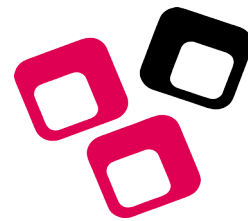


# Central European Conference on Information and Intelligent Systems

CECIIS



23<sup>rd</sup>  
International Conference  
2012

Organized by:  
University of Zagreb,  
Faculty of Organization and Informatics  
Varaždin, Croatia

September 19<sup>th</sup> - 21<sup>st</sup>, 2012  
Varaždin, Croatia

ISSN 1847-2001 (Print)  
ISSN 1848-2295 (Online)

UDC 004:007

University of Zagreb  
Faculty of Organization and Informatics Varaždin

# Central European Conference on Information and Intelligent Systems

CECIIS



23<sup>rd</sup> International Conference

September 19<sup>th</sup> - 21<sup>st</sup>, 2012  
Varaždin, Croatia

Varaždin, 2012.

**Publisher**

University of Zagreb  
Faculty of Organization and Informatics  
Varaždin  
Pavlinska 2  
HR-42 000 Varaždin, Croatia

**Contact**

e-mail: [ceciis@foi.hr](mailto:ceciis@foi.hr)  
phone: +385 42 390 851  
fax: +385 42 213 413  
web: [www.ceciis.foi.hr](http://www.ceciis.foi.hr)  
fb: [www.facebook.com/ceciis.foi](http://www.facebook.com/ceciis.foi)

**For Publisher**

Vjeran Strahonja (University of Zagreb, Faculty of Organization and Informatics)

**Editors**

Tihomir Hunjak (University of Zagreb, Faculty of Organization and Informatics)  
Sandra Lovrenčić (University of Zagreb, Faculty of Organization and Informatics)  
Igor Tomičić (University of Zagreb, Faculty of Organization and Informatics)

**Editors In Cooperation with:**

Albert-Ludwigs-Universität Freiburg, Institut für Informatik und Gesellschaft, Germany  
Karl-Franzens Universität Graz, Institut für Informationswissenschaft, Austria  
University of Zagreb, Faculty of Transport and Traffic Science, Croatia  
University of Maribor, Faculty of Economics and Business, Slovenia  
University of Maribor, Faculty of Electrical Engineering and Computer Science, Slovenia

**Publishing Board**

Igor Tomičić (University of Zagreb, Faculty of Organization and Informatics)  
Bernarda Kos (University of Zagreb, Faculty of Organization and Informatics)  
Marko Jurišić (University of Zagreb, Faculty of Organization and Informatics)

**This publication is partially financed by:**

Ministry of Science, Education and Sport, Republic of Croatia  
University of Zagreb, Croatia  
Varaždin County

All rights reserved. No parts of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior permission of the copyright owner.

**ISSN 1847-2001** (Print)  
**ISSN 1848-2295** (Online)

# Contents

Index of Authors	V
Preface	VII

## Invited Lectures

Ján Paralič <b>Business information systems - experiences from Slovakia</b>	3
Matjaž B. Jurič <b>Impact of SOA on Information System Development</b>	9

## Data and Knowledge Bases

Ivan Opalički, Sandra Lovrenčić <b>How Well are Domain and Upper Ontologies Connected?</b>	17
Tomislav Belcar, Sandra Lovrenčić <b>Use of Description Logics Expressive Power in Ontologies</b>	23
Marko Maliković, Mirko Čubrilo, Predrag Janičić <b>Formalization of a Strategy for the KRK Chess Endgame</b>	29
Dominika Jurovata, Michal Kebísek, Júlia Kurnátová <b>Application of Knowledge Discovery in Databases Process in the Production Systems</b>	37
Júlia Kurnátová, Dominika Jurovata, Pavel Važan <b>Evaluation of strategies control of production system according to gained knowledge</b>	43
Markus Schatten, Krešimir Ivković <b>Regular Path Expressions for Querying Semistructured Data - Implementation in Prolog</b>	49
Bogdan Okreša Đurić, Markus Schatten <b>Modeling Multiagent Knowledge Systems Based on Implicit Culture</b>	57
Markus Schatten <b>Complex Analytical Method for Self-organizing Multiagent Systems</b>	63
Visnja Ognjenovic, Vladimir Brtko, Ivana Berkovic, Eleonora Brtko <b>Comparison of the classification rules generated by See 5.0 and SSCO Systems</b>	71
Dušan Mundžar, Darko Matotek, Marija Jakuš <b>Quantitative research methods participation in the information sciences papers in Croatia</b>	77

