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Call for Paper

Special Issue on "Advanced Topics in Fractional Dynamics" in the journal "Advances in Mathematical Physics"

(Contributed by Prof. J. A. Tenreiro Machado)
http://www.hindawi.com/journals/amp/si/372436/cfp/

Call for Papers
Fractional order differentiation consists in the generalisation of classical integer differentiation to real or complex orders. During the last decades, fractional differentiation has drawn increasing attention in the study of the so-called anomalous social and physical behaviors, where scaling power law of fractional order appears universal as an empirical description of such complex phenomena. The goal of this special issue is to address the latest developments in the area of fractional calculus application in dynamical systems. Papers describing original research work that reflects the recent theoretical advances and experimental results as well as new topics for research are invited on all aspects of object tracking. Potential topics include, but are not limited to:
Modeling and applications of complex systems in physics, biology,
biophysics, and medicine
Fractional variational principles
Continuous time random walk
Computational fractional derivative equations
Viscoelasticity
Fractional differential equations
Fractional operators on fractals
Local fractional derivatives
Automatic control Thermal systems
Electromagnetism
Economical and financial systems
Electrical, mechanical, and thermal systems
Bifurcation
Chaos
Synchronization

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Manuscript Due Friday, 17 May 2013
First Round of Reviews Friday, 9 August 2013
Publication Date Friday, 4 October 2013

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Books

Fractional Kinetics in Solids: Anomalous Charge Transport in Semiconductors, Dielectrics and Nanosystems

Vladimir Uchaikin (Author), Renat Sibatov (Author)

Book Description

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:

• Statistical Grounds
• Fractional Kinetics of Dispersive Transport
• Transient Processes in Disordered Semiconductor Structures
• Fractional Kinetics in Quantum Dots and Wires
• Fractional Relaxation in Dielectrics
• The Scale Correspondence Principle

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.

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Journals

Nonlinear Dynamics

Volume 71, Issue 1-2

Original Paper

Similarity reductions and exact solutions of generalized Bretherton equation with time-dependent coefficients
R. K. Gupta, Anupma Bansal

Fuzzy PID control of epileptiform spikes in a neural mass model
Xian Liu, Huijun Liu, Yinggan Tang, Qing Gao

Breaking and improving an image encryption scheme based on total shuffling scheme
Congxu Zhu, Chunlong Liao, Xiaoheng Deng

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Journal of Computational Physics

Volume 238, In progress

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International Journal of Mathematics & Computation

Volume 19, Number 2

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Paper Highlight

State transition of a non-Ohmic damping system in a corrugated plane

Kun Lü and Jing-Dong Bao

Publication information: Kun Lü and Jing-Dong Bao. State transition of a non-Ohmic damping system in a corrugated plane. Physical Review E 76, 061119 (2007).
http://pre.aps.org/abstract/PRE/v76/i6/e061119

Abstract
Anomalous transport of a particle subjected to non-Ohmic damping of the power δ in a tilted periodic potential is investigated via Monte Carlo simulation of the generalized Langevin equation. It is found that the system exhibits two relative motion modes: the locked state and the running state. In an environment of sub-Ohmic damping $0<\delta<1$, the particle should transfer into a running state from a locked state only when local minima of the potential vanish; hence a synchronization oscillation occurs in the particle's mean displacement and mean square displacement (MSD). In particular, the two motion modes are allowed to coexist in the case of super-Ohmic damping $1<\delta<2$ for moderate driving forces, namely, where double centers exist in the velocity distribution. This causes the particle to have faster diffusion, i.e., its MSD reads <x^2(t)>=2D_{eff}^δ t^{δ_eff}. Our result shows that the effective power index _eff can be enhanced and is a nonmonotonic function of the temperature and the driving force. The mixture of the two motion modes also leads to a breakdown of the hysteresis loop of the mobility.

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Anomalous diffusion: nonlinear fractional Fokker-Planck equation

C. Tsallis, E.K. Lenzi

Publication information: C. Tsallis, E.K. Lenzi. Anomalous diffusion: nonlinear fractional Fokker-Planck equation. Chemical Physics 284: 341-347(2002).
http://www.sciencedirect.com/science/article/pii/S0301010402005578

Abstract
We discuss the anomalous diffusion associated with a nonlinear fractional Fokker－Planck equation with a diffusion coefficient $D \propto |x|^{-\theta} (\theta \in R)$. Two classes of exact solutions are found. The first one is a modified porous medium equation and corresponds to integer derivatives and a drift force $F \propto x|x|^{\alpha-1} (\alpha \in R)$. The second one corresponds to fractional space derivative in the absence of external drift. The connection with nonextensive statistical mechanics is also discussed in both cases.

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The End of This Issue