- “Constructing Process Views for Service Outsourcing”, by Rik Eshuis, and Alex Norta, identifies projection rules that can be used to construct a public process view from a private process that may contain invocable and observable activities. Based on these rules, the paper defines several projection relations that can exist between a private provider process and its public process views.
- “Web-Services in the Dutch Healthcare Insurance Sector: Expected Versus Achieved Benefits”, by Hayley Bakker, and Maria E. Iacob, investigates whether the promises made by technology providers and IT strategists have been made true by looking at the actual business benefits of web services in the Dutch healthcare insurance sector.

We are very encouraged by the high quality of the papers received in response to the call for contributions for the EIS track. Therefore, we are confident the track will not only raise very interesting discussions and address cutting-edge problems and applications in the area of EIS but will also contribute to the advancement and consolidation of knowledge in the EIS field.

Our special thanks go to all the authors and reviewers who all contributed to the success of this track. We look forward to your participation and cooperation in the future SAC conferences!

We would also like to take this opportunity to thank the officials of SAC 2009 for making this track possible.

## EDITORIAL MESSAGE

# Special Track on Embedded Systems

*Alessio Bechini, University of Pisa, Italy*

*Cosimo Antonio Prete, University of Pisa, Italy*

Nowadays we are observing an impressive growing in computing power demand in CPU-enabled devices that are currently used in everyday life. Embedded systems are present in an extraordinary number of different applications, from consumer electronics to biomedical systems, often involving any kind of multimedia support, as well as larger and larger storage modules. Even more than in past years, today the successful employment of such devices is mainly determined by their functionality/cost ratio. Embedded software has recently developed towards new complexity levels, posing new challenging issues: in this setting, the adoption of multithreaded software architectures is becoming almost mandatory, as additional computing power is frequently achieved by means of multicore CPUs and dedicated accelerators. Nonetheless, the market pressure calls for the employment of new methodologies for shortening the development time and for driving the evolution of existing products. New efficient solutions to problems emerging in this setting can be put into action by means of a joint effort of academia and industry.

Design of embedded systems must take into account a wide variety of strict specifications on performance, code size, energy consumption, real-time constraints, maintainability, security and possibly scalability: the more convenient trade-off has to be found, often operating on a large number of different parameters. Solutions can be proposed at different levels of abstraction, making use of an assortment of tools and methodologies: experimentations play a crucial role in this setting, helping in pointing out more convenient paths in hardware/software design space exploration.

The focus of the *Embedded Systems* track is on the application of both novel and well-known techniques to the embedded systems development. Particular attention is paid to solutions that require expertise in different fields (e.g. computer architecture, OS, compilers, security, software engineering, simulation). The track will benefit also from direct experiences in the employment of embedded devices in “unconventional” application areas, so to show up new challenges in the system design/development process.

Attending the track, researchers and practitioners from academia and industry will get a chance to keep in touch with problems, open issues and future directions in the field of development of dedicated applications for embedded systems.

Both track chairs are in debt with all the authoritative members of the Program Committee, who enthusiastically accepted to personally work for the success of the event.

Last but not least, special acknowledgements are due to the large group of reviewers, whose precious and knowledgeable help has been the principal guarantee for the high-quality profile of the event. Further details, as well as the reviewers’ list, can be found at the track website: <http://www2.ing.unipi.it/sac09/>

## PROGRAM COMMITTEE

Peter Altenbernd - Fachhochschule Darmstadt - Germany  
Sandro Bartolini - University of Siena - Italy  
Valerie Bertin - ST Microelectronics - France  
Enrico Bini - Scuola Superiore S. Anna - Italy  
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Marc Engels - Flanders' Mech. T. Centre, Leuven - Belgium  
Pierfrancesco Foglia - University of Pisa - Italy  
Björn Franke - University of Edinburgh - UK  
Malay Ganai - NEC labs - USA  
Roberto Giorgi - University of Siena - Italy  
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Tei-Wei Kuo - National Taiwan University - Taiwan  
Kenji Hisazumi - Kyushu University - Japan  
Shih-Hsi Liu - California State Univ. at Fresno - USA  
Gokhan Memik - Northwestern University - USA  
Emre Ozer - ARM Ltd. - UK  
Christian Poellabauer - University of Notre Dame - USA  
Kai Richter - Syntavision GmbH - Germany  
Richard Schantz - BBN Technologies - USA  
Yuriy Sheynin - AANET - Russia  
Henk Sips - TU Delft - The Netherlands  
Jean-Pierre Talpin - INRIA/IRISA - France  
Miroslav Velev - Aries Design Automation - USA  
Tilman Wolf - University of Massachusetts Amherst - USA  
I-Ling Yen - University of Texas at Dallas - USA

## STATISTICS

In the current edition of this event, 10 full papers and 4 posters out of 33 submissions have been accepted. Each submitted paper has been evaluated on average by 3.6 reviewers.

## CONTRIBUTIONS

All the contributions cover a wide range of topics within the track scope, providing a significant snapshot of research advances in the area of Embedded Systems. In particular, the following topics have been addressed: management of flash-memory and NVRAM storage systems, compilation techniques targeting multicore platforms, software updates in distributed embedded systems, functional verification and real-time debugging of embedded systems, real-time software upon configurable hardware, embedded cryptosystems, energy-saving real-time scheduling, performance characterization of gesture recognition systems, dynamic energy management in presence of renewable energy sources, efficient implementation of protocol stacks.

