

amcs

2013 • Volume 23 • Number 2

ISSN 1641-876X (print)
ISSN 2083-8492 (online)
QUARTERLY
June 2013

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



University of Zielona Góra Press, Poland

AIMS & SCOPE

The *International Journal of Applied Mathematics and Computer Science* strives to meet the demand for the presentation of interdisciplinary research in various fields related to control theory, applied mathematics, scientific computing, and computer science. In particular, it publishes high quality original research results in the following areas:

- modern control theory and practice
- artificial intelligence methods and their applications
- applied mathematics and mathematical optimisation techniques
- mathematical methods in engineering, computer science, and biology.

We are primarily interested in presenting theoretical and application-oriented papers dealing with the following topics:

- control theory, including optimal control, system identification, adaptive and robust control, multivariable control, and non-linear systems
- dynamical systems, including spatiotemporal processes, control problems, state and parameter estimation, and sensor networks
- fault detection and diagnosis, including model-based approaches, observers, and classifiers
- fault-tolerant control, including the control of continuous-variable and quantised systems
- robotics, including modelling and simulation, mobile robots, and optimal trajectory planning
- mathematical modelling and simulation, including numerical algorithms
- optimisation, including mathematical optimisation techniques, global optimisation, and evolutionary algorithms
- classification and pattern recognition
- artificial intelligence, including neural networks, knowledge engineering, reasoning and learning models, expert and decision support systems, fuzzy systems, and search methods
- mathematical biology
- applications in engineering and medicine.

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. All papers proposed for specials should be refereed and meet the same criteria for scientific quality as articles presented in regular issues.

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.

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 in various fields related to control theory, applied mathematics, scientific computing, and computer science.

In particular, AMCS publishes high quality original research results in the following areas:

modern control theory and practice

artificial intelligence methods and their applications

applied mathematics and mathematical optimisation techniques

mathematical methods in engineering, computer science, and biology.

Current indexing and abstracting

Science Citation Index Expanded (SciSearch®), Journal Citation Reports/Science Edition, Scopus-Elsevier, Google Scholar, INSPEC, EBSCO, DBLP Computer Science Bibliography, MathSciNet, Mathematical Reviews, Compendex, Zentralblatt MATH, Current Mathematical Publications, Computer Abstracts International Database, Applied Mechanics Reviews, ACM Digital Library, CSA Technology Research Database, CSA High Technology Research Database with Aerospace, Computer and Information Systems Abstracts, Summon by Serials Solutions, VINITI, BazTech, Polish Virtual Library of Science/Mathematical Collection, Digital Library of Zielona Góra

Impact Factor

0.487 (2011), 0.794 (2010), 0.684 (2009)

 Editors

Editor-in-Chief

Józef KORBICZ
University of Zielona Góra, Poland

Deputy Editor

Dariusz UCIŃSKI
University of Zielona Góra, Poland

Associate Editors

Igor AIZENBERG
Texas A&M University-Texarkana, USA

Luís GOMES
New University of Lisbon, Portugal

Adam GRZECH
Wrocław University of Technology, Poland

Nicholas P. KARAMPETAKIS
Aristotle University of Thessaloniki, Greece

Jacek KLUSKA
Rzeszów University of Technology, Poland

Marek KURZYŃSKI
Wrocław University of Technology, Poland

James LAM
University of Hong Kong, China

Silvio SIMANI
University of Ferrara, Italy

Andrzej ŚWIERNIAK
Silesian University of Technology, Gliwice, Poland

Board Members

Marian ADAMSKI
University of Zielona Góra, Poland

Sergei AVDONIN
University of Alaska Fairbanks, USA

Stanisław BAŃKA
West Pomeranian University of Technology in Szczecin, Poland

Andrzej BARTOSZEWICZ
Technical University of Łódź, Poland

Vincent COCQUEMPOT
Lille 1 University, France

Michael A. DEMETRIOU
Worcester Polytechnic Institute, USA

Moritz DIEHL
KU Leuven, Belgium

Abdelhaq EL JAI
University of Perpignan, France

Miroslav FIKAR
Slovak University of Technology in Bratislava, Slovakia

Bin JIANG
Nanjing University of Aeronautics and Astronautics, China

Janusz KACPRZYK
Polish Academy of Sciences, Warsaw, Poland

Jerzy KLAMKA
Silesian University of Technology, Gliwice, 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

