A two-parametric distribution and phase transitions on the chaotic regime of families of one-dimensional maps

Roberto Álvarez-Martínez[1] Germinal Cocho Gil[1]
Gustavo Martínez-Mekler[2]

May 9, 2007

1. Departamento de Sistemas Complejos.Instituto de Física.Universidad Nacional Autónoma de México. (UNAM) Av. Universidad 3000.México, D.F. (México).

2. Instituto de Ciencias Físicas. Universidad Nacional Autónoma de México (UNAM). Av. Universidad . Cuernavca. (México)

In this work, I propose a family of unimodal maps to study the presence of power laws and phase transitions in range-frecuency plots. This family is characterized by a parameter, which modulates both the intermittency and the concavity.

I have studied the symbolic dynamics of the chaotic maps in order to obtain a sequence S of symbols $\{1, 0\}$. These symbols can be grouped into subsets, of n consecutive elements of S that I called *n-omers*. This allowed me to classify the n-omers according to its frequency. This distribution is not a simple power law distribution $r \propto f^{-\alpha}$, but rather a power law regime, with two different exponents. In this talk, I will present a possible explanation for this behaviour.

Two complementary goals are pursued in this work. The first one, is to find a universal mechanism to generate a two power law regime. For this reason we have studied a model proposed by W. Li [1], and we prove that is a good mechanism to obatin two power laws.

I will also demonstrate that in the intermittent limit the family of maps I am proposing has a phase transition[2,3]. Finally we have found some interesting relationship among unidimensional maps, expansion-modification systems and quasi-species model

References

[1] W. Li, Physical Review A, 43, 10, (1991)

[2] M. Giampieri, S. Isola, Discret and continuos dynamical systems 12, 1, (2005)

[3] S. Isola , Far East Journal of Dynamical Systems 6(1) (2004)