

Communications in Computer and Information Science

868

Commenced Publication in 2007

Founding and Former Series Editors:

Alfredo Cuzzocrea, Xiaoyong Du, Orhun Kara, Ting Liu, Dominik Ślęzak,
and Xiaokang Yang

Editorial Board

Simone Diniz Junqueira Barbosa

*Pontifical Catholic University of Rio de Janeiro (PUC-Rio),
Rio de Janeiro, Brazil*

Phoebe Chen

La Trobe University, Melbourne, Australia

Joaquim Filipe

Polytechnic Institute of Setúbal, Setúbal, Portugal

Igor Kotenko

*St. Petersburg Institute for Informatics and Automation of the Russian
Academy of Sciences, St. Petersburg, Russia*

Krishna M. Sivalingam

Indian Institute of Technology Madras, Chennai, India

Takashi Washio

Osaka University, Osaka, Japan

Junsong Yuan

University at Buffalo, The State University of New York, Buffalo, USA

Lizhu Zhou

Tsinghua University, Beijing, China

More information about this series at <http://www.springer.com/series/7899>

Enrique Cabello · Jorge Cardoso
Leszek A. Maciaszek · Marten van Sinderen (Eds.)

Software Technologies

12th International Joint Conference, ICSOFT 2017
Madrid, Spain, July 24–26, 2017
Revised Selected Papers

Editors

Enrique Cabello
King Juan Carlos University
Madrid
Spain

Jorge Cardoso
University of Coimbra
Coimbra
Portugal

Leszek A. Maciaszek
Wroclaw University of Economics
Wroclaw
Poland

Marten van Sinderen
Computer Science
University of Twente
Enschede
The Netherlands

ISSN 1865-0929 ISSN 1865-0937 (electronic)
Communications in Computer and Information Science
ISBN 978-3-319-93640-6 ISBN 978-3-319-93641-3 (eBook)
<https://doi.org/10.1007/978-3-319-93641-3>

Library of Congress Control Number: 2018947013

© Springer International Publishing AG, part of Springer Nature 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by the registered company Springer International Publishing AG part of Springer Nature
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The present book includes extended and revised versions of a set of selected papers from the 12th International Conference on Software Technologies (ICSOFT 2017), held in Madrid, Spain, during July 24–26.

ICSOFT 2017 received 85 paper submissions from 33 countries, of which 15% are included in this book. The papers were selected by the event chairs and their selection is based on a number of criteria that include the classifications and comments provided by the Program Committee members, the session chairs' assessment, and also the program chairs' perception of the overall quality of papers included in the technical program. The authors of selected papers were then invited to submit a revised and extended version of their papers having at least 30% innovative material.

The purpose of the ICSOFT conferences, including its 12th edition in 2017, is to bring together researchers and practitioners interested in developing and using software technologies for the benefit of businesses and society at large. The conference solicits papers and other contributions in themes ranging from software engineering and development via showcasing cutting-edge software systems and applications to addressing foundational innovative technologies for systems and applications of the future.

The papers selected to be included in this book conform to the ICSOFT purpose and contribute to the understanding of current research and practice on software technologies. The main topics covered in the papers include: software quality and metrics (Chaps. 1, 2, 6 and 9), software testing and maintenance (Chap. 2), development methods and models (Chaps. 3, 4, 5 and 9), systems security (Chap. 6), dynamic software updates (Chap. 7), systems integration (Chap. 8), business process modelling (Chap. 9), intelligent problem solving (Chap. 10), multi-agent systems (Chap. 12), and solutions involving big data, the Internet of Things and business intelligence (Chaps. 11 and 13).

We would like to thank all the authors for their contributions and the reviewers for ensuring the quality of this publication.

