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Fractal Derivative and Operators and Their Applications

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Latest SCI Journal Papers on FDA

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(Searched on Aug 30, 2020)

Optimal leader-following consensus of fractional opinion formation models
By: Almeida, Ricardo; Kamocki, Rafal; Malinowska, Agnieszka B.; etc..
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 381 Published: JAN 1 2021

An efficient algorithm for numerical solution of fractional integro-differential equations via Haar wavelet
By: Amin, Rohul; Shah, Kamal; Asif, Muhammad; etc..
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 381 Published: JAN 1 2021

Robust stability criterion for perturbed singular systems of linearized differential equations
By: Dassios, Ioannis; Tzounas, Georgios; Milano, Federico
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 381 Published: JAN 1 2021

Option pricing in illiquid markets: A fractional jump-diffusion approach
By: Hainaut, Donatien; Leonenko, Nikolai
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 381 Published: JAN 1 2021

A finite difference method for an initial-boundary value problem with a Riemann-Liouville-Caputo spatial fractional derivative
By: Luis Gracia, Jose; Stynes, Martin
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 381 Published: JAN 1 2021

Some comments on using fractional derivative operators in modeling non-local diffusion processes
By: Namba, T.; Rybka, P.; Voller, V. R.
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Real-time reconstruction of external impact on fractional order system under measuring a part of coordinates
By: Surkov, P. G.
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 381 Published: JAN 1 2021

Solving ill-posed problems faster using fractional-order Hopfield neural network
By: Tavares, Camila A.; Santos, Tainah M. R.; Lemes, Nelson H. T.; etc..
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 381 Published: JAN 1 2021

Euler-Maruyama scheme for Caputo stochastic fractional differential equations
By: Doan, T. S.; Huong, P. T.; Kloeden, P. E.; etc..
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 3809 Published: DEC 15 2020

Shifted Jacobi spectral-Galerkin method for solving fractional order initial value problems
By: Kim, Hyunju; Kim, Keon Ho; Jang, Bongsoo
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 380 Published: DEC 15 2020

Multistep schemes for one and two dimensional electromagnetic wave models based on fractional derivative approximation
By: Maurya, Rahul Kumar; Devi, Vinita; Singh, Vineet Kumar
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 380 Published: DEC 15 2020

Fourth order compact scheme for space fractional advection-diffusion reaction equations with variable coefficients
By: Patel, Kuldip Singh; Mehra, Mani
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 380 Published: DEC 15 2020

The fractional Tikhonov regularization methods for identifying the initial value problem for a time-fractional diffusion equation
By: Yang, Fan; Pu, Qu; Li, Xiao-Xiao
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 380 Published: DEC 15 2020

Fractional Fourier transform based underwater multi-targets direction-of-arrival estimation using wideband linear chirps
By: Yin, Jing-wei; Guo, Kun; Han, Xiao; etc..
APPLIED ACOUSTICS Volume: 169 Published: DEC 2020

Semi-Linear Fractional sigma-Evolution Equations with Nonlinear Memory
By: Kainane Mezadek, Abdelatif

JOURNAL OF PARTIAL DIFFERENTIAL EQUATIONS Volume: 33 Issue: 4 Pages: 291-312
Published: DEC 2020

Fractal Dimension of Random Attractors for Non-autonomous Fractional Stochastic Reaction-diffusion Equations
By: Shu Ji; Bai Qianqian; Huang Xin; etc..
JOURNAL OF PARTIAL DIFFERENTIAL EQUATIONS Volume: 33 Issue: 4 Pages: 377-394
Published: DEC 2020

A Weak Galerkin Finite Element Method for High Dimensional Time-fractional Diffusion Equation
By: Wang, Xiuping; Gao, Fuzheng; Liu, Yang; etc..
APPLIED MATHEMATICS AND COMPUTATION Volume: 386 Published: DEC 1 2020

