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EDITORIAL

FCAA RELATED NEWS, EVENTS AND BOOKS (FCAA–VOLUME 19–4–2016)

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Dear readers,

in the Editorial Notes we announce news for our journal, anniversaries, information on international meetings, events, new books, etc. related to the FCAA (“Fractional Calculus and Applied Analysis”) areas.

1. Calendar of Events

**Special Session on “Advances in Fractional Calculus.
Theory and Applications”, at the 20th World Congress of IFAC
(IFAC 2017): Toulouse, France, July 9–14, 2017**

More details can be found on

Website: <http://nas.isep.pw.edu.pl/fractional/>,
and on the IFAC (International Federation of automatic Control) Congress
itself, at **Website:** <https://www.ifac2017.org/>.

The topics of interest include, but are not limited to: numerical and analytical solutions to fractional order systems; new implementation methods; improvements in fractional order derivatives approximation methods; time response analysis of fractional order systems; the analysis, modeling and control of phenomena in: electrical engineering; electromagnetism; electrochemistry; thermal engineering; mechanics; mechatronics; automatic control; biology; biophysics; physics, etc.

We would much appreciate if you consider this invitation to participate in this session and you present a paper. If you accept, please complete the form on the web site

<http://nas.isep.pw.edu.pl/fractional/index.php/submission-form/>
as soon as possible.

Paper submission: October 31, 2016

Notification of acceptance: February 20, 2017

Final paper submission deadline: March 31, 2017

Looking forward to hearing from you. Yours sincerely,

Cristina I. Muresan, Konrad A. Markowski, Dana Copot

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2. Reviews on New Books

Piotr Ostalczyk, *Discrete Fractional Calculus*. *Applications in Control and Image Processing*. Ser. in Computer Vision, Vol. 4, World Scientific (2016), 396 pp., ISBN: 978-981-4725-66-8 (hardcover), ISBN: 978-981-4725-68-2 (ebook).

Details: <http://www.worldscientific.com/worldscibooks/10.1142/9833>.

About this book: The main subject of the monograph is the fractional calculus in the discrete version. The volume is divided into three main parts. Part one contains a theoretical introduction to the classical and fractional-order discrete calculus where the fundamental role is played by the backward difference and sum. In the second part, selected applications of the discrete fractional calculus in the discrete system control theory are presented. In the discrete system identification, analysis and synthesis, one can consider integer or fractional models based on the fractional-order difference equations. The third part of the book is devoted to digital image processing.

Contents:

- Discrete-Variable Real Functions
- The n-th Order Backward Difference/Sum of the Discrete-Variable Function
- Fractional-Order Backward Differ-Sum
- The FOBD-S Graphical Interpretation
- The FOBD/S Selected Properties
- The FO Dynamic System Description
- Linear FO System Analysis
- The Linear FO Discrete-Time Fundamental Elements
- FO Discrete-Time System Structures
- Fractional Discrete-Time PID Controller
- FOS Approximation Problems
- Fractional Potential
- FO Image Filtering and Edge Detection
- Appendix A: Selected Linear Algebra Formulae and Discrete-Variable Special Functions.

Readership: Researchers, academics, professionals and graduate students in pattern recognition/image analysis, robotics and automated systems, systems engineering and mathematical modeling.

Features:

Sample Chapter available free at the website: Chapter 1. Discrete-variable real functions (1,511 KB).

Along with the 13 chapters and Appendix in 3 parts, the book includes a long list of Reference items (18 pages), 13 tables, and 445 figures (plots).

The fractional calculus (FC) originally concerned continuous-variable functions. Such functions describing the so-called analog signals of real world are continuous functions of the temporal variable t . One of the first fractional-order derivatives application appeared in the anomalous diffusion models. In the early sixties of the last century there was proposed the fractional model of the ultra-capacitor. In mechanics, the viscoelasticity phenomenon particularly accurately describes mathematical models based on FC.

The interposition of the digital computers to signal processing which can deal with immense quantities of information expressed by numbers, not signals, forced a conversion of the analog signal to a sequence of samples expressed as a set of digital words. This sampling process is usually performed in a digital-to-analog converter (under the well-known restrictions expressed by the Shannon theorem). Therefore, one establishes a relation between the continuous variable function and its discrete-variable counterpart. In a discrete version of the FC the continuous-variable functions are substituted by discrete-variable ones, the fractional-order derivatives are replaced by fractional-order differences, and the fractional-order integrals by fractional-order sums. One should admit, that operating on fractional-order differences and sums is more complicated in comparison with the integer-order case. The complications are related to longer signal processing time and larger computer memory needed. The huge development of computers, converters and the memory size compensates for this inconvenience.

This book presents a theory and selected applications of the discrete FC in the discrete system control theory and discrete processing. It is dedicated to students and engineers working on automatic control, dynamic systems identification and image processing.

Boling Guo, Xueke Pu, Fenghui Huang, *Fractional Partial Differential Equations and Their Numerical Solutions*. World Scientific (2015), 348 pp., ISBN: 978-981-4667-04-3 (hardcover), ISBN: 978-981-4667-06-7 (ebook).

Details: <http://www.worldscientific.com/worldscibooks/10.1142/9543>.

The book was originally published by Science Press in 2011. This edition is published by World Scientific Publishing Company Pte Ltd by arrangement with Science Press, Beijing, China.

About this book: This book aims to introduce some new trends and results on the study of the fractional differential equations, and to provide a good understanding of this field to beginners who are interested in this field, which is the authors' beautiful hope.

This book describes theoretical and numerical aspects of the fractional partial differential equations, including the authors' researches in this field, such as the fractional Nonlinear Schrödinger equations, fractional LandauLifshitz equations and fractional GinzburgLandau equations. It also covers enough fundamental knowledge on the fractional derivatives and fractional integrals, and enough background of the fractional PDEs.

Sample Chapter(s): Chapter 1. Physics Background (344 KB)

Contents:

– Physics Background – Fractional Calculus and Fractional Differential Equations – Fractional Partial Differential Equations – Numerical Approximations in Fractional Calculus – Numerical Methods for the Fractional Ordinary Differential Equations – Numerical Methods for Fractional Partial Differential Equations

Readership: Graduate students and researchers in mathematical physics, numerical analysis and computational mathematics.

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