Communications
in Computer and Information Science 59

Dominik Ślęzak Tai-hoon Kim
Akingbehin Kiumi Tao Jiang
June Verner Silvia Abrahão (Eds.)

# Advances in Software Engineering

International Conference on Advanced Software Engineering and Its Applications, ASEA 2009
Held as Part of the Future Generation Information Technology Conference, FGIT 2009
Jeju Island, Korea, December 10-12, 2009
Proceedings

Springer

Volume Editors

Dominik Ślęzak
University of Warsaw & Infobright Inc., Warsaw, Poland
E-mail: slezak@infobright.com

Tai-hoon Kim
Hannam University, Daejeon, South Korea
E-mail: taihoonn@hnu.kr

Akingbehin Kiumi
University of Michigan, Dearborn, MI, USA
E-mail: kiumi@umich.edu

Tao Jiang
University of California, Riverside, CA, USA
E-mail: jiang@cs.ucr.edu

June Verner
Drexel University, Philadelphia, PA, USA
E-mail: june.verner@cis.drexel.edu

Silvia Abrahão
Valencia University of Technology, Valencia, Spain
E-mail: sabrahao@dsic.upv.es

Library of Congress Control Number: 2009939508

CR Subject Classification (1998): D.2, K.6.3, D.2.5, C.4, H.4, I.7, K.6

ISSN 1865-0929
ISBN-10 3-642-10618-8 Springer Berlin Heidelberg New York
ISBN-13 978-3-642-10618-7 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

springer.com

© Springer-Verlag Berlin Heidelberg 2009
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 12805846 06/3180 5 4 3 2 1 0

# Foreword

As future generation information technology (FGIT) becomes specialized and fragmented, it is easy to lose sight that many topics in FGIT have common threads and, because of this, advances in one discipline may be transmitted to others. Presentation of recent results obtained in different disciplines encourages this interchange for the advancement of FGIT as a whole. Of particular interest are hybrid solutions that combine ideas taken from multiple disciplines in order to achieve something more significant than the sum of the individual parts. Through such hybrid philosophy, a new principle can be discovered, which has the propensity to propagate throughout multifaceted disciplines.

FGIT 2009 was the first mega-conference that attempted to follow the above idea of hybridization in FGIT in a form of multiple events related to particular disciplines of IT, conducted by separate scientific committees, but coordinated in order to expose the most important contributions. It included the following international conferences: Advanced Software Engineering and Its Applications (ASEA), Bio-Science and Bio-Technology (BSBT), Control and Automation (CA), Database Theory and Application (DTA), Disaster Recovery and Business Continuity (DRBC; published independently), Future Generation Communication and Networking (FGCN) that was combined with Advanced Communication and Networking (ACN), Grid and Distributed Computing (GDC), Multimedia, Computer Graphics and Broadcasting (MulGraB), Security Technology (SecTech), Signal Processing, Image Processing and Pattern Recognition (SIP), and u- and e-Service, Science and Technology (UNESST).

We acknowledge the great effort of all the Chairs and the members of advisory boards and Program Committees of the above-listed events, who selected 28% of over 1,050 submissions, following a rigorous peer-review process. Special thanks go to the following organizations supporting FGIT 2009: ECSIS, Korean Institute of Information Technology, Australian Computer Society, SERSC, Springer LNCS/CCIS, COEIA, ICC Jeju, ISEP/IPP, GECAD, PoDIT, Business Community Partnership, Brno University of Technology, KISA, K-NBTC and National Taipei University of Education.

We are very grateful to the following speakers who accepted our invitation and helped to meet the objectives of FGIT 2009: Ruay-Shiung Chang (National Dong Hwa University, Taiwan), Jack Dongarra (University of Tennessee, USA), Xiaohua (Tony) Hu (Drexel University, USA), Irwin King (Chinese University of Hong Kong, Hong Kong), Carlos Ramos (Polytechnic of Porto, Portugal), Timothy K. Shih (Asia University, Taiwan), Peter M.A. Sloot (University of Amsterdam, The Netherlands), Kyu-Young Whang (KAIST, South Korea), and Stephen S. Yau (Arizona State University, USA).

We would also like to thank Rosslin John Robles, Maricel O. Balitanas, Farkhod Alisherov Alisherovish, and Feruza Sattarova Yusfovna – graduate students of Hannam University who helped in editing the FGIT 2009 material with a great passion.

October 2009

Young-hoon Lee
Tai-hoon Kim
Wai-chi Fang
Dominik Ślęzak

# Preface

We would like to welcome you to the proceedings of the 2009 International Conference on Advanced Software Engineering & Its Applications (ASEA 2009), which was organized as part of the 2009 International Mega-Conference on Future Generation Information Technology (FGIT 2009), held during December 10–12, 2009, at the International Convention Center Jeju, Jeju Island, South Korea.

