Advanced Sciences and Technologies for Security Applications

Editor-in-Chief

Anthony J. Masys, Associate Professor, Director of Global Disaster Management, Humanitarian Assistance and Homeland Security, University of South Florida, Tampa, USA

Advisory Editors

Gisela Bichler, California State University, San Bernardino, CA, USA

Thirimachos Bourlai, Department of Computer Science and Electrical Engineering, West Virginia University, Multispectral Imagery Lab (MILab), Morgantown, WV, USA

Chris Johnson, University of Glasgow, Glasgow, UK

Panagiotis Karampelas, Hellenic Air Force Academy, Attica, Greece

Christian Leuprecht, Royal Military College of Canada, Kingston, ON, Canada

Edward C. Morse, University of California, Berkeley, CA, USA

David Skillicorn, Queen's University, Kingston, ON, Canada

Yoshiki Yamagata, National Institute for Environmental Studies, Tsukuba, Ibaraki, Japan

Indexed by SCOPUS

The series Advanced Sciences and Technologies for Security Applications comprises interdisciplinary research covering the theory, foundations and domain-specific topics pertaining to security. Publications within the series are peer-reviewed monographs and edited works in the areas of:

- biological and chemical threat recognition and detection (e.g., biosensors, aerosols, forensics)
- crisis and disaster management
- terrorism
- cyber security and secure information systems (e.g., encryption, optical and photonic systems)
- traditional and non-traditional security
- energy, food and resource security
- economic security and securitization (including associated infrastructures)
- transnational crime
- human security and health security
- social, political and psychological aspects of security
- recognition and identification (e.g., optical imaging, biometrics, authentication and verification)
- smart surveillance systems
- applications of theoretical frameworks and methodologies (e.g., grounded theory, complexity, network sciences, modelling and simulation)

Together, the high-quality contributions to this series provide a cross-disciplinary overview of forefront research endeavours aiming to make the world a safer place.

The editors encourage prospective authors to correspond with them in advance of submitting a manuscript. Submission of manuscripts should be made to the Editor-in-Chief or one of the Editors.

Tünde Anna Kovács · Zoltán Nyikes ·
Tamás Berek · Norbert Daruka · László Tóth
Editors

Critical Infrastructure Protection in the Light of the Armed Conflicts

Springer

Editors
Tünde Anna Kovács
Banki Donat Faculty of Mechanical
and Safety Engineering
Obuda University
Budapest, Hungary

Tamás Berek
Faculty of Military Science and Officer
Training
National University of Public Service
Budapest, Hungary

László Tóth
Banki Donat Faculty of Mechanical
and Safety Engineering
Obuda University
Budapest, Hungary

Zoltán Nyikes
Department of Informatics
Milton Friedman University
Budapest, Hungary

Norbert Daruka
Banki Donat Faculty of Mechanical
and Safety Engineering
Obuda University
Budapest, Hungary

ISSN 1613-5113 ISSN 2363-9466 (electronic)
Advanced Sciences and Technologies for Security Applications
ISBN 978-3-031-47989-2 ISBN 978-3-031-47990-8 (eBook)
https://doi.org/10.1007/978-3-031-47990-8

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2024

This work is subject to copyright. All rights are solely and exclusively licensed 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

Paper in this product is recyclable.

Organization

Scientific Guarantors

Prof. Zoltán Rajnai, Ph.D., Obuda University, Budapest, Hungary
Ing. Tünde Anna Kovács, Ph.D., Obuda University, Budapest, Hungary
Ing. Zoltán Nyikes, Ph.D., Milton Friedman University, Budapest, Hungary
Ing. László Tóth, Ph.D., Obuda University, Budapest, Hungary

The International Scientific Committee

Prof. Miklós Maróth, D.Sc., Eötvös Loránd Research Network, Hungary
Prof. Mihály Réger, D.Sc., Obuda University, Hungary
Prof. emer. Tamás Réti, D.Sc., Obuda University, Hungary
Prof. Lívia Cvetityánin, D.Sc., Obuda University, Hungary
Prof. László Kovács, D.Sc., Ludovika University of Public Service, Hungary
Prof. emer. Lajos Berek, C.Sc., Obuda University, Hungary
Prof. Kornélia Lazányi, Ph.D., Obuda University, Hungary
Prof. Pál Michelberger, Ph.D., Obuda University, Hungary
Prof. János Besenyő, Ph.D., Obuda University, Hungary
Prof. Róbert Szabolcsi, Ph.D., Obuda University, Hungary
Prof. Pavel Manas, Ph.D., University of Defence in Brno, Czech Republic
Prof. David Rehak, Ph.D., Technical University of Ostrava, Czech Republic
Prof. Petrica Vizureanu, Ph.D., Gheorghe Asachi Technical University of Iasi, Romania
Prof. Miroslaw Banasik, Ph.D., Jan Kochanowski University in Kielce, Poland
Prof. Michel Arrigoni, Ph.D., ENSTA Bretagne, France
Prof. Alexis Rusinek, Ph.D., French Embassy in Budapest, France
Prof. Valeriu Gabriel Ghica, Ph.D., University Politehnica of Bucharest, Romania
Prof. Mircea Voda, Ph.D., “Politehnica” University of Timisoara, Romania

