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A SIMPLE APPROACH TO GENERATE COMPLEX SYSTEMS

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ABSTRACT

Simple mathematical model for generating complex patterns is presented. The model is based on random effect. Numbers of functions were used to study the effect of the model on uniform geometrical figures such as triangle, square, pentagon, etc. Each figure under certain conditions disintegrates to similar pattern infinitely.

INTRODUCTION

It is common in nature to find system whose overall behavior is extremely complex, yet whose fundamental component parts are each very simple. The complexity is generated by cooperative effect of many simple identical components.

The laser is a prototype of synergetics [1].It is composed of many individual parts (the atoms). It is a system far from thermal equilibrium, it is open, and it shows a qualitative transition between disorder and order. The ordered structure produced is the coherent laser light. Actually, there are many systems in physics, chemistry, biology, and other sciences[2] in which many systems cooperate so that they produced spatial, temporal or functional structures at a microscopic level. Examples are provided by structure formation in fluid, e.g. the famous Benard instability, in chemistry the formation of rings, spirals, and oscillations by chemical reactions, in biology morphogenesis, coordinations of motions of limbs, etc.

More general investigation of self-organization and "chaos" in dynamical system have typically used simple mathematical models. One approach [3] consider dissipative nonlinear differential equations (typically derived as idealization3 of Navier-Stokes hydrodynamic equations). The time evolution given particular initial conditions is represented by a trajectory in the space of variables described by the differential equations in the simplest cases (such as those typical for chemical concentrations described by the Boltzmann transport equations), all trajectories tend at large times to a small number of isolated limit points, or approach simple periodic limit cycle orbits. In other cases, the trajectories may instead concentrate on complicated an apparently chaotic ("strange attractors"). Nearly linear systems typically exhibit simple limit points or cycles. When nonlinearity is increased by variation of external parameters of limit points or cycles may increase without bound, eventually building up a strange attractor (typically exhibiting a statistically self-similar structure in phase space). A simple approach [3,4] involves discrete time step, and considers, the evolution of numbers on an interval of the real line under iterated mappings. As the nonlinearity is increased, greater number of limit points and cycles appear, followed by essentially chaotic behavior.