

004.056.5
M 78

Edited by Serhii Yevseiev, Ruslan Hryshchuk,
Kateryna Molodetska, Mariia Nazarkevych

MODELING OF **SECURITY SYSTEMS** FOR CRITICAL INFRASTRUCTURE FACILITIES



Edited by
Serhii Yevseiev, Ruslan Hryshchuk,
Kateryna Molodetska, Mariia Nazarkevych

MODELING OF SECURITY SYSTEMS FOR CRITICAL INFRASTRUCTURE FACILITIES

Monograph



2022

UDC 004.056
M78

Published in 2022
by PC TECHNOLOGY CENTER
Snatylova dacha str., 4, Kharkiv, Ukraine, 61165

Approved by the Academic Council of National Technical University «Kharkiv Polytechnic Institute»
Protocol No. 5 of 01.07.2022

Reviewers:

Dudykevych Valerii, Doctor of Technical Science, Professor, Head of the Department of Information Security of Lviv Polytechnic National University;
Korchenko Alexandr, Doctor of Technical Sciences, Professor, Head of the Department of Information Technology Security of National Aviation University,

M78

Authors:

Edited by Serhii Yevseiev, Ruslan Hryshchuk, Kateryna Molodetska, Mariia Nazarkevych
Serhii Yevseiev, Ruslan Hryshchuk, Kateryna Molodetska, Mariia Nazarkevych, Volodymyr Hrytsyk, Oleksandr Milov, Olha Korol, Stanislav Milevskiy, Roman Korolev, Serhii Pohasii, Andrii Tkachov, Yevgen Melenti, Oleksandr Lavrut, Alla Havrylova, Serhii Herasymov Halyna Holotaistrova, Dmytro Avramenko, Roman Vozniak, Oleksandr Voitko, Kseniia Yerhidzei, Serhii Mykus, Yuri Pribyliev, Olena Akhiezer, Mykhailo Shyshkin, Ivan Opirskyy, Oleh Harasymchuk, Olha Mykhalova, Yuri Nakonechnyy, Marta Stakhiv, Bogdan Tomashevsky
Modeling of security systems for critical infrastructure facilities; monograph / S. Yevseiev, R. Hryshchuk, K. Molodetska, M. Nazarkevych and others, Kharkiv: PC TECHNOLOGY CENTER 2022 196 p.

The monograph discusses the methodology for cooperative conflict interaction modeling of security system agents. The concept of modeling the structure and functioning of the security system or critical infrastructure facilities is demonstrated. The method for assessing forecast of social impact in regional communities is presented. Counteracting the strategic manipulation of public opinion in decision-making by actors of social networking services based on the conceptual model for managed self-organization in social networking services are developed. Algorithms for thinning the critical infrastructure identification system and their software are implemented.

The monograph is intended for teachers, researchers and engineering staff in the field of cybersecurity, information technology, social engineering, communication systems, computer technology, automated control systems and economic information security, as well as for adjuncts, graduate students and senior students of relevant specialties.

Figures 99, Tables 24, References 176 items.

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the authors. This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

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.

Trademark Notice: product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without went to infringe.

DOI:10.15587/978-617-7319-57-2

ISBN 978-617-7319-57-2 (on-line)


ISBN 978-617-7319-56-5 (print)




Copyright © 2022 S. Yevseiev,
R. Hryshchuk, K. Molodetska, M. Nazarkevych and others authors
This is an open access paper under the Creative Commons CC BY license

AUTHORS

SERHII YEVSEIEV

Doctor of Technical Science, Professor, Head of Department
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0003-1647-6444>


RUSLAN HRYSHCHUK

Doctor of Technical Science, Professor, Honored Worker
of Science and Technology of Ukraine, Head of Faculty
Faculty of State Secrets Protection and Information Warfare
Sergei Karolyov Zhytomyr Military Institute
 ORCID ID: <https://orcid.org/0000-0001-9985-8477>

KATERYNA MOLODETSKA

Doctor of Technical Science, Professor
Department of Computer Technology and Systems Modelling
Polissia National University
 ORCID ID: <https://orcid.org/0000-0001-9864-2463>


MARIIA NAZARKEVYCH

Doctor of Technical Science, Professor
Department of Information Systems and Networks
Institute of Computer Sciences and Information Technologies
Lviv Polytechnic National University
 ORCID ID: <https://orcid.org/0000-0002-6528-9867>

VOLODYMYR HRYTSYK

Doctor of Technical Science, Professor
Department of Automated Control Systems
Lviv Polytechnic National University
 ORCID ID: <https://orcid.org/0000-0002-9696-5805>

OLEKSANDR MILOV

Doctor of Technical Science, Professor
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0001-6135-2120>

OLHA KOROL

PhD, Associate Professor
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0002-8733-9984>

