STUDY OF CRITICAL BEHAVIOR OF A NUMBER OF DYNAMIC SYSTEMS

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Phenomena of dynamic chaos, self-organization are related to stochastic instability and critical behavior of non-linear physical systems of various nature. These processes appear, for example, in the phenomena of dynamic failure of condensed matters and fully-developed turbulence [1, 2].

A cascade of dynamic dissipative structures, holding a fractal structure, arises in such non-linear systems. Properties of multi-fractals are characterized by spectral function $f(d_{fi})$, specified by behavior of element number l, required for covering of fractal sets with probability $P_i \sim l^{-dfi}$ [3, 4].

The system transition from one time-scale level onto the next one is controlled by a concentration criterion and passes through a bifurcation cascade. Quantitative process characteristics at different stages do not depend on Hamiltonians of interatomic interaction. Fractal organization of processes on all time-scale levels testifies to similarity of processes and allows referring these processes to the common universality class [3, 4].

On the whole the system evolution is specified not by Hamiltonians of interatomic interaction, but by emerging cascades of dissipative structures. Similar values of fractal dimensions on all considered scales, which characterize the failure structure, allow a formation study of micro-defects of failure and macro-failure, as scale limits for unique process spectrum, possessing common order parameters [3, 4].

The paper specifies capabilities for obtaining relaxation processes' specification of quantity in some systems (more simple for observation), which can be applied for prediction of other systems' behavior (more complicated for study) [3, 4].

References

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