

Nonlinear Systems and Complexity

Volume 24

Series editor

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Nonlinear Systems and Complexity provides a place to systematically summarize recent developments, applications, and overall advance in all aspects of nonlinearity, chaos, and complexity as part of the established research literature, beyond the novel and recent findings published in primary journals. The aims of the book series are to publish theories and techniques in nonlinear systems and complexity; stimulate more research interest on nonlinearity, synchronization, and complexity in nonlinear science; and fast-scatter the new knowledge to scientists, engineers, and students in the corresponding fields. Books in this series will focus on the recent developments, findings and progress on theories, principles, methodology, computational techniques in nonlinear systems and mathematics with engineering applications. The Series establishes highly relevant monographs on wide ranging topics covering fundamental advances and new applications in the field. Topical areas include, but are not limited to: Nonlinear dynamics Complexity, nonlinearity, and chaos Computational methods for nonlinear systems Stability, bifurcation, chaos and fractals in engineering Nonlinear chemical and biological phenomena Fractional dynamics and applications Discontinuity, synchronization and control.

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Editors

Mathematical Methods in Engineering

Applications in Dynamics of Complex
Systems

 Springer

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ISSN 2195-9994 ISSN 2196-0003 (electronic)
Nonlinear Systems and Complexity
ISBN 978-3-319-90971-4 ISBN 978-3-319-90972-1 (eBook)
<https://doi.org/10.1007/978-3-319-90972-1>

Library of Congress Control Number: 2018949150

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Printed on acid-free paper

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This work organized in two volumes publishes a selection of most relevant contributions according to the referees, presented at the International Symposium, *MME 2017 Mathematical Methods in Engineering*, held at Çankaya University, Ankara, Turkey, during April 27–29, 2017.

The second volume of the book *Mathematical Methods in Engineering: Applications in Dynamics of Complex Systems* contains two Parts, namely “Modelling of the Dynamics of Complex Systems” and “Fractional Calculus Applications.”

In the follow-up, 15 high-quality contributions are also included. The book expands the works entitled: *New Solutions of the Functional Equations and Their Possible Application in Treatment of Complex Systems*, *Empirical Copula in the Detection of Batch Effects*, *Finite Element Method for Schnackenberg Mode*, *Fault Tolerant Control of the (13C) Isotope Separation Cascade*, *Power Series Transform in Cryptology and ASCII*, *The General Form of Maximally Accretive Quasi-Differential Operators for First Order*, *Modeling of Biochemical Networks via Classification and Regression Tree Methods*, *Solving the Nonlinear System of Third Order Boundary Value Problems*, *C-Glasso Estimator for Multivariate Adaptive Regression Spline*.

In addition, the book contains *Multiscale Characterization and Model for the Dynamic Behavior of Ferroelectric Materials Using Fractional Operators*, *A Transient Flow of Non-Newtonian Fluid Modelled by a Mixed Time-Space Derivative: An Improved Integral-Balance Approach*, *Exact Traveling Wave Solutions for Local Fractional Partial Differential Equations in Mathematical Physics*, *A New Numerical Approximation of Fractional Discretization: Upwind Discretization for Riemann-Liouville and Caputo Derivatives*, *Certain Fractional Integrals and Solutions of Fractional Kinetic Equations Involving the Product of S-function*, *An Autotuning Method for a Fractional Order PD Controller for Vibration Suppression*.

The symposium provided a forum for discussing recent developments about theoretical and applied areas of mathematics and engineering with emphasis to the topics fractional calculus and nonlinear analysis.

The members of the organizing committee were Kenan Taş (Turkey), J. A. Tenreiro Machado (Portugal), and Yangjian Cai (China).

All local organizing committee members with leadership of Dumitru Baleanu and all members of Çankaya University, Mathematics Department, as well as the organizers of Special Sessions, Plenary and Invited Speakers, and International Scientific Committee deserve heartfelt thanks.

The editors of this book are grateful to the President of the board of trustees of Çankaya University, Sitki Alp, and to the Rector, Prof. Dr. Hamdi Mollamahmutoglu, for their continuous support of the symposium activities.

We thank all the referees and other colleagues who helped in preparing this book for publication.

Finally, our special thanks are due to Kiruthika Kumar and Michael Luby from Springer, for their continuous help and work in connection with this book.

Ankara, Turkey
Ankara, Turkey
Porto, Portugal

Kenan Taş
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