## EDITORIAL MESSAGE

### Special Track on Information Access and Retrieval

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Information Retrieval (IR) is an active research area since many decades, and, nowadays, it has become a hot and attractive research field. In fact, in the past 30 years, IR has grown well beyond its primary goals of indexing and searching textual documents in static bibliographic collections, and has moved away from the perception of being the narrow area of interest of librarians and information experts. This is testified by the large volume of research papers devoted to IR topics that are published every years in the proceedings of the many International Conferences, on IR. Nowadays, research in information retrieval is central to the design and the development of advanced intelligent information access systems, and spans a number of research topics including document modelling, multimedia document indexing, document classification and categorization, system architecture, user interfaces and query languages, data visualisation techniques, topic detection and tracking, geographic information retrieval, peer to peer systems, etc. Information access technologies, and in particular IR, are currently being used in many different application contexts that go far beyond the initial scope of their design, such as search engines and location based services. In fact, the development of the Internet has made urgent the problem of designing systems that effectively retrieve information on the WWW that is relevant to users' needs. The application of models and techniques proposed and tested in standard experimental contexts to new application areas is a very challenging task that we believe is worth of great attention by the researchers.

The special Track on Information Access and Retrieval (IAR) was firstly organized within the ACM International Symposium on Applied Computing in 2002; it is concerned with the theory, implementation and evaluation of information access to novel application areas, and novel contexts of information access. Its main aim is allowing researchers and practitioners in the IR field to present their experiences in the middle of theory-practice spectrum of IR, where believe many successful applications lie. These applications might sometime not be theoretically very innovative and their effectiveness might be sometime questionable when measured by established benchmarks; on the other side novel theoretical approaches to model some aspects of IR may be not fully and completely experimented, but their contribution to research and development in IR is still very valuable and useful. This year we received 36 paper submissions to the special track. Only 10 papers (and 5 posters) have been accepted, thus giving us a healthy acceptance rate of 30%. Each paper was reviewed by at least 3 members of the Program Committee, and only papers with at least two positive reviews were considered acceptable. For this, as always, our gratitude goes to the over 50 members of the track Program Committee (a list of which can be found in these proceedings) whose help was invaluable for the selection process. For the last years, that is from 2002 to the current edition, the accepted papers dealt with several issues in the domain of Information Access and Retrieval, among which multimedia IR, Information Filtering, document summarization, information extraction, effectiveness evaluation, document classification, web searching, and cross language IR, geographic Information retrieval.

This year, the track sessions are two, each of which comprises five papers.

The first session deals with modeling aspects of query evaluation in information access and retrieval systems. In the paper titled “*Bipolar query satisfaction using satisfaction and dissatisfaction degrees*” by Tom Matthé and Guy De Tré, a novel approach to flexible queries in databases is proposed based on the introduction of both positive and negative preferences so as to allow the expression of both what is desirable and undesirable. Besides a satisfaction degree, also an independent dissatisfaction degree is used. In the second paper, titled “*Heterogeneous bipolar criteria satisfaction handling in geographical decision support systems*” by Guy De Tré et al., the previous model is applied in the context of geographical decision making to determine suitability maps. The third paper, titled “*Alternatives to Conjunctive Query Processing in Peer-to-Peer File-sharing Systems*” by Wai Gen Yee et al. faces the problems encountered in peer-to-peer file-sharing systems that suffer from both the sparse descriptions of shared files and the over-specification of query constraints, and propose alternative means of query processing in which results are sent from the server to the client only if they are deemed relevant. The fourth paper titled “*Fast Error-Tolerant Search on Very Large Texts*” by Marjan Celikik and Holger Bast tackles the problem that naturally arises in the context of error-tolerant full-text search where, for a given query, the system must return not only documents matching the query words exactly, but also those matching their spelling variants. They propose a new algorithm for the spelling variants clustering that combines various ideas from the large body of literature on approximate string searching and spelling correction techniques. The fifth paper titled “*A Session Based Personalized Search Using An Ontological User Profile*” by Mariam Daoud, Lynda Tamine-Lechani and Mohand Boughanem describes a personalized search approach involving a semantic graph-based user profile, generated from an ontology, and referring to the user interest in a specific search session. They also detect the session boundary based on tracking changes in the dominant concepts held by the user profile, relatively to a new submitted query.

The second session presents papers dealing with diverse information retrieval modeling issues. The first paper of this session, titled “*HITS Algorithm Improvement using Anchor-related Text Extracted by DOM Structure Analysis*” by Yoshinori Hijikata et al., analyses the Kleinberg's HITS algorithm for ranking web pages by focusing its topic drift problem. They propose a solution based on the use of anchor-related text, called DOM-based anchor-related text, executing a deep analysis on the DOM structures of web pages. The second paper titled “*A Sentence Level Probabilistic Model for Evolutionary Theme Pattern Mining from News Corpora*” by Shizhu Liu et al., considers the problem of discovering and summarizing the evolutionary patterns of themes in temporal text collections. They not only give new representations of sentences and themes with named entities, but also propose a sentence-level probabilistic model based on the new representation pattern. The approach not only gets each topic's distribution per term, but also generates candidate summary sentences of the themes. The third paper titled “*Diverse Peer Selection in Collaborative Web Search*” by LeShinWu and Filippo Menczer starts from the observation that routing a query to multiple peers, that provide the same results, is a waste of resources. Thus, it proposes a peer selection approach for adaptive query routing which deals with overlapping collections, and takes into account not only which neighbors are the best resource providers for a given query, but also which combinations of neighbors can provide the least redundant results. The fourth paper titled “*A Class of Multistep Sparse Matrix Strategies for Concept Decomposition Matrix Approximation*” by Chi Shen and Mike Unuakhalu proposes a new method for concept decomposition matrix approximation that allows to limit the query time and storage costs of the usual method based on clustering and least square matrix approximation without decreasing the retrieval quality. Finally, the fifth paper titled “*Self-organizing collaborative filtering in global-scale massive multi-user virtual environments*” by Alexander Höhfeld et al. present a novel collaborative filtering algorithm used within the P2P-based self-organizing middleware service HyperVerse to generate and manage recommendations.

