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Conferences

Deadline Extension Announcement: The 5th IFAC Symposium on Fractional Differentiation and its Applications - FDA12

May 14-17 2012, Hohai University, Nanjing, China

Website：http://em.hhu.edu.cn/fda12/

The 5th IFAC Symposium on Fractional Differentiation and Its Applications - FDA'12 will be held at Hohai University, Nanjing, China, from 14-17 May 2012. As you may know, this series of conferences is the largest of its kind, following the previous successful conferences, 2004 in France, 2006 in Portugal, 2008 Turkey, and 2010 in Spain.

Up to now, the organization committee has received nearly 300 abstracts. Thanks for the contributions from our colleagues around the world! The organization committee has extended the abstract submission deadline to January 31, 2012. Please help inform our FDA colleagues, who have yet to submit his/her abstract, do it as early as possible.

For details please visit http://em.hhu.edu.cn/fda12

Invitation to FDA12

The purpose of this Symposium in series is to provide the participants with a broad overview of the state of the art on fractional systems, leading to the cross-fertilization of new research on theoretical, experimental and computational fronts for potential uses of fractional differentiation in diverse applications. The organizing committee invites you from all over the world to come to Nanjing to attend this wonderful event.

Topics

Anomalous diffusion; Automatic Control; Biology; Continuous Time Random Walk; Electrical Engineering; Electronics; Electrochemistry; Electromagnetism; Finance and Economics; Earth Science; Fractional Filters; Biomedical Engineering; Fractional Phase-Locked Loops; Fluid Mechanics; Fractional Variational Principles; Fractional Transforms; Fractional Wavelet; Composite Drug Signals; History of Fractional Calculus; Image Processing; Mathematical methods; Mechanics; Physics; Robotics; Signal Processing; Singularities Analysis and Integral Representations for Fractional Differential Systems; Special Functions Related to Fractional Calculus; Thermal Engineering; Viscoelasticity; etc.

Plenary speakers

Prof. Guanrong Chen Prof. Virginia Kiryakova

Prof. Joseph Klafter Prof. Ralf Metzler

Prof. Jean-Claude Trigeassou Prof. Weiqiu Zhu

Important dates

Deadline for abstracts: 31 January 2012

Deadline for full papers: 15 February 2012

Deadline for early registration (fill online registration): 15 February 2012

This series of conferences is the largest of its kind. Following the previous successful conferences, 2004 in France, 2006 in Portugal, 2008 Turkey, and 2010 in Spain, we expect that 200 or so participants from around the world will attend the FDA12.

We are looking forward to meeting you at the FDA12, in Nanjing, China.

---------Organizing Committee of FDA12

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Books

Fractional Kinetics in Solids:

Anomalous Charge Transport in Semiconductors, Dielectrics and Nanosystems

(Vladimir Uchaikin and Renat Sibatov)
https://www.worldscibooks.com/physics/8185.html

The standard (Markovian) transport model based on the Boltzmann equation cannot describe some non-equilibrium processes called anomalous that take place in many disordered solids. Causes of anomality lie in non-uniformly scaled (fractal) spatial heterogeneities, in which particle trajectories take cluster form. Furthermore, particles can be located in some domains of small sizes (traps) for a long time. Estimations show that path length and waiting time distributions are often characterized by heavy tails of the power law type. This behavior allows the introduction of time and space derivatives of fractional orders. Distinction of path length distribution from exponential is interpreted as a consequence of media fractality, and analogous property of waiting time distribution as a presence of memory.

In this book, a novel approach using equations with derivatives of fractional orders is applied to describe anomalous transport and relaxation in disordered semiconductors, dielectrics and quantum dot systems. A relationship between the self-similarity of transport, the Levy stable limiting distributions and the kinetic equations with fractional derivatives is established. It is shown that unlike the well-known Scher–Montroll and Arkhipov–Rudenko models, which are in a sense alternatives to the normal transport model, fractional differential equations provide a unified mathematical framework for describing normal and dispersive transport. The fractional differential formalism allows the equations of bipolar transport to be written down and transport in distributed dispersion systems to be described. The relationship between fractional transport equations and the generalized limit theorem reveals the probabilistic aspects of the phenomenon in which a dispersive to Gaussian transport transition occurs in a time-of-flight experiment as the applied voltage is

decreased and/or the sample thickness increased. Recent experiments devoted to studies of transport in quantum dot arrays are discussed in the framework of dispersive transport models. The memory phenomena in systems under consideration are discussed in the analysis of fractional equations.

