

**PROCEEDINGS OF
THE 2015 INTERNATIONAL CONFERENCE ON
SOFTWARE ENGINEERING RESEARCH & PRACTICE**

SERP 2015

Editors

**Hamid R. Arabnia
Leonidas Deligiannidis, Fernando G. Tinetti**

Associate Editors

George Jandieri, Ashu M. G. Solo



WORLD COMP'15

July 27-30, 2015

Las Vegas Nevada, USA

www.world-academy-of-science.org

©CSREA Press

This volume contains papers presented at The 2015 International Conference on Software Engineering Research & Practice (SERP'15). Their inclusion in this publication does not necessarily constitute endorsements by editors or by the publisher.

Copyright and Reprint Permission

Copying without a fee is permitted provided that the copies are not made or distributed for direct commercial advantage, and credit to source is given. Abstracting is permitted with credit to the source. Please contact the publisher for other copying, reprint, or republication permission.

Copyright © 2015 CSREA Press
ISBN: 1-60132-412-X
Printed in the United States of America

CSREA Press
U. S. A.

Foreword

It gives us great pleasure to introduce this collection of papers to be presented at the 2015 International Conference on Software Engineering Research and Practice (SERP'15), July 27-30, 2015, at Monte Carlo Resort, Las Vegas, USA.

An important mission of the World Congress in Computer Science, Computer Engineering, and Applied Computing (a federated congress to which this conference is affiliated with) includes *"Providing a unique platform for a diverse community of constituents composed of scholars, researchers, developers, educators, and practitioners. The Congress makes concerted effort to reach out to participants affiliated with diverse entities (such as: universities, institutions, corporations, government agencies, and research centers/labs) from all over the world. The congress also attempts to connect participants from institutions that have **teaching** as their main mission with those who are affiliated with institutions that have **research** as their main mission. The congress uses a quota system to achieve its institution and geography diversity objectives."* By any definition of diversity, this congress is among the most diverse scientific meeting in USA. We are proud to report that this federated congress has authors and participants from 76 different nations representing variety of personal and scientific experiences that arise from differences in culture and values. As can be seen (see below), the program committee of this conference as well as the program committee of all other tracks of the federated congress are as diverse as its authors and participants.

The program committee would like to thank all those who submitted papers for consideration. About 58% of the submissions were from outside the United States. Each submitted paper was peer-reviewed by two experts in the field for originality, significance, clarity, impact, and soundness. In cases of contradictory recommendations, a member of the conference program committee was charged to make the final decision; often, this involved seeking help from additional referees. In addition, papers whose authors included a member of the conference program committee were evaluated using the double-blinded review process. One exception to the above evaluation process was for papers that were submitted directly to chairs/organizers of pre-approved sessions/workshops; in these cases, the chairs/organizers were responsible for the evaluation of such submissions. The overall paper acceptance rate for regular papers was 29%; 11% of the remaining papers were accepted as poster papers (at the time of this writing, we had not yet received the acceptance rate for a few individual tracks.)

We are very grateful to the many colleagues who offered their services in organizing the conference. In particular, we would like to thank the members of the Program Committee of SERP'15, members of the congress Steering Committee, and members of the committees of federated congress tracks that have topics within the scope of SERP. Many individuals listed below, will be requested after the conference to provide their expertise and services for selecting papers for publication (extended versions) in journal special issues as well as for publication in a set of research books (to be prepared for publishers including: Springer, Elsevier, BMC journals, and others).

- *Dr. Selim Aissi (Congress Steering Committee); Vice President, Global Information Security, Visa Inc., USA*
- *Prof. Abbas M. Al-Bakry (Congress Steering Committee); University President, University of IT and Communications, Baghdad, Iraq*
- *Prof. Nizar Al-Holou (Congress Steering Committee); Professor and Chair, ECE Department; Vice Chair, IEEE/SEM-Computer Chapter; University of Detroit Mercy, Detroit, Michigan, USA*
- *Dr. Hadeel Sh. Kareem Al-Obaidy; College of Information Technology College - Department of Computer Science, University of Bahrain, Kingdom of Bahrain*
- *Dr. Hamid Ali Abed Alasadi (Congress Steering Committee); Head, Department of Computer Science, Basra University, Iraq; Member of Optical Society of America (OSA), USA; Member of The International Society for Optical Engineering (SPIE), Bellingham, Washington, USA*
- *Prof. Hamid R. Arabnia (Congress Steering Committee & Coordinator); Professor of Computer Science; The University of Georgia, USA; Editor-in-Chief, Journal of Supercomputing (Springer); Editor-in-Chief, Transactions of Computational Science & Computational Intelligence (Springer); Elected Fellow, Int'l Society of Intelligent Biological Medicine (ISIBM); USA*
- *Dr. Azita Bahrami (EEE'15 + FECS'15); President, IT Consult, USA*

