FDA Express **Vol. 20, No. 3, Sep 15, 2016**

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Fractional Calculus & Applied Analysis

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Latest SCI Journal Papers on FDA

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(Searched on April 15, 2016)

Complex order fractional derivatives in viscoelasticity
By: Atanackovic, Teodor M.; Konjik, Sanja; Pilipovic, Stevan; et al.
MECHANICS OF TIME-DEPENDENT MATERIALS Volume: 20 Issue: 2 Pages: 175-195 Published: JUN 2016

Fractional derivative and hereditary combined model for memory effects on flexible polyurethane foam
By: Elfarhani, Makram; Jarraya, Abdessalem; Abid, Said; et al.

MECHANICS OF TIME-DEPENDENT MATERIALS Volume: 20 Issue: 2 Pages: 197-217 Published: JUN 2016

A new material identification pattern for the fractional Kelvin-Zener model describing biomaterials and human tissues
By: Spasic, Dragan T.; Kovincic, Nemanja I.; Dankuc, Dragan V.
COMMUNICATIONS IN NONLINEAR SCIENCE AND NUMERICAL SIMULATION Volume: 37 Pages: 193-199 Published: AUG 2016

Wave Propagation in Heterogeneous Media with Local and Nonlocal Material Behavior
By: Aksoy, Huseyin Gokmen
JOURNAL OF ELASTICITY Volume: 122 Issue: 1 Pages: 1-25 Published: JAN 2016

Review of methods and approaches for mechanical problem solutions based on fractional calculus
By: Zhuravkov, Michael A.; Romanova, Natalie S.
MATHEMATICS AND MECHANICS OF SOLIDS Volume: 21 Issue: 5 Pages: 595-620 Published: MAY 2016

On the reconstruction of derivative sampling method of band-limited signal
By: Tseng, Chien-Cheng; Lee, Su-Ling
SIGNAL PROCESSING Volume: 129 Pages: 166-182 Published: DEC 2016

Parallel mixed FEM simulation of a class of single-phase models with non-local operators
By: Alyoubi, A.; Ganesh, M.
JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS Volume: 307 Pages: 106-118 Published: DEC 1 2016

Condition-based diagnosis of mechatronic systems using a fractional calculus approach
By:Enrique Gutierrez-Carvajal, Ricardo; de Melo, Leonimer Flavio; Rosario, Joao Mauricio; et al.
INTERNATIONAL JOURNAL OF SYSTEMS SCIENCE Volume: 47 Issue: 9 Pages: 2169-2177 Published: JUL 3 2016

Statistical correlation of fractional oscillator response by complex spectral moments and state variable expansion
By:Pinnola, Francesco Paolo
COMMUNICATIONS IN NONLINEAR SCIENCE AND NUMERICAL SIMULATION Volume: 39 Pages: 343-359 Published: OCT 2016

Application of a fractional model for simulation of the viscoelastic functions of polymers
By: Kontou, E.; Katsourinis, S.
JOURNAL OF APPLIED POLYMER SCIENCE Volume: 133 Issue: 23 Published: JUN 15 2016

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Call for Papers

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Special Session on Advances in Fractional Calculus. Theory and Applications - IFAC 2017

http://nas.isep.pw.edu.pl/fractional

------to be hold during the 20th Word Congress of the International Federation of Automatic Control (IFAC 2017) in Toulouse, France, July 9-14, 2017.

https://www.ifac2017.org/

Abstract

In the last couple of decades, fractional calculus had played a very important role in various fields such as: physics, chemistry, mechanics, electricity, biology, economy and control theory. Moreover, it has been found that the dynamical behavior of many complex systems can be properly described by fractional order models. Such tool has been extensively applied in many fields which has seen an overwhelming growth in the last decade. The special session is intended to review new developments based on the fractional differentiation, both on theoretical and application aspects. This special session is a place for researchers and practitioners sharing ideas on the theories, applications, numerical methods and simulations of fractional calculus and fractional differential equations. Our interested topics are enumerated in the below and submissions in the relevant fields are welcome. The topics of interest include, but are not limited to:

• numerical and analytical solutions to fractional order systems;

• new implementation methods;

• improvements in fractional order derivatives approximation methods;

• time response analysis of fractional order systems;

• the analysis, modeling and control of phenomena in:

– electrical engineering; – electromagnetism; – electrochemistry; – thermal engineering; – mechanics; – mechatronics; – automatic control; – biology; – biophysics; – physics, etc.

