

amcs

2010 • Volume 20 • Number 1

ISSN 1641-876X

Covered by
Thomson Reuters

 International Journal of
**applied mathematics
and computer science**

Special section

COMPUTATIONAL
INTELLIGENCE IN
MODERN CONTROL SYSTEMS

Editors

Józef KORBICZ
Dariusz UCIŃSKI



University of Zielona Góra Press, Poland

About

The *International Journal of Applied Mathematics and Computer Science* is a quarterly published jointly by the University of Zielona Góra and the Lubuskie Scientific Society in Zielona Góra, Poland, since 1991. It strives to meet the demand for the presentation of interdisciplinary research concerned with applications of mathematical methods to computer science and engineering.

AMCS publishes high quality original research results in the following areas:
mathematical methods in computer science and engineering,
modern control theory and applications,
artificial intelligence methods and their applications,
applied mathematics and mathematical optimization approaches.

Current indexing and abstracting

Science Citation Index Expanded (SciSearch®)
Journal Citation Reports/Science Edition
INSPEC
EBSCO
Scopus-Elsevier
MathSciNet
Mathematical Reviews
Compendex
Zentralblatt MATH
Current Mathematical Publications
Applied Mechanics Reviews
VINITI
BazTech

 Editors

Editor-in-Chief

Józef KORBICZ
University of Zielona Góra, Poland

Deputy Editor

Dariusz UCIŃSKI
University of Zielona Góra, Poland

Editorial Office

University of Zielona Góra
Institute of Control &
Computation Engineering
ul. Podgórna 50
65-246 Zielona Góra
Poland
tel.: +48 68 3282506
fax: +48 68 3284751
e-mail: amcs@uz.zgora.pl
website: www.amcs.uz.zgora.pl

Agnieszka ROŻEWSKA
Manager

Agata WIŚNIEWSKA-KUBICKA
Technical Editor

Associate Editors

Marian ADAMSKI
University of Zielona Góra, Poland
Igor AIZENBERG
Texas A&M University-Texarkana, USA
Sergei AVDONIN
University of Alaska Fairbanks, USA
Robert BABUŠKA
Delft University of Technology, The Netherlands
Stanisław BAŃKA
West Pomeranian University of Technology in Szczecin, Poland
Andrzej BARTOSZEWICZ
Technical University of Łódź, Poland
Famida N. CHOWDHURY
University of Louisiana, Lafayette, USA
Michael A. DEMETRIOU
Worcester Polytechnic Institute, USA
Moritz DIEHL
KU Leuven, Belgium
Steven X. DING
University of Duisburg-Essen, Germany
Abdelhaq EL JAI
University of Perpignan, France
Dimitar FILEV
Ford Research & Advanced Engineering, Dearborn, USA
Rolf FINDEISEN
University of Magdeburg, Germany
Adam GRZECH
Wrocław University of Technology, Poland
Adam JANIĄK
Wrocław University of Technology, Poland
Janusz KACPRZYK
Polish Academy of Sciences, Warsaw, Poland
Nicholas P. KARAMPETAKIS
Aristotle University of Thessaloniki, Greece
László KEVICZKY
Hungarian Academy of Sciences, Budapest, Hungary
Jerzy KLAMKA
Silesian University of Technology, Gliwice, Poland
Jacek KLUSKA
Rzeszów University of Technology, Poland
Jan M. KOŚCIELNY
Warsaw University of Technology, Poland
Zdzisław KOWALCZUK
Gdańsk University of Technology, Poland
Krzysztof KOZŁOWSKI
Poznań University of Technology, Poland
Miroslav KRSTIC
University of California, San Diego, USA
Adam KRZYŻAK
Concordia University, Montreal, Canada
Marek KURZYŃSKI
Wrocław University of Technology, Poland