## Education for Information Society

Anita Papic, Jadranka Stojanovski <b>Information Services in Academic Libraries: Browsing Services vs. Searching Services</b>	85
Radovan Vrana <b>Making the Internet a safer place: students' perceptions about Internet security threats</b>	91
Adis Medić <b>Improvement of Web Services at the local level in Bosnia and Herzegovina</b>	99
Tanja Sraka Mohar, Dejan Sraka, Branko Kaučič <b>Analysing blended based learning systems</b>	107
Marjan Krasna, Tomaz Bratina, Branko Kaucic <b>Transition from traditional to electronic testing</b>	115
Ana Ćorić, Elisabeth Pergler <b>Team Communication via Facebook: Success or Failure?</b>	123
Bojan Vukšić, Nikola Krajačić, Boris Tomaš <b>Augmented reality in high school education</b>	131
Jasmina Pivar, Ivan Malbašić, Jelena Horvat <b>Literature Analysis of Transfer and Learning Tacit Knowledge</b>	137
Andi Jambrošić, Blaž Rodič <b>E-learning and the quality of primary schools in Slovenia</b>	147
Nikola Krajačić, Iva Gregurec, Boris Tomaš <b>Skills Framework for a Social Age - SFSA</b>	157
Goran Hajdin, Kristina Špernjak, Matija Šaško <b>Higher Education Employability in Croatia – Analysis from 2002 to 2011</b>	165
Melita Milić, Igor Škorić <b>The impact of school and home environment on computer attitude</b>	173
Ivana Marić, Petra Barišić, Ivana Jurjević <b>Knowledge and skills needed in knowledge economy</b>	181
Ezmodla Barolli, Violeta Vidaček-Hainš, Albana Gorishti, Jozef Bushati <b>Reflections about learning and teaching through ICT in Balkan countries</b>	187
Andreja Kovačić, Goran Bubaš, Tihomir Orehovački <b>Integrating culture into a Business English course: Students' perspective on a collaborative online writing project</b>	195

## Information and Communication Technologies

Ivan Vuljak, Renata Mekovec <b>E-service Quality of Faculty Web Portals: Exploring the Students' Perspective</b>	205
Iva Gregurec, Petra Grd <b>Search Engine Optimization (SEO): Website analysis of selected faculties in Croatia</b>	211
Katarina Topolko, Dijana Oreški, Jelena Horvat <b>Multi-criteria Modeling of Postgraduate Students Bank Selection</b>	219
Nikola Ivković, Danijel Radošević, Ivan Magdalenić <b>Towards Automatic Generation of Parallel Programs</b>	227
Matija Kapić, Iva Gregurec, Alen Delić <b>Behavior of Varaždin Secondary Level Education Students on Facebook</b>	233
Robert Fabac, Ivana Šarić <b>Virtual Organizations in Croatia: The Case of Bjelovar-Bilogora County</b>	239
Valerija Bubljić, Jadranka Zimmermann <b>The Role of ICT in Croatian Small Enterprises</b>	247

Milorad Nikitović, Vjeran Strahonja <b>Analysis of factors influencing the success of implementation of ERP systems based on self-assessment</b>	257
Dijana Posavec <b>ICT in the printing processes normative standardization of the printing processes by the use of ICT</b>	265
Leo Sinjeri, Neven Vrčec, Goran Bubaš <b>Maturity of towns' Web sites in Croatia according to the evolutionary e-Government Maturity Model</b>	273
Michael Harnisch, Thomas Puchleitner <b>Patronizing Information Units</b>	279
Robertina Zdjelar <b>The Balanced Scorecard Method as Background for e-Government in Regional Government</b>	287

## Information Systems Security

Christian Flender, Martin Peters, Günter Müller <b>Measuring Consumer Information Deficits in Transactions of Data-centric Services</b>	299
Davor Maček, Ivan Magdalenić, Nikola Ivković <b>Risk Assessment of the Bank's Noncompliance with Payment Card Industry Data Security Standard</b>	305
Olivera Grljević, Zita Bošnjak, Renata Mekovec <b>Privacy Preservation in Social Network Analysis</b>	313
Tomislav Fotak, Petra Koruga, Miroslav Bača <b>Trends in Hand Geometry Biometrics</b>	319
Jasmin Ćosić, Zoran Ćosić <b>The Necessity of Developing an Digital Evidence Ontology</b>	325
Kruno Golubić, Hrvoje Stančić <b>Clearing and Sanitization of Media Used for Digital Storage: Towards Recommendations for Secure Deleting of Digital Files</b>	331
Velibor Božić <b>Risk management in Informatization</b>	337
Zrinka Lovrić <b>Model of Simplified Implementation of PCI DSS by Using ISO 27001 Standard</b>	347