## **EDITORIAL MESSAGE**

### **Special Track on Multimedia and Visualization**

*Maria da Graça C. Pimentel, Universidade de São Paulo, Brazil*

*Ethan V. Munson, University of Wisconsin-Milwaukee, USA*

The Multimedia and Visualization track is concerned with principles, tools and processes that improve our ability to understand, create, manage, visualize and maintain multimedia in general and in interactive media in particular. The aim of this track is to bring together researchers from academia and industry who are actively engaged both in theoretical and practical aspects of these multidisciplinary themes, including those interested in discussing issues related to Human-Media Interaction.

The Multimedia and Visualization track's scope is deliberately quite broad. Submissions were encouraged whose research addressed any combination of issues in multimedia, visualization and interaction.

The Multimedia and Visualization track received a total of 44 submissions. After review of each paper by at least three reviewers, thirteen submissions were accepted as full papers and five were accepted as posters. The accepted works cover many topics within the track's scope, ranging from multimedia coding to digital television to multimedia specification languages to algorithms for multimedia to visualization of graphs and information flows.

## EDITORIAL MESSAGE

# Special Track on Object-Oriented Languages and Systems

*Davide Ancona, DISI, Univ. of Genova, Italy*

*Alex Buckley, SUN Microsystems, USA*

### Introduction

The object-oriented (OO) paradigm is extensively used to design and implement today's large scale software systems.

However, existing OO languages and platforms need to evolve to better support features like interoperability, software reuse, dynamic software adaptation, efficiency on multicore hardware, security, and safety.

The aim of the Special Track on Object Oriented Programming Languages and Systems (OOPS, <http://oops.disi.unige.it>) is to foster the development of extensions to existing OO languages and platforms, as well as the design and implementation of new languages and platforms embracing and enhancing the object-oriented paradigm. Particularly of interest for OOPS are papers that provide a thorough analysis covering most of the following aspects: theory, design, implementation, applicability, performance evaluation, and comparison/integration with existing constructs and mechanisms.

### Statistical Information

In response to the call for papers, 9 papers were submitted to the track.

All papers were referred by a high quality program committee consisting of the following 19 academic and industrial researchers.

Kim Bruce, Pomona College, USA  
Shigeru Chiba, Tokyo Institute of Technology, Japan  
Curtis Clifton, Rose-Hulman Inst. of Tech., USA  
Alessandro Coglio, Kestrel Institute, USA  
Pascal Costanza, Vrije Universiteit Brussel, Belgium  
Sophia Drossopoulou, Imperial College, UK  
Erik Ernst, University of Aarhus, Denmark  
Jacques Garrigue, Nagoya University, Japan  
Paola Giannini, Univ. of Piemonte Orientale, Italy  
Kathryn Gray, University of Cambridge, UK

Jakko Järvi, Texas A&M University, USA  
Tetsuo Kamina, University of Tokyo, Japan  
Andrew Kennedy, Microsoft Research, UK  
Doug Lea, Suny Oswego, USA  
Francesco Logozzo, Microsoft Research, USA  
Jeremy Manson, Google, USA  
Hidehiko Masuhara, University of Tokyo, Japan  
Tamiya Onodera, IBM Tokyo Research Laboratory, Japan  
Matthew Parkinson, University of Cambridge, UK

38 review reports were produced with 4 or 5 reviews per each paper. We are highly grateful to the members of the program committee and to the authors for submitting their contributions. Without their excellent work, it would not have been possible to schedule such a high quality program for the track.

Based on the reviewers' reports, the general ACM SAC guidelines for acceptance and rejection of submissions, and the unavoidable time and space constraints associated with any conference, it was possible to select 4 full papers for presentation at the track, with an acceptance rate of 44%.

As already done for the past three editions of OOPS, we are planning a further selection and revision process for a special issue of the Science of Computer Programming Journal, or analogous journals in the field of object-oriented technology.



## Summary of Accepted Papers

Saito and Igarashi [1] propose two mechanisms, namely, *nonheritable methods* and *local exactization* to remedy the mismatch between **ThisType** and subtyping. The safety of the mechanisms is proved for a small calculus.

Furr et al. [2] describe Diamondback Ruby (DRuby), a tool that blends Ruby's dynamic type system with a static typing discipline. When possible, DRuby infers static types to discover type errors and, when necessary, the programmer can provide DRuby with annotations that assign static types to dynamic code. These annotations are checked at run time, isolating type errors to unverified code.

Piveta et. al. [3] propose an unified way to represent both the conditions in which the application of a refactoring can be considered a refactoring opportunity and the mechanisms to associate these conditions with refactorings. The resulting representation mechanisms can be used to express search criteria based on software metrics, structural problems in existing software, heuristics or improvements on the software quality.

Lievens and Harrison [4] propose a simple scheme where symmetric methods may be defined in the classes of any of their parameters. When combined with multiple dynamic dispatch, this scheme allows for modular extensibility where a method defined in one class is overridden by a method defined in a class that is not its subtype. Soundness of a core calculus supporting symmetric encapsulated multi-methods is proved.

