

CHAOS

THEORY AND APPLICATIONS

IN APPLIED SCIENCES AND ENGINEERING

Chaos Theory and Applications (CHTA)

Volume:7– Issue No:1 (March 2025)

<https://dergipark.org.tr/en/pub/chaos/issue/90440>

Honorary Editorial Board

Julien C. SPOTT, University of Wisconsin–Madison, USA, csprott@wisc.edu

Guanrong CHEN, City University of Hong Kong, HONG KONG, eegchen@cityu.edu.hk

René LOZI, University Côte D'Azur, FRANCE, rlozi@unice.fr

José A. Tenreiro MACHADO⁺, Polytechnic Institute of Porto, PORTUGAL, jtm@isep.ipp.pt

Editor-in-Chief

Akif AKGUL, Hitit University, TURKEY, akifakgul@hitit.edu.tr

Associate Editors

Miguel A. F. SANJUAN, Universidad Rey Juan Carlos, SPAIN, miguel.sanjuan@urjc.es

Chunbiao LI, Nanjing University of Information Science & Technology, CHINA, goontry@126.com

Dumitru BALEANU, Lebanese American University, LEBANON, dumitru.baleanu@lau.edu.lb

Yeliz KARACA, University of Massachusetts Chan Medical School, USA, yeliz.karaca@ieee.org

J. M. MUÑOZ PACHECO, Benemérita Universidad Autónoma de Puebla, MEXICO, jesum.pacheco@correo.buap.mx

Martin BOHNER, Missouri University of Science and Technology, USA, bohner@mst.edu

Sifeu T. KINGNI, University of Maroua, CAMEROON, stkingni@gmail.com

Vinod PATIDAR, Sir Padampat Singhan University, INDIA, vinod.patidar@spsu.ac.in

Hijaz AHMAD, International Telematic University, ITALY, hijaz555@gmail.com

Fahrettin HORASAN, Kirikkale University, TURKEY, fhorasan@kku.edu.tr

Editorial Board Members

Jun MA, Lanzhou University of Technology, CHINA, hyperchaos@lut.edu.cn

Herbert Ho-Ching LU, The University of Western Australia, AUSTRALIA, herbert.iu@uwa.edu.au

Bocheng BAO, Changzhou University, CHINA, mervinbao@126.com

Juan Eduardo NAPOLES VALDES, Universidad Tecnológica Nacional, ARGENTINA, profjnapoles@gmail.com

Dag Øivind MADSEN, University of South-Eastern Norway, NORWAY, Dag.Oivind.Madsen@usn.no

Praveen AGARWAL, Anand International College of Engineering, INDIA, goyal.praveen2011@gmail.com

Alexander PCHELINTSEV, Tambov State Technical University, RUSSIA, pchelintsev.an@yandex.ru

Yong WANG, Chongqing University of Posts and Telecommunications, CHINA, wangyong_cqupt@163.com

Marcelo MESSIAS, São Paulo State University, BRAZIL, marcelo.messias1@unesp.br

Sajad JAFARI, Ton Duc Thang University, VIETNAM, sajadjafari83@gmail.com

Anastasios (Tassos) BOUNTIS, University of Patras, GREECE, anastasios.bountis@nu.edu.kz