July 2017

Enrique Cabello
Jorge Cardoso
Leszek Maciaszek
Marten van Sinderen

Organization

Conference Chair

Enrique Cabello Universidad Rey Juan Carlos, Spain

Program Co-chairs

Jorge Cardoso University of Coimbra, Portugal and Huawei German
Research Center, Munich, Germany
Leszek Maciaszek Wroclaw University of Economics, Poland
and Macquarie University, Sydney, Australia
Marten van Sinderen University of Twente, The Netherlands

Program Committee

Markus Aleksy ABB Corporate Research Center, Germany
Waleed Alsabhan KACST, UK
Bernhard Bauer University of Augsburg, Germany
Maurice H. ter Beek ISTI-CNR, Pisa, Italy
Wolfgang Bein University of Nevada, Las Vegas, USA
Fevzi Belli Izmir Institute of Technology, Turkey
Gábor Bergmann Budapest University of Technology and Economics,
Hungary
Mario Luca Bernardi Giustino Fortunato University, Italy
Jorge Bernardino Polytechnic Institute of Coimbra, ISEC, Portugal
Mario Berón Universidad Nacional de San Luis, Argentina
Marcello M. Bersani Politecnico di Milano, Italy
Thomas Buchmann University of Bayreuth, Germany
Miroslav Bureš Czech Technical University, Czech Republic
Nelio Cacho Federal University of Rio Grande do Norte, Brazil
Antoni Lluís Mesquida Universitat de les Illes Balears, Spain
Calafat
Jose Antonio Universidad Politécnica de Madrid, Spain
Calvo-Manzano
Ana R. Cavalli Institute Telecom SudParis, France
Marta Cimitile Unitelma Sapienza, Italy
Felix J. Garcia Clemente University of Murcia, Spain
Kendra Cooper Independent Scholar, Canada
Agostino Cortesi Università Ca' Foscari di Venezia, Italy
António Miguel Rosado Instituto Politécnico de Viana do Castelo, Portugal
da Cruz
Lidia Cuesta Universitat Politècnica de Catalunya, Spain

Sergiu Dascalu	University of Nevada, Reno, USA
Jaime Delgado	Universitat Politècnica de Catalunya, Spain
Steven Demurjian	University of Connecticut, USA
John Derrick	University of Sheffield, UK
Philippe Dugerdil	Geneva School of Business Administration, University of Applied Sciences of Western Switzerland, Switzerland
Gregor Engels	University of Paderborn, Germany
Morgan Ericsson	Linnaeus University, Sweden
Maria Jose Escalona	University of Seville, Spain
Jean-Rémy Falleri	Bordeaux INP, France
João Faria	University of Porto, Portugal
Cléver Ricardo Guareis de Farias	University of São Paulo, Brazil
Chiara Di Francescomarino	FBK-IRST, Italy
Matthias Galster	University of Canterbury, New Zealand
Mauro Gaspari	University of Bologna, Italy
Hamza Gharsellaoui	Al-Jouf College of Technology, Saudi Arabia
Paola Giannini	University of Piemonte Orientale, Italy
J. Paul Gibson	Mines-Telecom, Telecom SudParis, France
Gregor Grambow	AristaFlow GmbH, Germany
Hatim Hafiddi	INPT, Morocco
Jean Hauck	Universidade Federal de Santa Catarina, Brazil
Christian Heinlein	Aalen University, Germany
Jose Luis Arciniegas Herrera	Universidad del Cauca, Colombia
Mercedes Hidalgo-Herrero	Universidad Complutense de Madrid, Spain
Jose R. Hilerá	University of Alcalá, Spain
Andreas Holzinger	Medical University Graz, Austria
Jang-Eui Hong	Chungbuk National University, South Korea
Zbigniew Huzar	University of Wrocław, Poland
Ivan Ivanov	SUNY Empire State College, USA
Judit Jasz	University of Szeged, Hungary
Bo Nørregaard Jørgensen	University of Southern Denmark, Denmark
Hermann Kaindl	Vienna University of Technology, Austria
Dimitris Karagiannis	University of Vienna, Austria
Carlos Kavka	ESTECO SpA, Italy
Dean Kelley	Minnesota State University, USA
Jitka Komarkova	University of Pardubice, Czech Republic
Rob Kusters	Eindhoven University of Technology and Open University of the Netherlands, The Netherlands
Lamine Lafi	University of Sousse, Tunisia
Konstantin Läufer	Loyola University Chicago, USA
Pierre Leone	University of Geneva, Switzerland
David Lorenz	Open University, Israel
Ivan Lukovic	University of Novi Sad, Serbia

