

EDITORIAL

FCAA RELATED MEETINGS, BOOKS, IN MEMORIAM (FCAA–VOLUME 15–N° 4)

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Dear readers,

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

1. Forthcoming Meetings Related to FCAA Topics

ECCC'2013, European Control Conference 2013
Special Session: Fractional Dynamical Systems and Signals
July 17-19, 2013, in Zurich, Switzerland
<http://www.ecc13.ch/>

The goal of this special session is to gather colleagues that work in the field of fractional calculus in order to present the latest results in fractional dynamical systems and signals domain. Papers describing original research work that reflects the recent theoretical advances and experimental results as well as open new issues for research are invited. This session will cover the following topics (but not limited to):

- Signal analysis and filtering with fractional tools (restoration, reconstruction, analysis of fractal noises, - Fractional modeling especially of (but not limited to) thermal systems, electrical systems (motors, transformers, skin effect,), dielectric materials, electrochemical systems (batteries, ultracapacitors, fuel cells, ...), mechanical systems (vibration insulation, viscoelastic materials, ...), Biological systems (muscles, lungs, ...) - System identification (linear, non linear, MIMO methods, ...) - Systems implementation (fractional controllers and filters implementation, ...) - Systems analysis (Stability, observability, controllability, ...) - Observers - Control (Fractional PID, CRONE, H_∞ , ...) - Diagnosis of fractional systems, - etc.

Submission Deadline: Contributed Papers and special issues must be submitted before October 19, 2012.

Submission Guidelines: Prepare our papers according to recommendations available at <http://www.ecc13.ch/call.html>.

Reported by J. Sabatier, Email: jocelyn.sabatier@u-bordeaux1.fr

2. New Books Related to FCAA Topics

Saïd Abbas, Mouffak Benchohra, Gaston M. N'Guérékata,
Topics in Fractional Differential Equations, Springer, 2012, 396 pp.

<http://www.springer.com/mathematics/dynamical+systems/book/978-1-4614-4035-2>.

Ser.: Developments in Mathematics, Vol. 27; ISBN: 978-1-4614-4035-2.

During the last decade, there has been an explosion of interest in fractional dynamics as it was found to play a fundamental role in the modeling of a considerable number of phenomena; in particular the modeling of memory-dependent and complex media. Fractional calculus generalizes integrals and derivatives to non-integer orders and has emerged as an important tool for the study of dynamical systems where classical methods reveal strong limitations. This book is addressed to a wide audience of researchers working with fractional dynamics, including mathematicians, engineers, biologists, and physicists. This timely publication may also be suitable for a graduate level seminar for students studying differential equations.

"*Topics in Fractional Differential Equations*" is devoted to the existence and uniqueness of solutions for various classes of Darboux problems for hyperbolic differential equations or inclusions involving the Caputo fractional derivative. In this book, problems are studied using the fixed point approach, the method of upper and lower solution, and the Kuratowski measure of noncompactness. An historical introduction to fractional calculus will be of general interest to a wide range of researchers. Chapter 1 contains some preliminary background results. Chapter 2 is devoted to fractional order partial functional differential equations. Chapter 3 is concerned with functional partial differential inclusions, while in Chapter 4, functional impulsive partial hyperbolic differential equations are considered. Chapter 5 is concerned with impulsive partial hyperbolic functional differential inclusions. Implicit partial hyperbolic differential equations are considered in Chapter 6, and finally in Chapter 7, Riemann-Liouville fractional order integral equations are considered. Each chapter concludes with a section devoted to notes and bibliographical remarks. The work is self-contained but also contains questions and directions for further research.

Content Level: Research

Keywords: - Caputo Fractional derivative - Darboux problem - Riemann-Liouville Integral equations - fractional calculus - fractional differential equations - hyperbolic partial differential equation

Related subjects: Analysis - Dynamical Systems & Differential Equations

Features:

- Discusses the progress of fractional calculus as a tool in the study of dynamical systems
- Presents solutions to the various classes of Darboux problems for hyperbolic differential equations
- Addresses a wide audience of specialists including mathematicians, engineers, biologists, and physicists

Table of Contents: Preface; - 1. Preliminary Background; - 2. Partial Hyperbolic Functional Differential Equations; - 3. Partial Hyperbolic Functional Differential Inclusions; - 4. Impulsive Partial Hyperbolic Functional Differential Equations; - 5. Impulsive Partial Hyperbolic Functional Differential Inclusions; - 6. Implicit Partial Hyperbolic Functional Differential Equations; - 7. Fractional Order Riemann-Liouville Integral Equations; - References; - Index.

Joseph Klafter and Igor M. Sokolov, *First Steps in Random Walks: From Tools to Applications*. Oxford University Press, 2011, 256 pp.