[1] Chieri Saito and Atsushi Igarashi, *Matching ThisType to Subtyping*

[2] M. Furr, J. An, J. S. Foster, and M. Hicks, *Static Type Inference for Ruby*

[3] E. Piveta, M. Pimenta, J. Araújo, A. Moreira, P. Guerreiro, and R. T. Price, *Representing Refactoring Opportunities*

[4] D. Lievens and W. Harrison, *Symmetric Encapsulated Multi-Methods to Abstract over Application Structure*

# Editorial Message

## Special Track on Programming Languages

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### 1. OBJECTIVES OF THE TRACK

The Programming Languages (PL) Track provides researchers and practitioners with a forum to present their ideas and experience in designing new programming concepts and implementing programming languages. It includes the topics of Compiling Techniques, Domain-Specific Languages, Formal Semantics and Syntax, Garbage Collection, Language Design and Implementation, Languages for Modeling, Model-Driven Development and Model Transformation, New Programming Language Ideas and Concepts, New Programming Paradigms, Practical Experiences with Programming Languages, Program Analysis and Verification, Program Generation and Transformation, Programming Languages from All Paradigms (Agent-Oriented, Aspect-Oriented, Functional, Logic, Object-Oriented, etc.), and Visual Programming Languages.

### 2. STATISTICAL INFORMATION

Twenty-six papers were originally submitted from 18 different countries: Brazil, Canada, China, Denmark, France, Germany, India, Ireland, Italy, Japan, Korea, Lebanon, the Netherlands, Portugal, Spain, the UK, Uruguay, and the USA. Among those, 8 regular papers were selected for an acceptance rate of 30.7% and 2 posters.

The Track Program Committee had 24 members: Suad Alagić (University of Southern Maine, USA), Paulo Borba (Federal University of Pernambuco, Brazil), Wei-Ngan Chin (National University of Singapore, Singapore), Thomas Cleenerwerck (Vrije Universiteit Brussel, Belgium), Sophia Drossopolou (Imperial College, UK), Jan Heering (CWI, The Netherlands), Nigel Horspool (University of Victoria, Canada), Bo Huang (Intel, China), Roberto Ierusalimsky (PUC-Rio de Janeiro, Brazil), Ralf Lämmel (Universität Koblenz-Landau, Germany), Annie Liu (State University of New York at Stony Brook, USA), Pablo Martinez Lopez (Universidad Nacional de Quilmes, Argentina), Soo-Mook Moon (Seoul National University, Korea), Terence Parr (University of San Francisco, USA), Enrico Pontelli (New Mexico State University, USA), Ganesan Ramalingam

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(Microsoft, India), Komondoor Raghavan (IBM, India), Martin Rinard (MIT, USA), Boštjan Slivnik (University of Ljubljana, Slovenia), Diomidis Spinellis (Athens University of Economics and Business, Greece), Harald Søndergaard (University of Melbourne, Australia), Tachio Terauchi (Tohoku University, Japan), Xiaqing Wu (Countrywide Financial Corp., USA), and Wu Yang (National Chiao-Tung University, Taiwan). Additional reviewers were: Giorgos Gousios, Markus Kaiser, Vassilios Karakoidas, and Vadim Zaytsev.

### 3. THE CONTRIBUTED PAPERS

Full papers:

1. Paul Biggar, Edsko de Vries, and David Gregg. A Practical Solution for Scripting Language Compilers. The paper presents an interesting solution for compiling scripting languages where language implementers typically faced the following challenges: the lack of a defined semantics, emulating C APIs, and supporting run-time code generation. The proposed approach was tested on `phc`, their ahead-of-time compiler for PHP.
2. Torben Mogensen. Troll, a Language for Specifying Dice-Rolls. The paper describes the most important features of the Troll language and their implementation. The most important features are: ability to automatically analyze descriptions for probability, multisets of integers as data structures, and new loop structures. Troll is implemented as an interpreter written in Standard ML either using random-roll semantics or probability semantics.
3. Akim Demaille, Roland Levillain, and Benoit Sigoure. TWEAST: A Simple and Effective Technique to Implement Concrete-Syntax AST Rewriting Using Partial Parsing. The paper describes a simple technique to implement AST generation and rewriting in general purpose languages using concrete syntax. The proposed approach is based on extensions made in the scanner and the parser and the use of objects supporting partial parsing called Texts With Embedded Abstract Syntax Trees (TWEASTs).
4. Julien Cervelle, Remi Forax, Gautier Loyaute, and Gilles Roussel. Banzai: a Java framework for the implementation of high-performance servers. The paper describes Banzai a Java framework that uses the Tatoo parser generator to simplify the implementation of high-performance servers based on plain-text protocols. The Banzai framework relies on the ability of Tatoo to

produce push non-blocking parsers with a fixed memory footprint during parsing and on a generic and efficient server architecture.

5. Dongseok Jang and KwangMoo Choe. Points-to Analysis for JavaScript. The paper presents the points-to analysis for JavaScript with the aim to determine the set of objects to which a reference variable or an object property may point. The analysis has a wide range of applications in code optimization and software engineering tools.

6. David Briggs and Suad Alagić. Algebraic Specification Techniques for Parametric Types with Logic-based Constraints. The paper describes the techniques to support writing generic specifications in a modular fashion and combining and extending them with great flexibility. Identifying the needed semantic properties of the type parameters in generic type definitions factors out the individual verification proofs of the code and replaces them with proof obligations on the instantiating types.