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Deadlines

Paper submission: 31 October 2016

Notification of acceptance: 20 February 2017

Final paper submission deadline: 31 March 2017

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Books

Linear Fractional Diffusion-Wave Equation for Scientists and Engineers

Y Povstenko

Book Description

This book systematically presents solutions to the linear time-fractional diffusion-wave equation. It introduces the integral transform technique and discusses the properties of the Mittag-Leffler, Wright, and Mainardi functions that appear in the solutions. The time-nonlocal dependence between the flux and the gradient of the transported quantity with the "long-tail" power kernel results in the time-fractional diffusion-wave equation with the Caputo fractional derivative. Time-nonlocal generalizations of classical Fourier's, Fick's and Darcy's laws are considered and different kinds of boundary conditions for this equation are discussed (Dirichlet, Neumann, Robin, perfect contact). The book provides solutions to the fractional diffusion-wave equation with one, two and three space variables in Cartesian, cylindrical and spherical coordinates. The respective sections of the book can be used for university courses on fractional calculus, heat and mass transfer, transport processes in porous media and fractals for graduate and postgraduate students. The volume will also serve as a valuable reference guide for specialists working in applied mathematics, physics, geophysics and the engineering sciences.

More information on this book can be found by the following link:
http://link.springer.com/book/10.1007%2F978-3-319-17954-4

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Fractional Calculus With Applications in Mechanics: Wave Propagation, Impact and Variational Principles

Teodor M. Atanacković, Stevan Pilipović, Bogoljub Stanković, DušAn Zorica

Book Description

The books Fractional Calculus with Applications in Mechanics: Vibrations and Diffusion Processes and Fractional Calculus with Applications in Mechanics: Wave Propagation, Impact and Variational Principles contain various applications of fractional calculus to the fields of classical mechanics. Namely, the books study problems in fields such as viscoelasticity of fractional order, lateral vibrations of a rod of fractional order type, lateral vibrations of a rod positioned on fractional order viscoelastic foundations, diffusion-wave phenomena, heat conduction, wave propagation, forced oscillations of a body attached to a rod, impact and variational principles of a Hamiltonian type. The books will be useful for graduate students in mechanics and applied mathematics, as well as for researchers in these fields. Part 1 of this book presents an introduction to fractional calculus. Chapter 1 briefly gives definitions and notions that are needed later in the book and Chapter 2 presents definitions and some of the properties of fractional integrals and derivatives. Part 2 is the central part of the book. Chapter 3 presents the analysis of waves in fractional viscoelastic materials in infinite and finite spatial domains. In Chapter 4, the problem of oscillations of a translatory moving rigid body, attached to a heavy, or light viscoelastic rod of fractional order type, is studied in detail. In Chapter 5, the authors analyze a specific engineering problem of the impact of a viscoelastic rod against a rigid wall. Finally, in Chapter 6, some results for the optimization of a functional containing fractional derivatives of constant and variable order are presented.

More information on this book can be found by the following link: http://onlinelibrary.wiley.com/book/10.1002/9781118909065

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Journals

Fractional Calculus and Applied Analysis

Volume 19, Issue 4 (Aug 2016)

Responses comparison of the two discrete-time linear fractional state-space models

Kaczorek, Tadeusz / Ostalczyk, Piotr

A survey on impulsive fractional differential equations

Wang, JinRong / Fečkan, Michal / Zhou, Yong

Generalization of the fractional poisson distribution

Herrmann, Richard

Diffusivity identification in a nonlinear time-fractional diffusion equation

Płociniczak, Łukasz

An extension problem for the fractional derivative defined by marchaud

Bucur, Claudia / Ferrari, Fausto

Strong maximum principle for fractional diffusion equations and an application to an inverse source problem

Liu, Yikan / Rundell, William / Yamamoto, Masahiro

The Neumann problem for the generalized Bagley-Torvik fractional differential equation

Staněk, Svatoslav

On the fractional probabilistic Taylor's and mean value theorems

Di Crescenzo, Antonio / Meoli, Alessandra

Time-fractional heat conduction in a two-layer composite slab

Povstenko, Yuriy

Weighted adams type theorem for the riesz fractional integral in generalized morrey space

Burtseva, Evgeniya / Samko, Natasha

Fractional schrödinger equation with zero and linear potentials

Baqer, Saleh / Boyadjiev, Lyubomir

Positive solutions of higher-order nonlinear multi-point fractional equations with integral boundary conditions

Günendi, Mustafa / Yaslan, İsmail

Weighted bounded solutions for a class of nonlinear fractional equations

Lizama, Carlos / Velasco, M. Pilar

Existence and global asymptotic behavior of positive solutions for superlinear fractional dirichlet problems on the half-line

