


amcs

p-ISSN 1641-876X
e-ISSN 2083-8492

QUARTERLY
June 2021

2021 • Volume 31 • Number 2

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

30
years



University of Zielona Góra Press, Poland

About AMCS

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.*

Indexing and abstracting

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.

Current journal metrics

JCR Journal Impact Factor: **0.967** (2019)
JCR 5-Year Impact Factor: **1.105** (2019)
SCImago Journal Rank: **0.416** (2020)
Source Normalized Impact per Paper: **1.375** (2020)
CiteScore: **3.0** (2020)
Polish ministerial points: **100** (2021)

 Editors

Editor-in-Chief

Józef KORBICZ
University of Zielona Góra, Poland

Deputy Editor

Dariusz UCIŃSKI
University of Zielona Góra, Poland

Associate Editors

Jérôme CIESLAK
University of Bordeaux, France
Stefan DOMEK
West Pomeranian University of Technology in Szczecin, Poland
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
Miguel BERNAL
Sonora Institute of Technology (ITSON), Obregón, Mexico
Paolo CASTALDI
University of Bologna, Italy
Zhaohui CEN
Qatar Environment and Energy Research Institute, Ar Rayyan, Qatar
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 FABIJANSKA
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
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
Adam KRZYŻAK
Concordia University, Montreal, Canada
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 LAWRYNCZUK
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
Jimoh O. PEDRO
University of the Witwatersrand, Johannesburg, South Africa
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
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
Baozhen YAO
Dalian University of Technology, China
Shen YIN
Harbin Institute of Technology, China
Alexey ZHIRABOK
Far Eastern Federal University, Vladivostok, Russia
Teresa ZIELIŃSKA
Warsaw University of Technology, Poland
Jacek M. ZURADA
University of Louisville, USA

Editorial Office

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


+48 683282506
amcs@uz.zgora.pl
www.amcs.uz.zgora.pl

Agnieszka ROŻEWSKA
Manager

Agata WIŚNIEWSKA-KUBICKA
Technical Editor

amcs

2021 • Volume 31 • Number 2

 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 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.

CONTENTS



Ca 28307

Maksimov V.I. On a stable solution of the problem of disturbance reduction	187
Grabowski P. Comparison of direct and perturbation approaches to analysis of infinite-dimensional feedback control systems	195
Tatar N.-e. Mittag-Leffler stability for a Timoshenko problem	219
Vafeas P., Papadopoulos P.K. and Svarnas P. A mixed type boundary-value problem related to the electrostatics of cold plasma jet reactors based on dielectric barrier discharge	233
Hamdi H., Rodrigues M., Rabaoui B. and Benhadj Braiek N. A fault estimation and fault-tolerant control based sliding mode observer for LPV descriptor systems with time delay	247
Tran T.A., Jauberthie C., Trave-Massuyés L. and Lu Q.H. An interval Kalman filter enhanced by lowering the covariance matrix upper bound	259
Sun W., Shen L., Shao H. and Liu P. Dynamic location models of mobile sensors for travel time estimation on a freeway	271
Sun K. and Liu X. Path planning for an autonomous underwater vehicle in a cluttered underwater environment based on the heat method	289
Siminski K. An outlier-robust neuro-fuzzy system for classification and regression	303
Liu S., Ji H., Hou Z., Zuo J. and Fan L. Data-driven online modelling for a UGI gasification process using modified lazy learning with a relevance vector machine	321
Ferdania D.F., Irawati, Garminia H., Akhmaloka and Rachmansyah K.A. Minimal state automata for detecting a β globin gene mutation	337
Devidas S., Rao Y.V. S. and Rekha N.R. A decentralized group signature scheme for privacy protection in a blockchain	353