- Prof. P. Balasubramanian (ESA'15); School of Computer Engineering, Nanyang Technological University, Singapore
- Charles D. Carson; Alumnus Southern Polytechnic State University, Marietta, Georgia, USA
- Prof. Juan Jose Martinez Castillo; Director, The Acantelys Alan Turing Nikola Tesla Research Group and GIPEB, Universidad Nacional Abierta, Venezuela
- Dr. En Cheng; Department of Computer Science, The University of Akron, Akron, Ohio, USA
- Prof. Kevin Daimi (Congress Steering Committee); Director, Computer Science and Software Engineering Programs, Department of Mathematics, Computer Science and Software Engineering, University of Detroit Mercy, Detroit, Michigan, USA
- Prof. Leonidas Deligiannidis; Department of Computer Information Systems, Wentworth Institute of Technology, Boston, Massachusetts, USA
- Prof. Mary Mehrnoosh Eshaghian-Wilner (Congress Steering Committee); Professor of Engineering Practice, University of Southern California, California, USA; Adjunct Professor, Electrical Engineering, University of California Los Angeles, Los Angeles (UCLA), California, USA
- Prof. Houcine Hassan; Universitat Politècnica de Valencia, Spain
- Prof. Mohammad Shahadat Hossain (PhD, UMIST, Manchester), MBCS; Department of CSE, University of Chittagong, Bangladesh; Visiting Academic Staff, The University of Manchester, UK
- Prof. George Jandieri (Congress Steering Committee); Georgian Technical University, Tbilisi, Georgia; Chief Scientist, The Institute of Cybernetics, Georgian Academy of Science, Georgia; Editorial Board Member: International Journal of Microwaves and Optical Technology
- Dr. Vitus S. W. Lam; Information Technology Services, The University of Hong Kong, Hong Kong; Chartered Member of the British Computer Society; Editor, International Journal of Latest Trends in Software Engineering; Associate Editor, INFOCOMP Journal of Computer Science
- Dr. Bo Liu; Spatio-temporal Data Analysis Research Department, NEC Labs China, Beijing, P. R. China (formerly at Argonne National Laboratory, USA)
- Dr. Yan Luo; National Institutes of Health, Bethesda, Maryland, USA
- Dr. Andrew Marsh (Congress Steering Committee); CEO, HoIP Telecom Ltd (Healthcare over Internet Protocol), UK; Secretary General of World Academy of BioMedical Sciences and Technologies (WABT) a UNESCO NGO, The United Nations
- Assoc. Prof. Dr. Paniti Netinant; School of Information Technology, Rangsit University, Thailand
- Prof. G. N. Pandey (Congress Steering Committee); Vice-Chancellor, Arunachal University of Studies, Arunachal Pradesh, India; Adjunct Professor, Indian Institute of Information Technology, Allahabad, India
- Prof. R. Ponalagusamy; Department of Mathematics, National Institute of Technology, Tiruchirappalli, India; and Editor-in-Chief, International Journal of Mathematics and Engineering with Computers
- Dr. Benaoumeur Senouci (ESA'15); Associate Professor, Embedded Systems Department, ECE, LACS Laboratory, Central Electronic Engineering School, Paris, France
- Dr. Yilun Shang; Associate Professor, Department of Mathematics, Tongji University, Shanghai, P. R. China
- Prof. Dr. Avinash Shankaranarayanan (FECS'15); Royal Melbourne Institute of Technology (RMIT), Hanoi, Vietnam
- Dr. Akash Singh (Congress Steering Committee); IBM Corporation, Sacramento, California, USA; Chartered Scientist, Science Council, UK; Fellow, British Computer Society; Member, Senior IEEE, AACR, AAAS, and AAAI; IBM Corporation, USA
- Ashu M. G. Solo, (Publicity Chair), Fellow of British Computer Society, Principal/R&D Engineer, Maverick Technologies America Inc.
- Prof. Fernando G. Tinetti (Congress Steering Committee); School of Computer Science, Universidad Nacional de La Plata, La Plata, Argentina; Co-editor, Journal of Computer Science & Technology (JCS&T)
- Prof. Dr. Bernd E. Wolfinger (PDPTA'15); Telecommunications and Computer Networks Division, Computer Science Department, University of Hamburg, Hamburg (Stellingen), Germany
- Prof. Jane You (Congress Steering Committee); Associate Head, Department of Computing, The Hong Kong Polytechnic University, Kowloon, Hong Kong
- Dr. Xiao-Guang Yue (PDPTA'15); Wuhan University of Technology, Wuhan, P. R. China
- Dr. Fang Zheng (GCA'15); IBM T.J. Watson Research Center, Yorktown Heights, New York, USA

We would like to extend our appreciation to the members of the program committees of individual sessions, tracks, and workshops; their names do not appear in this document; they are listed on the web sites of individual tracks.

