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EXISTENCE, UNIQUENESS AND STABILITY RESULTS FOR FRACTIONAL HYBRID PANTOGRAPH EQUATION WITH RANDOM IMPULSE

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Abstract. This article presents the existence and uniqueness of the solutions to fractional random impulsive hybrid pantograph equation by using fixed point theory. The existence of the solution is investigated by using Lery-Schauder fixed point theorem and the uniqueness is proved by Banach contraction principle. Further, the stability of the solution is also analyzed. In the end, an example is constructed to illustrate the applications to the abstract results.

Keywords. Existence, uniqueness, stability, hybrid differential equation, pantograph equation, fixed point theorem, random impulsive equation.

AMS (MOS) subject classification: 34A08, 34A37, 34A38, 34D20.

1 Introduction

Quadratic perturbations of nonlinear differential equations have attracted much attention nowadays. We call such differential equations as hybrid differential equations. The theory of hybrid differential equation is a rich area for variety of nonlinear ordinary as well as partial differential equations. The importance of the investigations of this equations lies in the fact that they include several dynamic systems as special cases. Hybrid differential equations of integer order has found its extensive applications in realistic mathematical modeling of a wide variety of practical situations and has emerged as an important area of investigation in recent years.

The pantograph equation is one of the most important kinds of delay differential equations, and plays an important role in explaining various phenomena. In recent years, several numerical methods have been devoted to solve of pantograph delay differential equations of integer order such as, Chebyshev polynomials, Bernoulli polynomials, variational iteration method, etc. The pantograph is a current collection device, which is used in electric