A PREY PREDATOR MODEL
WITH FUZZY INITIAL VALUES

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Abstract

In this paper we consider a prey-predator model with fuzzy initial values. We use the concept of generalized differentiability and obtain graphical solutions for the problem under consideration.

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1. Introduction

Differential equations are indispensable for modeling real world phenomena. Unfortunately every time uncertainty can intervene with real world problems. The uncertainty can arise from deficient data, measurement errors or when determining initial conditions. Fuzzy set theory is a powerful tool to overcome these problems. Initially, the derivative for fuzzy valued mappings was developed by Puri and Ralescu [8], and generalized and extended the concept of Hukuhara differentiability for set-valued mappings to the class of fuzzy mappings. Subsequently, using the Hukuhara derivative, Kaleva [5] started to develop a theory for FDE. But it soon appeared that the Hukuhara derivative has a shortcoming which fuzzifies the the solution as time goes on. To overcome this situation in [1, 2] the concept of strongly generalized derivative was introduced and in [6] this concept studied for higher order fuzzy differential equations. This concept allows us to overcome the above mentioned shortcoming.

We first recall some basic concepts used in the present paper.

A fuzzy set A in a universe set X is a mapping $A(x) : X \to [0, 1]$. We think of A as assigning to each element $x \in X$ a degree of membership, $0 \le A(x) \le 1$. Let us denote by $\mathcal{F}$ the class of fuzzy subsets of the real axis, $A(x) : X \to [0, 1]$ satisfying the following properties:

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