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Conferences

The Extension of Early Registration

-The Fifth IFAC Symposium on Fractional Differentiation and Its Applications

May 14-17 2012, Hohai University, Nanjing, China
Website：http://em.hhu.edu.cn/fda12/

Dear FDA Colleagues,

As you know, the deadline for full paper and early registration (Feb.15) has passed. However some colleagues who have already submitted abstracts have yet to email us registration form. If you have done it, please ignore this email.

Following suggestions from our colleagues, we have extended this early registration deadline to 31 March. All participants including plenary and semi-plenary speakers, Sino-German Workshop participants are required to send your registration form to us before the end of March. Your early action will help us a lot to arrange the hotel and to plan the program as well as the other logistic issues.

All of registration form should be sent to email addresses: fda12@hhu.edu.cn or sun.fda2012@gmail.com. If you have not received acknowledgement after three days, please send email to the above-mentioned email-boxes again to avoid any temporary network problem.

We accept registration fee by bank transfer before the FDA12 and by credit card and cash on site during the FDA12.

If any further inquires, please feel free to contact us through the above email addresses.

Thanks again for your kind attention and participation!

Yours truly,

Prof. Wen Chen, Chair of Organization Committee
Prof. Dumitru Baleanu, Chair of Program Committee
Prof. Francesco Mainardi, Chair of Steering Committee

Prof. YangQuan Chen, Chair of Honors and Awards Committee
Profs. Ralf Metzler and Weihua Deng, Chairs of Sino-German Workshop on Fractional Dynamics

Website: http://em.hhu.edu.cn/fda12/index.html

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The Sino-German Workshop on Fractional Dynamics

--- financially sponsored by "China-Germany Center for Sciences"

Co-chaired by Ralf Metzler (Germany) and Weihua Deng (China)
14-17 May 2012, Nanjing, China, fully overlapped with FDA12

This Workshop has recently got great financial sponsorship from "China-Germany Center for Sciences" which is established jointly by the Natural Sciences Foundation of China and Deutsche Forschungsgemeinschaft (DFG) to support academic exchange and collaborations between China and Germany. The Sino-German Workshop, fully overlapped with **the Fifth IFAC Symposium on Fractional Differentiation and Its Applications**, intends to bring together leading experts from Germany and China.

The covered topics concern anomalous diffusion and relaxation, and their mathematical description in terms of advanced random walk models and fractional Fokker-Planck equations, as well as applications from systems including geophysics, biological physics, condensed matter and polymer physics, porous materials, general optimization of search processes, as well as econophysics. These vastly different themes indeed all share common statistical properties described by Levy stable distributions and fractional differential and integral expressions.

Germany and, more recently, China, are the most active countries in the field of fractional calculus and its applications. At the same time there has not been much contact between relevant scientists between the two countries. This Workshop intends to establish connections between these scientists and to promote future collaborations. The Workshop is certainly going to be attractive for a wider audience, as we managed to secure some of the world leaders of this field as speakers (see List of Speakers at http://em.hhu.edu.cn/fda12/Specialsessions.html), so it is a reasonable hope that the Workshop will indeed kick off a new research link between Germany and China. The total 33 researchers from both countries in addition to Israel as a partner country will get the full support from "China-Germany Center for Sciences" to attend this Workshop as well as FDA12.

Website: http://em.hhu.edu.cn/fda12/index.html

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Fractional Differential Equations (2012)

(Contributed Prof. by Fawang Liu)

Call for Papers

In recent years, a growing number of works by many authors from various fields of science and engineering deal with dynamical systems described by fractional differential equations. Fractional differential equations are generalization of ordinary differential equations to arbitrary (noninteger) order. Fractional differential equations capture nonlocal relations in space and time with power law memory kernels. Due to extensive applications in engineering and science, research in fractional differential equations has become intense around the world.

