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ENTROPY-GRAPH MODELS USAGE FOR NATURAL-TECHNOGENIC OBJECTS WITHIN THE "STATE (SYSTEM – ENVIRONMENT) – PROCESS – STATE OF THE SYSTEM" STUDY

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There are no infinite straight lines in nature, so there is invariance at infinite scales number in nature. According to the fundamental provisions structures formation theory in irreversible processes, there is necessity appeal to fractal geometry with getting connection between the basic concepts of chaos and structure, the entropy of different nature systems state quantitative assessment.

In process of development and evolution (new structures sequence) of a complex system by important factors in maintaining stability and integrity are the self-organization within the systems internal environment and their interaction with the environment, the links maintenance that homogenize the system space, not allowing voltage points creation – an entropy explosion, the chaos realization. The main task for complex systems synergetic analysis is to identify the main factors at each stage of successive and irreversible transition from one systems state to another with the implementation of a certain internal organization level and the structural elements connection degree with the predominance of a certain communication type between them. To identify pre-crisis states, an integrated signaling approach is implemented based on modern synergetic, multifractal and wavelet analysis methods, entropy methods, graphological models, etc.
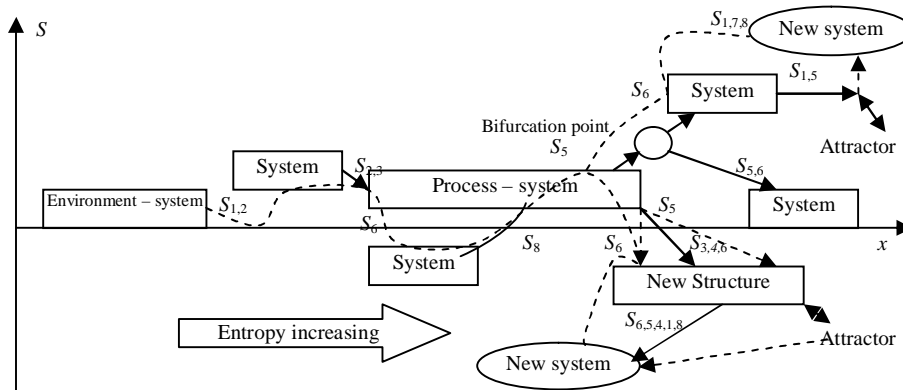
---- – information data flow, information about changing; → – physical data flow, physical changes
Figure 1 – Schema of system state changes by entropy-information assessment equilibration search: $S_{1,2,3,4,5,6,7,8}$ – information, thermodinamical, Bolzman, Gibbs, Shennon, Kolmagorov, Reny-Thales entropies, wavelet entropy

Significant long-term deviation from equilibrium state leads to consolidation in space-time system existence environment dissipative formations accumulation, the dissipation intensification with a sharp system change in attractor direction (fig. 1).

In order to satisfy the homeostatic state in relation to the object implementation of natural (defined from the beginning) macro functions, it is necessary to fully realize the extremely minimal number of important functions for system stability informational support. This requires compliance with high activity conditions of components, system elements, structural integrity and significant functional flexibility. It is the synergetics of system object homeostasis is determined by the information entropy balance of internal and external environment and the reserve of flexibility constituent elements and stability, which ensures structural integrity and further maintains the primacy of its macro properties.

Informative calculation of according to the researched observations data complex object state according to the entropy assessment of conformity $S = -\sigma_i(x)/\sigma(x) \cdot \ln \sigma_i(x)/\sigma(x)$ allows to objectively establish the state and events development direction in the interaction "object/system – environment" in using phenomenological base of knowledge-oriented databases. Relevance is determined by the information system complexity $I = \lg(M), M = \sum_{i=1}^{n} m_i$, which takes into account the research object composition, its structure as the realization of natural connections between them. To do this is determined the relative characteristics of state and processes: $\eta = S/I$; $\delta = S_{in}/I$; $\eta + \delta = 1$.

Thus, compare of dynamic complex object heterogeneous properties for its complete complex assessment is made, which consist of this systematic approach given through synonymous concepts – information by R. Hartley, information complexity, resource, complete system entropy, and – K. Shannon entropy and synergy (synergetic component), chaos and order, competition and cooperation.