



applied mathematics and computer science

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 full-length research 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.

AMCS is published in Poland by the University of Zielona Góra in partnership with De Gruyter Poland (Sciendo) and Lubuskie Scientific Society, under the auspices of the Committee on Automatic Control and Robotics of the Polish Academy of Sciences.

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 in Poland since 1991 by the University of Zielona Góra in partnership with De Gruyter Poland (Sciendo) and Lubuskie Scientific Society, under the auspices of the Committee on Automatic Control and Robotics of the Polish Academy of Sciences. 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 original, high-quality full-length research papers in the following areas: modern control theory and practice; artificial intelligence methods and their applications; applied mathematics and mathematical optimisation techniques; and mathematical methods in engineering, computer science and biology.

Chief indexing and abstracting services

ACM Digital Library, Applied Mechanics Reviews, Clarivate Analytics (formerly Thomson Reuters), Current Mathematical Publications (AMS), DBLP Computer Science Bibliography, EBSCO, Elsevier, Google Scholar, Inspec, Mathematical Reviews (MathSciNet), Proquest, Zentralblatt MATH, and others.

Impact Factor

1.504 (2018) 5-Year IF: 1.553 (2018)



Editor-in-Chief

Józef KORBICZ University of Zielona Góra, Poland

Deputy Editor

Dariusz UCIŃSKI University of Zielona Góra, Poland

Associate Editors

Stefan DOMEK

West Pomeranian University of Technology in Szczecin, Poland Miroslav FIKAR

Slovak University of Technology in Bratislava, Slovakia

Marios M. POLYCARPOU

University of Cyprus, Nicosia, Cyprus

Vincenç PUIG

Technical University of Catalonia, Barcelona, Spain

Silvio SIMANI

University of Ferrara, Italy
Jerzy STEFANOWSKI
Poznań University of Technology, Poland

Guisheng ZHAI

Shibaura Institute of Technology, Tokyo, Japan

Board Members

Harald ASCHEMANN

University of Rostock, Germany Cherukuri ASWANI KUMAR

VIT University, Vellore, India

Czesław BAJER

Polish Academy of Sciences, Warsaw, Poland

Andrzej BARTOSZEWICZ

Technical University of Łódź, Poland

Marek BODNAR

University of Warsaw, Poland Paolo CASTALDI University of Bologna, Italy

Zhaohui CEN

Qatar Environment and Energy Research Institute, Ar Rayyan, Qatar

Jérôme CIESLAK University of Bordeaux, France

Julio CLEMPNER

National Polytechnic Institute, Mexico City, Mexico

Bogusław CYGANEK

AGH University of Science and Technology, Cracow, Poland

Andrzej DZIELIŃSKI

Warsaw University of Technology, Poland Anna FABIJAŃSKA

Lodz University of Technology, Poland Marcin GORAWSKI

Silesian University of Technology, Gliwice, Poland Martin GUGAT Friedrich-Alexander University of Erlangen-Nuremberg, Germany

Xiao HE

Tsinghua University, Beijing, China

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

Jacek KLUSKA

Rzeszów University of Technology, Poland

Joanna KOŁODZIEJ

Cracow University of Technology, Poland

Jan M. KOŚCIELNY

Warsaw University of Technology, Poland

Zdzisław KOWALCZUK

Gdańsk University of Technology, Poland Piotr KULCZYCKI

AGH University of Science and Technology, Cracow, Poland

Marek KURZYŃSKI
Wrocław University of Technology, Poland

Maciej KUSY

Rzeszów University of Technology, Poland

Francisco-Ronay LÓPEZ-ESTRADA

Technological Institute of Tuxtla Gutiérrez, Mexico Maciej ŁAWRYŃCZUK

Warsaw University of Technology, Poland 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

Gang NIU

Tongji University, Shanghai, China Ronald J. PATTON

University of Hull, UK

Witold PEDRYCZ

University of Alberta, Edmonton, Canada Piotr PORWIK

University of Silesia in Katowice, Poland

Jianbin QIU

Harbin Institute of Technology, China

Ewaryst RAFAJŁOWICZ

Wrocław University of Technology, Poland Rotislav RAZUMCHIK

Russian Academy of Sciences, Moscow, Russia

Leszek RUTKOWSKI

Technical University of Częstochowa, Poland

Andrey V. SAVCHENKO

National Research University HSE, Nizhny Novgorod, Russia

Horst SCHULTE

HTW Berlin, Germany
Piotr SKRZYPCZYŃSKI

Poznań University of Technology, Poland Roman SŁOWIŃSKI Poznań University of Technology, Poland

Florin STOICAN

University POLITEHNICA of Bucharest, Romania

Andrzej ŚWIERNIAK Silesian University of Technology, Gliwice, Poland

Zoltán SZABÓ

Hungarian Academy of Sciences, Budapest, Hungary Ryszard TADEUSIEWICZ

AGH University of Science and Technology, Cracow, Poland Didier THEILLIOL University of Lorraine, Nancy, France

Haoping WANG
Nanjing University of Science and Technology, China

Marcin WITCZAK

University of Zielona Góra, Poland

Shen YIN

Harbin Institute of Technology, China

Alexey ZHIRABOK

Far Eastern Federal University, Vladivostok, Russia

Teresa ZIELIŃSKA

Warsaw University of Technology, Poland

Jacek M. ZÚRÁDA University of Louisville, USA

Editorial Office

University of Zielona Góra Institute of Control & Computation Engineering ul. prof. Z. Szafrana 2 65-516 Zielona Góra

+48 683282506

⊠ amcs@uz.zgora.pl

Www.amcs.uz.zgora.pl

Agnieszka ROŻEWSKA

Agata WIŚNIEWSKA-KUBICKA

Technical Editor

Poland



Requirements in brief

Our basic rules include electronic paper submission and processing, the LaTeX format following a special AMCS style, a license to publish, and a publication 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.

