Communications in Computer and Information Science 1447

Editorial Board Members

Joaquim Filipe

Polytechnic Institute of Setúbal, Setúbal, Portugal

Ashish Ghosh

Indian Statistical Institute, Kolkata, India

Raquel Oliveira Prates

Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil

Lizhu Zhou

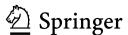
Tsinghua University, Beijing, China

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

Marten van Sinderen · Leszek A. Maciaszek · Hans-Georg Fill (Eds.)

Software Technologies

15th International Conference, ICSOFT 2020 Online Event, July 7–9, 2020 Revised Selected Papers



Editors Marten van Sinderen Information Systems Group Enschede, The Netherlands

Hans-Georg Fill Universität Fribourg Fribourg, Switzerland Leszek A. Maciaszek Wrocław University of Economics Institute of Business Informatics Wrocław, Poland Macquarie University Sydney, Australia

ISSN 1865-0929 ISSN 1865-0937 (electronic) Communications in Computer and Information Science ISBN 978-3-030-83006-9 ISBN 978-3-030-83007-6 (eBook) https://doi.org/10.1007/978-3-030-83007-6

© Springer Nature Switzerland AG 2021

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, expressed 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.

This Springer imprint is published by the registered company Springer Nature Switzerland AG 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 15th International Conference on Software Technologies (ICSOFT 2020), exceptionally held as a web-based event, due to the COVID-19 pandemic, during July 7–9, 2020.

ICSOFT 2020 received 95 paper submissions from 36 countries, of which 19 were accepted and presented as full papers at the conference. After the conference, the authors of a selection of the presented full papers were invited to submit a revised and extended version of their paper, having at least 30% new material. This resulted in 12 revised and extended papers (i.e., 13% of the original 95 submissions) that were included in this book.

The papers were selected by the event chairs and their selection was based on a number of criteria that included the classifications and comments provided by the Program Committee members, the session chairs' assessment, and the verification of the papers' revisions and extensions by the program and conference chairs.

The purpose of the ICSOFT conference series, which started in 2006, is to bring together researchers, engineers, and practitioners interested in software technologies. The conference areas are "Software Engineering and Systems Development", "Software Systems and Applications", and "Foundational and Trigger Technologies".

The topics of the extended and revised papers cover a wide range of some of the most recent and highly relevant software technologies ranging from model-based approaches for cyber-physical systems and internet-of-things systems, and machine learning algorithms for software testing, to semantic methods for cloud and data applications and formal verification approaches.

We would like to thank all the authors for their contributions and the reviewers who have helped ensure the quality of this publication.

July 2020

Hans-Georg Fill Marten van Sinderen Leszek Maciaszek

Organization

Conference Chair

Leszek Maciaszek Wrocław University of Economics and Business,

Poland, and Macquarie University, Sydney,

Australia

Program Co-chairs

Marten van Sinderen University of Twente, The Netherlands Hans-Georg Fill University of Fribourg, Switzerland

Program Committee

Peter Amthor Technische Universität Ilmenau, Germany

Vincent Aranega University of Lille, France

Pasquale Ardimento University of Bari Aldo Moro, Italy

Ethem Arkin Hacettepe University, Turkey

Soumyadip Bandyopadhyay BITS Pilani K K Birla Goa Campus, India, and Hasso

Plattner Institute, Germany

Davide Basile University of Florence, Italy

Yann Ben Maissa INPT, Morocco

Jorge Bernardino Polytechnic of Coimbra - ISEC, Portugal Mario Berón Universidad Nacional de San Luis, Argentina

Marcello Bersani Politecnico di Milano, Italy Dominique Blouin Telecom Paris, France

Antonio Bucchiarone Fondazione Bruno Kessler, Italy
Thomas Buchmann University of Bayreuth, Germany
Jonas Bulegon Gassen Antonio Meneghetti Faculdade, Brazil
Andrea Burattin University of Innsbruck, Austria

Fergal Caffery Dundalk Institute of Technology, Ireland

Alejandro Calderón

Ana Castillo

Ana Cavalli

University of Cádiz, Spain

Universidad de Alcalá, Spain

Telecom SudParis, France

Alexandru Cicortas West University of Timisoara, Romania Lidia López Cuesta Universitat Politècnica de Catalunya, Spain