ASEA 2009 focused on various aspects of advances in software engineering and its applications with computational sciences, mathematics and information technology. It provided a chance for academic and industry professionals to discuss recent progress in the related areas. We expect that the conference and its publications will be a trigger for further related research and technology improvements in this important subject.

We would like to acknowledge the great effort of all the Chairs and members of the Program Committee. Out of around 150 submissions to ASEA 2009, we accepted 46 papers to be included in the proceedings and presented during the conference. This gives an acceptance ratio firmly below 30%. Five of the papers accepted for ASEA 2009 were published in the special FGIT 2009 volume, LNCS 5899, by Springer. The remaining 41 accepted papers can be found in this CCIS volume.

We would like to express our gratitude to all of the authors of submitted papers and to all of the attendees, for their contributions and participation. We believe in the need for continuing this undertaking in the future.

Once more, we would like to thank all the organizations and individuals who supported FGIT 2009 as a whole and, in particular, helped in the success of ASEA 2009.

October 2009

Dominik Ślęzak
Tai-hoon Kim
Akingbehin Kiumi
Tao Jiang
June Verner
Silvia Abrahao

# Organization

## Organizing Committee

| | |
|---|---|
| General Chair | Haeng-kon Kim (Catholic University of Daegu, Korea) |
| Advisory Board | Tien N. Nguyen (Iowa State University, USA)<br>Jose Luis Arciniegas Herrera (University of Cauca, Colombia)<br>Byeong-Ho Kang (University of Tasmania, Australia) |
| Publication Chair | Yong-ik Yoon (Sookmyung Women's University, Korea) |
| Program Chairs | Tai-hoon Kim (Hannam University, Korea)<br>Akingbehin Kiumi (University of Michigan-Dearborn, USA) |
| Publicity Chairs | Tao Jiang (Huazhong University of Sci. and Tech., China)<br>June Verner (University of New South Wales, Australia)<br>Silvia Abrahao (Camino de Vera, Spain) |

## Program Committee

Chia-Chu Chiang
A. Hamou-Lhadj
Ami Marowka
Andrea De Lucia
Chima Adiele
Doo-Hwan Bae
Emilia Mendes
Gongzhu Hu
Harvey Siy
Hironori Washizaki
Houari Sahraoui
Hyeon Soo Kim
Jennifer Pérez Benedí
Jiro Tanaka
Jonathan Lee
Jongmoon Baik
Jose L. Arciniegas
Joseph Balikuddembe
Karel Richta
Kendra Cooper
Kin Fun Li
Kurt Wallnau
Laurence Duchien
Luigi Buglione
Maria Bielikova
Maria Tortorella
Morshed Chowdhury
Olga Ormandjieva
Praveen R. Srivastava
Rattikorn Hewett
Ricardo Campos
Robert Glass
Rudolf Ferenc
Shawkat Ali
Silvia Abrahao
Tokuro Matsuo
Wuwei Shen
Yijun Yu

# Table of Contents

A Systematic Literature Review of Software Process Improvement in Small and Medium Web Companies . . . . . 1
*Muhammad Sulayman and Emilia Mendes*

An XCP Based Distributed Calibration System . . . . . 9
*Yang He and Xiaomin Sun*

Structural and Behavioral Detection of Design Patterns . . . . . 16
*Nadia Bouassida and Hanene Ben-Abdallah*

Test Case Minimization and Prioritization Using CMIMX Technique . . . 25
*Praveen Ranjan Srivastava, Mahesh Ray, Julian Dermoudy, Byeong-Ho Kang, and Tai-hoon Kim*

Embedded Control Software Design with Aspect Patterns . . . . . 34
*Takahiro Soeda, Yuta Yanagidate, and Takanori Yokoyama*

Towards a Consistent Semantics for Unsafe Time Petri Nets . . . . . 42
*Abdelkrim Abdelli*

A Multiple Viewed Interrelated Ontology Model for Holistic Component Specification and Retrieval . . . . . 50
*Chengpu Li, Xiaodong Liu, and Jessie Kennedy*

A Conflict-Based Model for Problem-Oriented Software Engineering and Its Applications Solved by Dimension Change and Use of Intermediary . . . . . 61
*Jung Suk Hyun and Chan Jung Park*

Requirements Engineering Problems and Practices in Software Companies: An Industrial Survey . . . . . 70
*Badariah Solemon, Shamsul Sahibuddin, and Abdul Azim Abd Ghani*

A Formal Methodology for Semantics and Time Consistency Checking of UML Dynamic Diagrams . . . . . 78
*Youcef Hammal*

A Process Model for Forensic Analysis of Symbian Smart Phones . . . . . 86
*Xian Yu, Lie-Hui Jiang, Hui Shu, Qing Yin, and Tie-Ming Liu*

Reliability Analysis Method for Supporting Traceability Using UML . . . . 94
*Joonhoon Lee, Beoungil Cho, Hyunsang Youn, and Eunseok Lee*

