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Analytic study on a state observer synchronizing a class of linear fractional differential systems By: Zhou, Xian-Feng; Huang, Qun; Jiang, Wei; et al. COMMUNICATIONS IN NONLINEAR SCIENCE AND NUMERICAL SIMULATION Volume: 19 Issue: 10 Pages: 3808-3819 Published: OCT 2014

Obtaining prediction intervals for FARIMA processes using the sieve bootstrap By: Rupasinghe, Maduka; Mukhopadhyay, Purna; Samaranayake, V. A. JOURNAL OF STATISTICAL COMPUTATION AND SIMULATION Volume: 84 Issue: 9 Pages: 2044-2058 Published: SEP 2 2014

Books

Stochastic Calculus for Fractional Brownian Motion and Applications

Biagini F., Hu Y., Øksendal B., Zhang T.

Book Description

Fractional Brownian motion (fBm) has been widely used to model a number of phenomena in diverse fields from biology to finance. This huge range of potential applications makes fBm an interesting object of study.

fBm represents a natural one-parameter extension of classical Brownian motion therefore it is natural to ask if a stochastic calculus for fBm can be developed. This is not obvious, since fBm is neither a semimartingale (except when $H = \frac{1}{2}$), nor a Markov process so the classical mathematical machineries for stochastic calculus are not available in the fBm case.

Several approaches have been used to develop the concept of stochastic calculus for fBm. The purpose of this book is to present a comprehensive account of the different definitions of stochastic integration for fBm, and to give applications of the resulting theory. Particular emphasis is placed on studying the relations between the different approaches.

Readers are assumed to be familiar with probability theory and stochastic analysis, although the mathematical techniques used in the book are thoroughly exposed and some of the necessary prerequisites, such as classical white noise theory and fractional calculus, are recalled in the appendices.

More information on this book can be found by the following link: http://www.springer.com/mathematics/probability/book/978-1-85233-996-8

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Stochastic Foundations in Movement Ecology

Méndez Vicenç, Campos Daniel, Bartumeus Frederic

Book Description

This book presents the fundamental theory for non-standard diffusion problems in movement ecology. Lévy processes and anomalous diffusion have shown to be both powerful and useful tools for qualitatively and quantitatively describing a wide variety of spatial population ecological phenomena and dynamics, such as invasion fronts and search strategies.

Adopting a self-contained, textbook-style approach, the authors provide the elements of statistical physics and stochastic processes on which the modeling of movement ecology is based and systematically introduce the physical characterization of ecological processes at the microscopic, mesoscopic and macroscopic levels. The explicit definition of these levels and their interrelations is particularly suitable to coping with the broad spectrum of space and time scales involved in bio-ecological problems.

Including numerous exercises (with solutions), this text is aimed at graduate students and newcomers in this field at the interface of theoretical ecology, mathematical biology and physics.

More information on this book can be found by the following link: http://www.springer.com/physics/complexity/book/978-3-642-39009-8

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Journals

Special Issue of Optimization on Fractional Systems and Optimization

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http://www.tandfonline.com/toc/gopt20/63/8#.U67CuLKcFGY

(Contributed by Prof. Yong Zhou)

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Paper Highlight

The Wright functions as solutions of the time-fractional diffusion equation

Francesco Mainardi, Gianni Pagnini

Publication information: Francesco Mainardi, Gianni Pagnini. The Wright functions as solutions of the time-fractional diffusion equation. *Applied Mathematics and Computation* 141 (2003) 51–62.

http://www.sciencedirect.com/science/article/pii/S009630030200320X

Abstract

Numerical evidence of nondiffusive transport in three-dimensional, resistive pressure-gradient-driven plasma turbulence is presented. It is shown that the probability density function (pdf) of tracer particles' radial displacements We revisit the Cauchy problem for the time-fractional diffusion equation, which is obtained from the standard diffusion equation by replacing the first-order time derivative with a fractional derivative of order $\beta \in (0,2]$. By using the Fourier-Laplace transforms the fundamentals solutions (Green functions) are shown to be high transcendental functions of the Wright-type that can be interpreted as spatial probability density functions evolving in time with similarity properties. We provide a general representation of these functions in terms of Mellin-Barnes integrals useful for numerical computation.

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Analytical approximate solutions for nonlinear fractional differential

equations

Nabil T. Shawagfeh

Publication information: Nabil T. Shawagfeh. Analytical approximate solutions for nonlinear fractional differential equations. *Applied Mathematics and Computation*, 131(2–3), 2002, 517–529.

http://www.sciencedirect.com/science/article/pii/S0096300301001679

Abstract

We consider a class of nonlinear fractional differential equations (FDEs) based on the Caputo fractional derivative and by extending the application of the Adomian decomposition method we derive an analytical solution in the form of a series with easily computable terms. For linear equations the method gives exact solution, and for nonlinear equations it provides an approximate solution with good accuracy. Several examples are discussed.

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Trapezoidal methods for fractional differential equations: Theoretical and

computational aspects

R. Garrappa

Publication information:

R. Garrappa, Trapezoidal methods for fractional differential equations: Theoretical and computational aspects. Mathematics and Computers in Simulation, in press, <u>http://dx.doi.org/10.1016/j.matcom.2013.09.012</u>

Description

A new Matlab code for solving fractional differential equations has been posted on File Exchange of the Matlab Central website.

The code flmm2.m solves an initial value problem for a fractional differential equation (FDE) by means of some implicit fractional linear multistep methods (FLMMs) of the second order. The code solves scalar and multidimensional systems of linear and nonlinear type. It is freely available at the web address:

http://www.mathworks.com/matlabcentral/fileexchange/47081-flmm2

FLMMs are a generalization to FDEs of classical linear multistep methods and were introduced by Lubich in 1986. The code flmm2.m implements 3 different implicit FLMMs of the second order: the generalization of the Trapezoidal rule, the generalization of the Newton-Gregory formula and the generalization of the Backward Differentiation Formula (BDF); by default the BDF is selected when no method is specified. These methods are particularly suited for problems presenting stability issues.

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