Prof. Ján Dusza, Dr.Sc., PROMATECH Institute of Materials Research of SAS, Slovakia
Prof. Zdenek Dvorak, Ph.D., University of Žilina, Slovakia
Prof. Josip Stapanic, Ph.D., University of Zagreb, Croatia
Prof. Zlatko Čović, Ph.D., Subotica Tech—College of Applied Sciences, Serbia
Prof. Sanja Maravić Čisar, Ph.D., Subotica Tech—College of Applied Sciences, Serbia
Prof. Petar Čisar, Ph.D., University of Criminal Investigation and Police Studies, Serbia
Prof. Darko Trifunovic, Ph.D., Institute for National and International Security, Serbia
Prof. Ilias Majdouline, Ph.D., Universiapolis, International University of Agadir, Morocco
Prof. Enikő Bitay, Ph.D., Sapientia Hungarian University of Transylvania, Romania
Robert C. Castel, Ph.D., Israel National Parks Authority, Israel
Ing. Igor Fürstner, Ph.D., Subotica Tech—College of Applied Sciences, Serbia
Ing. Róbert Pintér, PhD, Subotica Tech—College of Applied Sciences, Serbia
Ing. János Simon, Ph.D., Subotica Tech—College of Applied Sciences, Serbia
Ing. László Gogolák, Ph.D., Subotica Tech—College of Applied Sciences, Serbia
Livia Szedmina, Ph.D., Subotica Tech—College of Applied Sciences, Serbia
Ing. Dalibor Dobrilovic, Ph.D., University of Novi Sad Technical faculty "Mihajlo Pupin" Zrenjanin, Serbia
Ing. Maciej Klosak, Ph.D., Universiapolis, International University of Agadir, Morocco
Ing. Amine Bendarma, Ph.D., Universiapolis, International University of Agadir, Morocco
Ing. Lucia Figuli, Ph.D., University of Žilina, Slovakia
Ing. Yuriy Klyuchka, Dr.Sc., National University of Civil Defence of Ukraine, Ukraine
Ing. Kostiantyn Afanasenko, Ph.D., National University of Civil Defence of Ukraine, Ukraine
Ing. Jovan Trajkovski, Ph.D., University of Ljubljana, Slovenia
Ing. Chiara Bedon, Ph.D., University of Triest, Italy
Agnieszka Rogozinska, Ph.D., Jan Kochanowski University in Kielce, Poland
Ing. Marcin Adamiak, Ph.D., Silesian University of Technology, Gliwice, Poland
Ing. Umesh Mhatre, Ph.D., Surface Modification Technologies Pvt. Ltd. India
Ing. Martin Hromoda, Ph.D., Tomas Bata University in Zlin, Czech Republic
Ing. Levente Dimen, Ph.D., University of Alba Iulia, Romania
Ing. Christophe Czarnota, Ph.D., Lorraine University, France
Ing. Slim Bahi, Ph.D., Lorraine University, France
Ing. Hajej Zied, Ph.D., Lorraine University, France
Ing. Nidhal Rezg, Ph.D., Lorraine University, France
Ing. Péter Pinke, Ph.D., Obuda University, Hungary
Ing. Endre Szűcs, Ph.D., Obuda University, Hungary
Ing. Norbert Daruka, Ph.D., Obuda University, Hungary

Irén Zabóné Varga, Ph.D., Obuda University, Hungary
Ing. Richárd Horváth, Ph.D., Obuda University, Hungary
Ing. Katalin Szenes, Ph.D., Obuda University, Hungary
Ing. András Keszthelyi, Ph.D., Obuda University, Hungary
Ing. István Barányi, Ph.D., Obuda University, Hungary
Csaba Szabó, Ph.D., Ministry of Interior, Hungary
Péter Szatmári, Ph.D., Milton Friedman University, Hungary
Ing. Vid Sebestyén Honfi, Ph.D., Milton Friedman University, Hungary
Ing. Pál Bárkányi, Ph.D., Milton Friedman University, Hungary
Ing. Zsolt Illési, Ph.D., Milton Friedman University, Hungary
Ildikó Laki, Ph.D., Milton Friedman University, Hungary
Ing. Hargitai Hajnalka, Ph.D., Széchenyi István University, Hungary
Ing. Imre Négyesi, Ph.D., Ludovika University of Public Service, Hungary
Ing. Tibor Farkas, Ph.D., Ludovika University of Public Service, Hungary
Ing. Sándor Magyar, Ph.D., Ludovika University of Public Service, Hungary
Ing. Tamás Berek, Ph.D., Ludovika University of Public Service, Hungary
Ing. Zsuzsanna Balogh, Ph.D., Ludovika University of Public Service, Hungary
Ing. Ernő Hegedűs, Ph.D., Ludovika University of Public Service, Hungary
Ing. Andás Tóth, Ph.D., Ludovika University of Public Service, Hungary

