Linear Fuzzy-valued Function

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Abstract:
This paper defines a concept of a linear fuzzy-valued function. Two important properties of fuzzy arithmetic are proved. Using the properties, the definition of linearity is verified by several appropriate examples. The relation between linearity and convexity of fuzzy-valued function is discussed.

Keywords
Fuzzy numbers, Fuzzy-valued function, linear function and convex function

MSC(2010): 03E72, 90C70

1. Introduction

Let X and Y be two non-empty sets. A function from X to Y can be generalzied in the natural way to multivalued function as a function from X into the set of all non-empty subse ts of Y. In the same way, further generalization tends to a fuzzy-valued function. i.e. a function from X to set of all fuzzy numbers in Y. The fuzzy-valued function might be widely used in different fields. The fuzzy linear regression model has been formulated by fuzzy-valued functions (Tanaka, Uejima and Asai, 1980 [7]). The fuzzy linear programming problem is studied by Tanaka and Asai, 1981 [8] based on linear fuzzy function. Unfortunately, the definition of linear function and its properties are not explored much in literature. See recent references [5] (2014) and [4] (2016) and references therein.

This paper defines linear fuzzy-valued function explicitly and study its basic properties. Further, linear fuzzy-valued function is illustrated by fuzzy cost and revenue function as an application.

2. Fuzzy numbers and arithmetic

We start with some basic definitions.

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