On entropy for fuzzy sets and discrete dynamical system

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Abstract

In this paper a random variable on a probability space which is a fuzzy set is introduced and the entropy of the fuzzy set with respect to a finite partition is defined. As follow a discrete dynamical system on a fuzzy set is presented and its entropy has been defined.

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1 Introduction

One of the most important characterizations can attach to a random variable and to a stochastic process is its entropy. The notion of entropy for discrete random variables as well as absuloutly continuous random variables is well defined. The discrete random variable is a random variable with at most countable image. Absoultly continuous random variable is a random variable with uncountable image that has a non- negative density function[1, 4]. A stochastic process is a mathematical model for the occurrence of random phenomena as time goes on. This is the case, for example, when a random experiment is repeated over and over again [1].
In this paper, we consider a probability space, Ω, which is fuzzy set with function $m : \Omega \longrightarrow [0,1]$[2].
In the next section, we define the entropy of the random variable X^{α}, which α is a finite partition on Ω.
We introduce random variables on the fuzzy set with respect to a discrete dynamical system on Ω and define the entropy of the dynamical system in the last section.

2 Entropy of a fuzzy set

Let Ω be a probability measure space with $\sigma-$ algebra β and probability measure μ. Also consider (Ω, m) be a fuzzy set ($m : \Omega \longrightarrow [0,1]$) and $\alpha = \{A_1, A_2, ..., A_{|\alpha|}\}$ be a finite partition on Ω.
Define $\chi_0^{\alpha} : \Omega \longrightarrow \{1, 2, ..., |\alpha|\}$, $\chi_0^{\alpha}(\omega) = i$ where $\omega \in A_i$.
Consider the random variable $X^{\alpha} : \Omega \longrightarrow \{1, 2, ..., |\alpha|\} \times [0,1]$ which $X^{\alpha}(\omega) = (\chi_0^{\alpha}(\omega), m(\omega))$, so two different cases will be happened:

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