License to publish

All authors must sign a license to publish upon paper acceptance. The license governs in detail the commercial and non-commercial use of papers published by our journal, and determines user and author rights.

Publication charge

The authors are expected to pay page charges, which cover the costs of the publishing process and will be processed following paper acceptance.

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!

www.amcs.uz.zgora.pl

© University of Zielona Góra. Some rights reserved. Contents available for non-commercial use under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 (CC BY-NC-ND 3.0) license. Printed in 110 copies. Primary version: print.



Our subscription is annual and covers four printed issues.

2020 Rates

Domestic

Individuals & scientific institutions: 180 PLN 480 PLN Other customers:

Foreign

Individuals: 120 EUR 200 EUR Institutions:

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.



Recent special issues and sections

2019, Vol. 29, No. 4: Special section NEW PERSPECTIVES IN NONLINEAR AND INTELLIGENT CONTROL (In Honor of Alexander P. Kurdyukov)

Editors: Julio B. CLEMPNER, Enso IKONEN, Alexander P. KURDYUKOV Authors: I. Selek and E. Ikonen, W. Khaksar et al., J.P. Flores-Flores and R. Martinez-Guerra, A.P. Kurdyukov and V.A. Boichenko, E. Estrada et al., C. Aguilar-Ibanez and M.S. Suarez-Castanon, C. Solis et al.

2019, Vol. 29, No. 3: Special section INFORMATION TECHNOLOGY FOR SYSTEMS RESEARCH Editors: Piotr KULCZYCKI, Janusz KACPRZYK, László T. KÓCZY, Radko MESIAR

Authors: K. Kulinowski et al., D. Kołaczek et al., I.Á. Harmati and L.T. Kóczy, S. Łukasik et al., Y.V. Bodyanskiy and O.K. Tyshchenko, E. Rakovská and M. Hudec, M. Wielgosz and A. Skoczeń

2019, Vol. 29, No. 2: Special section ADVANCES IN COMPLEX CLOUD AND SERVICE ORIENTED COMPUTING Editors: Anna KOBUSIŃSKA, Ching-Hsien HSU, Kwei-Jay LIN Authors: B.-J. Chang et al., V. Podolskiy et al., J.-J. Chou et al., Y. Ngoko et al.

2019, Vol. 29, No. 1: Special section EXPLORING COMPLEX AND BIG DATA Editors: Johann GAMPER, Robert WREMBEL Authors: C. Meghini et al., E. Güzel Kalaycı et al., G. Mahlknecht et al., A. Haq et al., S.M.F. Ali et al., A. Datta et al.

CONTENTS

Kurniawan E., Harno H.G., Wijonarko S., Widiyatmoko B., Bayuwati D., Purwowibowo P. and Maftukhah T. Variable-structure repetitive control for discrete-time linear systems with multiple-period exogenous signals	207
Kaczorek T. and Ruszewski A. Application of the Drazin inverse to the analysis of pointwise completeness and pointwise degeneracy of descriptor fractional linear continuous-time systems	219
Jabri D., Guelton K., Belkhiat D.E.C. and Manamanni N. Decentralized static output tracking control of interconnected and disturbed Takagi–Sugeno systems	225
Straka O. and Punčochář I. Decentralized and distributed active fault diagnosis: Multiple model estimation algorithms	239
Zeifman A., Satin Y., Kryukova A., Razumchik R., Kiseleva K. and Shilova G. On three methods for bounding the rate of convergence for some continuous-time Markov chains	251
Hong Y., Bin H. and Huang Z. Stabilization analysis of impulsive state-dependent neural networks with nonlinear disturbance: A quantization approach	267
Grzegorzewski P., Hryniewicz O. and Romaniuk M. Flexible resampling for fuzzy data	281
Madrid N., Medina J. and Ramírez-Poussa E. Rough sets based on Galois connections	299
Zok T., Badura J., Swat S., Figurski K., Popenda M. and Antczak M. New models and algorithms for RNA pseudoknot order assignment	315
Guan H., Zhang Y., Cheng HD. and Tang X. Bounded-abstaining classification for breast tumors in imbalanced ultrasound images	325
Yuan F., Zhu X. and Wang Y. Deformed solitons of a typical set of (2+1)-dimensional complex modified Korteweg–de Vries equations	337
Chen L., Zielinska T., Wang J. and Ge W. Solution of an inverse kinematics problem using dual quaternions	351
Díaz H., Sala A. and Armesto L. A linear programming methodology for approximate dynamic programming	363
Silva-García V.M., Flores-Carapia R., Rentería-Márquez C., Luna-Benoso B. and Chimal-Eguía J.C. Image cipher applications using the elliptical curve and chaos	377