It is shown that the approach based on the anomalous transport models and the fractional kinetic equations may be very useful in some problems that involve nano-sized systems. These are photon counting statistics of blinking single quantum dot fluorescence, relaxation of current in colloidal quantum dot arrays, and some others.

Contents:

- Anomalous Diffusion
- Dispersive Transport in Semiconductors
- Anomalous Dielectric Relaxation
- Quantum Dot Systems

Readership:

Students and post-graduate students, engineers, applied mathematicians, material scientists and physicists, specialists in theory of solids, in mathematical modeling and numerical simulations of complex physical processes, and to all who wish to make themselves more familiar with fractional differentiation method.

Fractional Dynamics: Recent Advances

(Joseph Klafter, S. C. Lim and Ralf Metzler)

http://www.worldscibooks.com/physics/8087.html

This volume provides the latest developments in the field of fractional dynamics, which covers fractional (anomalous) transport phenomena, fractional statistical mechanics, fractional quantum mechanics and fractional quantum field theory. The contributors are selected based on their active and important contributions to their respective topics. This volume is the first of its kind that covers such a comprehensive range of topics in fractional dynamics. It will point out to advanced

undergraduate and graduate students, and young researchers the possible directions of research in this subject.

In addition to those who intend to work in this field and those already in the field, this volume will also be useful for researchers not directly involved in the field, but want to know the current status and trends of development in this subject. This latter group includes theoretical chemists, mathematical biologists and engineers.

Contents:

Classical Systems:

- A Class of CTRWs: Compound Fractional Poisson Processes (E Scalas)
- Origin of Allometry Hypothesis (B J West and D West)

Quantum Systems:

- Principles of Fractional Quantum Mechanics (N Laskin)
- Two Examples of Fractional Quantum Dynamics (A Iomin)
- Fractional Dynamics of Open Quantum Systems (V E Tarasov)
- Casimir Effect Associated with Fractional Klein–Gordon Field (S C Lim and L P Teo)

Readership: Researchers in mathematical physics.

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Journals

Fractional Calculus and Applied Analysis

Volume 14 / 2011 - Volume 15 / 2012

Editorial
FCAA news: Meetings, Books, Anniversaries
Virginia Kiryakova

Survey Paper
PLC implementation of a crone controller
Patrick Lanusse and Jocelyn Sabatier

Research Paper
Fractional calculus of variations for a combined Caputo derivative
Agnieszka B. Malinowska and Delfim F. M. Torres

Research Paper
On the existence and uniqueness and formula for the solution of R-L fractional cauchy problem in $\mathbb{R}^n$

Dariusz Idczak and Rafal Kamocki

Research Paper
Fractional boundary value problems: Analysis and numerical methods
Neville J. Ford and M. Lu ŝa Morgado

Survey Paper
Fractional calculus and Sinc methods
Gerd Baumann and Frank Stenger

Research Paper
Integral expressions for Mathieu-type power series and for the Butzer-Flocke-Hauss Ω-function
Živorad Tomovski and Tibor K. Pogány

Discussion Paper
And I say to myself: "What a fractional world!"
J. A. Tenreiro Machado

Chaos

Volume 21, Number 4 (2011)

Editorial:
Honoring Janis Bennett
David K. Campbell

Articles:
Vibrational resonance in excitable neuronal systems
Haitao Yu, Jiang Wang, Chen Liu, Bin Deng, and Xile Wei

Dual-lag synchronization between coupled chaotic lasers due to path-delay interference
J. Tiana-Alsina, J. H. Garcia-Lopez, M. C. Torrent, and J. Garcia-Ojalvo

Center manifold reduction for large populations of globally coupled phase oscillators
Hayato Chiba and Isao Nishikawa