We invite authors to present original research articles as well as review articles in the area of fractional differential equations and their applications. This special issue will become an international forum for researches to present the most recent developments and ideas in the field. Potential topics include, but are not limited to:

- **Mathematical modeling of fractional dynamic systems**
- **Analytical and numerical methods to solve these equations**
- **Fractional image processing**
- **Anomalous diffusion**
- **Theorem of fractional difference equations**
- **Fractional model of viscoelastic damping**
- **Fractional controller design and system identification**
- **Stability analysis of fractional systems**
- **Nonlinear and stochastic fractional dynamic systems**
- **Fractional models and their experimental verifications**
- **Applications of fractional models to engineering systems**
- **Fractional models in geophysics**
- **Fractional random fields**
- **Probabilistic solutions of FDE**
- **Fractional dynamics and control**

Before submission authors should carefully read over the journal's Author Guidelines, which are located at http://www.hindawi.com/journals/ijde/guidelines/. Prospective authors should submit an electronic copy of their complete manuscript through the journal Manuscript Tracking System at http://mts.hindawi.com/ according to the following timetable:

Manuscript Due Friday, 18 May 2012
First Round of Reviews Friday, 10 August 2012
Publication Date Friday, 5 October 2012

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• Nikolai N. Leonenko, School of Mathematics, Cardiff University, Cardiff CF2 4YH, UK
• Wen Chen, Department of Engineering Mechanics, Hohai University, Xikang Road No. 1, Nanjing 210098, China

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Books

Fractional Calculus for Scientists and Engineers

Manuel Duarte Ortigueira

http://www.springer.com/engineering/computational+intelligence+and+complexity/book/978-94-007-0746-7

• Provides a practical overview of Fractional Calculus.
• Designed to be accessible by Scientists and Engineers mainly interested in applications.
• Multidisciplinary presentation will be useful to researchers in fields such as electromagnetism, control engineering, and signal processing.

In recent years fractional calculus has been rediscovered by scientists and engineers and applied in an increasing number of fields, such as electromagnetism, control engineering, and signal processing. The increase in the number of physical and engineering processes that are best described by fractional differential equations has motivated its study.
This book gives a practical overview of Fractional Calculus as it relates to Signal Processing. It is designed to be accessible by Scientists and Engineers mainly interested in applications, who do not want to spend too much time and effort to access to the main Fractional Calculus features and tools. Readers can benefit from the attempt to present a Fractional Calculus foundation based of the

Grünwald-Letnikov derivative, because it exhibits great coherence allowing deduction from it the other derivatives, which appear as a consequence of the Grünwald-Letnikov derivative properties and not as a prescription.

Keywords: Fractional Calculus - Fractional Derivative - Fractional Signal Processing - Linear Systems - Quantum Computing

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FRACTIONAL CALCULUS: An Introduction for Physicists

Richard Herrmann

Fractional calculus is undergoing rapid and ongoing development. We can already recognize, that within its framework new concepts and strategies emerge, which lead to new challenging insights and surprising correlations between different branches of physics.

This book is an invitation both to the interested student and the professional researcher. It presents a thorough introduction to the basics of fractional calculus and guides the reader directly to the current state-of-the-art physical interpretation. It is also devoted to the application of fractional calculus on physical problems, in the subjects of classical mechanics, friction, damping, oscillations, group theory, quantum mechanics, nuclear physics, and hadron spectroscopy up to quantum field theory.

Contents:

- Nonlocality and Memory Effects
- Quantum Mechanics
- Fractional Spin: A Property of Particles Described with the Fractional Schrödinger Equation
- Factorization
- Symmetries
- The Fractional Symmetric Rigid Rotor
- q-Deformed Lie Algebras and Fractional Calculus
- Fractional Spectroscopy of Hadrons
- Higher Dimensional Fractional Rotation Groups
- Fractors: Fractional Tensor Calculus
- Fractional Fields
- Gauge Invariance in Fractional Field Theories
- Outlook

Readership: Students and researchers in physics.