Applying Agility Framework in Small and Medium Enterprises . . . . . 102
*Suphak Suwanya and Werasak Kurutach*

Using Area-Team to Evaluate the Software Architecture for an Online Banking System: A Case Study . . . . . 111
*Muhammad Sulayman, Mehwish Riaz, Husnain Naqvi, and Muhammad Amir Aman*

Architectural Decay during Continuous Software Evolution and Impact of 'Design for Change' on Software Architecture . . . . . 119
*Mehwish Riaz, Muhammad Sulayman, and Husnain Naqvi*

Software Fault Localization Using Elastic Net: A New Statistical Approach . . . . . 127
*Saeed Parsa, Mojtaba Vahidi-Asl, Somaye Arabi, and Behrouz Minaei-Bidgoli*

Applying Formal Methods to Process Innovation . . . . . 135
*Antonella Santone and Maria Tortorella*

Abstracting Models from Execution Traces for Performing Formal Verification . . . . . 143
*Thierry Bodhuin, Federico Pagnozzi, Antonella Santone, Maria Tortorella, and Maria Luisa Villani*

A Hybrid Model in Dynamic Software Updating for C . . . . . 151
*Mehdi Jalili, Saeed Parsa, and Habib Seifzadeh*

A Function Point Logic File Identification Technique Using UML Analysis Class Diagrams . . . . . 160
*José Antonio Pow-Sang, Loretta Gasco, and Arturo Nakasone*

Reliable Mobile Application Modeling Based on Open API . . . . . 168
*Sera Jang and Eunseok Lee*

An Improved Steganography Covert Channel . . . . . 176
*Md Amiruzzaman, Hassan Peyravi, M. Abdullah-Al-Wadud, and Yoojin Chung*

Software Test Data Generation Based on Multi-agent . . . . . 188
*Siwen Yu, Jun Ai, and Yifu Zhang*

Knowledge Creation and Creativity in Agile Teams . . . . . 196
*Broderick Crawford and Claudio León de la Barra*

TEST: Testing Environment for Embedded Systems Based on TTCN-3 in SILS . . . . . 204
*Hochang Chae, Xiulin Jin, Seonghun Lee, and Jeonghun Cho*

A Framework for Measuring the Alignment between Business Processes and Software Systems . . . . . 213
*Lerina Aversano, Carmine Grasso, and Maria Tortorella*

Service Composition System in Consideration of the Characteristics of Services . . . . . 221
*Jai-Kyung Lee, Seong-Whan Park, Moohyun Cha, Seung Hak Kuk, and Hyeon Soo Kim*

Business Viability Assessment of Potential Software Projects: An Empirical Study with the CASSE Framework . . . . . 229
*Joseph Kibombo Balikuddembe and Antoine Bagula*

Aligning the Software Project Selection Process with the Business Strategy: A Pilot Study . . . . . 237
*Joseph Kibombo Balikuddembe and Antoine Bagula*

RE4Gaia: A Requirements Modeling Approach for the Development of Multi-Agent Systems . . . . . 245
*David Blanes, Emilio Insfran, and Silvia Abrahão*

Execution Traces: A New Domain That Requires the Creation of a Standard Metamodel . . . . . 253
*Luay Alawneh and Abdelwahab Hamou-Lhadj*

Software Performability Measurement Based on Availability Model with User-Perceived Performance Degradation . . . . . 264
*Koichi Tokuno and Shigeru Yamada*

An Experimental Evaluation of Error Rate in a Web Server System . . . . 272
*Xiao Xiao and Tadashi Dohi*

A New Criterion for the Optimal Software Release Problems: Moving Average Quality Control Chart with Bootstrap Sampling . . . . . 280
*Mitsuhiro Kimura and Takaji Fujiwara*

An EM Algorithm for Record Value Statistics Models in Software Reliability Estimation . . . . . 288
*Hiroyuki Okamura and Tadashi Dohi*

Yet Another Metric for Predicting Fault-Prone Modules . . . . . 296
*Osamu Mizuno and Hideaki Hata*

Quantifying the Influences of Imperfect Debugging on Software Development Using Simulation Approach . . . . . 305
*Chu-Ti Lin and Chin-Yu Huang*

Service Reliability and Availability Analysis of Distributed Software Systems Considering Malware Attack . . . . . 313
*Cheng-Jie Xiong, Yan-Fu Li, Min Xie, Szu-Hui Ng, and Thong-Ngee Goh*

A Test Coverage-Based Model for Predicting Software Fault Content and Location during Multi-phase Functional Testing . . . . . 321
*Carol Smidts and Ying Shi*

A Refined Non-parametric Algorithm for Sequential Software Reliability Estimation . . . . . 330
*Shintaro Mizoguchi and Tadashi Dohi*

A Tool-Supported Process for Reliable Classification of Web Pages . . . . . 338
*Domenico Amalfitano, Anna Rita Fasolino, and Porfirio Tramontana*

**Author Index** . . . . . 347