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CONSTRUCTION OF CHAOTIC DYNAMICAL SYSTEM

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Dynamical systems occur in all branches of sciences, from the differential equations of classical mechanics in physics to the difference equations of mathematical economics and biology. The basic goal of the theory of dynamical systems is to understand the eventual or asymptotic behavior of an iterative process. A discrete dynamical system can be characterized as a function f that is composed with itself over and over again

$$x, f(x), f^2(x), \dots, f^n(x), \dots,$$

where $f^2(x) = f(f(x)$, $f^3(x) = f(f^2(x)) = f(f(f(x))$, etc. If we let $x_n = f^n(x)$, then we obtain the first-order difference equation $x_{n+1} = f(x_n)$.

Difference equations and discrete dynamical systems represent two sides of the same coin. Difference equations represent analytic theory of the subject but discrete dynamical systems represent its geometrical and topological aspects.

We know that mappings $h_4(x) = 4x(1-x)$ and $D(x) = 2x\,(mod\;1)$ are chaotic in $[0;1]$ ([3], [4]). We consider the definition of R.Devaney for a chaotic mapping ([3]): a mapping $f : A \to A$ (A is a subset of a metric space) is said to be chaotic if the set of it periodic points is dense in A, it is transitive and f has a sensitive dependence on initial conditions. In [5] is shown that doubling mapping D is topological semi-conjugate with the shift map in one-sided infinite sequences space Σ_2. The shift map is chaotic too. Models with chaotic mappings are not predictable in long-term.

We have found family of chaotic mappings in space Σ_2 ([1]). We use the idea of conjugacy and so we can construct a family of mappings in the unit segment such that it is chaotic ([2]).

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