



I T H E A

International Journal
MODELS
INFORMATION **&**
ANALYSES

2018 **Volume 7** **Number 3**

**International Journal
INFORMATION MODELS AND ANALYSES
Volume 7 / 2018, Number 3**

EDITORIAL BOARD

Editor in chief: **Krassimir Markov** (Bulgaria)

Alberto Arteta	(Spain)	Liudmila Cheremisinova	(Belarus)
Albert Voronin	(Ukraine)	Lyudmila Lyadova	(Russia)
Aleksey Voloshin	(Ukraine)	Martin P. Mintchev	(Canada)
Alexey Petrovskiy	(Russia)	Nataliia Kussul	(Ukraine)
Alfredo Milani	(Italy)	Natalia Ivanova	(Russia)
Anatoliy Krissilov	(Ukraine)	Natalia Pankratova	(Ukraine)
Avram Eskenazi	(Bulgaria)	Nelly Maneva	(Bulgaria)
Boris Sokolov	(Russia)	Nugzar Todua	(Georgia)
Diana Bogdanova	(Russia)	Olena Chebanyuk	(Ukraine)
Dmytro Progonov	(Ukraine)	Olexander Palagin	(Ukraine)
Ekaterina Solovyova	(Ukraine)	Olga Nevzorova	(Russia)
Evgeniy Bodyansky	(Ukraine)	Orly Yadid-Pecht	(Israel)
Galyna Gayvoronska	(Ukraine)	Pedro Marijuan	(Spain)
Galina Setlac	(Poland)	Rafael Yusupov	(Russia)
George Totkov	(Bulgaria)	Sergey Kryvyy	(Ukraine)
Gurgen Khachatryan	(Armenia)	Stoyan Poryazov	(Bulgaria)
Hasmik Sahakyan	(Armenia)	Tatyana Gavrilova	(Russia)
Iliia Mitov	(Bulgaria)	Tea Munjishvili	(Georgia)
Juan Castellanos	(Spain)	Valeria Gribova	(Russia)
Koen Vanhoof	(Belgium)	Vasil Sgurev	(Bulgaria)
Krassimira B. Ivanova	(Bulgaria)	Vitalii Velychko	(Ukraine)
Leonid Hulianytskyi	(Ukraine)	Vladimir Ryazanov	(Russia)
Levon Aslanyan	(Armenia)	Volodymyr Opanasenko	(Ukraine)
Luis Fernando de Mingo	(Spain)	Yuriy Zaichenko	(Ukraine)

**IJ IMA is official publisher of the scientific papers of the members of
the ITHEA® International Scientific Society**

IJ IMA rules for preparing the manuscripts are compulsory.

The **rules for the papers** for ITHEA International Journals are given on www.ithea.org.

The camera-ready copy of the paper should be received by ITHEA® Submission system <http://ij.ithea.org>.

Responsibility for papers published in IJ IMA belongs to authors.

International Journal "INFORMATION MODELS AND ANALYSES" Volume 7, Number 3, 2018

Edited by the **Institute of Information Theories and Applications FOI ITHEA**, Bulgaria, in collaboration with:

University of Telecommunications and Posts, Bulgaria,

V.M.Glushkov Institute of Cybernetics of NAS, Ukraine,

Universidad Politécnica de Madrid, Spain,

Hasselt University, Belgium,

University of Perugia, Italy,

Institute for Informatics and Automation Problems, NAS of the Republic of Armenia

St. Petersburg Institute of Informatics, RAS, Russia,

Publisher: **ITHEA®** Sofia, 1000, P.O.B. 775, Bulgaria. www.ithea.org, e-mail: office@ithea.org

Technical editor: **Ina Markova**

Printed in Bulgaria

Copyright © 2018 All rights reserved for the publisher and all authors.

© 2012-2018 "Information Models and Analyses" is a trademark of ITHEA®

© ITHEA is a registered trade mark of FOI-Commerce Co.

ISSN 1314-6416 (printed)

ISSN 1314-6432 (Online)