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Call for Papers

Applications of Fractional and Hausdorff Fractal Derivatives in Modeling of Anomalous Physical and Engineering Behaviors

(research topic of Frontiers)

As an extension of the classical integer-order modeling approach, fractional calculus has long been recognized as an efficient and valuable tool in modeling complex phenomena, such as anomalous diffusion, viscoelastic behaviors, heat conduction, chaos, and magnetic resonance imaging. Nowadays, various numerical methods also have been conducted to reveal the underground physical interpretations for the fractional models. Nevertheless, the fractional operator is well-known as a non-local one, which will bring in remarkable computational costs and memory requirements for the numerical simulation.
Hausdorff fractal derivative, one kind of fractal derivatives, has also been proposed to describe a variety of complex problems. Fractal operator significantly extends the application scope of the classical calculus modeling approach under the framework of continuum mechanics to fractal materials. The Hausdorff derivative is mathematically simple and numerically easy to implement with clear physical significance and real-world applications.

Nowadays, various modeling formalisms, including fractional derivative and Hausdorff fractal derivative

operators, have been proposed to characterize anomalous physical and engineering behaviors. The fractional derivative operator is well suitable for non-local phenomena and long-term interactions, while Hausdorff fractal derivative underlines the Non-Euclidean distance and temporal scale effect. The inherent relationships and comparisons between these models lack detailed discussions.
Moreover, the existing models have been found to well describe some specific problems with data fitting or qualitative analysis. The underlying physical interpretations of the modeling formalisms or identifications of parameters still require intensive attention.
This Research Topic aims to collect the up-to-the-minute developments in such two modeling operators, including modeling and numerical simulation.

Related research areas (not limited to):

• Anomalous diffusion: ultra-slow diffusion, sub- and super diffusion;
• Complex rheological behaviors;
• Power-law acoustic attenuation;
• Non-Newtonian fluid;
• Biomedical engineering;
• Signal Processing;
• Other applications of the abovementioned two kinds of models;
• Advanced numerical methods for fractional derivative models;
• Physical analysis of fractional derivative and Hausdorff fractal derivative models;
• Recent development of variable-order fractional derivative and local derivative modeling formalisms, and the corresponding applications.

Important Note:

All contributions to this Research Topic must be within the scope of the section and journal to which they are submitted, as defined in their mission statements. Frontiers reserves the right to guide an out-of-scope manuscript to a more suitable section or journal at any stage of peer review.

Submission Deadlines:

Submission of Abstract: 15 November 2020
Submission of Manuscript: 13 January 2021

All details on this online conference are now available at: https://www.frontiersin.org/research-topics/15439/applications-of-fractional-and-hausdorff-fractal-derivatives-in-modeling-of-anomalous-physical-and-e.

Dynamical Systems, Differential Equations and Applications

(special issue of entropy)

This Special Issue is dedicated to the International Conference on Mathematical Analysis and Applications in Science and Engineering (ICMA2SC'20, https://www.isep.ipp.pt/Page/ViewPage/ICMASC). ICMA2SC'20 is a refereed conference emphasizing different topics of mathematical analysis and applications in science and engineering. This Special Issue will focus on dynamical systems taken in the broad sense; these include, in particular, iterative dynamics, ordinary differential equations, and (evolutionary) partial differential equations. We welcome papers dealing with these topics, either at a theoretical level or at a level of their multiple applications to physics (e.g., cosmology, quantum physics and matter theory, and thermodynamics), or yet as standard applications to control theory, artificial intelligence, diagnosis algorithms, and so on.
Entropy is an international journal enjoying a high Impact Factor, and definitely constitutes one of the most appropriate outlets for the publication of quality research in the topics mentioned above. Note that both original research works and outstanding review articles are called for in this Special Issue.

Keywords:

- iterative dynamics
- ordinary differential equations
- (evolutionary) partial differential equations
- applications to physics (cosmology, quantum physics, matter theory, thermodynamics) and other sciences.