James LAM
University of Hong Kong, China
Vyacheslav MAKSIMOV
Russian Academy of Sciences, Ural Branch, Ekaterinburg, Russia
Krzysztof MALINOWSKI
Warsaw University of Technology, Poland
Wojciech MITKOWSKI
AGH University of Science and Technology, Cracow, Poland
Henk NIJMEIJER
Eindhoven University of Technology, The Netherlands
Stanisław OSOWSKI
Warsaw University of Technology, Poland
Ronald J. PATTON
University of Hull, UK
Witold PEDRYCZ
University of Alberta, Edmonton, Canada
Vincenç PUIG
Technical University of Catalonia, Barcelona, Spain
Ewaryst RAFAŁOWICZ
Wrocław University of Technology, Poland
Eric ROGERS
University of Southampton, UK
Leszek RUTKOWSKI
Technical University of Częstochowa, Poland
Jose SÁ da COSTA
Technical University of Lisbon, Portugal
Dominique SAUTER
Nancy University, France
Alexey E. SHUMSKY
Pacific State Economic University, Vladivostok, Russia
Silvio SIMANI
University of Ferrara, Italy
Roman SŁOWIŃSKI
Poznań University of Technology, Poland
Jan SOKOŁOWSKI
Nancy University, France
Andrzej ŚWIERNIAK
Silesian University of Technology, Gliwice, Poland
Ryszard TADEUSIEWICZ
AGH University of Science and Technology, Cracow, Poland
Piotr TATJEWSKI
Warsaw University of Technology, Poland
Krzysztof TCHON
Wrocław University of Technology, Poland
Guisheng ZHAI
Osaka Prefecture University, Japan
Changshui ZHANG
Tsinghua University, Beijing, China
Donghua ZHOU
Tsinghua University, Beijing, China
Enrique ZUAZUA
Basque Center for Applied Mathematics, Derio, Spain
Jacek M. ZURADA
University of Louisville, USA

Requirements in brief

Our basic rules include electronic paper submission and processing, the LaTeX format following a special AMCS style preferred for paper final versions, copyright transfer, a voluntary page charge.

Paper submission

Paper proposals may be submitted only through our on-line submission system as PDF files. The papers will be subject to a full review procedure, and a decision on whether or not to accept the paper will be made based on the reviewers' comments.

Electronic processing

The authors of accepted papers will be requested to provide the final versions of their work as electronic word processing files preferably in the LaTeX format using our AMCS class.

Paper style

The style of papers to be published in AMCS is determined by a special LaTeX class, which is described in detail in our instructions for authors.

Copyright transfer

All authors must sign the copyright transfer agreement before the article can be published. The agreement allows protecting the copyrighted material, without affecting the authors' proprietary rights.

Page charge

Papers published in AMCS are subject to a voluntary page charge, which will be invoiced through the author to the author's institution. Publication, however, is not dependent on the payment of this charge.

Reprints

15 free reprints (without covers) and one sample copy of the journal are provided when the paper has been published. Additional reprints and journal copies can be ordered from the Editorial Office.

Details, submission and downloads

The complete guide for authors can be found on our website at www.amcs.uz.zgora.pl.

Present your research with us!

Our subscription is annual and covers four printed issues.

2010 Rates

Domestic

Individuals & scientific institutions: 160 PLN
Other customers: 600 PLN

Foreign

Individuals: 180 EUR
Institutions: 200 EUR

The prices include shipping and handling costs.

Payment methods

We accept bank transfers and off-line credit card payments.

Orders

Please contact the Editorial Office for subscription orders.



Specials

Selected special issues and sections

2009, Vol. 19, No. 4: Special section
ROBOT CONTROL THEORY
Editor: Cezary ZIELIŃSKI
Authors: K. Tchoń, M. Michatek, A. Mazur, P. Skrzypczyński

2009, Vol. 19, No. 3: Special issue
VERIFIED METHODS: APPLICATIONS IN MEDICINE AND ENGINEERING
Editors: Andreas RAUH, Ekaterina AUER, Eberhard P. HOFER, Wolfram LUTHER
Authors: B. G.-Tóth, A. Rauh, J.-P. Merlet, R. Pepy, N. Dimitrova, E. Auer, M. Tändl, M. Freihold, J.A. Enszer

2008, Vol. 18, No. 4: Special issue
ISSUES IN FAULT DIAGNOSIS AND FAULT TOLERANT CONTROL
Editors: Józef KORBICZ, Dominique SAUTER
Authors: A. Ligęza, Y. Tharrault, K. Patan, E. Skubalska-Rafajłowicz, A.A. Yassine, M. Patan, C. Cempel, N.K. Poulsen, D. Theilliol, Z. Kowalczyk, C. Aubrun, P.M. Marusak, M. Laursen, E. Rafajłowicz, W. Cholewa

