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Anti-synchronization of 3-Cells Cellular Neural Network Attractors via Integral Sliding Mode Control

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Abstract: In this research work, we first discuss the properties of the 3-cells Cellular Neural Network (CNN attractor) discovered by Arena et al. (1998). Recent research has shown the importance of biological control in many biological systems appearing in nature. In computer science, machine learning and biology, cellular neural networks (CNN) are a parallel computing paradigm, similar to neural networks with the difference that communication is allowed between neighbouring units only. CNN has wide applications and recently, CNN is found to have many applications in biology and applied areas of biology. Chua and Yang introduced the Cellular Neural Network (CNN) in 1988 as a nonlinear dynamical system composed by an array of elementary and locally interacting nonlinear subsystems, which are called cells. We also derive new control results for the global chaos anti-synchronization of the 3-cells Cellular Neural Network (CNN) attractors via integral sliding mode control. All the main results are proved using Lyapunov stability theory. Also, numerical simulations have been plotted using MATLAB to illustrate the main control results for the 3-cells cellular neural network (CNN) attractor.

Keywords: Chaos, chaotic systems, biology, cellular neural networks, CNN attractor, integral sliding mode control, chaos synchronization, anti-synchronization, stability theory, etc.

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