7. Paul Tarau. Isomorphisms, Hylomorphisms and Hereditarily Finite Data Types in Haskell. The paper presents the expressiveness of Haskell as a metalanguage for executable mathematics, by describing encodings for functions and finite sets in a uniform framework as data type isomorphisms with a group structure. The framework has been extended with hylomorphisms providing generic mechanisms for encoding Hereditarily Finite Sets and Hereditarily Finite Functions.

8. Weihua Zhang, Lili Liu, Chen Zhang, Hongjiong Zhang, Binyu Zang, and Chuanqi Zhu. Optimizing Techniques for Saturated Arithmetic with First-Order Linear Recurrence. The paper discusses how to vectorize saturated arithmetic, a typical operation in multimedia applications, with first-order linear recurrence (FOLR). In the presented framework the rearrangement of the data from the input vector is the essence of the transformation. The research reveals a new pattern in multimedia applications and investigates the corresponding vectorization on recent SIMD architectures.

Posters:

1. Petr Krajca and Vilem Vychodil. Data Parallel Dialect of Scheme. The paper describes the language called Schemik which is high-level lexically-scoped implicitly-parallel dialect of Scheme. The execution of programs is formally described by transitions of a particular pushdown automaton working with two stacks.

2. Yoshihiro Oyama, Yoshiki Kaneko, and Hideya Iwasaki. Kenro: A Virtual Machine Monitor Mostly Described in Haskell. The paper is an experience report on developing a tiny virtual machine monitor, named Kenro, mostly in Haskell as a concrete example of low-level, hardware-dependent system software.

## 4. ACKNOWLEDGMENTS

We would like to thank all authors for their valuable contributions. We also thank the program committee members who voluntarily supported us to recruit good papers and review the papers.

EDITORIAL MESSAGE

**Special Track on Programming for  
Separation of Concerns**

*Yvonne Coady, Victoria University, Canada*

*Corrado Santoro, Università di Catania, Italy*

*Emiliano Tramontana, Università di Catania, Italy*

Complex systems are intrinsically expensive to develop because several concerns must be addressed simultaneously. Once the development phase is over, these systems are often hard to reuse and evolve because their concerns are intertwined and making apparently small changes forces programmers to modify many parts. Moreover, legacy systems are difficult to evolve due the following problems: the lack of a well defined architecture, use of several programming languages and paradigms, etc.

Separation of concerns (SoC) techniques such as *computational reflection*, *aspect-oriented programming* and *subject-oriented programming* have been successfully employed to produce systems whose concerns are well separated, thereby facilitating reuse and evolution of system components or systems as a whole. However, a criticism of techniques such as computational reflection is that they may bring about degraded performance compared with conventional software engineering techniques. Besides, it is difficult to precisely evaluate the degree of flexibility for reuse and evolution of systems provided by the adoption of these SoC techniques.

With respect to dependability, a question arises as to whether the use of these techniques is double-edged. In particular, can these systems suffer a ripple effect, whereby a small change in some part has unexpected and potentially dangerous effects on the whole?

The Programming for Separation of Concerns (PSC) track at the 2009 Symposium on Applied Computing aimed to bring together researchers to share experiences in using SoC techniques, and explore the practical problems of existing tools, environments, etc.

## Statistics

The PSC track received the submission of 10 papers from 10 countries. Each paper received between 3 and 4 reviews. According to the general SAC guidelines, it was possible to select 4 of the submissions as regular papers.

## About the Papers

The PSC track has been allocated one session, chaired by Emiliano Tramontana.

In this session, *Jiyong Park* and *Seongsoo Hong* propose an approach for building aspect-oriented systems using XML annotations into the core concerns. The authors provide an example of the applicability of such an approach for developing the components of an embedded operating system.

*Walter Cazzola*, *Diego Colombo* and *Duncan Harrison* introduce the use of aspect orientation for improving the code that produces contents in the context of 3D scenes.

*Hans Schippers*, *Michael Haupt* and *Robert Hirschfeld* describe the machine-level support that should be provided to a family of languages allowing the modularization of cross-cutting concerns and for the composition of concerns.

Finally, *Peter Ebraert*, *Jorge Vallejos* and *Yves Vandewoude* propose an extension of feature-oriented programming in order to handle features as first-class change objects.

## Acknowledgments

The PSC co-chairs wish to express their gratitude to Antonella Di Stefano and Giuseppe Pappalardo working as steering committee of the PSC track, all the authors, the SAC General Program Chairs Ronaldo Menezes and Mirko Viroli, and the program committee members of the PSC track: G. Agha, M. Aksit, F. Bergenti, W. Cazzola, S. Chiba, P. Costanza, P. Ebraert, R. Giunta, S. Hanenberg, J. Hannemann, R. Hirschfeld, M. Koutny, L. Mancini, H. Masuhara, D. Pearce, E. Tanter, N. Venkatasubramanian, N. Wang, H. Wu.

**EDITORIAL MESSAGE**  
**Special Track on Real Time Systems**

*Paulo Martins, Chaminade University, USA*

*Binoy Ravindran, Virginia Tech, USA*

The focus of the RTS track is to advance the state-of-the art in the design, analysis, and implementation of real-time systems. Applications of real-time systems span many domains including avionics, aerospace, telecommunications, defense, process control, consumer electronics, multimedia, entertainment, and automotive. The track includes original research contributions on a number of aspects of real-time systems including system design, scheduling, scheduler implementation, synchronization, and execution time analysis.