2008, Vol. 18, No. 3: Special issue
SELECTED PROBLEMS OF COMPUTER SCIENCE AND CONTROL
Editors: Krzysztof GAŁKOWSKI, Eric ROGERS, Jan WILLEMS
Authors: E. Zerz, P.H. Bauer, D.H. Owens, R. Rabenstein, T. Zięba, M. Hunger, S. Yarmolik, M. Sawerwain, P. Molchanov, K. Halawa, Ł. Hładowski, S. Banerjee, Y. Yang, S. Petrusseva

2008, Vol. 18, No. 2: Special section
SELECTED TOPICS IN BIOLOGICAL CYBERNETICS
Editors: Andrzej KASIŃSKI, Filip PONULAK
Authors: F. Ponulak, I. Uysal, J. Śmieja, R. Cierniak, M. Hrebień

2008, Vol. 18, No. 1: Special issue
APPLIED IMAGE PROCESSING
Editors: Anton KUMMERT, Ewaryst RAFAJŁOWICZ
Authors: E.R. Davies, S. Schauland, T. Wejrzanowski, E. Skubalska-Rafajłowicz, E. Rafajłowicz, Y. Li, Ł. Jeleń, M. Smereka, Y. Xin, M. Wnuk

AIMS & SCOPE

The aim of the *International Journal of Applied Mathematics and Computer Science (AMCS)* is to publish original research results in various areas related to computer science and mathematics. The scope of topics covered by *AMCS* is extensive and includes the following:

- *Control systems*: optimal control, distributed parameter systems, system identification, adaptive and robust control, non-linear systems, multi-dimensional systems.
- *Mathematical and numerical modelling*: ordinary and partial differential equations, numerical algorithms, simulation, applications.
- *Artificial intelligence*: artificial neural networks, fuzzy and expert systems, rough sets theory, evolutionary and genetic algorithms, search methods, cellular automata, soft computing, applications.
- *Knowledge processing*: knowledge mining and acquisition, knowledge representation, expert systems, data mining, data basis, applications.
- *Fault detection, fault analysis and diagnostics*: model-based systems, soft computing techniques, pattern recognition, state and parameter estimation, signal processing, applications.
- *Optimization*: mathematical optimization techniques, global optimization, evolutionary and genetic algorithms.
- *Robotics*: modelling and simulation, optimal control, controllability, parameter and state estimation, optimal trajectory planning, singularities.

The editors welcome proposals for exchange between similar journals. Also, all persons interested in bringing out special issues of *AMCS* are encouraged to contact the Editor-in-Chief. Such issues may be published on any important and timely subject within the scope of the journal.

The publication of *AMCS* is financially supported by the Ministry of Science and Higher Education in Poland and the University of Zielona Góra.

For more information, visit our website at www.amcs.uz.zgora.pl.

CONTENTS

Special section

Ławryńczuk M. and Tatjewski P. Nonlinear predictive control based on neural multi-models	7
Patan K. Local stability conditions for discrete-time cascade locally recurrent neural networks	23
Nalepa G.J. and Ligęza A. The HeKatE methodology. Hybrid engineering of intelligent systems	35
Nowicki R.K. On classification with missing data using rough-neuro-fuzzy systems	55
Belter D. and Skrzypczyński P. A biologically inspired approach to feasible gait learning for a hexapod robot	69

Regular section

Kaczorek T. and Rogowski K. Positivity and stabilization of fractional 2D linear systems described by the Roesser model	85
Nowak Ł.D., Paławska-Południak M. and Twardowska K. On the convergence of the wavelet-Galerkin method for nonlinear filtering	93
Collignon T.P. and van Gijzen M.B. Two implementations of the preconditioned conjugate gradient method on heterogeneous computing grids	109
Kulczycki P. and Charytanowicz M. A complete gradient clustering algorithm formed with kernel estimators	123
Świercz E. Classification in the Gabor time-frequency domain of non-stationary signals embedded in heavy noise with unknown statistical distribution	135
Śmietański J., Tadeusiewicz R. and Łuczyńska E. Texture analysis in perfusion images of prostate cancer—A case study	149
Troć M. and Unold O. Self-adaptation of parameters in a learning classifier system ensemble machine	157
Ploix S., Yassine A.A. and Flaus J.-M. A new efficient and flexible algorithm for the design of testable subsystems	175
Mrozek I. Analysis of multibackground memory testing techniques	191
Walkowiak K. Anycasting in connection-oriented computer networks: Models, algorithms and results	207