Lyapunov exponents for multi-parameter tent and logistic maps
Mark McCartney

Plykin type attractor in electronic device simulated in MULTISIM
Sergey P. Kuznetsov

Understanding the complexity of the Lévy-walk nature of human mobility with a multi-scale cost/benefit model
Nicola Scafetta

Linear matrix inequality criteria for robust synchronization of uncertain fractional-order chaotic systems
Liping Chen, Yi Chai, and Ranchao Wu

Combinatorial games with a pass: A dynamical systems approach
Rebecca E. Morrison, Eric J. Friedman, and Adam S. Landsberg

Multiple coherence resonance induced by time-periodic coupling in stochastic Hodgkin–Huxley neuronal networks
Xiu Lin, Yubing Gong, and Li Wang

Noise reduction by recycling dynamically coupled time series
M. Eugenia Mera and Manuel Morán

Adaptive tuning of feedback gain in time-delayed feedback control
J. Lehnert, P. Hövel, V. Flunkert, P. Yu. Guzenko, A. L. Fradkov, and E. Schöll

Fractal descriptors in the Fourier domain applied to color texture analysis
João Batista Florindo and Odemir Martinez Bruno

Melnikov's criteria, parametric control of chaos, and stationary chaos occurrence in systems with asymmetric potential subjected to multiscale type excitation
C. A. Kitio Kwuimy, C. Nataraj, and G. Litak

Combination synchronization of three classic chaotic systems using active backstepping design
Luo Runzi, Wang Yinglan, and Deng Shucheng

Enhancement and weakening of stochastic resonance for a coupled system
Jing-hui Li

Finding communities in weighted networks through synchronization
Xuyang Lou and Johan A. K. Suykens

On stochastic stabilization of the Kelvin-Helmholtz instability by three-wave resonant interaction
S. V. Kostrykin, N. N. Romanova, and I. G. Yakushkin

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Classical Papers

The Random Walk's Guide to Anomalous Diffusion: A Fractional Dynamics Approach

Authors: Ralf Metzler, Joseph Klafter

Publication information: Physics Reports, 2000, 339, 1-77

URL: http://www.sciencedirect.com/science/article/pii/S0370157300000703

Abstract: Fractional kinetic equations of the diffusion, diffusion-advection, and Fokker-Planck type are presented as a useful approach for the description of transport dynamics in complex systems which are governed by anomalous diffusion and non-exponential relaxation patterns. These fractional equations are derived asymptotically from basic random walk models, and from a generalised master equation. Several physical consequences are discussed which are relevant to dynamical processes in complex systems. Methods of solution are introduced and for some special cases exact solutions are calculated. This report demonstrates that fractional equations have come of age as a complementary tool in the description of anomalous transport processes.

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Researchers & Groups

Mark M. Meerschaert

Department of Statistics and Probability, Michigan State University, United State

Mark M. Meerschaert is a Professor in the Department of Statistics and Probability at Michigan State University. Meerschaert has professional experience in the areas of probability, statistics, statistical physics, mathematical modeling, operations research, partial differential equations, ground water and surface water hydrology. He started his professional career in 1979 as a systems analyst at Vector Research, Inc. of Ann Arbor and Washington D.C., where he worked on a wide variety of modeling projects for government and industry. Meerschaert earned his doctorate in Mathematics from the University of Michigan in 1984. He has taught at the University of Michigan, Albion College, Michigan State University, the University of Nevada in Reno, and the University of Otago in Dunedin, New Zealand. His current research interests include limit theorems and parameter estimation for infinite variance probability models, heavy tail models in finance, modeling river flows with heavy tails and periodic covariance structure, anomalous diffusion, continuous time random walks, fractional derivatives and fractional partial differential equations, and ground water flow and transport.