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

Hans Henrik NIEMANN
Technical University of Denmark, Kgs. Lyngby, Denmark

Stanisław OSOWSKI
Warsaw University of Technology, Poland

Ronald J. PATTON
University of Hull, UK

Witold PEDRYCZ
University of Alberta, Edmonton, Canada

Marios M. POLYCARPOU
University of Cyprus, Nicosia, Cyprus

Vincenç PUIG
Technical University of Catalonia, Barcelona, Spain

Ewaryst RAFAJŁOWICZ
Wrocław University of Technology, Poland

Leszek RUTKOWSKI
Technical University of Częstochowa, Poland

Jose SÁ da COSTA
Technical University of Lisbon, Portugal

Dominique SAUTER
University of Lorraine, Nancy, France

Maria SERON
The University of Newcastle, Australia

Miroslav ŠIMANDL
University of West Bohemia in Pilsen, Czech Republic

Piotr SKRZYPCZYŃSKI
Poznań University of Technology, Poland

Roman SŁOWIŃSKI
Poznań University of Technology, Poland

Mircea-Traian SOFONEA
University of Perpignan, France

Jan SOKOŁOWSKI
University of Lorraine, Nancy, France

Ryszard TADEUSIEWICZ
AGH University of Science and Technology, Cracow, Poland

Yonghong TAN
Shanghai Normal University, China

Piotr TATJEWSKI
Warsaw University of Technology, Poland

Krzysztof TCHOŃ
Wrocław University of Technology, Poland

Didier THEILLIOL
University of Lorraine, Nancy, France

Marcin WITCZAK
University of Zielona Góra, Poland

Guisheng ZHAI
Shibaura Institute of Technology, Tokyo, Japan

Changshui ZHANG
Tsinghua University, Beijing, China

Alexey ZHIRABOK
Far Eastern Federal University, Vladivostok, Russia

Enrique ZUAZUA
Basque Center for Applied Mathematics, Bilbao, Spain

Jacek M. ZURADA
University of Louisville, USA

Editorial Office

University of Zielona Góra
Institute of Control &
Computation Engineering
ul. Podgórna 50
65-246 Zielona Góra
Poland
tel.: +48 683282506
fax: +48 683284751
e-mail: amcs@uz.zgora.pl
website: www.amcs.uz.zgora.pl

Agnieszka ROŻEWSKA
Manager

Agata WIŚNIEWSKA-KUBICKA
Technical Editor



Guide

Requirements in brief

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

Paper submission

Paper proposals may be submitted only through our on-line submission system. If suitable for our journal, 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.

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. No other formats are accepted.

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, and covers the exclusive rights to reproduce and distribute the article.

Page charge

Papers published in AMCS are subject to a voluntary page charge, which will be invoiced through the authors to their institutions. Publication is not dependent on the payment of this charge. However, for papers exceeding the required length, mandatory excess page charges will be applied.

Provisions

One sample copy of the journal and the electronic version of the paper are provided for authors once the issue has been published.

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!



Subscription

Our subscription is annual and covers four printed issues.

2013 Rates

Domestic

Individuals & scientific institutions: 180 PLN
Other customers: 600 PLN

Foreign

Individuals: 180 EUR
Institutions: 200 EUR

Prices exclusive of VAT. Postage free for standard delivery.

Payment methods

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

Orders

Please contact the Editorial Office for subscription orders.