Bachar, Imed / Mâagli, Habib

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Physica A: Statistical Mechanics and its Applications

(selected)

Fractional derivatives in the transport of drugs across biological materials and human skin

Michele Caputo, Cesare Cametti

Characterizing time dependent anomalous diffusion process: A survey on fractional derivative and nonlinear models

Song Wei, Wen Chen, Y.C. Hon

Space–time fractional diffusion equation using a derivative with nonsingular and regular kernel

J.F. Gómez-Aguilar

A fractional-order infectivity SIR model

C.N. Angstmann, B.I. Henry, A.V. McGann

Modeling diffusive transport with a fractional derivative without singular kernel

J.F. Gómez-Aguilar, M.G. López-López, V.M. Alvarado-Martínez, J. Reyes-Reyes, M. Adam-Medina

Relationships between power-law long-range interactions and fractional mechanics

Ryosuke Ishiwata, Yūki Sugiyama

A perturbative study of fractional relaxation phenomena

A. Tofighi, A. Golestani

Selfsimilarity and fractional kinetics of solar wind–magnetosphere coupling

G.M. Zaslavsky, P.N. Guzdar, M. Edelman, M.I. Sitnov, A.S. Sharma

Hurst exponents, Markov processes, and fractional Brownian motion

Joseph L. McCauley, Gemunu H. Gunaratne, Kevin E. Bassler

Nonlinear fractional dynamics on a lattice with long range interactions

N. Laskin, G. Zaslavsky

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Paper Highlight

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Cauchy and Signaling Problems for the Time-Fractional Diffusion-Wave Equation

Luchko, Yuri; Mainardi, Francesco

Publication information: JOURNAL OF VIBRATION AND ACOUSTICS-TRANSACTIONS OF THE ASME Volume: 136 Issue: 5 Article Number: 050904 Published: OCT 2014

http://arxiv.org/abs/1609.05443

Abstract

In this paper, some known and novel properties of the Cauchy and signaling problems for the one-dimensional time-fractional diffusion-wave equation with the Caputo fractional derivative of order beta, 1 <= beta <= 2 are investigated. In particular, their response to a localized disturbance of the initial data is studied. It is known that, whereas the diffusion equation describes a process where the disturbance spreads infinitely fast, the propagation velocity of the disturbance is a constant for the wave equation. We show that the time-fractional diffusion-wave equation interpolates between these two different responses in the sense that the propagation velocities of the maximum points, centers of gravity, and medians of the fundamental solutions to both the Cauchy and the signaling problems are all finite. On the other hand, the disturbance spreads infinitely fast and the time-fractional diffusion-wave equation is nonrelativistic like the classical diffusion equation. In this paper, the maximum locations, the centers of gravity, and the medians of the fundamental solution to the Cauchy and signaling problems and their propagation velocities are described analytically and calculated numerically. The obtained results for the Cauchy and the signaling problems are interpreted and compared to each other.

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Use of a variable-index fractional-derivative model to capture transient dispersion in heterogeneous media

Sun, HongGuang; Zhang, Yong; Chen, Wen; Reeves, Donald M.

Publication information: JOURNAL OF CONTAMINANT HYDROLOGY Volume: 157 Pages: 47-58 Published: FEB 2014

http://www.sciencedirect.com/science/article/pii/S0169772213001654

Abstract

Field and numerical experiments of solute transport through heterogeneous porous and fractured media show that the growth of contaminant plumes may not exhibit constant scaling, and may instead transition between diffusive states (i.e., superdiffusion, subdiffusion, and Fickian diffusion) at various transport scales. These transitions are likely attributed to physical properties of the medium, such as spatial variations in medium heterogeneity. We refer to this transitory dispersive behavior as "transient dispersion", and propose a variable-index fractional-derivative model (FDM) to describe the underlying transport dynamics. The new model generalizes the standard constant-index FDM which is limited to stationary heterogeneous media. Numerical methods including an implicit Eulerian method (for spatiotemporal transient dispersion) and a Lagrangian solver (for multiscaling dispersion) are utilized to produce variable-index FDM solutions. The variable-index FDM is then applied to describe transient dispersion observed at two field tracer tests and a set of numerical experiments. Results show that 1) uranine transport at the small-scale Grimsel test site transitions from strong subdispersion to Fickian dispersion, 2) transport of tritium at the regional-scale Macrodispersion Experimental (MADE) site transitions from near-Fickian dispersion to strong superdispersion, and 3) the conservative particle transport through regional-scale discrete fracture network transitions from superdispersion to Fickian dispersion. The variable-index model can efficiently quantify these transitions, with the scale index varying linearly in time or space.

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