Stephane Maag	Telecom SudParis, France
Ivano Malavolta	Vrije Universiteit Amsterdam, The Netherlands
Eda Marchetti	ISTI-CNR, Italy
Katsuhisa Maruyama	Ritsumeikan University, Japan
Manuel Mazzara	Innopolis University, Russian Federation
Tom McBride	University of Technology Sydney, Australia
Fuensanta Medina-Dominguez	Carlos III Technical University of Madrid, Spain
Jose Ramon Gonzalez de Mendivil	Universidad Publica de Navarra, Spain
Francesco Mercaldo	National Research Council of Italy, Italy
Gergely Mezei	Budapest University of Technology and Economics, Hungary
Greg Michaelson	Heriot-Watt University, UK
Marian Cristian Mihaescu	University of Craiova, Romania
Dimitris Mitrakos	Aristotle University of Thessaloniki, Greece
Valérie Monfort	LAMIH Valenciennes UMR CNRS 8201, France
Mattia Monga	Università degli Studi di Milano, Italy
Antonio Muñoz	University of Malaga, Spain
Takako Nakatani	Open University of Japan, Japan
Elena Navarro	University of Castilla-La Mancha, Spain
Joan Navarro	La Salle, Universitat Ramon Llull, Spain
Viorel Negru	West University of Timisoara, Romania
Paolo Nesi	University of Florence, Italy
Jianwei Niu	University of Texas at San Antonio, USA
Rory O'Connor	Dublin City University, Ireland
Marcos Palacios	University of Oviedo, Spain
Catuscia Palamidessi	Inria, France
Luis Pedro	University of Aveiro, Portugal
Jennifer Pérez	Universidad Politécnica de Madrid, Spain
Dana Petcu	West University of Timisoara, Romania
Dietmar Pfahl	University of Tartu, Estonia
Giuseppe Polese	Università degli Studi di Salerno, Italy
Traian Rebedea	University Politehnica of Bucharest, Romania
Michel Reniers	Eindhoven University of Technology, The Netherlands
Colette Rolland	Université de Paris 1 Panthéon Sorbonne, France
Gustavo Rossi	Lifia, Argentina
Matteo Rossi	Politecnico di Milano, Italy
Stuart Harvey Rubin	University of California San Diego, USA
Chandan Rupakheti	Rose-Hulman Institute of Technology, USA
Gunter Saake	Institute of Technical and Business Information Systems, Germany
Krzysztof Sacha	Warsaw University of Technology, Poland
Francesca Saglietti	University of Erlangen-Nuremberg, Germany
Maria-Isabel Sanchez-Segura	Carlos III University of Madrid, Spain

Luis Fernandez Sanz	University of Alcala, Spain
Elad Michael Schiller	Chalmers University of Technology, Sweden
Istvan Siket	Hungarian Academy of Science, Research Group on Artificial Intelligence, Hungary
Michal Smialek	Warsaw University of Technology, Poland
Cosmin Stoica Spahiu	University of Craiova, Romania
Miroslaw Staron	University of Gothenburg, Sweden
Anca-Juliana Stoica	Uppsala University, Sweden
Ketil Stølen	SINTEF, Norway
Hiroki Suguri	Miyagi University, Japan
Bedir Tekinerdogan	Wageningen University, The Netherlands
Chouki Tibermacine	LIRMM, CNRS and Montpellier University, France
Claudine Toffolon	Université du Maine, France
Michael Vassilakopoulos	University of Thessaly, Greece
Dessislava Vassileva	Sofia University St. Kliment Ohridski, Bulgaria
László Vidács	University of Szeged, Hungary
Sergiy Vilkomir	East Carolina University, USA
Gianluigi Viscusi	EPFL Lausanne, Switzerland
Christiane Gresse von Wangenheim	Federal University of Santa Catarina, Brazil
Dietmar Winkler	Vienna University of Technology, Austria
Dianxiang Xu	Boise State University, USA
Jinhui Yao	Xerox Research, USA
Murat Yilmaz	Çankaya University, Turkey
Jingyu Zhang	Macquarie University, Australia

