

Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering

445

Editorial Board Members

Ozgur Akan

Middle East Technical University, Ankara, Turkey

Paolo Bellavista

University of Bologna, Bologna, Italy

Jiannong Cao

Hong Kong Polytechnic University, Hong Kong, China

Geoffrey Coulson

Lancaster University, Lancaster, UK

Falko Dressler

University of Erlangen, Erlangen, Germany

Domenico Ferrari

Università Cattolica Piacenza, Piacenza, Italy

Mario Gerla

UCLA, Los Angeles, USA

Hisashi Kobayashi


Princeton University, Princeton, USA

Sergio Palazzo

University of Catania, Catania, Italy

Sartaj Sahni

University of Florida, Gainesville, USA

Xuemin Shen 

University of Waterloo, Waterloo, Canada

Mircea Stan

University of Virginia, Charlottesville, USA

Xiaohua Jia

City University of Hong Kong, Kowloon, Hong Kong

Albert Y. Zomaya

University of Sydney, Sydney, Australia

More information about this series at <https://link.springer.com/bookseries/8197>

Dragan Perakovic · Lucia Knapcikova (Eds.)

Future Access Enablers for Ubiquitous and Intelligent Infrastructures

6th EAI International Conference, FABULOUS 2022
Virtual Event, May 4, 2022
Proceedings

Editors

Dragan Perakovic 
Faculty of Transport and Traffic Science
University of Zagreb
Zagreb, Croatia

Lucia Knapcikova 
Faculty of Manufacturing Technologies
Technical University of Košice
Prešov, Slovakia

ISSN 1867-8211

ISSN 1867-822X (electronic)

Lecture Notes of the Institute for Computer Sciences, Social Informatics
and Telecommunications Engineering

ISBN 978-3-031-15100-2

ISBN 978-3-031-15101-9 (eBook)

<https://doi.org/10.1007/978-3-031-15101-9>

© ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2022

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

We are delighted to introduce the proceedings of FABULOUS 2022 – the 6th EAI International Conference on Future Access Enablers of Ubiquitous and Intelligent Infrastructures, which is the result of fruitful cooperation between the European Alliance for Innovation, the Faculty of Transport and Traffic Sciences of the University of Zagreb, and the Faculty of Manufacturing Technologies with a seat in Prešov of the Technical University of Košice.

Our ambition is to establish channels of communication and disseminate knowledge among professionals working in manufacturing and related institutions. Therefore, we cordially invited experts, researchers, academicians, and practitioners in relevant fields to share their knowledge on the management of manufacturing systems at the conference. The themes of FABULOUS 2022 were Teletraffic and Intelligent Networks, the Internet of Things, Cyber Security, Artificial Intelligence, Machine Learning, Smart Environment Applications/Scenarios, and Multimedia.

The technical program of FABULOUS 2022 consisted of 18 full papers in video presentation sessions, all in full online conference format. The papers were selected from 70 submissions based on a blind review process, with a minimum of 3 reviews per paper. We are grateful to all the authors of accepted, who prepared scientific presentations of their research work. We sincerely appreciate their constant support.

It was also a great pleasure to work with such an excellent organizing committee team. Heartfelt thanks are due for their hard work in organizing and supporting the conference. In particular, we are grateful to the Technical Program Committee, who helped to put together a high-quality scientific program, and Goran Marković (general co-chair) and Alexandru Vulpe (web chair) for all their support. We are also grateful to the Conference Manager, Karina Ogandjanian, for her support and all the reviewers for their excellent work.

The 6th EAI FABULOUS conference provided a good platform for all researchers, developers, and practitioners to network and discuss all science and technology aspects that are relevant to ubiquitous and intelligent infrastructures. We strongly believe that FABULOUS 2023, which will take place in Zagreb, Croatia, will be as successful and stimulating as this year's conference.