The International Organization Board

Ing. Tünde Anna Kovács, Ph.D.
Ing. Zoltán Nyikes, Ph.D.
Ing. László Tóth, Ph.D.
Prof. János Besenyő, Ph.D.
Ing. Imre Négyesi, Ph.D.
Ing. Sándor Magyar, Ph.D.
Ing. Tamás Berek, Ph.D.
Ing. Péter Balogh, M.Sc.
Ing. Norbert Daruka, Ph.D.
Ing. János Novák, Ph.D. student
Ing. Péter Felker, M.Sc.
Ing. Csenge Huszák, Ph.D. student
Krisztina István, B.Sc.

Foreword

It is an honour for us to host the international conference "Central European Critical Infrastructure Protection" at the Banki Donat Faculty of Mechanical and Safety Engineering at Obuda University. Today, the protection of critical infrastructures has gained new light and priority. The title of the volume also refers to this: "Critical infrastructure protection in the light of the armed conflicts." The armed conflicts and wars are nearer to Europe than at any time in the last decades. This situation highlighted the vulnerability of critical infrastructure and the importance of protection. The development of technologies, cyber-technologies, and digitalization all around our daily lives imply new security challenges in critical infrastructure protection and security science. A key goal is to show the unity of our region (Central Europe) and give space for all experienced and young researchers and Ph.D. students from around the world to share their latest results with the public.

The volume contains lectures given at the ICCECIP 2022 conference, which cover the wide research area of security science, including: cyber-security, individual security, physical protection, and political security. The information and latest research results in the book are useful for Ph.D. students, researchers, professionals, experts, and teachers in all science areas.

Nowadays, when protecting critical infrastructures is a top priority worldwide, we are delighted to be able to host this conference here.

Today's conference is also a great opportunity for students at the Doctoral School on Safety and Security Sciences to talk about their research and publish their results.

I would like to thank the organizers for organizing this conference, where researchers from several countries presented their results.

The presentations also cover cyber-security, individual security, physical protection, and political security.

See you again at the ICCECIP conference in Budapest!

Budapest, Hungary — Zoltán Rajnai

Contents

Intelligence and Protection of Key (Critical) Infrastructure Objects 1
Darko Trifunovic

Examination of UV Radiation During Inert Gas Arc Welding 9
Márton Schramkó, Péter Pinke, and Tünde Anna Kovács

Current Legal Challenges Related to Social Networking Sites 19
Csenge Halász

Cyber Threats to Consumers and Other Risks in the Field of E-commerce Security 33
Judit Barta and Zita Nyikes

Space Weather Effects on Critical Infrastructure 45
Gábor Facskó, Gergely Koban, Nikolett Biró, and Munkhjargal Lkhagvadorj

Exploring the Nexus Between Critical Infrastructure, Fragility and Peace Operations 57
Richárd Schneider

Terrorist Threats to African Hospitals 67
János Besenyő

Surface Modification of Metallic Materials Using Laser and Plasma Technologies 81
Marcin Adamiak, Augustine N. S. Appiah, Anna Woźniak, and Oktawian Bialas

Threats and Vulnerabilities in Web Applications and How to Avoid Them 93
Zlatko Čović

Managing Climate Change Risks in Critical Infrastructure Protection with Examples from the European Financial Sector 105
Tamás Somogyi

Bionic Hand with Phalanx Built-In Servos 117
Daniel Sályi and Döníz Borsos

Review of the Maintenance Strategies, and Failures in the Aspects of the Reliability 125
Csenge Huszák, Péter Pinke, and Tünde Anna Kovács

The Use of Information Security Methods and Techniques in the Education of Software Engineers 137
Zlatko Čović and Igor Fürstner

Risk Assessment of Industrial Collaborative Welding Robots: A Critical Review of Methodologies and Limitations 149
Nada El Yasmine Aichaoui and Tünde Anna Kovács