## Intelligent Information Systems

Slaven Smojver <b>Analysis of Banking Supervision via Inspection Game and Agent-Based Modeling</b>	355
Luka Pavlič, Marjan Heričko, Maja Pušnik <b>Improving e-Services Adoption With Semantic e-Services Platform and Question-Based Approach</b>	363
Darko Galinec, Danijel Macanga <b>Observe, Orient, Decide and Act Cycle and Pattern-Based Strategy: Characteristics and Complementation</b>	371
Jasmina Magdić, Željka Car <b>Model for Implementing Customer Relationship Management System</b>	379
Karol Furdík, Gabriel Lukáč <b>Events Processing and Device Interoperability in a Smart Office IoT Application</b>	387
Alen Delić, Natalia Nađ, Tonimir Kišasondi <b>Analysis of user needs to create specific learning environments</b>	395
Mario Brčić, Damir Kalpić, Krešimir Fertalj <b>Resource Constrained Project Scheduling under Uncertainty: A Survey</b>	401

## Intelligent Transport Systems

Edouard Ivanjko, Marko Matulin, Štefica Mrvelj <b>Dynamic capacity allocation of tollbooth plaza based on fuzzy logic</b>	413
Tonči Carić, Juraj Fosin, Mario Buntić <b>Regional Pre-trip Sales Force Routing Derived From Multi-source Weber Problem</b>	421
Ljupko Šimunović, Velimir Anđelić, Ivan Pavlinušić <b>Blind people guidance system</b>	427
Hrvoje Haramina, Milivoj Mandić, Edouard Ivanjko <b>Appliance of Intelligent Transportation Systems within the Moving Block Technology</b>	433

## Software Engineering

Zlatko Stapić, Eva García López, Antonio García Cabot, Luis de Marcos Ortega, Vjerran Strahonja <b>Performing systematic literature review in software engineering</b>	441
Ivan Luković, Sonja Ristić, Aleksandar Popović, Pavle Mogin <b>An approach to the platform independent specification of a business application</b>	449
Darko Andročec, Dragutin Kermek <b>Useful Patterns for BPEL Developers</b>	457
Zdravko Roško <b>Strategy Pattern as a Variability Enabling Mechanism in Product Line Architecture</b>	463
Matija Tomašković, Ruben Picek <b>Automatic Conversion of Desktop Applications to Java Web Technology</b>	473
Marko Velić, Ivan Padavić, Željko Dobrović <b>Metamodel of agile project management and the process of building with LEGO® bricks</b>	481
<b>Author Guidelines</b>	491

## Index of Authors

- Andročec, Darko 457  
Anđelić, Velimir 427  
Bača, Miroslav 319  
Barišić, Petra 181  
Barolli, Ezmolda 187  
Belcar, Tomislav 23  
Berkovic, Ivana 71  
Bošnjak, Zita 313  
Božić, Velibor 337  
Bratina, Tomaz 115  
Brčić, Mario 401  
Brtka, Vladimir 71  
Brtka, Eleonora 71  
Bubaš, Goran 195, 273  
Bublić, Valerija 247  
Buntić, Mario 421  
Bushati, Jozef 187  
Car, Željka 379  
Carić, Tonči 421  
Ćorić, Ana 123  
Ćosić, Jasmin 325  
Ćosić, Zoran 325  
Čubrilo, Mirko 29  
de Marcos Ortega, Luis 441  
Delić, Alen 233, 395  
Dobrović, Željko 481  
Fabac, Robert 239  
Fertalj, Krešimir 401  
Flender, Christian 299  
Fosin, Juraj 421  
Fotak, Tomislav 319  
Furdík, Karol 387  
Galinec, Darko 371  
García Cabot, Antonio 441  
García López, Eva 441  
Golubić, Kruno 331  
Gorishti, Albana 187  
Grd, Petra 211, 319  
Gregurec, Iva 157, 211, 233  
Grljević, Olivera 313  
Hajdin, Goran 165  
Haramina, Hrvoje 433  
Harnisch, Michael 279  
Heričko, Marjan 363  
Horvat, Jelena 137, 219  
Ivanjko, Edouard 413, 433  
Ivković, Krešimir 49  
Ivković, Nikola 227, 305  
Jakuš, Marija 77  
Jambrošić, Andi 147  
Janičić, Predrag 29  
Jurič, Matjaž B. 9  
Jurjević, Ivana 181  
Jurovatá, Dominika 37, 43  
Kalpić, Damir 401  
Kapić, Matija 233  
Kaučić, Branko 107, 115  
Kebísek, Michal 37  
Kermek, Dragutin 447  
Kišasondi, Tonimir 395  
Kovačić, Andreja 195  
Krajačić, Nikola 131, 157  
Krasna, Marjan 115  
Kurnátová, Júlia 37, 43  
Lovrenčić, Sandra 17, 23  
Lovrić, Zrinka 347  
Lukáč, Gabriel 387  
Luković, Ivan 449  
Macanga, Danijel 371  
Maček, Davor 305  
Magdalenić, Ivan 227, 305  
Magdić, Jasmina 379  
Malbašić, Ivan 137  
Maliković, Marko 29  
Mandić, Milivoj 433  
Marić, Ivana 181  
Matotek, Darko 77  
Matulin, Marko 413  
Medić, Adis 99  
Mekovec, Renata 205, 313  
Milić, Melita 173  
Mogin, Pavle 449  
Mrvelj, Štefica 413  
Müller, Günter 299  
Mundar, Dušan 77  
Nađ, Natalia 395  
Nikitović, Milorad 257  
Ognjenovic, Visnja 71  
Okreša Đurić, Bogdan 57  
Opalički, Ivan 17  
Orehovacki, Tihomir 195  
Oreški, Dijana 219  
Padavić, Ivan 481  
Papic, Anita 85