STANISLAV MILEVSKYI

PhD, Associate Professor
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0001-5087-7036>

ROMAN KOROLEV

PhD, Associate Professor
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <http://orcid.org/0000-0002-7948-5914>


SERHII POHASII

PhD, Associate Professor
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0002-4540-3693>


ANDRII TKACHOV

PhD, Associate Professor
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0003-1428-0173>

YEVGEN MELENTI

PhD, Associate Professor
Special Department No. 3 «Tactical-special training,
marksmanship training and special physical training»
Juridical Personnel Training Institute for Security Service
of Ukraine
Yaroslav Mudryi National Law University
 ORCID ID: <https://orcid.org/0000-0003-2955-2469>


OLEKSANDR LAVRUT

Doctor of Engineering Sciences, Professor
Department of Tactics
Helman Petro Sahaidachnyi National Army Academy
 ORCID ID: <https://orcid.org/0000-0002-4909-6723>


ALLA HAVRYLOVA

Senior Lecturer
Department of Cyber Security
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0002-2015-8927>


> SERHII HERASYMOV

Doctor of Technical Science, Professor, Head of Department
Department of Weapons and Military Equipment Operation
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0003-1810-0387>


HALYNA HOLOTAISTROVA

Associate Professor
Department of Computer Mathematics and Data Analysis
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0001-8349-6571>


DMYTRO AVRAMENKO

Senior Researcher
Research Department
Institute of Troops (Forces) Support and Information Technologies
National Defence University of Ukraine named after Ivan Chernyakhovskiy
 ORCID ID: <https://orcid.org/0000-0003-1892-380X>


ROMAN VOZNIAK

PhD, Head of Laboratory
Head of the Research Laboratory of Information Technology Problems Research Department
Institute of Troops (Forces) Support and Information Technologies
National Defence University of Ukraine named after Ivan Chernyakhovskiy
 ORCID ID: <https://orcid.org/0000-0002-3789-2837>


OLEKSANDR VOITKO

PhD, Deputy Head of Department
Department of Information Technologies and Information Security Employment
Institute of the Troops (Forces) Support and Information Technologies
National Defence University of Ukraine named after Ivan Chernyakhovskiy
 ORCID ID: <https://orcid.org/0000-0002-4610-4476>


KSENIIA YERHIDZEI

PhD, Head of Laboratory
Research Laboratory
Institute of Troops (Forces) and Information Technologies
National Defence University of Ukraine named after Ivan Chernyakhovskiy
 ORCID ID: <https://orcid.org/0000-0003-4634-133X>


SERHII MYKUS

Doctor of Technical Sciences, Professor, Head of Department
Department of Information Technology Application and Information Security
Institute of Troops (Forces) Support and Information Technologies
National Defence University of Ukraine named after Ivan Chernyakhovskiy
 ORCID ID: <https://orcid.org/0000-0002-7103-4166>

YURIIP RIBYLIEV

Doctor of Technical Science, Professor
Department of Information Technologies Employment and Information Security
National Defence University of Ukraine named after Ivan Chernyakhovskiy
 ORCID ID: <https://orcid.org/0000-0003-1941-3561>

OLENA AKHIEZER

PhD, Associate Professor, Head of Department
Department of Computer Mathematics and Data Analysis
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <http://orcid.org/0000-0002-7087-9749>

MYKHAILO SHYSHKIN

PhD, Associate Professor
Department of Industrial and Biomedical Electronics
National Technical University «Kharkiv Polytechnic Institute»
 ORCID ID: <https://orcid.org/0000-0002-2276-7259>


IVAN OPIRSKYI

Doctor of Technical Sciences, Professor
Department of Information Protection
Lviv Polytechnic National University
 ORCID ID: <https://orcid.org/0000-0002-8461-8996>

OLEH HARASYMCHUK

PhD, Associate Professor
Department of Information Protection
Lviv Polytechnic National University
 ORCID ID: <https://orcid.org/0000-0002-8742-8872>

OLHA MYKHAYLOVA

PhD, Associate Professor
Department of Information Protection
Lviv Polytechnic National University
 ORCID ID: <https://orcid.org/0000-0002-3086-3160>


YURIY NAKONECHNYI

PhD, Associate Professor
Department of Information Protection
Lviv Polytechnic National University
 ORCID ID: <https://orcid.org/0000-0002-6046-6190>

MARTA STAKHIV

PhD, Associate Professor
Department of Information Protection
Lviv Polytechnic National University
 ORCID ID: <https://orcid.org/0000-0002-4094-2081>

BOGDAN TOMASHEVSKY

PhD, Associate Professor
Department of Cyber Security
Ternopil Ivan Puluj National Technical University
 ORCID ID: <https://orcid.org/0000-0002-1934-4773>