Article

ψ-Hilfer Fractional Functional Differential Equation by Picard Operator Method

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Abstract

We present in this article the existence and uniqueness results for a fractional functional differential equation with boundary condition and finite delay involving ψ− Hilfer-type fractional derivative. Next we establish the equivalent mixed-type integral for boundary condition. Further, the Ulam-Hyers Mittag stability is discussed. The Pi-card operator method, Banach fixed point theorem, and generalized Gronwall's inequality plays an important role to prove our results. At the end, an illustrative example will be introduce to justify our results.

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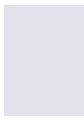
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... These models have been applied successfully, for instance in theory of viscoelasticity and viscoplasticity, modelling of polymers and proteins, transmission of of ultrasound waves, modelling

of human tissue under mechanical loads, etc. There have been extensive consideration in the last decades of the existence theory of boundary value problems including fractional differential equation, see [5, 4, 19,7,3,18]. This paper is organized as follows. ...

... For more details, see [4, 19]. ...

... Claim (4) . The Mönch condition is satisfied. ...

Existence results of ψ-Hilfer integro-differential equations with fractional order in Banach space

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Jul 2020

⬤ Mohammed A. Almalahi · ⬤ Satish K Panchal

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... In [8], the authors establish new conditions for the existence and uniqueness of solutions for a class of nonlinear -Hilfer fractional Volterra-Fredholm integro-differential equations with boundary conditions. See references [18], [22], [25], [26] , [31], [34] for further information. ...

... Substituting Eq. (21) into Eqs. (19), and (22), (23), (24), (25) and (26) , and using MATLAB software, we obtain: ...

Necessary conditions for $$\Psi $$ -Hilfer fractional optimal control problems and $$\Psi $$ -Hilfer two-step Lagrange interpolation polynomial

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Nov 2023

⬤ Ramalakshmi Kalimuthu · ⬤ B. Sundara Vadivoo

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... The Hilfer fractional derivative interpolates between the Riemann-Liouville and Caputo derivatives as it reduces to the Riemann-Liouville and Caputo fractional derivatives for $\beta = 0$ and $\beta = 1$, respectively. The Hilfer fractional derivative is used in theoretical simulation of dielectric relaxation in glass-forming materials and in fractional diffusion equations; see [10, 11] . Some properties and applications of the Hilfer derivative can be found in [12][13][14][15][16] and references therein. ...

... Thus the ψ-Hilfer fractional derivative covers a wide class of fractional derivatives and provides a platform to obtain a particular one by fixing the function ψ; see Remark 2.4. For some recent results on the existence and uniqueness of solutions of initial value problems and on the Ulam-Hyers-Rassias stability, see [10, 11, [18][19][20][21][22][23][24][25][26][27] and references therein. ...

Mixed nonlocal boundary value problem for implicit fractional integro-differential equations via ψ-Hilfer fractional derivative

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⬤ Chatthai Thaiprayoon · ⬤ Weerawat Sudsutad · ⬤ Sotiris K. Ntouyas

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... Therefore, the FDEs styles become more workable and pragmatic comparing to the integer-order samples. FDEs appear in lots of engineering and chemistry, physics, biology, signal and image processing, economics, control theory, biophysics, aerodynamics, blood flow phenomena and so on, see the monographs as [2,3, 6, 8]. There are several definitions of fractional calculus (FC), like Riemann-Liouville's (RL) definition and Caputo's definition, and there are other less-famous definitions like Erdelyi-Kober's and Hadamard's definitions and so on. ...

QUALITATIVE ANALYSIS FOR FRACTIONAL-ORDER NONLOCAL INTEGRAL-MULTIPOINT SYSTEMS VIA A GENERALIZED HILFER OPERATOR

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⬤ Mohammed N. Alkord · ⬤ Sadikali Shaikh · ⬤ Saleh S. Redhwan · ⬤ Mohammed S. Abdo

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... Also, the existence, uniqueness, and UH stabilities result for a coupled ψ− Hilfer fractional integrodiferential equation on bounded domains investigated by [28]. Almalahi et al. [29, 30] established qualitative theories for fractional functional diferential equation with boundary condition and fnite delay as well as a coupled system of hybrid fractional diferential equations via ϕ− Hilfer fractional derivatives. Very recently, Xie et al. [31] investigated some qualitative properties of multiorder diferential equations with initial condition involving R-L fractional derivatives of the following form: ...

Study of Nonlocal Multiorder Implicit Differential Equation Involving Hilfer Fractional Derivative on Unbounded Domains

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... We point the reader to a number of papers for some recent stability analysis results [15,16,17,9,11,18,19,20]. For results on the existence and uniqueness of several kinds of initial value problems for FDEs involving the ψ-Hilfer derivative operator, one can see [21,15, 22, 23,24]. Four novel forms of E κ -Ulam stabilities were recently introduced by Wang and Li in [24]. ...

On the Explicit Solution of ψ-Hilfer Integro-Differential Nonlocal Cauchy Problem

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Khaled A. Aldwoah · Mohammed A. Almalahi · Satish K Panchal · Mansour Saleman M. Lotayif

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... In Ref [9], the researchers introduced the FD with another function in the frame of Hilfer FD, with the so-called ζ−Hilfer FD. For some new results of ζ-Hilfer type initial value problems (IVPs), see [10][11] [12] [13] and, for boundary value problems (BVPs), see [14][15][16]. ...

Investigating a Generalized Fractional Quadratic Integral Equation

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... One of the applicable branches of mathematical analysis is Fractional Calculus which considers integrals and derivatives of arbitrary order [1] so is an extension of integer-order calculus i.e., it unifies and generalizes the notions of integer-order differentiation and n-fold integration; for more details see [2][3] [4] . ...