Sergiu Dascalu

Cléver Ricardo de Farias

Martina De Sanctis
Steven Demurjian

University of Nevada, Reno, USA
University of São Paulo, Brazil
Gran Sasso Science Institute, Italy
University of Connecticut, USA

Chiara Di Francescomarino FBK-IRST, Italy

Amleto Di Salle University of L'Aquila, Italy

Francisco Domínguez Mayo University of Seville, Spain

German-Lenin Universidad Carlos III de Madrid, Spain

Dugarte-Peña

Gencer Erdogan SINTEF, Norway

Morgan Ericsson Linnaeus University, Sweden Université Lille 1, France University of Porto, Portugal

Estrela Ferreira Cruz Instituto Politécnico de Viana do Castelo, Portugal

Felix Garcia Clemente University of Murcia, Spain

Alejandra Garrido Universidad Nacional de La Plata and CONICET,

Argentina

Aritra Ghosh Florida Atlantic University, USA
Paola Giannini University of Piemonte Orientale, Italy

John Gibson Telecom SudParis, France

Ana-Belén Gil-González
Gorkem Giray
Ricardo Giuliani Martini
Jose Gonzalez
Gregor Grambow
University of Salamanca, Spain
Independent Researcher, Turkey
Universidade Franciscana, Brazil
University of Seville, Spain
Hochschule Aalen, Germany

Christiane Gresse Federal University of Santa Catarina, Brazil

von Wangenheim

Hatim Hafiddi INPT, Morocco

Ludovic Hamon Le Mans Université, France

Jean Hauck Universidade Federal de Santa Catarina, Brazil

Pedro Henriques University of Minho, Portugal Jose Herrera Universidad del Cauca, Colombia

Mercedes Hidalgo-Herrero Universidad Complutense de Madrid, Spain

Jose R. Hilera University of Alcala, Spain

Ralph Hoch TU Wien, Austria

Andreas Holzinger Medical University Graz, Austria

Jang-Eui Hong Chungbuk National University, South Korea Miloslav Hub University of Pardubice, Czech Republic

Zbigniew Huzar Wroclaw University of Science and Technology,

Poland

Ivan Ivanov SUNY Empire State College, USA
Judit Jasz University of Szeged, Hungary
Maria Jose Escalona University of Seville, Spain

Hermann Kaindl TU Wien, Austria Carlos Kavka ESTECO SpA, Italy

Dean Kelley Minnesota State University, USA
Jun Kong North Dakota State University, USA

Rob Kusters Open Universiteit Nederland, The Netherlands

Wing Kwong Hofstra University, USA

Pierre Laforcade Lium, France Giuseppe Lami ISTI-CNR, Italy

Yu Lei The University of Texas at Arlington, USA

Pierre Leone University of Geneva, Switzerland

Letitia Li BAE Systems, USA David Lorenz Open University, Israel

Daniel Lucrédio Federal University of São Carlos, Brazil

Ivan Lukovic University of Novi Sad, Serbia Stephane Maag Telecom SudParis, France

Ivano Malavolta Vrije Universiteit Amsterdam, The Netherlands

Eda Marchetti ISTI-CNR, Italy

Manuel Mazzara Innopolis University, Russia

Hamid Mcheick University of Quebec at Chicoutimi, Canada Andreas Meier Zurich University of Applied Sciences, Switzerland

Francesco Mercaldo IIT-CNR, Italy

Antoni Mesquida Calafat Universitat de les Illes Balears, Spain

Gergely Mezei Budapest University of Technology and Economics,

Hungary

Cristian Mihaescu University of Craiova, Romania

Antao Moura Federal Universisty of Campina Grande, Brazil

Christian Muck University of Vienna, Austria Antonio Muñoz University of Malaga, Spain

Takako Nakatani The 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

Claus Pahl Free University of Bozen-Bolzano, Italy

Marcos Palacios University of Oviedo, Spain Asier Perallos University of Deusto, Spain

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

Mohammad Mehdi University of Science and Technology of Mazandaran,

Pourhashem Kallehbasti Iran

Rosario Pugliese Universita' di Firenze, Italy Stefano Quer Politecnico di Torino, Italy