In this second edition of the RTS track, there were 12 papers submitted from 9 countries. After a rigorous blind peer review process by 21 PC members, only 4 full papers were accepted for inclusion in the conference proceedings, resulting in an acceptance rate of 33%. Two additional papers were selected as poster papers. Due to space limitations, many good papers were rejected.

Many people have contributed to the success of this track and the SAC conference. We would like to acknowledge and thank all the PC members and reviewers for their timely, insightful and valuable comments on the manuscripts. Thanks are also due to the authors, who provided articles and timely revisions. Finally, we are grateful to the organizers of SAC for helping us organize the RTS track, and for their patience and painstaking editorial work.

Welcome to Hawaii!

## EDITORIAL MESSAGE

### Special Track on Computer Security

*Giampaolo Bella, Università di Catania, Italy*

*Luca Compagna, SAP Research, Sophia Antipolis, France*

As chairs of this track, we are pleased to welcome you to its eight edition at the ACM Symposium on Applied Computing. The Program Committee was enriched also this year with further eminent representatives from both industry and academia. Here is, in alphabetical order, the 2009 version.

- **Gail-Joon Ahn** (Arizona State University, USA)
- **David Basin** (Department of Computer Science, ETH Zurich, Switzerland)
- **Arslan Broemme** (ICW, Germany)
- **Iliano Cervesato** (Carnegie Mellon University, Qatar)
- **David W Chadwick** (Computing Laboratory, University of Kent, UK)
- **Bruce Christianson** (Faculty of Eng. & Information Sciences, U. of Hertfordshire, UK)
- **Nancy Durgin** (Sandia National Laboratories, USA)
- **Simon Foley** (Department of Computer Science, University College, Cork, Ireland)
- **Dieter Gollmann** (TU Hamburg, Germany)
- **Stefanos Gritzalis** (University of the Aegean, Greece)
- **Sokratis K Katsikas** (University of Piraeus, Greece)
- **Helmut Kurth** (ATSEC, Germany)
- **Chris Lesniewski-Laas** (MIT, USA)
- **Volkmar Lotz** (SAP Research, France)
- **Heiko Mantel** (TU Darmstadt, Germany)
- **Fabio Martinelli** (National Research Council, Italy)
- **John McDermott** (Naval Research Laboratories, USA)
- **Chris Mitchell** (Royal Holloway University of London, UK)
- **David von Oheimb** (Siemens Corporate Technology, Munich, Germany)
- **Dusko Pavlovic** (Kestrel Institute, USA & Oxford University, UK)
- **Kymie Tan** (Carnegie-Mellon University, USA)
- **Jianying Zhou** (Institute for Infocomm Research, Singapore)

In response to the call for papers, this edition received 58 submissions from virtually everywhere in the world, confirming a considerable review load to each committee member. The review process, which also involved a number of qualified delegates, was double-blind – not only were submissions anonymous but the reviewers of each paper ignored each other's identity. After each paper received 3 ample reviews, only the 10 papers with uniform consensus were accepted, defining a very selective acceptance rate of 17%. Some decent papers had to be rejected because it was impossible to accommodate a second round of reviews to improve them. We are therefore confident of the high quality of the material that is published in the following.

Here is this edition's programme, which is split up into two sessions.

- *J. Vaidya* tackles privacy issues emerging from classical linear programming problems.



- *Kerschbaum et al.* experiment with the performance of a protocol for privacy-preserving benchmarking and derive illuminating conclusions.
- *Schryen and Kadura* face the delicate issue of measuring security and specifically set it in the context of open-source versus closed-source software.
- *O’Gorman and Blott* confirm the stream correlation attacks suffered by a deployed peer-to-peer network.
- *Lombardi and Di Pietro* demonstrate an architectural extension of the Linux kernel with a virtualization level.
- *Villamarín-Salomón and Brustoloni* introduce an approach to detecting botnets on the basis of their DNS traffic.
- *Mao et al.* advance a semi-supervised and intelligent learning method for intrusion detection systems.
- *Davtyan et al.* show how to attack a trusted component of a voting terminal that is widely adopted in USA elections.
- *Liu et al.* develop a dedicated architecture to thwart SQL injection attacks.
- *Djalaliev and Brustoloni* rely upon a currently common TPM to harden the Linux kernel with usage control enforcement.

### About the Track Chairs

Giampaolo Bella has chaired the track in Computer Security at the ACM Symposium on Applied Computing since its inception. He is assistant professor at the University of Catania in Italy, where he teaches Computer Security. His main research interests lie in the analysis of crucial security properties by formal methods based on mechanical tools such as proof assistants, or manual tools such as soft constraint solving. After his Ph.D. from Cambridge University Computer Laboratory, he was a research associate at Technical University Munich for a semester, and then back at Cambridge University for a three-year EPSRC project on verifying e-commerce protocols. In 2008, he was a senior researcher with SAP Research France on the European Project AVANTSSAR for the validation of service-oriented architectures. He has published the book "Formal Correctness of Security Protocols" with Springer-Verlag in the Information Security and Cryptography series (ISBN: 978-3-540-68134-2), where he investigates proofs of correctness of realistic security protocols using a formal language with strong machine support.

