Some results on t-remotest points and t-approximate remotest points in fuzzy normed spaces

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Abstract

In this paper, we define t-remotest points and t-approximate remotest points in fuzzy normed spaces and prove some theorems on theses concepts. In particular, we find t-remotest points and t-approximate remotest points by considering a cyclic map.

Keywords: t-remotest point, t-approximate remotest point, t-remotest fuzzy set.
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1 Introduction

The theory of fuzzy sets was introduced by L. Zadeh [7] in 1965. Many authors have introduced the concept of fuzzy metric in different ways ([1]-[7]). George and Veeramani ([3], [4]) modified the concept of fuzzy metric space intoduced by Kramosil and Michálek [5] and defined a Housdorff topology on this fuzzy metric space. In this paper we obtain the t-remotest points and the t-approximate remotest points of the non-empty f-bounded subsets A and B of a fuzzy normed space $(X, N, *)$, by considering a cyclic map $T : A \cup B \longrightarrow A \cup B$ i.e. $T(A) \subseteq B$ and $T(B) \subseteq A$.
First, we recall the basic definitions and preliminaries that is need for main results.

Definition 1.1. [3] A binary operation $* : [0, 1] \times [0, 1] \longrightarrow [0, 1]$ is said to be continuous t-norm if $([0, 1], *)$ is a topological monoid with unit 1 such that $a * b \leq c * d$ whenever $a \leq c$ and $b \leq d$, and $a, b, c, d \in [0, 1]$.

Definition 1.2. [6] The 3-tuple $(X, N, *)$ is said to be a fuzzy normed space if X is a vector space, $*$ is a continuous t-norm and N is a fuzzy set on $X \times (0, \infty)$ satisfying the following conditions for every $x, y \in X$ and $t, s > 0$,

$(i) N(x, t) > 0$,
$(ii) N(x, t) = 1 \Leftrightarrow x = 0$,
$(iii) N(\alpha x, t) = N(x, t/|\alpha|)$, for all $\alpha \neq 0$,
$(iv) N(x, t) * N(y, s) \leq N(x + y, t + s)$,
$(v) N(x, .) : (0, \infty) \longrightarrow [0, 1]$ is continuous,
$(vi) \lim_{t\to\infty} N(x, t) = 1$.

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