Traian Rebedea University Politehnica of Bucharest, Romania

Werner Retschitzegger
Marcela Xavier Ribeiro
Andres Rodriguez
Colette Rolland
António Rosado da Cruz

Johannes Kepler University, Austria
Federal University of São Carlos, Brazil
Universidad Nacional de La Plata, Argentina
Université Paris 1 Panthèon Sorbonne, France
Instituto Politécnico de Viana do Castelo Port

António Rosado da Cruz Instituto Politécnico de Viana do Castelo, Portugal Gustavo Rossi Universidad Nacional de La Plata, Argentina

Matteo Rossi Politecnico di Milano, Italy

Stuart Rubin University of California, San Diego, USA
Gunter Saake Institute of Technical and Business Information

Systems, Germany

Organization

Maria-Isabel

Х

Sanchez-Segura

Carlos III University of Madrid, Spain

Nickolas Sapidis

University of Western Macedonia, Greece BITS Pilani K K Birla Goa Campus, India Santonu Sarkar Elad Schiller Chalmers University of Technology, Sweden Peter Schneider-Kamp University of Southern Denmark, Denmark

Eva-Maria Schoen HAW Hamburg, Germany

Hungarian Academy of Science, Hungary Istvan Siket

Carnegie Mellon University, USA Kuldeep Singh

University of Nebraska at Omaha, USA Harvey Siy

Cosmin Stoica Romania

Ketil Stolen SINTEF, Norway

Miyagi University, Japan Hiroki Suguri

Selma Suloglu Rochester Institute of Technology, USA

Université du Maine, France Claudine Toffolon Michael Vassilakopoulos University of Thessaly, Greece László Vidács University of Szeged, Hungary

Yan Wang Google, USA

Dietmar Winkler Vienna University of Technology, Austria

Jinhui Yao Xerox Research, USA

Murat Yilmaz Dublin City University, Ireland Fatiha Zaidi Université Paris-Saclay, France Tampere University, Finland Zheying Zhang

Additional Reviewers

Jaganmohan

University of Texas at Arlington, USA

Chandrasekaran

Franck Chauvel

SINTEF, Norway

Alexandru Cicortas West University of Timisoara, Romania

SINTEF, Norway Enrique Garcia-Ceja Hana Mkaouar Telecom Paris, France Mounira Msahli Telecom Paris, France

Nikola Obrenović University of Novi Sad, Serbia

Invited Speakers

Dominik Slezak University of Warsaw, Poland

Wil van der Aalst RWTH Aachen University, Germany

Siemens AG, Germany Frank Buschmann

Contents

Shared Autonomous Mobility on Demand: A Fuzzy-Based Approach and Its Performance in the Presence of Uncertainty	1
Efficient Scheduling of Periodic, Aperiodic, and Sporadic Real-Time Tasks with Deadline Constraints	25
R-TNCES State Space Generation Using Ontology-Based Method on a Distributed Cloud-Based Architecture	44
MLCA: A Model-Learning-Checking Approach for IoT Systems Sébastien Salva and Elliott Blot	70
A Real-Time Integration of Semantic Annotations into Air Quality Monitoring Sensor Data	98
On Improvement of Formal Verification of Reconfigurable Real-Time Systems Using TCTL and CTL-Based Properties on IaaS Cloud Environment	114
A Genetic Algorithm with Tournament Selection for Automated Testing of Satellite On-board Image Processing	134
Model-Based Threat Modeling for Cyber-Physical Systems: A Computer-Aided Approach	158
A Machine Learning Based Methodology for Web Systems Codeless Testing with Selenium	184
Multilevel Readability Interpretation Against Software Properties: A Data-Centric Approach	203

xii Contents

Efficient Verification of Reconfigurable Discrete-Event System Using	
Isabelle/HOL Theorem Prover and Hadoop	227
Sohaib Soualah, Yousra Hafidi, Mohamed Khalgui, Allaoua Chaoui,	
and Laid Kahloul	
A Method for the Joint Analysis of Numerical and Textual IT-System Data	
to Predict Critical System States	242
Patrick Kubiak, Stefan Rass, Martin Pinzger, and Stephan Schneider	
Author Index	263