

Dynamical Characterization of Fractal Curves

Luiz Bevilacqua^{*}, Marcelo Barros^{**} and Augusto C.N. Galeão^{**}
^{*} Universidade Federal do ABC

^{**} Laboratório Nacional de Computação Científica
bevi@lncc.br, barros@lncc.br, acng@lncc.br

June 9, 2008

Abstract

Diverging from the classical approaches the technique presented here explores a different way to determine the fractal dimension of one-dimensional structures. The fundamental idea is: *given a geometric structure find an appropriate physical experiment that can identify whether the given geometry is fractal or not and additionally what is the associated fractal dimension*. This paper deals with fractal curves and the dynamical response of associated simple oscillators. Using the same technique it is also possible to find out if a given curve belongs to a fractal sequence. The dynamical characterization can generate more than one “dynamical fractal dimension” due to the multiple degrees of freedom of the oscillators. This property far from being a drawback is rich in information and due to this fact it is possible to identify, at least for curves of the Koch family, the randomness of a generation process. A new class of fractal curves was also introduced and analyzed that we have called “mixed fractals”. These curves separate into two groups one is fractal the other is quasi-fractal sequence.

Keywords: fractal curves, dynamical dimension, mixed fractals.