Specials

Recent special issues and sections

2012, Vol. 22, No. 4: Special section
HYBRID AND ENSEMBLE METHODS IN MACHINE LEARNING
Editors: Oscar CORDÓN, Przemysław KAZIENKO
Authors: C. Li and T.-W. Chiang, R. Colomo-Palacios *et al.*,
H. Qin *et al.*, T. Kajdanowicz and P. Kazienko, S.M. Sumi *et al.*,
M. Woźniak and B. Krawczyk, B. Trawiński *et al.*

2012, Vol. 22, No. 2: Special section
ANALYSIS AND CONTROL OF SPATIOTEMPORAL DYNAMIC SYSTEMS
Editors: Dariusz UCIŃSKI, Józef KORBICZ
Authors: Z. Emirsajtów, P.J. Mitkowski and W. Mitkowski, A. Myśliński,
E. Niewiadomska-Szynkiewicz, M. Patan, E. Rafajłowicz *et al.*

2012, Vol. 22, No. 1: Special issue
ADVANCES IN CONTROL AND FAULT-TOLERANT SYSTEMS
Editors: Józef KORBICZ, Didier MAQUIN, Didier THEILLIOL
Authors: H. Jamouli *et al.*, D. Uciński, F. Yang *et al.*,
M. Ungermann *et al.*, H.H. Niemann, H. Yang *et al.*, X. Olive,
C. Edwards *et al.*, T. Jain *et al.*, P. Weber *et al.*, R.J. Patton *et al.*,
S. Montes de Oca *et al.*, P. Gáspár *et al.*, D. Xu *et al.*, D. Ichlal *et al.*,
A. Yetendje *et al.*, K. Patan and J. Korbicz

2011, Vol. 21, No. 3: Special section
ISSUES IN ADVANCED CONTROL AND DIAGNOSIS
Editors: Vicenç PUIG, Marcin WITCZAK
Authors: W. Chen *et al.*, A. Khelassi *et al.*, M. Bonfè *et al.*,
B. Boussaid *et al.*, S. Fang and M. Blanke, K-U Dettmann and D. Söffker

2011, Vol. 21, No. 2: Special section
EFFICIENT RESOURCE MANAGEMENT FOR
GRID-ENABLED APPLICATIONS
Editors: Joanna KOŁODZIEJ, Fatos XHAFA
Authors: O. Terzo *et al.*, A. Carpen-Amarie *et al.*, J. Kołodziej
and F. Xhafa, M. Hall-May *et al.*, H. González-Vélez and
M. Kontagora, G. Di Modica *et al.*, F.A. López-Fuentes

CONTENTS

Chen Q., Teng Z. and Hu Z. Bifurcation and control for a discrete-time prey–predator model with Holling-IV functional response	247
Barboteu M., Bartosz K. and Kalita P. An analytical and numerical approach to a bilateral contact problem with nonmonotone friction	263
Khapalov A. The well-posedness of a swimming model in the 3-D incompressible fluid governed by the nonstationary Stokes equation	277
Bartecki K. A general transfer function representation for a class of hyperbolic distributed parameter systems	291
Kaczorek T. Descriptor fractional linear systems with regular pencils	309
Zhai G., Chen N. and Gui W. Decentralized design of interconnected \mathcal{H}_∞ feedback control systems with quantized signals	317
Kowalczuk Z. and Domżański M. Asynchronous distributed state estimation for continuous-time stochastic processes	327
Shiri B., Shahmorad S. and Hojjati G. Convergence analysis of piecewise continuous collocation methods for higher index integral algebraic equations of the Hessenberg type	341
Obaid H.A., Ouifki R. and Patidar K.C. An unconditionally stable nonstandard finite difference method applied to a mathematical model of HIV infection	357
Dulęba I. and Opałka M. A comparison of Jacobian-based methods of inverse kinematics for serial robot manipulators	373
Schwaller B., Ensminger D., Dresch-Langley B. and Ragot J. State estimation for a class of nonlinear systems	383
Kościelny J.M. and Łabęda-Grudziak Z.M. Double fault distinguishability in linear systems	395
Bartyś M. Generalized reasoning about faults based on the diagnostic matrix	407
Simani S. Residual generator fuzzy identification for automotive diesel engine fault diagnosis	419
Lisowski J. Sensitivity of computer support game algorithms of safe ship control	439
Skubalska-Rafajłowicz E. Random projections and Hotelling’s T^2 statistics for change detection in high-dimensional data streams	447
Górecki T. and Łuczak M. Linear discriminant analysis with a generalization of the Moore–Penrose pseudoinverse	463
Wyrwoł B. and Hryniewicz E. Decomposition of the fuzzy inference system for implementation in the FPGA structure	473