UHML stability of a class of $ \Delta $-Hilfer FDEs via CRM

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Safoura Rezaei Aderyani · Reza Saadati · Donal O'Regan · Thabet Abdeljawad

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... For some recent results of stability analysis, we refer the reader to a series of papers [2,13,16,17,23,25,30,31]. For the existence and uniqueness results of different classes of initial value problem for fractional differential equations involving ψ-Hilfer derivative operator, one can see [1,2, 3, 14,26]. More recently, Wang and Li in [32] introduced four new types of E κ -Ulam stabilities. ...

On the Explicit Solution of ψ-Hilfer Integro-Differential Nonlocal Cauchy Problem

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Aug 2021

Mohammed A. Almalahi · Satish K Panchal

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... In this work, we consider Hilfer-Katugampola type fractional derivative which interpolates some fractional derivatives such as, Hilfer, Hilfer-Hadamard, Riemann-Liouville, Hadamard, Caputo, Caputo-Hadamard, see [4,5,6,7,8] and the references therein. On the other hand, some researchers via different types of fractional derivatives studied the existence and stability of Ulam-Hyers, which can be found in [10, 11,12,13,14,15,16,17,18]. A pantograph is an important tool employed in electric trains in order to collect electric currents from the overload lines. ...

Existence and δ-Approximate solution of implicit fractional pantograph equations in the frame of Hilfer-Katugampola operator

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Jun 2021

Mohammed A. Almalahi · Satish K Panchal

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... There is a prominent and noticeable interest within the investigation of qualitative characteristics of solutions (existence, uniqueness, stability) of (FDEs). For applications and up-to-date work, we refer the readers to [18] [19] [20][21][22][23][24][25][26]. ...

Ulam–Hyers–Mittag-Leffler stability for tripled system of weighted fractional operator with TIME delay

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Jun 2021 · ADV DIFFER EQU-NY

Mohammed A. Almalahi · Satish K Panchal · Fahd Jarad · Thabet Abdeljawad

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... Thereafter improvement of Ulam-Hyers stability provided by Rassias [7] in 1978 so-called Ulam-Hyers-Rassias (UHR). For some recent results of stability analysis by different types of fractional derivative operators (FDOs), we refer the reader to a series of papers [8,9,10,11,12,13, 14, 15,16,17,18,19,20,21,22,23]. ...

Some existence and stability results for ψ-Hilfer fractional implicit differential equation with periodic conditions

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... Ulam-stability, Ulam-Hyers stability, and Ulam-Hyers-Rassias stability, these labels have become famous today in literature. There are many researchers studied generalized Hilfer fractional dierential equations [3, 4,5,14]. ...

Existence and stability results of relaxation fractional differential equations with Hilfer-Katugampola fractional derivative

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... Existence theory for classical terminal value problems have been investigated by several researchers [11][12] [13] [14][15][16][17][18][19][20][21][22]. It is well known [23] that the comparison principle for initial value problems of ordinary differential equations is a very useful tool in the study of qualitative and quantitative theory. ...

On the theory of fractional terminal value problem with ψ-Hilfer fractional derivative

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On the Theory of ψ-Hilfer Nonlocal Cauchy Problem

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E α -Ulam-Hyers Stability Result for ψ -Hilfer Nonlocal Fractional Differential Equation

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Positive Solutions to a Coupled Fractional Differential System with p -Laplacian Operator

June 2019 · Discrete Dynamics in Nature and Society

Yuehan Liu · Xiaodi Zhao · ⬤ Pang Huihui

In this paper, we consider a fractional differential system with multistrip and multipoint mixed boundary conditions involving p - Laplacian operator and fractional derivatives. The existence result of positive solutions is established by the Leggett-Williams fixed point theorem. Also, an example is presented to illustrate our main result.

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Existence, Uniqueness and Ulam-Hyers-Rassias Stability of Differential Coupled Systems with Riesz-Ca...

June 2023 · Tatra Mountains Mathematical Publications

⬤ Mouffak Benchohra · ⬤ Abdelkrim Salim · ⬤ Jamal Eddine Lazreg

This article deals with the existence, uniqueness and Ulam-Hyers-Rassias stability results for a class of coupled systems for implicit fractional differential equations with Riesz-Caputo fractional derivative and boundary conditions. We will employ the Banach's contraction principle as well as Schauder's fixed point theorem to demonstrate our existence results. We provide an example to illustrate ... [Show full abstract]

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Stability analysis for boundary value problems with generalized nonlocal condition via Hilfer–Katuga...

May 2020 · Advances in Difference Equations

⬤ Fahd Jarad · ⬤ Idris Ahmed · ⬤ Poom Kumam · [...] · ⬤ Alhassan Ibrahim

Abstract In this research, we present the stability analysis of a fractional differential equation of a generalized Liouville–Caputo-type (Katugampola) via the Hilfer fractional derivative with a nonlocal integral boundary condition. Besides, we derive the relation between the proposed problem and the Volterra integral equation. Using the concepts of Banach and Krasnoselskii's fixed point ... [Show full abstract]

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Inverse Problem for a Multi-Term Fractional Differential Equation

June 2020 · Fractional Calculus and Applied Analysis

⬤ Muhammad Ali · ⬤ Sara Aziz · ⬤ Salman A. Malik

Inverse problem for a family of multi-term time fractional differential equation with non-local boundary conditions is studied. The spectral operator of the considered problem is non-self-adjoint and a bi-orthogonal set of functions is used to construct the solution. The operational calculus approach has been used to obtain the solution of the multi-term time fractional differential equations. ... [Show full abstract]

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