As Sponsors-at-large, partners, and/or organizers each of the followings (separated by semicolons) provided help for at least one track of the World Congress: Computer Science Research, Education, and Applications Press (CSREA); US Chapter of World Academy of Science (<http://www.world-academy-of->

science.org/); American Council on Science & Education & Federated Research Council (<http://www.americancse.org/>); HoIP, Health Without Boundaries, Healthcare over Internet Protocol, UK (<http://www.hoip.eu>); HoIP Telecom, UK (<http://www.hoip-telecom.co.uk>); and WABT, Human Health Medicine, UNESCO NGOs, Paris, France (<http://www.thewabt.com/>). In addition, a number of university faculty members and their staff (names appear on the cover of the set of proceedings), several publishers of computer science and computer engineering books and journals, chapters and/or task forces of computer science associations/organizations from 4 countries, and developers of high-performance machines and systems provided significant help in organizing the conference as well as providing some resources. We are grateful to them all.

We express our gratitude to keynote, invited, and individual conference/tracks and tutorial speakers - the list of speakers appears on the conference web site. We would also like to thank the followings: UCMSS (Universal Conference Management Systems & Support, California, USA) for managing all aspects of the conference; Dr. Tim Field of APC for coordinating and managing the printing of the proceedings; and the staff of Monte Carlo Resort (Convention department) in Las Vegas for the professional service they provided. Last but not least, we would like to thank the Co-Editors and Associate Co-Editors of SERP' 15: Prof. Hamid R. Arabnia, Prof. Leonidas Deligiannidis, Prof. George Jandieri, Ashu M. G. Solo, and Prof. Fernando G. Tinetti.

We present the proceedings of SERP' 15.

Steering Committee, 2015
<http://www.world-academy-of-science.org/>

Contents

SESSION: FORMAL METHODS + PROCESS AND PRODUCT LINE IMPROVEMENT + AGILE DEVELOPMENT AND MANAGEMENT + WORKFLOW MANAGEMENT + PROJECT MANAGEMENT ISSUES

Formal Modelling In The Concept Phase of Product Development 3

Mathijs Schuts, Jozef Hooman

On the Agile Development of Virtual Reality Systems 10

Fernando Mattioli, Daniel Caetano, Alexandre Cardoso, Edgard Lamounier

The Impacts of Absorptive Capacity on Improving Software Development: A Preliminary Study 17

Chung-Yang Chen, Jung-Chieh Lee

An Infrastructure to Support Autonomic Control Loops in Dynamic Software Product Lines 23

Jane Dirce Alves Sandim Eleuterio, Cecilia Mary Fischer Rubira

Psychological Considerations for Agile Development Teams 27

James Crowder

An Architecture for Dynamic Self- Adaptation in Workflows 35

Sheila Katherine Venero Ferro, Cecilia Mary Fischer Rubira

Distributed Agile Development: A Survey of Challenges and Solutions 42

Harneet Kaur, Hisham M. Haddad, Jing Selena He

PM5: One Approach to the Management of IT Projects Applied in the Brazilian Public Sector 49

Paulo Roberto Martins de Andrade, Adriano Bessa Albuquerque, Otavio Fernandes Frota, Jose Fernandes da Silva Filho

SESSION: TESTING, VERIFICATION, VALIDATION METHODS + SECURITY ANALYSIS, ENERGY EFFICIENT SOFTWARE + SOFTWARE QUALITY ISSUES

Modelling The Energy Cost of Application Software for Developers 57

Fadwa Abdulhalim, Omar Alghamdi, Kshirasagar Naik

A Systematic Mapping about Testing of Functional Programs 64

Alexandre Ponce de Oliveira, Paulo Sergio Lopes de Souza, Simone Rocio Senger de Souza, Julio Cezar Estrella, Sarita Mazzini Bruschi

