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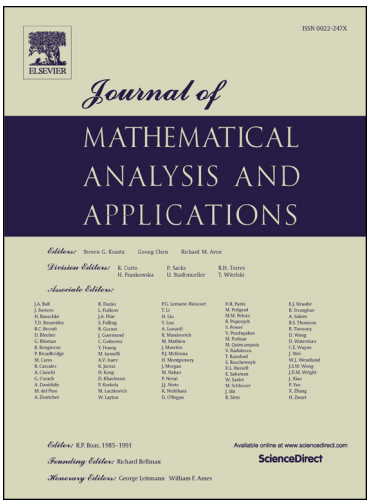

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Existence and exponential stability for impulsive neutral stochastic functional differential equations driven by fBm with noncompact semigroup via Mönch fixed point

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Abstract

In this paper, we investigate the existence and exponential stability of mild solutions for a class of impulsive neutral stochastic functional differential equations driven by fBm with noncompact semigroup in Hilbert spaces. Sufficient conditions for the existence of mild solutions are obtained using the Hausdorff measure of noncompactness and the Mönch fixed point theorem. Further, we establish a new impulsive-integral inequality to prove the exponential stability of mild solutions in the mean square moment. Finally, an example is presented to illustrate our obtained results.

Keywords: Impulsive neutral stochastic functional differential equations, Fractional Brownian motion, Noncompact semigroup, Hausdorff measure of noncompactness, Fixed point, Impulsive-integral inequality

1. Introduction

Impulsive effects are common phenomena caused by instantaneous perturbations at certain moment, such phenomena described by impulsive differential equations which have been used efficiently in modeling many practical problems that arise in the fields of mechanics, electrical engineering, medicine biology, ecology, etc. So the theory of impulsive differential equations have become an area of active investigation in recent years. For more details, we refer to monographs [16, 28] and papers [18, 29, 32]. Correspondingly, the study of impulsive functional differential equations have been very intensive, see [7, 8]. Stochastic differential equations are more accurate and realistic to describe real world than ordinary differential equations, since real world is inevitably affected by some random or uncertain factors. There are many interesting results on stochastic differential equations have been gained in [12, 21, 27, 33, 34, 35] and the references therein. So far, there are few papers on the existence and exponential stability of mild solutions for impulsive stochastic functional differential equations since the corresponding theory for such a problem have not been fully developed. Although Hu and Ren [15] proved the existence of mild solutions for impulsive neutral stochastic functional integro-differential equations with infinite delays through Krasnoselskii-Schaefer fixed point theorem. Lin and Hu [19] studied the sufficient conditions for impulsive neutral stochastic functional integro-differential inclusions with nonlocal initial conditions. Pan and Cao [23] discussed the exponential stability of impulsive stochastic functional differential equations with finite delay by using Lyapunov method. Long et al. [20] obtained Global attracting set and stability of stochastic neutral partial functional differential equations with impulses by using an impulsive-integral inequality. Anguraj and Vinodkumar [1] investigated the existence, uniqueness and stability of mild solutions for impulsive stochastic partial neutral functional differential equations by constructing Picards successive approximation.

As an extensive of Brownian motion, fractional Brownian motion have received a lot of attention in recent years. It is characterized that self-similarity and non-stationary. When $H \neq \frac{1}{2}$, fractional Brownian motion is neither a semimartingale nor a Markov-process. Hence, we can not use the classical stochastic analysis technology to discuss it.

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