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Journals

Chaos

Volume 22, Number 1 (2012)

The impact of awareness on epidemic spreading in networks
Qingchu Wu, Xinchu Fu, Michael Small, and Xin-Jian Xu

Multiscale dynamics in communities of phase oscillators
Dustin Anderson, Ari Tenzer, Gilad Barlev, Michelle Girvan, Thomas M. Antonsen and Edward Ott

Resonance phenomena and long-term chaotic advection in volume-preserving systems
Dmitri L. Vainchtein and Alimu Abudu

Propagation of spiking regularity and double coherence resonance in feedforward networks
Cong Men, Jiang Wang, Ying-Mei Qin, Bin Deng, Kai-Ming Tsang, and Wai-Lok Chan

Transcripts: An algebraic approach to coupled time series
José M. Amigó, Roberto Monetti, Thomas Aschenbrenner, and Wolfram Bunk

Saddle-point solutions and grazing bifurcations in an impacting system
Joanna F. Mason and Petri T. Piiroinen

Multiscale characterization of recurrence-based phase space networks constructed from time series
Ruoxi Xiang, Jie Zhang, Xiao-Ke Xu, and Michael Small

Fractal variability: An emergent property of complex dissipative systems
Andrew J. E. Seely and Peter Macklem

Analytical properties of horizontal visibility graphs in the Feigenbaum scenario
Bartolo Luque, Lucas Lacasa, Fernando J. Ballesteros, and Alberto Robledo

Theoretical analysis of multiplicative-noise-induced complete synchronization in global coupled dynamical network
Yuzhu Xiao, Sufang Tang, and Yong Xu

Using time-delayed mutual information to discover and interpret temporal correlation structure in complex populations
D. J. Albers and George Hripcsak

Vibrational resonance in Duffing systems with fractional-order damping
J. H. Yang and H. Zhu

Symmetry chaotic attractors and bursting dynamics of semiconductor lasers subjected to optical injection
A. D. Mengue and B. Z. Essimbi

Multistability of twisted states in non-locally coupled Kuramoto-type models
Taras Girnyk, Martin Hasler, and Yuriy Maistrenko

Geometric and dynamic perspectives on phase-coherent and noncoherent chaos
Yong Zou, Reik V. Donner, and Jürgen Kurths

Long-range interactions between adjacent and distant bases in a DNA and their impact on the ribonucleic acid polymerase-DNA dynamics
M. Saha and T. C. Kofane

The structure and resilience of financial market networks
Thomas Kauê Dal'Maso Peron, Luciano da Fontoura Costa, and Francisco A. Rodrigues

Alternation of regular and chaotic dynamics in a simple two-degree-of-freedom system with nonlinear inertial coupling

G. Sigalov, O. V. Gendelman, M. A. AL-Shudeifat, L. I. Manevitch, A. F. Vakakis, and L. A. Bergman

Finger tapping movements of Parkinson's disease patients automatically rated using nonlinear delay differential equations
C. Lainscsek, P. Rowat, L. Schettino, D. Lee, D. Song, C. Letellier, and H. Poizner

Stabilization of chaos systems described by nonlinear fractional-order polytopic differential inclusion
Saeed Balochian and Ali Khaki Sedigh

Bifurcation phenomena in an impulsive model of non-basal testosterone regulation
Zhanybai T. Zhusubaliyev, Alexander N. Churilov, and Alexander Medvedev

Neural networks and chaos: Construction, evaluation of chaotic networks, and prediction of chaos with multilayer feedforward networks
Jacques M. Bahi, Jean-François Couchot, Christophe Guyeux, and Michel Salomon

Nonlinear dynamics of the membrane potential of a bursting pacemaker cell
J. M. González-Miranda

Exponential synchronization of stochastic neural networks with leakage delay and reaction-diffusion terms via periodically intermittent control
Qintao Gan

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Chaos, Solitons & Fractals

Volume 45, Issue 4, (April 2012)

Coupled polariton solitons in semiconductor microcavities with a double-well potential
W.L. Zhang, Y.J. Rao

Mary signal detection via a bistable system in the presence of Lévy noise
Lingzao Zeng, Jianlong Li, Jiachun Shi

Effect of asynchronous updating on the stability of cellular automata
J.M. Baetens, P. Van der Weeën, B. De Baets