Luca Compagna is a member of SAP Research Center Sophia Antipolis since March 2006. He is contributing to the Security and Trust research area as responsible for the Security Engineering cluster and the AVANTSSAR project. He received his Ph.D. in Electronics and Computer Science Engineering from the University of Genova and the University of Edinburgh (joint programme) in 2005. Until now Luca's research mainly focused on security engineering, automated reasoning and their application to the modelling and analysis of industrial relevant case studies. He has been the main contributor to the development of the SAT-based Model-Checker for bounded model-checking of security protocols. He contributed to various projects on information security (e.g., AVISPA and Serenity) and he has published various scientific publications in his area of interest.

## EDITORIAL MESSAGE

### Special Track on Advances in Computer Simulation (SIM)

*Fabien Michel, Laboratoire d'Informatique, de Robotique et de Microélectronique  
de Montpellier, Université Montpellier II, CNRS, France*

*Giuseppe Vizzari, Complex Systems and Artificial Intelligence research centre,  
University of Milano-Bicocca, Italy*

Computer simulation approaches have established as fundamental conceptual and practical instruments for the analysis of growingly complex systems, both for industry and business applications as well as in the scientific research context. Computational models and simulators are currently employed in the most different application areas, ranging from urban modeling and planning to logistics and production, from biology to social sciences. Consequently, the adopted modeling approaches and methodologies, as well as simulation project life-cycles, techniques for the evaluation and interpretation of simulation results are often very distant.

This track at ACM SAC aimed at providing a forum for the discussion of results and relevant research advances on the topic of computer simulation, fostering thus interdisciplinary discussion and cross fertilization of the involved disciplines and application areas. It was intended to facilitate the dissemination of theoretical advances in computer simulation, as well as representing a vehicle for discussions about methodologies, models and tools, in several application domains.

The track was open to both reports on practical results of computer simulation experiences as well as recent research contributions. Topics of interest included, but were not limited to:

- Computational models for simulation (e.g. discrete event modeling, cellular automata, multi-agent systems)
- Modeling and simulation methodologies
- Simulation project life-cycle
- Modeling and simulation languages, platforms and tools
- Tools and methodologies for large-scale simulation
- Case studies and applications in domains such as: simulation of human and social dynamics, military applications, industrial engineering, manufacturing, supply chain management, virtual reality, swarm intelligence, ethological/ecological/biological modeling, artificial life, video games.

The Special Track received 20 submissions, 5 of which were accepted as full papers (with a 25% acceptance rate), and 4 papers were selected for the poster presentation. The accepted papers present a good balance between theoretical investigations on complex systems of different nature (biological and social) providing analytical results, reports on ongoing activities involving the development of software simulation systems, but

also methodological remarks on the design, development and employment of simulation models and instruments in specific domains of application.

Several accepted papers adopt agent-based approaches to the modeling and simulation of complex systems such as biological ones (the human immune system) and social ones (crowds of pedestrians); one paper adopts an agent-based approach to the simulation and study of human decision making activities.

Other papers adopt different techniques, rooted on physical, mathematical, discrete events, statistical approaches to the specification of simulation models, in particular with reference to applications in the computer networks and protocols, business processes and military areas.

In conclusion, the selected papers can be considered as an inevitably small, but yet relevant, selection of the current advancements in the very broad research area of computer simulation.

## EDITORIAL MESSAGE

### Service Oriented Architectures and Programming

*Claudio Guidi, Università di Bologna, Italy*

*Ivan Lanese, Università di Bologna, Italy*

*Manuel Mazzara, Newcastle University, United Kingdom*

Our track aim has been to bring together researchers and practitioners having different backgrounds but the common objective of transforming Service Oriented Programming into a mature discipline with both solid scientific foundations and software engineering development methodologies supported by dedicated tools. Our call for papers has received a great response from many institutions around the world working on this topic. We have received 27 abstracts, and then we had 23 papers actually submitted. Unfortunately, we were able to accept only 8 full papers and 1 poster paper.

We have done our best in the creation of a PC consisting of both industrial and academic people (and few mixed) from different countries, able to give a good feedback and to recognize the best ideas. We have really to thank them all, just listing everybody here will be never enough. Anyway thank you very much to: Marco Aiello (University of Groningen, The Netherlands), Roberto Bruni (Università di Pisa, Italy), Reicko Heckel (University of Leicester, UK), Nickolas Kavantzias (Oracle, USA), Nora Koch (LMU and Cirquent GmbH, Germany), Roberto Lucchi (European Commission - Joint Research Centre, Italy), Li MA (IBM China Research Lab, China), Jing Mei, (IBM China Research Lab, China), Hernan Melgratti (Universidad de Buenos Aires, Argentina), Greg Meredith (Biosimilarity LLC, USA), Fabrizio Montesi (italianaSoftware s.r.l., Italy), Martin Wirsing (LMU, Germany) and Gianluigi Zavattaro (Università di Bologna, Italy).

These people have not been the solely support we had. We still have to thank all the additional reviewers that helped us in this review process, whose aim was to provide three different detailed reviews for each paper. Thank you very much to: Michael Lutz (European Commission - Joint Research Centre, Italy), Alberto Lluh Lafuente (Università di Pisa, Italy), Anirban Bhattacharyya (Newcastle University, UK), Nicola Gessa (Enea, Italy), Michele Mazzucco (Newcastle University, UK), Paolo Milazzo (Università di Pisa, Italy), Anna Trifonova (Norwegian University of Science and Technology, Norway) and Zhixian Yan (Ecole Polytechnique Fédérale de Lausanne, Switzerland).