Manuscript Submission Information:

Manuscripts should be submitted online at www.mdpi.com by registering and logging in to this website. Once you are registered, click here to go to the submission form. Manuscripts can be submitted until the deadline. All papers will be peer-reviewed. Accepted papers will be published continuously in the journal (as soon as accepted) and will be listed together on the special issue website. Research articles, review articles as well as short communications are invited. For planned papers, a title and short abstract (about 100 words) can be sent to the Editorial Office for announcement on this website.
Submitted manuscripts should not have been published previously, nor be under consideration for publication elsewhere (except conference proceedings papers). All manuscripts are thoroughly refereed through a single-blind peer-review process. A guide for authors and other relevant information for submission of manuscripts is available on the Instructions for Authors page. Entropy is an international peer-reviewed open access monthly journal published by MDPI. Please visit the Instructions for Authors page before submitting a manuscript. The Article Processing Charge (APC) for publication in this open access journal is 1600 CHF (Swiss Francs). Submitted papers should be well formatted and use good English. Authors may use MDPI's English editing service prior to publication or during author revisions.

Submission Deadlines:

The official submission deadline is 1 October 2020 and will be *postponed* to 2021 year at a later stage.

All details on this online conference are now available at:
https://www.mdpi.com/journal/entropy/special_issues/diff.

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Books

Fractional Calculus in Medical and Health Science

(Editors:Devendra Kumar, Jagdev Singh)

Details:https://www.routledge.com/Fractional-Calculus-in-Medical-and-Health-Science/Kumar-Singh/p/book/9780367351212

Book Description

This book covers applications of fractional calculus used for medical and health science. It offers a collection of research articles built into chapters on classical and modern dynamical systems formulated by fractional differential equations describing human diseases and how to control them.
The mathematical results included in the book will be helpful to mathematicians and doctors by enabling them to explain real-life problems accurately. The book will also offer case studies of real-life situations with an emphasis on describing the mathematical results and showing how to apply the results to medical and health science, and at the same time highlighting modeling strategies.
The book will be useful to graduate level students, educators and researchers interested in mathematics and medical science.

Editors Biography

Devendra Kumar is an Assistant Professor in the Department of Mathematics, University of Rajasthan, Jaipur-302004, Rajasthan, India. He did his Master of Science (M.Sc.) in Mathematics and Ph.D. in Mathematics from University of Rajasthan, India. He primarily teaches the subjects like real and complex analysis, functional analysis, integral equations and special functions in post-graduate level course in mathematics. His area of interest is Mathematical Modelling, Special Functions, Fractional Calculus, Applied Functional Analysis, Nonlinear Dynamics, Analytical and Numerical Methods. He has published two books: Engineering Mathematics-I (2008), Engineering Mathematics-II (2013). His works have been published in the Nonlinear Dynamics, Chaos Solutions & Fractals, Physical A, Journal of Computational and Nonlinear Dynamics, Applied Mathematical Modelling, Entropy, Advances in Nonlinear Analysis, Romanian Reports in Physics, Applied Mathematics and Computation, Chaos and several other peer-reviewed international journals. His 130 research papers have been published in various Journals of repute with h-index of 30. He has attained a number of National and International Conferences and presented several research papers. He has also attended Summer Courses, Short Terms Programs and Workshops.

Jagdev Singh is an Associate Professor in the Department of Mathematics, JECRC University, Jaipur-303905, Rajasthan, India. He did his Master of Science (M.Sc.) in Mathematics and Ph.D. in Mathematics from University of Rajasthan, India. He primarily teaches the subjects like mathematical modeling, real