Strategy changing penalty promotes cooperation in spatial prisoner's dilemma game
Qing Jin, Zhen Wang, Zhen Wang, Yi-Ling Wang

Nonlinear quantum dynamics in diatomic molecules: Vibration, rotation and spin
Ciann-Dong Yang, Hung-Jen Weng

The stability of distributed neutral delay differential systems with Markovian switching
R. Ravi Kumar, Kil To Chong

Switching induced complex dynamics in an extended logistic map
Erik A. Levinsohn, Steve A. Mendoza, Enrique Peacock-López

Fiscal policy lags and income adjustment processes
Luigi De Cesare, Mario Sportelli

Mixing properties of set-valued maps on hyperspaces via Furstenberg families
Heman Fu, Zhitao Xing

A family of integrable differential–difference equations, its bi-Hamiltonian structure and binary nonlinearization of the Lax pairs and adjoint Lax pairs
Xi-Xiang Xu

Limit cycles near generalized homoclinic and double homoclinic loops in piecewise smooth systems
Feng Liang, Maoan Han

The discontinuous flat top tent map and the nested period incrementing bifurcation structure
Ben Futter, Viktor Avrutin, Michael Schanz

Robust stability analysis for Markovian jumping interval neural networks with discrete and distributed time-varying delays
P. Balasubramaniam, S. Lakshmanan, A. Manivannan

Global exponential synchronization criterion for switched linear coupled dynamic networks
Zhi Li

Differential form method for finding symmetries of a (2 + 1)-dimensional Camassa–Holm system based on its Lax pair
Na Lv, Jian-Qin Mei, Hong-Qing Zhang

Nonlinear delay monopoly with bounded rationality
Akio Matsumoto, Ferenc Szidarovszky

Some fixed point results for a generalized ψ-weak contraction mappings in orbitally metric spaces
Wasfi Shatanawi

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Classical Papers

Fractional calculus: integral and differential equations of fractional order

A. Carpinteri and F. Mainardi

(Contributed by R. Gorenflo and F. Mainardi)

Publication information: *Fractals and Fractional Calculus in Continuum Mechanics.* Springer Verlag, Wien and New York, 1997, pp. 223- 276.

E-print: arXiv:0805.3823

We introduce the linear operators of fractional integration and fractional differentiation in the framework of the Riemann-Liouville fractional calculus. Particular attention is devoted to the technique of Laplace transforms for treating these operators in a way accessible to applied scientists, avoiding unproductive generalities and excessive mathematical rigor. By applying this technique we shall derive the analytical solutions of the most simple linear integral and differential equations of fractional order. We show the fundamental role of the Mittag-Leffler function, whose properties are reported in an ad hoc Appendix. The topics discussed here will be: (a) essentials of Riemann-Liouville fractional calculus with basic formulas of Laplace transforms, (b) Abel type integral equations of first and second kind, (c) relaxation and oscillation type differential equations of fractional order.

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Mittag-Leffler waiting time, power laws, rarefaction, continuous time random walk, diffusion limit

S.S. Pai, N. Sebastian, S.S. Nair, Dh.P. Joseph, D. Kumar

(Contributed by Rudolf Gorenflo)

Publication information: Pages 1-22 in: Proceedings of the *National Workshop on Fractional Calculus and Statistical Distributions*, November 25-27, 2009,
Publication No. 41 (July **2010**) of *Centre for Mathematical Sciences Pala Campus*, Pala/Kerala/India.

E-print: arXiv:1004.4413

We discuss some applications of the Mittag-Leffler function and related probability distributions in the theory of renewal processes and continuous time random walks. In particular we show the asymptotic (long time) equivalence of a generic power law waiting time to the Mittag-Leffler waiting time distribution via rescaling and respeeding the clock of time. By a second respeeding (by rescaling the spatial variable) we obtain the diffusion limit of the continuous time random walk under power law regimes in time and in space. Finally, we exhibit the time-fractional drift process as a diffusion limit of the fractional Poisson process and as a subordinator for space-time fractional diffusion.