Selected Publications

- Parameter estimation for tempered power law distributions, *Communications in Statistics – Theory and Methods*, to appear (with Parthanil Roy, Department of Statistics and Probability, Michigan State University; and Qin Shao, Department of Mathematics, University of Toledo). Click here to download R code and data sets used in this paper.
- Tempered fractional Cauchy problems on bounded domains, *Proceedings of the American Mathematical Society*, to appear (with Erkan Nane; and P. Vellaisamy).
- Fernique-type inequalities and moduli of continuity for anisotropic Gaussian random fields, *Transactions of the American Mathematical Society*, to appear (with Wensheng Wang, School of Finance and Statistics, East China Normal University, and Department of Mathematics, Hangzhou Normal University; and Yimin Xiao, Department of Statistics and Probability, Michigan State University).
- Fractional governing equations for coupled random walks, *Computers and Mathematics with Applications*, to appear in the Special Issue on Advances in Fractional Differential Equations III (with Agnieszka Jurlewicz; Peter Kern, Mathematical Institute, Heinrich-Heine-Universität Düsseldorf, Germany; and Hans-Peter Scheffler, Department of Mathematics, University of Siegen, Germany). Click here to download R codes used in this paper.

- Tauberian theorems for matrix regular variation, *Transactions of the American Mathematical Society*, to appear (with Hans-Peter Scheffler).
- Clustered continuous time random walks: Diffusion and relaxation consequences, *Proceedings of the Royal Society A: Mathematical, Physical & Engineering Sciences*, to appear (with Karina Weron, Institute of Physics, Wrocław University of Technology, Poland; Aleksander Stanislavsky, Institute of Radio Astronomy, Kharkov, Ukraine; Agnieszka Jurlewicz, Institute of Mathematics and Computer Science, Wrocław University of Technology, Poland; and Hans-Peter Scheffler).
- Fractal dimensions for continuous time random walk limits (with Erkan Nane; and Yimin Xiao).
- Fractional Pearson diffusion (with Nikolai N. Leonenko, Cardiff School of Mathematics, Cardiff University; and Alla Sikorskii, Department of Statistics and Probability, Michigan State University).
- Fractional calculus in hydrologic modeling: A numerical perspective (with David A. Benson and Jordan Revielle, Hydrological Science and Engineering, Colorado School of Mines).
- Space-time fractional diffusion on bounded domains (with Zhen-Qing Chen, Department of Mathematics, University of Washington; and Erkan Nane).
- A fractal Richards' equation to capture the non-Boltzmann scaling of water transport in unsaturated media (with HongGuang Sun, College of Hydrology and Water Resources, Hohai University, Nanjing 210098, China; Yong Zhang, Division of Hydrologic Sciences, Desert Research Institute, Las Vegas; Jianting Zhu, Division of Hydrologic Sciences, Desert Research Institute, Las Vegas; and Wen Chen, College of Hydrology and Water Resources, Hohai University, Nanjing 210098, China).
- Inverse stable subordinators (with Peter Straka, Department of Statistics and Probability, Michigan State University).

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Jobs

Postdoc Position, Math Biology, INRIA, France

(From NA Digest)

INRIA (Grenoble, France) invites applications for a post-doctoral position in Mathematical Biology.

Title : From smooth sigmoidal-type interactions to switch-like behavior

Subject : Applications are invited for a postdoctoral position to carry out theoretical and computational research on discontinuous dynamical systems (with switch-like interactions). Sigmoidal-type interactions are ubiquitous in biology, from the firing rate response of neurons and gene regulatory networks models to the Michaelis-Menten model for enzymes kinetics. A common approach to analyze such models is to replace the sigmoid functions by step functions leading to switch-like nonlinearities. However the use of discontinuous dynamical systems raises numerical and mathematical problems mainly due to the occurrence of the so-called sliding motion during which the solution slides along a threshold. The goal of this project is to compare the flow induced by the sigmoidal functions with the one created by the associated nonsmooth system. In particular, one open question is the link between the limit solution when sigmoids approach step functions and the solution of the discontinuous system.

- Skills: The ideal candidate should have a PhD in Applied Mathematics and should have an interest in applications in biology. The applicant should be able to perform independent research.

- Starting date and length: The position is funded for one-year with a gross monthly salary of 2264 euros and may be extended for up to 18 months.

Located in the earth of the French Alps, Grenoble is an ideal place for skiing, climbing, hiking and all types of mountains sports.

Application can be made on-line through http://www.inria.fr/en/institute/recruitment/offers/post-doctoral-research-fellowships/campaign-2012

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