analysis, functional analysis, integral equations and special functions in post-graduate level course in mathematics. His area of interest is Mathematical Modelling, Mathematical Biology, Fluid Dynamics, Special Functions, Fractional Calculus, Applied Functional Analysis, Nonlinear Dynamics, Analytical and Numerical Methods. He has published three books: Advance Engineering Mathematics (2007), Engineering Mathematics-I (2008), Engineering Mathematics-II (2013). His works have been published in the Nonlinear Dynamics, Chaos Solutions & Fractals, Physica A, Journal of Computational and Nonlinear Dynamics, Applied Mathematical Modelling, Entropy, Advances in Nonlinear Analysis, Romanian Reports in Physics, Applied Mathematics and Computation, Chaos and several other peer-reviewed international journals. His 120 research papers have been published in various Journals of repute with h-index of 30. He has attained a number of National and International Conferences and presented several research papers. He has also attended Summer Courses, Short Terms Programs and Workshops.

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Physical insight of local fractional calculus and its application to fractional kdv–burgers–kuramoto equation
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Some remarks on fractional integral of one-dimensional continuous functions
Jia Yao, Ying Chen, Junqiao Li, Bin Wang

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Mathematical analysis of coupled systems with fractional order boundary conditions
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On a high-pass filter described by local fractional derivative
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Paper Highlight

A new and efficient constitutive model based on fractional time derivatives for transient analyses of viscoelastic systems

A. G. Cunha-FilhoY. BriendA. M. G. de LimaM. V. Donadon

Publication information: Mechanical Systems and Signal Processings, Published 1 January 2021

https://doi.org/10.1016/j.ymssp.2020.107042

Abstract

In the open literature, many authors have used the fractional calculus in conjunction with the finite element method to model certain viscoelastic systems. The so-named fractional derivative model may be a better option for transient analyses of systems containing viscoelastic materials due to its causal behavior and its capability to fit accurately the viscoelastic damping properties and to represent properly their fading memory. However, depending on the situation, it leads to costly computations due to the integration of the non-local viscoelastic displacement and stress fields, especially for long time intervals. In this contribution, it is proposed a new and efficient general three-dimensional fractional constitutive formulation based on the use of a recurrence term to give a simplest and low-cost constitutive law to describe the frequency- and temperature-dependent behavior of viscoelastic materials, especially for complex systems. To demonstrate the efficiency and accuracy of the proposed formulation compared with those available in the literature, an academic example formed by a thin three-layer sandwich plate is performed and the main features and capabilities of the proposed methodology are highlighted.

Highlights:

- A general three-dimensional constitutive equation based on the fractional calculus.
- Use of the fractional derivative model (FDM) for viscoelastic systems.
- An efficient and accurate new FDM formulation based on a recurrence term.
- Eliminate the self-dependency of the viscoelastic stress field of the constitutive equation.
- Verification of the proposed new formulation with those available in the open literature.

Keywords:

Viscoelasticity; Fractional derivative model; Recurrence termFinite element

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Dispersive Transport Described by the Generalized Fick Law with Different Fractional Operators

Renat T. Sibatov, HongGuang Sun

Publication information: Fractal Fract, Volume 4, Issue 3, 2020
https://doi.org/10.3390/fractalfract4030042

Abstract

The approach based on fractional advection–diffusion equations provides an effective and meaningful tool to describe the dispersive transport of charge carriers in disordered semiconductors. A fractional generalization of Fick's law containing the Riemann–Liouville fractional derivative is related to the well-known fractional Fokker–Planck equation, and it is consistent with the universal characteristics of dispersive transport observed in the time-of-flight experiment (ToF). In the present paper, we consider the generalized Fick laws containing other forms of fractional time operators with singular and non-singular kernels and find out features of ToF transient currents that can indicate the presence of such fractional dynamics. Solutions of the corresponding fractional Fokker–Planck equations are expressed through solutions of integer-order equation in terms of an integral with the subordinating function. This representation is used to calculate the ToF transient current curves. The physical reasons leading to the considered fractional generalizations are elucidated and discussed.

Keywords:

anomalous diffusion; fractional equation; dispersive transport; time-of-flight experiment

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The End of This Issue