Cloud-ODC: Defect Classification and Analysis for the Cloud	71
<i>Mohammed Alannsary, Jeff Tian</i>	
Support for Security Analysis of Design Models Based on Traceability	78
<i>Hirokazu Yatsu, Masaru Matsunami, Toshimi Sawada, Go Hirakawa, Atsushi Noda, Naoya Obata, Takahiro Ando, Kenji Hisazumi, Weiqiang Kong, Akira Fukuda</i>	
Automatization of Acceptance Test for Metrology Algorithms	84
<i>Bernd Muller</i>	
Design and Implementation of a Constraint-Based Test Case Generator with Test Fixture Computation	89
<i>Chi-Kuang Chang, Nai-Wei Lin</i>	
Taxonomy Dimensions of Complexity Metrics	96
<i>Bouchaib Falah, Kenneth Magel</i>	
Quantitative Software Engineering	103
<i>Igor Schagaev, Svetlana Anulova, Hamid Arabnia</i>	
Debugging Multi-threaded Applications Using Pin Augmented GDB- PGDB	109
<i>Nachiketa Chatterjee, Srijoni Majumdar, Shila Rani Sahoo, Partha Pratim Das</i>	
SESSION: SOFTWARE ENGINEERING AND DEVELOPMENT ISSUES + SOFTWARE SCALABILITY + APPLICATIONS	
Performance of Lambda Expressions in Java 8	119
<i>Adam Ward, Dwight Deugo</i>	
Programmers: A Revolution in Computer Language Parsing	125
<i>Steven O'Hara</i>	
TD-Manager: A Tool For Managing Technical Debt Through Integrated Catalog	132
<i>Lucas Foganholi, Rogerio Eduardo Garcia, Danilo Eler, Ronaldo Correia, Celso Olivete</i>	
Fault Detection Coverage Measurement using a Fault Imitation Method for Nuclear Digital Controller	139
<i>Young-Jun Lee, Jang-Soo Lee, Young-Kuk Kim</i>	
Validation of User Interface Model: a Systematic Literature Review	145
<i>Livia Cristina Gabos Martins, Rogerio Eduardo Garcia</i>	
Designing Context Sensitive Mobile User Interface	152
<i>Mao Zheng, Olga Ormandjieva, Hao Fan</i>	

Cnetmon: Ncurses-based Network Interface Activity Monitor 157
Steve Hutchinson, John Wittkamper, Jovina Allen, Robert Erbacher

Political Risk Mitigation Model for Software Development Budget 164
Bukohwo Esiefarienrhe, Greg Wajiga

A Step Ahead To Connect Your Bus-With GPS 171
Srikanth Nagadapally, Balakumar Krishnaswamy, Abhigna Shettap, Devireddy Prathika, Roger Lee

PRONTO System: Integration Between Doctors and Pharmacists in the Basic Healthcare 177
Mauro Marcelo Mattos, Luciana Pereira de Araujo, Maria Eduarda Demmer, Shaiane Mafra Casa, Eric Boeing, Jonathan Rodrigues Ev, Joao Magnani, Simone Erbs da Costa, Marcio Michelluzzi, Caique Reinhold, Rogerio Mello Vanti, Jacques Robert Heckmann

SESSION: MODELING LANGUAGES, UML + PETRI NETS, SOA AND APPLICATIONS + PORTABILITY + REQUIREMENTS ENGINEERING and ASPECT ORIENTED SOFTWARE ENGINEERING

Modeling Elevator System With Coloured Petri Nets 183
Mohammed Assiri, Mohammed Alqarni, Ryszard Janicki

Semantic Approach for Traceability Link Recovery using Uniform Resource Identifier (STURI) 190
Mazen Alobaidi, Khalid Mahmood

A new Framework for Quality-Based SOA Migration 196
Ayman Massoud

A Directive-Based Transformation Approach for UML Class Diagrams 203
Devon Simmonds

Adapting Native Applications to Cross Platform Environments 210
Andrew Moubray, Tyler Danner, Jason Litchfield, Harry Sellars, Roger Lee

Metrics for Migrating Distributed Applications 217
Devon Simmonds

SESSION: SOFTWARE ARCHITECTURE AND FRAMEWORKS + ENTERPRISE ARCHITECTURE + COMMERCIAL ISSUES

Development of Enterprise Architecture of PPDR Organisations 225
Wilmuth Muller, Frank Reinert

Enterprise Architecture and Information Technology: Coping with Organizational Transformation Applying the Theory of Structuration 231

Dominic M. Mezzanotte, Sr., Josh Dehlinger

Proposed Framework for Handling Architectural NFR's within Scrum Methodology 238

Ahmed Sabry, Sherif El-Rabbat

HONIC: Customer Satisfaction Index Based Framework to Transform Customer Experience 245

Rose Neena Tom

SESSION: POSTER PAPERS

Verification based Development Process for Improving Reliability of Open Feedback System 251

JungEun Cha, YoungJoon Jung, Chaedeok Lim

SESSION: LATE BREAKING PAPERS: SOFTWARE ENGINEERING PROCESSES + SECURITY ISSUES

Semi-supervised Learning Applied to Performance Indicators in Software Engineering Processes 255

Leandro Bodo, Hilda Carvalho de Oliveira, Fabricio Aparecido Breve, Danilo Medeiros Eler

Big Data: Security Engineering Framework 262

Daya Gupta, Shruti Jaiswal, Prudence Kadebu