<http://www.oup.com/us/catalog/general/subject/Physics/Mathematicalphysics/?view=usa&ci=9780199234868#>

ISBN13: 9780199234868 , ISBN10: 0199234868

Related subjects: Physics, Mathematical Physics

The name “random walk” for a problem of a displacement of a point in a sequence of independent random steps was coined by Karl Pearson in 1905 in a question posed to readers of “Nature”. The same year, a similar problem was formulated by Albert Einstein in one of his *Annus Mirabilis* works. Even earlier such a problem was posed by Louis Bachelier in his thesis devoted to the theory of financial speculations in 1900. Nowadays the theory of random walks has proved useful in physics and chemistry (diffusion, reactions, mixing in flows), economics, biology (from animal spread to motion of subcellular structures) and in many other disciplines. The random walk approach serves not only as a model of simple diffusion but of many complex sub- and super-diffusive transport processes as well. This book discusses the main variants of random walks and gives the most important mathematical tools for their theoretical description.

Features of this book: - Unique pedagogical concept makes it accessible to undergraduate level; - Gives practical coverage of all topics of random walk theory used in physics and chemistry; - Includes the most

up-to-date results; - Well illustrated, including tutorial summaries, many exercises and examples; - Solutions manual available for instructors

Table of Contents: 1. Characteristic Functions 2. Generating Functions and Applications 3. Continuous Time Random Walks 4. CTRW and Aging Phenomena 5. Master Equations 6. Fractional Diffusion and Fokker-Planck Equations for Subdiffusion

Ying Luo, YangQuan Chen, *Fractional Order Motion Controls*. J. Wiley & Sons, 2012, 424 pp.

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-1119944554.html>

ISBN: 978-1-1199-4455-3

Related subjects: Special Topics of Mechanical Engineering

Covering fractional order theory, simulation and experiments, this book explains how fractional order modelling and fractional order controller design compares favourably with traditional velocity and position control systems. The authors systematically compare the two approaches using applied fractional calculus. Stability theory in fractional order controllers design is also analysed. **Features:**

- Presents material suitable for a variety of real-world applications, including hard disk drives, vehicular controls, robot control and micropositioners in DNA microarray analysis
- Includes extensive experimental results from both lab bench level tests and industrial level, mass-production-ready implementations
- Covers detailed derivations and numerical simulations for each case
- Discusses feasible design specifications, ideal for practicing engineers

The book also covers key topics including: fractional order disturbance cancelation and adaptive learning control studies for external disturbances; optimization approaches for nonlinear system control and design schemes with backlash and friction. Illustrations and experimental validations are included for each of the proposed control schemes to enable readers to develop a clear understanding of the approaches covered, and move on to apply them in real-world scenarios.

Table of Contents:

- Part I. Fundamentals Of Fractional Controls
- Part II. Fractional Order Velocity Servo
- Part III. Fractional Order Position Servo
- Part IV. Stability And Feasibility for FOPID Design
- Part V. Fractional Order Disturbance Compensators
- Part VI. Effects Of Fractional Order Controls on Nonlinearities
- Part VII. Fractional Order Control Applications

3. Forthcoming Special Issues Related to FCAA Topics

Call for Papers

The Special Issue “**New Challenges in Fractional Systems**” is posted on the journal *Mathematical Problems in Engineering*, Hindawi; at website: <http://www.hindawi.com/journals/mpe/osi/>

Fractional order differentiation consists in the generalization of classical integer differentiation to real or complex orders. From a mathematical point of view, several interpretations of fractional differentiation were proposed, but there is still a deep debate about it. The fractional differentiation and fractional integration are non-local operations based on an integral with a singular kernel. This explains why these operators are still not well defined and that several definitions still coexist. Since the first recorded reference work in 1695 up to the present day, many articles have been published on this subject, but much progress still to be done particularly on the relationship of these different definitions with the physical reality of a system. A fractional order system is a system described by an integro-differential equation involving fractional order derivatives of its input(s) and/or output(s). From a physical point of view, linear fractional derivatives and integrals order systems are not classical linear systems, and not quite conventional distributed parameter systems. They are in fact halfway between these two classes of systems, and are a modelling tool well suited to a wide class of phenomena with non-standard dynamic behaviour, and the applications of fractional order systems are now well accepted in the following **disciplines**:

- Signal processing (filtering, restoration, reconstruction, analysis of fractal noises, ...);
- Image processing (fractal environment modelling, pattern recognition, edge detection, ...);
- Economy (analysis of stock exchange signals, ...);
- Electrical engineering (modelling of motors, transformers, skin effect, ...);
- Electronics, telecommunications (phase locking loops, ...);
- Electromagnetism (modelling of complex dielectric materials, ...);
- Electrochemistry (modelling of batteries and ultracapacitors ...);
- Thermal engineering (modelling and identification of thermal systems, ...);
- Mechanics, mechatronics (viscoelasticity, vibration insulation, ...);
- Automatic control (system identification, observation and control of fractional systems, ...);
- Biology, biophysics (signal and models of biological systems, viscoelasticity in biology, ...);
- Physics (analysis and modelling of diffusion phenomenon, ...).