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Researchers & Groups

AFC Group at CSOIS@USU

Center for Self-Organizing and Intelligent Systems, Electrical and Computer Engineering, Utah State University, USA
Director: YangQuan Chen

About AFC at CSOIS@USU:

The Applied Fractional Calculus (AFC) is a multi-disciplinary research group at Utah State University (USU) that focuses on signal processing, modeling, and control for real world applications based on **fractional calculus**, with a recent focus on understanding complex systems and complexity, stochasticity through the fractional dynamics. Our funded efforts linked to fractional calculus are in areas such as industrial motion and process controls, renewable energy systems (solar, algea, battery etc.), crowd dynamics and evacuation control, cyber-physical systems, medical image sequence processing, UAV-based personal remote sensing etc.

Current Members on AFC at CSOIS@USU:

YangQuan Chen
Dr. YangQuan Chen is an Associate Professor of Dept. of Electrical and Computer Engineering of Utah State University (USU) and the Director of Center for Self-Organizing and Intelligent Systems (CSOIS) of USU.
Contact: yqchen@ieee.org
URL: http://mechatronics.ece.usu.edu/yqchen/
Google myCitation: http://scholar.google.com/citations?user=RDEIRbcAAAAJ&hl=en

BS'85, MSc.89, Ph.D. 98.
Interests in AFC: Fractional order signal processing, modeling, and control for real world applications. Fractional dynamics (CO/VO/DO) as a pathway to understanding complex systems, complexity and stochasticity.

Igor Podlubny
Contact: igor.podlubny@tuke.sk
URL: http://www.tuke.sk/podlubny/
Google myCitation: http://scholar.google.com/citations?user=4H2CInEAAAAJ
Interests in AFC: Fractional calculus, Integral transforms, Integral equations, Orthogonal polynomials, Mittag-Leffer fuctions and other special functions, Numerical methods, Viscoelasticity, Heat conduction, Fracture mechanics, Dynamical systems, Control theory, Biology and medicine, Non-Newtonian physics.

Ying Luo
Contact: luoyinglarry@yahoo.com
Google myCitation: http://scholar.google.com/citations?user=QkC9IwYAAAAJ&hl=en
BS'04, Ph.D. 09
Interests in AFC: Fractional order modeling and control for real world applications.

Gary Bohannan
MSEE: 1975, Naval Postgraduate School, Monterey, CA, USA PhD (Condensed Matter Physics): 2000, Montana State University, Bozeman, MT, USA
Contact: gary.bohannan@gmail.com gwbohannan@stcloudstate.edu
Research interest: Fractional order dynamics, analog fractance devices, fractional order modeling and control system design.

Hadi Malek
Contact: hadi.malek@ieee.org, hadi.malek@energydynamicslab.com
BS 2001, MSc. 2007, Ph.D. 2013.
Interests in AFC: Inductive Power Transmission(IPT), Applications of Fractional Order Operators in Renewable Energy Systems, Fractional Order Modeling and Control, Power Electronics & Electromagnetic.

Jinlu Han
Contact: jinlu.han@aggiemail.usu.edu
Interest in AFC: Fractional order control for cyber-physical systems.

Zhuo Li
Contact: Zhuo.li@aggiemail.usu.edu
URL: https://sites.google.com/site/zhuolishomepage/
BS'09, MSc.11, Ph.D. ongoing.
Interests in control theory with implementation on cyber-physical systems such as unmanned robots and mobile sensing and actuation systems.

Dan Stuart

Contact: IdahoEinstein@gmail.com

Interests in AFC: Fractional order control and dynamics as it applies to crowd dynamics, computer vision, and other real world applications.

Xuefeng Zhang

Contact: fushun-info@163.com

Interests in AFC: Linear time varying fractional order systems, and fractional order game dynamic systems.

Kecai Cao

Contact: caokecai@gmail.com

BS'00, MS.03, Ph.D. 07.

Interests in AFC: Using fractional calculus in modeling of complex systems such as crowd dynamics, financial dynamics and opinion dynamics; Apllication of fractional order controllers in real world problems.