Recommendations for the Creation of Usable Critical Infrastructure for the Delivery of Priority Services of State Bodies 161
Rade Dragović, Dalibor Dobrilovic, and Dragan Dragović

Industrial IoT and 5G in Critical Information Infrastructures 173
Andras Toth

Analysis and Evaluation of the Transport Sector During the COVID-19 Epidemic: Budapest Versus Amman 189
Malak Majed Shatnawi and Zoltán Rajnai

Future of BB-PPDR: Evolution and 5G Security Aspects 201
Tamas Zsolt Kardos

Safety Requirement of Vehicle's Design and Testing Methods 211
Omar Trabelsi and Tünde Anna Kovács

Enhancing Cybersecurity in Industrial Control Systems Through GRC Framework: Principles, Regulations, and Risk Assessment 223
Haya Altaleb and Zoltán Rajnai

Image Transmission with LoRaWAN in Agriculture 235
Döníz Borsos

Creating Cyber Resiliency in Critical Infrastructures 247
Attila Mate Kovacs

Impacts of COVID on Cybersecurity 257
Zsolt Mihály Szabó

Critical Infrastructure Protection Options Against the Misuse of Explosives 267
Norbert Daruka

Analysis of the Turbocompressor Rotor Dynamics Taking into Account Features of Active Magnetic Bearings Using Specialized Computing Systems 279
Mykhailo Kuchma and Gennadii Martynenko

The Possibility of Energy Enterprises Technological Units' Protection from the Fragmentation Effect of Ammunition 291
Afanasenko Kostiantyn, Lypovyi Volodymyr, Kalchenko Yaroslav, and Hryhorenko Oleksandr

Importance of Vehicle's Unloaded Weight Optimization: The Personal Injury Severity Point of View 303
József Kertész and Tünde Anna Kovács

Developing a Mesh for Electromagnetic Shielding of Vehicles' Electronic Devices 315
Mariam Shbanah, Tünde Anna Kovács, and Zoltán Nyikes

Integrated Physical Protection of Emergency Water Production Facilities 329
Tamás Berek

Exploring Some Possible Applications of DRM Drones 341
Zoltán Nyikes and László Tóth

Application of Incremental Sheet Forming for Cladding Panels with Customized Design 353
Richárd Baumgartner and Viktor Gonda

Hungarian Regulation of Personnel Entry Control to Nuclear Power Plant I 365
Ákos Bunyitai

Hungarian Regulation of Personnel Entry Control to Nuclear Power Plant II 375
Ákos Bunyitai

Connections Enabling Command and Control 385
Attila Gulyás

Legal Aspects of Network Security 397
Levente Durczy, Kornélia Lazányi, Zsolt Sziklai, and András Molnár

Thoughts on the Place and Role of Cybersecurity Awareness 411
Imre Dobak and Sandor Magyar

Social and Ethical Issues of the Military Use of Artificial Intelligence 421
Imre Négyesi

Quantum Computers—Security Threats and Solutions 431
Sára Szatmáry

Are Self-driving Cars a Safer Solution? 443
Rozália Szatmáry and Kornélia Lazányi

Neuro-fuzzy Vulnerability Evaluation According to Excellence Criteria 457
Bence Tureczki and Katalin Szenes

Investigating the Effect of Adding Multiwalled Carbon Nanotubes on the Morphological Properties of Polybutylene Terephthalate 473
Zoubeida Taha and Andrea Ádámné Major

An Analysis of What e-Administration Information Security Means in Hungary 483
Marianna Ádám, Vid Sebestyén Honfi, Zsolt Illési, and Pál Bárkányi

An Algorithm for Determining the Parameters of Oil Spill Fire 497
Oliinik Volodymyr

Cyber Security Challenges in Construction 509
Nikolett Katalin Bús and Zoltán Nyikes

Human Dynamics in Armed Conflicts 519
Kornélia Lazányi

About the Editors

Tünde Anna Kovács, Ph.D., Associate Professor, Department of Materials Technology, Institute of Mechanical and Manufacturing, Banki Donat Faculty of Mechanical and Safety Engineering, Obuda University, Budapest, Hungary.

Zoltán Nyikes, Ph.D., Associate Professor, Department of Informatics, Milton Friedman University, Budapest, Hungary.

Tamás Berek, Ph.D., Associate Professor, Faculty of Military Science and Officer Training National University of Public Service, Budapest, Hungary.

Norbert Daruka, Ph.D., Lecturer, Banki Donat Faculty of Mechanical and Safety Engineering, Obuda University, Budapest, Hungary.

László Tóth, Ph.D., Associate Professor, Department of Materials Technology, Institute of Mechanical and Manufacturing, Banki Donat Faculty of Mechanical and Safety Engineering, Obuda University, Budapest, Hungary.