May, 2022

Dragan Peraković
Lucia Knapčíková

Organization

Steering Committee

Chair

Imrich Chlamtac

University of Trento, Italy

Co-chairs

Dragan Peraković

University of Zagreb, Croatia

Lucia Knapcikova

Technical University of Kosice, Slovakia

Organizing Committee

General Chairs

Dragan Peraković

University of Zagreb, Croatia

Goran Marković

University of Belgrade, Serbia

Lucia Knapcikova

Technical University of Kosice, Slovakia

Technical Program Committee Chairs

Marko Periša

University of Zagreb, Croatia

Marko Krstić

RATEL Beograd, Serbia

Anca D. Jurcut

University College Dublin, Ireland

B. B. Gupta

National Institute of Technology Kurukshetra,
India

Annamária Behúnová

Technical University of Kosice, Slovakia

Web Chair

Alexandru Vulpe

Politehnica University of Bucharest, Romania

Publicity and Social Media Chair

Petra Zorić

University of Zagreb, Croatia

Workshops Chair

Gordana Jotanović University of East Sarajevo,
Bosnia and Herzegovina

Sponsorship and Exhibits Chair

Dragan Peraković University of Zagreb, Croatia

Publications Chairs

Dragan Peraković University of Zagreb, Croatia
Lucia Knapcikova Technical University of Kosice, Slovakia

Posters and PhD Track Chair

Ivan Grgurević University of Zagreb, Croatia

Local Chair

Ivan Cvitić University of Zagreb, Croatia

Technical Program Committee

Alberto Huertas Celdran	University of Murcia, Spain
Aleksandar Jevremovic	Singidunum University, Serbia
Alessandro Ruggiero	University of Salerno, Italy
Alexandru Vulpe	Politehnica University of Bucharest, Romania
Anca D. Jurcut	University College Dublin, Ireland
Andrii Shalaginov	Kristiania University College, Norway
Anna Otsetova	University of Telecommunications and Post, Bulgaria
Annamária Behúnová	Technical University of Kosice, Slovakia
Arcangelo Castiglione	University of Salerno, Italy
Arianit Maraj	Kosovo Telecom and AAB College, Kosovo
B. B. Gupta	National Institute of Technology Kurukshetra, India
Dalibor Dobrilovic	University of Novi Sad, Serbia
Dharma Agrawal	University of Cincinnati, USA
Dražan Kozak	University of Osijek, Croatia
Dušan Šimšik	Technical University of Kosice, Slovakia
Goran Marković	University of Belgrade, Serbia
Goran Jauševac	University of East Sarajevo, Bosnia and Herzegovina
Gordana Jotanovic	University of East Sarajevo, Bosnia and Herzegovina

Imran Razzak	Deakin University, Australia
Ivan Pavlenko	Sumy State University, Ukraine
Ivan Cvitic	University of Zagreb, Croatia
Ivan Grgurević	University of Zagreb, Croatia
Jakub Kaščák	Technical University of Košice, Slovakia
Jan Pitel	Technical University of Kosice, Slovakia
Janusz Grabara	Czestochowa University of Technology, Poland
Jerzy Winczek	Czestochowa University of Technology, Poland
Jozef Husár	Technical University of Kosice, Slovakia
Katarzyna Huk	University of Zielona Góra, Poland
Marcel Behún	Technical University of Kosice, Slovakia
Marko Krstic	Regulatory Agency for Electronic Communications and Postal Services, Serbia
Marko Matulin	University of Zagreb, Croatia
Marko Periša	University of Zagreb, Croatia
Martin Straka	Technical University of Kosice, Slovakia
Michael Herzog	Technical University of Applied Sciences Wildau, Germany
Milan Čabarkapa	University of Belgrade, Serbia
Mirjana Stojanović	University of Belgrade, Serbia
Miroslav Vujić	University of Zagreb, Croatia
Natalia Hornáková	Slovak University of Technology in Bratislava, Slovakia
Pavel Necas	Matej Bel University, Slovakia
Peter Kolarovszki	University of Žilina, Slovakia
Petr Skrehot	Expert Institute of Health and Safety, Czech Republic
Phuc Do	Vietnam National University - Ho Chi Minh City, Vietnam
Rachit Garg	Lovely Professional University, India
Raffaele Olivieri	University of Messina, Italy
Raymond Choo	University of Texas at San Antonio, Texas
Štefica Mrvelj	University of Zagreb, Croatia
Valentina Radojičić	University of Belgrade, Serbia
Vesna Radonjić Đogatović	University of Belgrade, Serbia
Vitalii Ivanov	Sumy State University, Ukraine
Vladimir Brtko	University of Novi Sad, Serbia
Željko Stojanov	University of Novi Sad, Serbia

