

Kazumi Nakamatsu, Gloria Phillips-Wren,  
Lakhmi C. Jain, and Robert J. Howlett (Eds.)

---

New Advances in Intelligent Decision Technologies

# Studies in Computational Intelligence, Volume 199

## Editor-in-Chief

Prof. Janusz Kacprzyk  
Systems Research Institute  
Polish Academy of Sciences  
ul. Newelska 6  
01-447 Warsaw  
Poland  
E-mail: kacprzyk@ibspan.waw.pl

---

Further volumes of this series can be found on our homepage: [springer.com](http://springer.com)

Vol. 176. Beniamino Murgante, Giuseppe Borruoso and Alessandra Lapucci (Eds.)  
*Geocomputation and Urban Planning*, 2009  
ISBN 978-3-540-89929-7

Vol. 177. Dikai Liu, Lingfeng Wang and Kay Chen Tan (Eds.)  
*Design and Control of Intelligent Robotic Systems*, 2009  
ISBN 978-3-540-89932-7

Vol. 178. Swagatam Das, Ajith Abraham and Amit Konar  
*Metaheuristic Clustering*, 2009  
ISBN 978-3-540-92172-1

Vol. 179. Mircea Gh. Negoita and Sorin Hintea  
*Bio-Inspired Technologies for the Hardware of Adaptive Systems*, 2009  
ISBN 978-3-540-76994-1

Vol. 180. Wojciech Mitkowski and Janusz Kacprzyk (Eds.)  
*Modelling Dynamics in Processes and Systems*, 2009  
ISBN 978-3-540-92202-5

Vol. 181. Georgios Miaoulis and Dimitri Plemenos (Eds.)  
*Intelligent Scene Modelling Information Systems*, 2009  
ISBN 978-3-540-92901-7

Vol. 182. Andrzej Bargiela and Witold Pedrycz (Eds.)  
*Human-Centric Information Processing Through Granular Modelling*, 2009  
ISBN 978-3-540-92915-4

Vol. 183. Marco A.C. Pacheco and Marley M.B.R. Vellasco (Eds.)  
*Intelligent Systems in Oil Field Development under Uncertainty*, 2009  
ISBN 978-3-540-92999-4

Vol. 184. Ljupco Kocarev, Zbigniew Galias and Shiguo Lian (Eds.)  
*Intelligent Computing Based on Chaos*, 2009  
ISBN 978-3-540-95971-7

Vol. 185. Anthony Brabazon and Michael O'Neill (Eds.)  
*Natural Computing in Computational Finance*, 2009  
ISBN 978-3-540-95973-1

Vol. 186. Chi-Keong Goh and Kay Chen Tan  
*Evolutionary Multi-objective Optimization in Uncertain Environments*, 2009  
ISBN 978-3-540-95975-5

Vol. 187. Mitsuo Gen, David Green, Osamu Katai, Bob McKay, Akira Namatame, Ruhul A. Sarker and Byoung-Tak Zhang (Eds.)  
*Intelligent and Evolutionary Systems*, 2009  
ISBN 978-3-540-95977-9

Vol. 188. Agustín Gutiérrez and Santiago Marco (Eds.)  
*Biologically Inspired Signal Processing for Chemical Sensing*, 2009  
ISBN 978-3-642-00175-8

Vol. 189. Sally McClean, Peter Millard, Elia El-Darzi and Chris Nugent (Eds.)  
*Intelligent Patient Management*, 2009  
ISBN 978-3-642-00178-9

Vol. 190. K.R. Venugopal, K.G. Srinivasa and L.M. Patnaik  
*Soft Computing for Data Mining Applications*, 2009  
ISBN 978-3-642-00192-5

Vol. 191. Zong Woo Geem (Ed.)  
*Music-Inspired Harmony Search Algorithm*, 2009  
ISBN 978-3-642-00184-0

Vol. 192. Agus Budiyo, Bambang Riyanto and Endra Joelianto (Eds.)  
*Intelligent Unmanned Systems: Theory and Applications*, 2009  
ISBN 978-3-642-00263-2

Vol. 193. Raymond Chiong (Ed.)  
*Nature-Inspired Algorithms for Optimisation*, 2009  
ISBN 978-3-642-00266-3

Vol. 194. Ian Dempsey, Michael O'Neill and Anthony Brabazon (Eds.)  
*Foundations in Grammatical Evolution for Dynamic Environments*, 2009  
ISBN 978-3-642-00313-4

Vol. 195. Vivek Bannore and Leszek Swierkowski  
*Iterative-Interpolation Super-Resolution Image Reconstruction: A Computationally Efficient Technique*, 2009  
ISBN 978-3-642-00384-4

Vol. 196. Valentina Emilia Balas, János Fodor and Annamária R. Várkonyi-Kóczy (Eds.)  
*Soft Computing Based Modeling in Intelligent Systems*, 2009  
ISBN 978-3-642-00447-6

Vol. 197. Mauro Birattari  
*Tuning Metaheuristics*, 2009  
ISBN 978-3-642-00482-7

Vol. 198. Efrén Mezura-Montes (Ed.)  
*Constraint-Handling in Evolutionary Optimization*, 2009  
ISBN 978-3-642-00618-0

Vol. 199. Kazumi Nakamatsu, Gloria Phillips-Wren, Lakhmi C. Jain, and Robert J. Howlett (Eds.)  
*New Advances in Intelligent Decision Technologies*, 2009  
ISBN 978-3-642-00908-2

Kazumi Nakamatsu, Gloria Phillips-Wren,  
Lakshmi C. Jain, and Robert J. Howlett (Eds.)

# New Advances in Intelligent Decision Technologies

Results of the First KES International  
Symposium IDT 2009

Prof. Dr. Kazumi Nakamatsu  
School of Human Science and Environment  
University of Hyogo  
1-1-12, Shinzaike-honcho  
Himeji, Hyogo 670-0092  
Japan  
E-mail: nakamatu@shse.u-hyogo.ac.jp

Prof. Dr. Lakhmi C. Jain  
SCT-Building  
University of South Australia  
Adelaide City  
The Mawson Lakes, SA 5095  
Australia  
E-mail: Lakhmi.Jain@unisa.edu.au

Prof. Dr. Gloria Phillips-Wren  
Selling School of Business and Mgmt  
Loyola College in Maryland  
4501 N. Charles Street  
Baltimore, MD 21210  
USA  
E-mail: gwren@loyola.edu

Prof. Dr. Robert J. Howlett  
University Brighton  
School of Engineering  
Intelligent Signal Processing  
Laboratories (ISP)  
Moulsecoomb  
Brighton BN2 4GJ  
UK  
E-mail: r.j.howlett@brighton.ac.uk

ISBN 978-3-642-00908-2

e-ISBN 978-3-642-00909-9

DOI 10.1007/978-3-642-00909-9

Studies in Computational Intelligence

ISSN 1860949X

Library of Congress Control Number: Applied for

© 2009 Springer-Verlag Berlin Heidelberg

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, 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.

*Typeset & Cover Design:* Scientific Publishing Services Pvt. Ltd., Chennai, India.

Printed in acid-free paper

9 8 7 6 5 4 3 2 1

springer.com