The goal of the present special issue is to address the latest developments in the area of fractional calculus application in signals and systems. Papers describing original research work that reflects the recent theoretical

advances and experimental results as well as open new avenues for research are invited on all aspects of object tracking.

Before submission the authors should carefully read over the journal's Author Guidelines and submit an electronic copy of their complete manuscript through the journal Manuscript Tracking System. Use websites: <http://www.hindawi.com/journals/mpe/guidelines/>
<http://mts.hindawi.com/>.

Manuscript Due: November 9, 2012

First Round of Reviews: February 1, 2012

Publication Date: March 29, 2013

Lead Guest Editor: Jocelyn Sabatier

Guest Editors: Clara Ionescu, József Kázmér Tar, Jose A. Tenreiro Machado

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4. In Memoriam: Professor Danuta Przeworska-Rolewicz

Founding Editor of FCAA,
<http://versita.com/przeworska-rolewicz/>

With great sorrow, we have to inform our audience that on June 23, 2012, at the age of 81, Prof. Danuta Przeworska-Rolewicz passed away.

She was among the Founding Editors of "FCAA" journals since 1998, served to its progress until the end, independently of the long-time illness, and published herself several articles therein.

Her fields of interest of interests were in: - singular integral equations; - algebraic methods in analysis; - functional analysis; etc.

Prof. D. Przeworska-Rolewicz authored in these areas *more than 200 articles* and *several books*, among them close to the "FCAA" area:

– D. Przeworska-Rolewicz, with S. Rolewicz: *Equations in Linear Spaces*, Monografie Matem. 47, PWN, Warsaw (1968).

– D. Przeworska-Rolewicz: *Equations with Transformed Argument. An Algebraic Approach*, PWN & Elsevier, Warsaw-Amsterdam (1973).

– D. Przeworska-Rolewicz: *Linear Spaces and Linear Operators* (in Polish), WNT, Warsaw (1977). Electronic 2-nd edition, IM PAN, 2007 .

– D. Przeworska-Rolewicz: *Introduction to Algebraic Analysis and its Applications* (in Polish), WNT, Warsaw (1979).

– D. Przeworska-Rolewicz: *Shifts and Periodicity for Right Invertible Operators*, Res. Notes in Mathematics, 43; Pitman Adv. Publish. Program, Boston-London-Melbourne (1980).

– D. Przeworska-Rolewicz: *Algebraic Analysis*, PWN & D. Reidel, Warsaw-Dordrecht (1988).

– D. Przeworska-Rolewicz: *Spaces of D-Paraanalytic Elements*, Dissertationes Math. 302, Warsaw (1994).

– D. Przeworska-Rolewicz: *Logarithms and Antilogarithms. An Algebraic Approach*. With Appendix by Z. Binderman. Kluwer Academic Publishers, Dordrecht-Boston-London (1998).

Let us remind her with a few lines of her rich biography of a brave woman:

Born in Warsaw, May 25, 1931 in the family of a world-known archeologist Stefan Przeworski, who was killed by Nazis' January 1940. Obtained M.A. in Mathematics at the University of Warsaw, Ph.D at the Institute of Mathematics of the Polish Academy of Sciences in 1958, D. Sci. (habilitation) in 1964 and the title of Professor, at the same institute, granted by the Council of State in 1974.

In 1952 she married Stefan Rolewicz, Professor at the Institute of Mathematics of the Polish Academy of Sciences and publisher of Polish Mathematical Journals.

For her activities (as a child) in the Resistance Movement during the second World War and the Warsaw Uprising in 1944, Prof. Danuta has been distinguished in 1982 by the Warsaw Uprising Cross. Other obtained awards are: St. Banach award of the Polish Mathematical Society (with S. Rolewicz) in 1968; award of the Polish Academy of Sciences in 1972 (for a book); a common award of Akademie der Wissenschaften der DDR and the Polish Academy of Sciences in 1978.

Nine persons received Ph.D. under her supervision, other 3 professors were granted the second scientific degree in collaboration with her, she gave a variety of courses in Faculty of Cybernetics of Technical Military Academy in Warsaw and many invited lectures as visiting professor abroad (longer visits in Canada, Germany, Australia, etc.).

Among her organization activities were the *periodic international conferences* "Functional-Differential Systems and Related Topics" (1979, 1981, 1983, 1985), "Different Aspects of Differentiability" (1993, 1995) and "Algebraic Analysis and Related Topics" (1999) and editing of their proceedings. She was a member of the editorial board of *Demonstratio Mathematica*, *Scientiae Mathematicae*, *Matematica Japonica* and of *Fractional Calculus and Applied Analysis*.

A more detailed CV and list of publications of Prof. D. Przeworska-Rolewicz, on occasion of her 70th anniversary, were published in FCAA, Volume 4, No 2 (2001), <http://www.math.bas.bg/~fcaa/>.