Contents

Future Access Networks

Evaluation of an Inertial and Optical Sensors Based Mapping and Localization System	3
<i>Stefan Hensel, Marin B. Marinov, and Max Schmitt</i>	
MAC-Based Symmetric Key Protocol for Secure Traffic Forwarding in Drones	16
<i>Zaid Ameen Abduljabbar, Vincent Omollo Nyangaresi, Junchao Ma, Mustafa A. Al Sibahee, Mustafa S. Khalefa, and Dhafer G. Honi</i>	
Optimal Placement of Two IRSs in Beyond 5G Indoor Network	37
<i>Ahmed M. Nor, Octavian Fratu, and Simona Halunga</i>	
An Auction-Based Mechanism for Task Offloading in a Secure Fog-Cloud Environment	47
<i>Branka Mikavica and Aleksandra Kostić-Ljubisavljević</i>	
Exploring the Applicability of Open-Source Tools for Web Application Cybersecurity Improvement	64
<i>Ivan Cvitić, Dragan Peraković, Marko Periša, and Mario Sekondo</i>	
BloHeS Consensus Mechanism – Introduction and Performance Evaluation	80
<i>Jovan Karamachoski and Liljana Gavrilovska</i>	
Designing a Cloud Based Platform for Monitoring Well-Being and Public Health in Areas with Natural Based Solutions	95
<i>Paris Gallos, Andreas Menychtas, Christos Panagopoulos, Eftychios Protopapadakis, Nikolaos Doulamis, Anastasios Doulamis, Emmanuel Sardis, Manthos Bimpas, Maria Kaselimi, and Ilias Maglogiannis</i>	
Internet of Things and Smart City/Smart Environment Applications	
Smart City IoT On-Demand Monitoring System Using a Drone Fleet	105
<i>Gordana Jotanovic, Vladimir Brtka, Jelena Stojanov, Zeljko Stojanov, Goran Jausevac, and Dalibor Dobrilovic</i>	
An IoT Integrated Air Quality Monitoring Device Based on Microcomputer Technology and Leading Industry Low-Cost Sensor Solutions	122
<i>Ioannis D. Apostolopoulos, George Fouskas, and Spyros N. Pandis</i>	

Information Service for the Visually Impaired Persons in Public Transport – MAppIN	141
<i>Marko Periša, Petra Zorić, and Valentina Anić</i>	
Data Collection and Processing Method in the Networks of Industrial IOT	153
<i>Larysa Globa, Vasyl Kurdecha, Demyd Popenko, Maksym Bezvuhliak, and Yevgeniy Porolo</i>	
Information and Communications Technology	
QoE Assessment Aspects for Virtual Reality and Holographic Telepresence Applications	171
<i>Georgios Kougioumtzidis, Vladimir Poulkov, Zaharias Zaharis, and Pavlos Lazaridis</i>	
Selected Application Tools for Creating Models in the Matlab Environment	181
<i>Stella Hrehova and Jozef Husár</i>	
Intelligent Monitoring of Loading and Unloading Process in Enterprise Transport System	193
<i>Lucia Knapčíková, Matúš Martiček, Jozef Husár, and Jakub Kaščák</i>	
Optimalization of Business Logistics Processes Through Implementation of Business Information Systems	204
<i>Lucia Zemanová, Marcel Behún, and Annamária Behúnová</i>	
Sustainable Communications and Computing Infrastructures	
Hydrogen Production for Improved Transportation System as a Part of Smart Cities	221
<i>Volodymyr Tymofii, Samer Al-Rabeei, Michal Hovanec, and Peter Korba</i>	
Improving the Quality of Services Provided by Air Transport Companies	234
<i>Simona Pjurová, Ingrid Sekelová, Samer Al-Rabeei, and Peter Korba</i>	
Development of Startups During the Covid-19 Pandemic	244
<i>Jaroslav Hura, Samer Al-Rabeei, Peter Korba, Michal Hovanec, Simona Pjurová, and Ingrid Sekelová</i>	
Author Index	255