From Discrete Chaotic Dynamics of Living and Thinking Systems to Artificial Brain, Consciousness and Creativity

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Abstract

Mathematical models, based on a physicochemical principles and laws of nature were formulated for living and thinking systems dynamics in a form of multilevel artificial neural networks (*ANN*). In this application, we are assuming that neural networks biochemical reactions are accompanied and controlled by an "information exchange" between neurons, neural networks and the different types of neural networks responsible for a brain's various cognitive functions. Both the qualitative and quantitative meaning of "information" and "information exchange" between neural networks have been formulated in relation to a neuron's chaotic states and we have formally introduced it into basic equations for (*ANN*) simulations [1]. As will be shown in this presentation, proposed ANN uses a new fundamental dynamic principles, combining energy and information exchange as a driving force responsible for specific properties such as "self-organization" and "self-synchronization". These result in the emergence of "phenomenological" states that form the complex patterns (discrete time –space distributions of chemical constituents composing brain neurons within the neural networks) which we associate with brain consciousness, cognition and creativity. Constructed *ANN* generates practically an unlimited variety of creative discrete time and space dynamic patterns, controlled by the continuous parameters. It has provided us with the confidence that by deep learning and training of these new generation of *ANN* (artificial brain) we can fit it to the desired cognitive and creative properties for their use in artificial intelligent autonomous conscious systems (robots). Results of numerical simulations will be presented in a form of various creative 2D and 3D discrete time-space distributed patterns. Application of the approach to the art of mandalas we argue can be extended to a proposed approach for autonomous conscious robots path planning.

Reference

V. Gontar, Artificial brain systems based on neural network discrete chaotic dynamics. Toward the development of conscious and rational robots*, in book, R. Mittu, D.Sofge, A. Wagner(eds), Robust Intelligence and Trust in Autonomous Systems, chapter 6*, Springer, 2016, pp.97-115.