Yaojin Xu

Contact: xuyaojin2003@163.com

BS'07, Ph.D. 2007-

Interests in control theory and applications, especially in consensus control and sourcing seeking of multi-agent systems.

Chun Yin

Contact: yinchun.86416@163.com

BS'08, Ph.D. ongoing.

Interests in control theory with implementation on cyber-physical systems such as PD control and sliding mode control.

Caibin Zeng

Contact: zeng.cb@mail.scut.edu.cn

BS'08, Ph.D. 2008-

Interests in AFC: Fractional Brownian motion, Anomalous diffusion, Fractional order stochastic systems, and Crowd dynamics.

Monographs and Edited Books:

1. Ying Luo and YangQuan Chen. “Fractional Order Motion Controls” John-Wiley and Sons, Inc., 2012 (Under contract, to appear summer 2012, 470 pages).

2. Zhuang Jiao, YangQuan Chen and Igor Podlubny. “Distributed-Order Dynamic Systems: Stability, Simulation, Applications and Perspectives” SpringerBrief, Springer-Verlag (under contract, to appear early 2012, 90 pages).

3. YangQuan Chen, Blas M Vinagre, Dingyu Xue, Vicente Feliu. "Fractional-order systems and controls: fundamentals and applications" Springer, 2010.

4. Igor Podlubny, Blas M. Vinagre Jara, YangQuan Chen, Vicente Feliu Batlle and Inés Tejado Balsera (2010). Proceedings of the 4-th IFAC International Workshop on Fractional Derivatives and Applications. (http://web.tuke.sk/fda10/)

5. Blas M Vinagre and YangQuan Chen (2002). "Fractional Calculus Applications in Automatic Control and Robotics". Lecture Notes Prepared for The Tutorial Workshop at the IEEE International Conference on Decision and Control (CDC), Dec. 9 2002, Las Vegas, USA. (http://mechatronics.ece.usu.edu/foc/cdc02tw/cdrom/Lectures/book.pdf)

Selected Publications:

1. C Li, Z Zhao and YQ Chen. Numerical approximation of nonlinear fractional differential equations with subdiffusion and superdiffusion, Computers & Mathematics with Applications, 2011.

2. Y Li, YQ Chen and I Podlubny. Stability of fractional-order nonlinear dynamic systems: Lyapunov direct method and generalized Mittag-Leffler stability, *Computers & Mathematics with Applications*, 2010, 59 (5): 1810-1821.

3. Y Li, YQ Chen and I Podlubny. Mittag–Leffler stability of fractional order nonlinear dynamic systems, *Automatica*, 2009, 45 (8): 1965-1969.

4. CA Monje, BM Vinagre, V Feliu, YQ Chen. Tuning and auto-tuning of fractional order controllers for industry applications, *Control Engineering Practice*, 2008, 16 (7): 798-812.

5. YQ Chen, HS Ahn and I Podlubny. Robust stability check of fractional order linear time invariant systems with interval uncertainties, *Signal Processing*, 2006, 86 (10): 2611-2618.

6. YQ Chen, BM Vinagre and I Podlubny. Continued fraction expansion approaches to discretizing fractional order derivatives—an expository review, *Nonlinear Dynamics*, 2004, 38 (1): 155-170.

7. BM Vinagre, YQ Chen and I Petras. Two direct Tustin discretization methods for fractional-order differentiator/integrator, *Journal of the Franklin Institute*, 2003, 340 (5): 349-362.

8. YQ Chen, BM Vinagre. A new IIR-type digital fractional order differentiator, *Signal Processing*, 2003, 83 (11): 2359-2365.

9. YQ Chen, KL Moore. Discretization schemes for fractional-order differentiators and integrators, *Circuits and Systems I: Fundamental Theory and Applications, IEEE Transactions on*, 2002, 49 (3): 363 -367.

10. D Xue, YQ Chen. A comparative introduction of four fractional order controllers, *Intelligent Control and Automation*, 2002. Proceedings of the 4th World Congress on, 4(4): 3228-3235.

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