Paralič, Ján 3  
Pavlič, Luka 363  
Pavlinušić, Ivan 427  
Pergler, Elisabeth 123  
Peters, Martin 299  
Picek, Ruben 473  
Pivar, Jasmina 137  
Popović, Aleksandar 449  
Posavec, Dijana 265  
Puchleitner, Thomas 279  
Pušnik, Maja 363  
Radošević, Danijel 227  
Ristić, Sonja 449  
Rodič, Blaž 147  
Roško, Zdravko 463  
Šarić, Ivana 239  
Šaško, Matija 165  
Schatten, Markus 49, 57, 63  
Šimunović, Ljupko 427  
Sinjeri, Leo 273  
Škorić, Igor 173  
Smojver, Slaven 355  
Špernjak, Kristina 165  
Sraka, Dejan 107  
Sraka Mohar, Tanja 107  
Stančić, Hrvoje 331  
Stapić, Zlatko 441  
Stojanovski, Jadranka 85  
Strahonja, Vjeran 257, 441  
Tomaš, Boris 131, 157  
Tomašković, Matija 473  
Topolko, Katarina 211  
Važan, Pavel 43  
Velić, Marko 481  
Vidacek-Hains, Violeta 187  
Vrana, Radovan 91  
Vrček, Neven 273  
Vukšić, Bojan 131  
Vuljak, Ivan 205  
Zdjelar, Robertina 287  
Zimmermann, Jadranka 247

## PREFACE

The 23<sup>rd</sup> Central European Conference on Information and Intelligent Systems (CECIIS 2012) was organized and hosted by the Faculty of Organization and Informatics, Varaždin, Croatia, from 19-21 September 2012. The most important aim of CECIIS is to strengthen the interface between researchers involved in the development and application of methods and techniques in the field of information and intelligent systems.

This proceedings presents 62 scientific papers that were reviewed by the international Program Committee and divided into seven sections: Education for Information Society, Information Systems Security, Information and Communication Technologies, Data and Knowledge Bases, Intelligent Information Systems, Intelligent Transport Systems and Software Engineering. Selected papers will be further reviewed by two independent international reviewers with the possibility of being extended and included in the Journal of Organizational and Information Sciences (JIOS), the international scientific journal published by the Faculty of Organization and Informatics. The proceedings also contains two invited lectures that were delivered by eminent experts in their respective fields.

Within the 23<sup>rd</sup> edition, the Conference also offered several accompanying events. For the second time the Students poster and presentation section as well as the FOI Security Symposium (FSec) were held. 11 poster abstracts and 22 FSec presentations are published separately on-line.

For the first time FOI Mobile and embedded development Symposium (f-moed) was held as well as Scientific-practical seminar Mathematics and the ICT.

We would like to thank all the authors, presenters, reviewers, session chairs and attendees and, above all, our invited speakers. We acknowledge the help that the Faculty of Organization and Informatics provided, which was very important for the overall success of the Conference. We would like to extend our appreciation to the Program and Organizing Committee members.

Finally, we are most grateful to all our sponsors for their financial and material support.

We are confident that inside these covers you will find relevant and interesting papers in the field of information and intelligent systems. We also look forward to your participation in one of many CECIIS conferences to come.

September 2012

On the behalf of  
Program and Organizing Committees  
Tihomir Hunjak & Sandra Lovrenčić