Jesús M. SEOANE, Universidad Rey Juan Carlos, SPAIN, jesus.seoane@urjc.es

G. Cigdem YALCIN, Istanbul University, TURKEY, gcyalcin@istanbul.edu.tr

Olfa BOUBAKER, University of Carthage, TUNUSIA, olfa_insat@yahoo.com

Marcelo A. SAVI, Universidade Federal do Rio de Janeiro, BRAZIL, savi@mecanica.coppe.ufrj.br
Christos K. VOLOS, Aristotle University of Thessaloniki, GREECE, volos@physics.auth.gr
Edmon PERKINS, LAB2701, USA, edmonperkins@gmail.com
Charalampos (Haris) SKOKOS, University of Cape Town, SOUTH AFRICA, haris.skokos@uct.ac.za
Ihsan PEHLIVAN, Sakarya University of Applied Sciences, TURKEY, ipehlivan@sakarya.edu.tr
Karthiekeyan RAJAGOPAL, SRM Institute of Science and Technology, INDIA, rkarthiekeyan@gmail.com
Binoy Krishna ROY, National Institute of Technology Silchar, INDIA, bkr_nits@yahoo.co.in
Jacques KENGNE, Université de Dschang, CAMEROON, kengnemozart@yahoo.fr
Fatih KURUGOLLU, University of Sharjah, UAE, fkurugollu@sharjah.ac.ae
Denis BUTUSOV, Petersburg State Electrotechnical University, RUSSIA, butusovdn@mail.ru
Sundarapandian VAIDYANATHAN, Vel Tech - Technical University, INDIA, sundarvtu@gmail.com
Serdar CICEK, Tarsus University, TURKEY, serdarcicek@gmail.com
Qiang LAI, East China Jiaotong University, CHINA, laiqiang87@126.com
Viet-thanh PHAM, Industrial University of Ho Chi Minh City, VIETNAM, pvt3010@gmail.com
Günyaz ABLAY, SUNY Polytechnic Institute, USA, gunyaz.ablay@agu.edu.tr
Yilmaz UYAROĞLU, Sakarya University, TURKEY, uyaroglu@sakarya.edu.tr
Esteban TLELO-CUAUTLE, Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), MEXICO, etlelo@inaoep.mx
Dan-Gheorghe DIMITRIU, Alexandru Ioan Cuza University of Iasi, ROMANIA, dimitriu@uaic.ro
Jawad AHMAD, Edinburgh Napier University, UK, jawad.saj@gmail.com
Ashish, Government College Satnali, Mahendergarh, INDIA, drashishkumar108@gmail.com
Murat TUNA, Kırklareli University, TURKEY, murat.tuna@klu.edu.tr
Orhan Ozgur AYBAR, Piri Reis University, TURKEY, oaybar@pirireis.edu.tr
Mehmet YAVUZ, Necmettin Erbakan University, TURKEY, mehmetyavuz@erbakan.edu.tr

Editorial Advisory Board Members

Ayhan ISTANBULLU, Balıkesir University, TURKEY, ayhanistan@yahoo.com
Ismail KOYUNCU, Afyon Kocatepe University, TURKEY, ismailkoyuncu@aku.edu.tr
Fatih OZKAYNAK, Firat University, TURKEY, ozkaynak@firat.edu.tr
Sezgin KACAR, Sakarya University of Applied Sciences, TURKEY, skacar@subu.edu.tr
Ugur Erkin KOCAMAZ, Bursa Uudag University, TURKEY, ugurkocamaz@gmail.com
Erdinc AVAROĞLU, Mersin University, TURKEY, eavaroglu@mersin.edu.tr
Ali DURDU, Social Sciences University of Ankara, TURKEY, ali.durdu@asbu.edu.tr
Hakan KOR, Hitit University, TURKEY, hakankor@hitit.edu.tr

Language Editors

Muhammed Maruf OZTURK, Suleyman Demirel University, TURKEY, muhammedozturk@sdu.edu.tr
Mustafa KUTLU, Sakarya University of Applied Sciences, TURKEY, mkutlu@subu.edu.tr
Hamid ASADI DERESHGI, Istanbul Arel University, TURKEY, hamidasadi@arel.edu.tr
Emir AVCIOGLU, Hitit University, TURKEY, emiravciogluhitit.edu.tr

Technical Coordinator

Muhammed Ali PALA, Sakarya University of Applied Sciences, TURKEY, pala@subu.edu.tr
Murat Erhan CIMEN, Sakarya University of Applied Sciences, TURKEY, muratcimen@sakarya.edu.tr
Harun Emre KIRAN, Hitit University, TURKEY, harunemrekiran@hitit.edu.tr
Berkay EMIN, Hitit University, TURKEY, berkayemin@hitit.edu.tr