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An application of a measure for organization of complex networks
GEORGI GEORGIEV, MICHAEL DALY, Assumption College — In order to measure self-organization in complex networks a quantitative measure for organization is necessary. This will allow us to measure their degree of organization and rate of self-organization. We apply as a measure for quantity of organization the inverse of the average sum of physical actions of all elements in a system per unit motion multiplied by the Planck's constant, using the principle of least action. The meaning of quantity of organization here is the inverse of average number of quanta of action per one node crossing of an element of the system. We apply this measure to the central processing unit (CPU) of computers. The organization for several generations of CPUs shows a double exponential rate of change of organization with time. The exact functional dependence has, S-shaped structure, suggesting some of the mechanisms of self-organization. We also study the dependence of organization on the number of transistors. This method helps us explain the mechanism of increase of organization through quantity accumulation and constraint and curvature minimization with an attractor, the least average sum of actions of all elements and for all motions. This approach can help to describe, quantify, measure, manage, design and predict future behavior of complex systems to achieve the highest rates of self-organization to improve their quality.

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