Last, but non least, we have to thank all the authors that submitted their works. We hope that the rejected papers received a proper feedback that will help the authors in improving their results and resubmit a new paper in the future, at this same track or somewhere else. Anyway, we wish them a good luck. We also hope that the authors of accepted papers will have good feedback for further improving their papers.

The accepted papers have been the followings:

**CMC-UMC: A Framework for the Verification of Abstract Service Oriented Properties** by Maurice H. ter Beek, Franco Mazzanti and Stefania Gnesi

**Runtime Monitoring of Web Service Choreographies Using Streaming XML** by Sylvain Hallé and Roger Villemaire

**PRECISO: A Reengineering Process and a Tool for Database Modernisation through Web Services Generation** by Ricardo P. del Castillo, Ignacio García-Rodríguez de Guzmán, Ismael Caballero, Macario Polo and Mario Piattin

**Load Management in Model-Aware Execution of Composite Web Services** by Karolina Zurowska, and Ralph Deters

**Using Process Mining to Business Process Distribution** by Faramarz Safi Esfahani, Masrah Azrifah Azmi Murad , Md.Nasir Sulaiman, and Nur Izura Udzir

**Annotating UDDI Registries to Support the Management of Composite Services** by M. Brian Blake, Michael F. Nowlan, Ajay Bansal, and Srividya Kona

**A general Service Oriented Approach for Managing Virtual Machines Allocation** by Paolo Anedda, Massimo Gaggero and Simone Manca

**SimSOA - an Approach for Agent -Based Simulation and Design-Time Assessment of SOC-based IT systems** by Stefan Thanheiser, Lei Liu and Hartmut Schmeck

**Assessing Complexity of Service-oriented Computing using Learning Classifier Systems** by Lei Liu, Stefan Thanheiser and Hartmut Schmeck

Finally, we have to say a warm “thank you” to all the people that have participated or will participate to the track in order to made it great with questions and suggestions. There is no paper that can be a great paper without the curiosity and the genuine enthusiasm of its readers.

Have a nice research,

**Claudio Guidi**

**Ivan Lanese**

**Manuel Mazzara**

## EDITORIAL MESSAGE

### **Special Track on Wireless Sensor Networks: Implementations and future perspectives (WSN)**

*Richard Anthony, University of Greenwich, UK*

*Julie A. McCann, Imperial College London, UK*

A paradigm shift is underway, with increasing emphasis for future processing and communication requirements to be met by embedded devices. As devices become ever smaller, cheaper and better provisioned, the visions of smart dust, intelligent environments and ambient computing become more realistic. Wireless Sensor Networks (WSN) are an established field of work, already being deployed in a wide variety of applications and domains and are a major contributor to the enablement of monitoring and controlling harsh environments, and are going to be increasingly important in environmental monitoring such as climate and sea level/temperature, soil acidity for crop yield maximization, as well as for a wide variety of security applications. WSN also bring specific research challenges – especially in terms of automated discovery, configuration and cooperation to optimize services and message routing over the network.

The ACM SAC 2009 Track on Wireless Sensor Networks (WSN) wished to focus on WSN research where the system required decentralization or challenging environments. We particularly welcomed practical results, description and analysis of user experiments and demonstrations and simulations or proofs-of-concept of WSN computing applications. We were not disappointed.

The work in this track, though small in number, covers a strong representative set of challenges and research that can be applied throughout the subject. If we consider the basic challenges of WSN research to be centered on energy and node resource usage, then the addition of node mobility, transactional services, real-time processing (routing) while maintaining trust, brings fresh and non trivial challenges. Specifically two papers look at the problems that mobility brings. That is, how do we route data in an efficient way while conserving energy when the data sink is moving? Furthermore, how do we optimize the acquisition of data while providing this flexible data routing in such a changeable environment? To this end we see solutions that look at location awareness to minimize routing delay while avoiding hotspots that can unduly reduce a small set of nodes' energy causing black spots in the network. A further two papers focus on real-time aspects of WSN monitoring in non-period reporting environments. One examines distributed multi-view vision detection for tracking applications and the other looks at networking challenges to maintain real-time schedules over the network given that the network is expected to be unreliable and the applications resource hungry. Both papers take battery power and energy concerns into account. This latter constraint has been one of the reasons that Transactions and transaction control mechanisms have not really been examined in any realistic way in WSN. That is, given that transaction based systems in such a distributed environment require strong message passing techniques to enforce two phase-locking, WSN are notorious for having unreliable networks and high failure rates for nodes. Here we present a poster that examines the conditions whereby such a technique could be used. This early work shows great

promise and can be applied to many WSN applications. Another poster examines the very important topic of security in WSNs. Given that traditional security solutions are too cumbersome for resource constrained WSNs these researchers have developed a lightweight energy aware solution based around trust. Finally, understanding the behaviour of WSN systems and applications is crucial if we wish to better engineer and improve performance of such systems. To this end, our final paper provides a profiling mechanism that allows the developer to have an idea of the sensing and scheduling behaviors of their application.

WSN are at a critical point in their evolution. On one hand, they are already established as a key technology supporting an alternative distributed computing paradigm for embedding computing within the fabric of our environment, whilst on the other hand they have huge unexplored potential to solve a plethora of challenging and urgent problems across almost all aspects of human activity. This track presents some solutions to such problems. We hope the combination of the beautiful Hawaiian environment and hospitality combined with the work we present here, inspires further research and solutions in the WSN domain.

Julie A McCann  
Richard Anthony

*24th Annual ACM Symposium on Applied Computing, Special Track on Wireless Sensor Networks: Implementations and future perspectives (WSN), Hawaii, 2009*