

SECOND-ORDER RANDOM FUZZY INTEGRO-DIFFERENTIAL EQUATION UNDER GENERALIZED DIFFERENTIABILITY

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Abstract. In this paper we study the existence and uniqueness of solution for second-order random fuzzy integro-differential equations (SRFIDEs) in the setting of a generalized Hukuhara derivative. Some examples are given to illustrate these results.

Keywords. Random fuzzy differential equation; Random fuzzy integro-differential equation; Random fuzzy variable.

AMS (MOS) subject classification: 34K50, 60H10, 93E03, 34A12

1 Introduction

The theory of fuzzy differential equations is an area of mathematics that has recently received a lot of attentions (see *e.g.* [2, 3, 6, 8, 20, 26],...). In [3], a new concept for solution of fuzzy differential equations is introduced and the existence, uniqueness of global solution for fuzzy initial value problems involving integro-differential operators of Volterra type are discussed. In [2], authors used the method of upper and lower solutions to prove the existence and uniqueness of global solution of nonlinear fuzzy integro-differential equation under generalized Hukuhara derivative. In [20], that authors used the Banach fixed point theorem to prove the existence and uniqueness of solution for the first-order fuzzy integro-differential equations.

In [15], Malinowski studied the random fuzzy differential equations (RFDE), extended to the theory of fuzzy differential equations. They provide good models of the dynamics of real phenomena which are subjected to two kinds of uncertainty: randomness and fuzziness, simultaneously. Puri and Ralescu [24] introduced the concept of fuzzy random variable in 1986. Some other concepts of fuzzy random variables can be found in Kwakernaak [12] and Kruse et al. [11]. Colubi et al. [5] discussed the relations between concepts of fuzzy random variables. The theory of random fuzzy differential equations, using the concept of a fuzzy random variable of Puri and Ralescu [25], has been investigated by many mathematicians in recent years (see [14, 17, 18, 23, 30, 27]). Some noticeable works about random fuzzy differential equations have been studied by Malinowski (see [16, 17]). In particular, in [16], using two kinds of fuzzy derivative which was introduced by Bede et

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