Additional Reviewers

Doina Bein	California State University, Fullerton, USA
Dominik Bork	University of Vienna, Austria
Angela Chan	University of Nevada, Reno, USA
Estrela Ferreira Cruz	Instituto Politécnico de Viana do Castelo, Portugal
Alessandro Fantechi	University of Florence, Italy
Dusan Gajic	University of Novi Sad, Serbia
Jalal Kiswani	University of Nevada, Reno, USA
Asia van de Mortel-Fronczak	Eindhoven University of Technology, The Netherlands
Benedikt Pittl	University of Vienna, Austria
Fredrik Seehusen	Sintef, Norway
Rocky Slavin	University of Texas at San Antonio, USA
Gábor Szárnyas	Budapest University of Technology and Economics, Hungary
Michael Walch	University of Vienna, Austria

Invited Speakers

Jan Bosch

Siobhán Clarke

Stefano Ceri

Andreas Holzinger

Chalmers University of Technology, Sweden

Trinity College Dublin, Ireland

Politecnico di Milano, Italy

Medical University Graz, Austria

Contents

Software Engineering

Assessing the User-Perceived Quality of Source Code Components Using Static Analysis Metrics	3
<i>Valasia Dimaridou, Alexandros-Charalampos Kyprianidis, Michail Papamichail, Themistoklis Diamantopoulos, and Andreas Symeonidis</i>	
A Technology for Optimizing the Process of Maintaining Software Up-to-Date	28
<i>Andrei Panu</i>	
From Specification to Implementation of an Automotive Transport System	49
<i>Oussama Khelifi, Christian Siegwart, Olfa Mosbahi, Mohamed Khalgui, and Georg Frey</i>	
Towards a Goal-Oriented Framework for Partial Agile Adoption.	69
<i>Soreangsey Kiv, Samedi Heng, Yves Wautelet, and Manuel Kolp</i>	
Using Semantic Web to Establish Traceability Links Between Heterogeneous Artifacts	91
<i>Nasser Mustafa and Yvan Labiche</i>	
A Machine Learning Approach for Game Bot Detection Through Behavioural Features	114
<i>Mario Luca Bernardi, Marta Cimitile, Fabio Martinelli, and Francesco Mercaldo</i>	
Genrih, a Runtime State Analysis System for Deciding the Applicability of Dynamic Software Updates	135
<i>Oleg Šelajev and Allan Raundahl Gregersen</i>	

Software Systems and Applications

Identifying Class Integration Test Order Using an Improved Genetic Algorithm-Based Approach	163
<i>Istvan Gergely Czibula, Gabriela Czibula, and Zsuzsanna Marian</i>	
Application of Fuzzy Logic to Assess the Quality of BPMN Models.	188
<i>Fadwa Yahya, Khouloud Boukadi, Hanène Ben-Abdallah, and Zakaria Maamar</i>	

Solving Multiobjective Knapsack Problem Using Scalarizing Function Based Local Search 210
Imen Ben Mansour, Ines Alaya, and Moncef Tagina

Monitoring and Control of Vehicles' Carbon Emissions 229
Tsvetan Tsokov and Dessislava Petrova-Antonova

WOF: Towards Behavior Analysis and Representation of Emotions in Adaptive Systems 244
Ilham Alloui and Flavien Vernier

Classifying Big Data Analytic Approaches: A Generic Architecture 268
Yudith Cardinale, Sonia Guehis, and Marta Rukoz

Towards a Digital Business Operating System 296
Jan Bosch

Author Index 309