Finite-Time Multistability for Impulsive Control Hopfield Neural Networks

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Abstract:

Different from the existing multiple asymptotic stability or multiple exponential stability, the finite-time multistability is studied in this paper for impulsive control Hopfield neural networks. First, by the Brouwer's fixed point theorem, $\prod_{i=1}^n(2M_i+1)$ total equilibrium points of such n-neuron neural networks can be guaranteed. Then, on the basis of Lyapunov function method and impulsive control theory, the finite-time multistability theorem is established for Hopfield neural networks with stabilizing impulses. The settling time estimation for determining the local finite-time stability of $\prod_{i=1}^n(M_i+1)$ equilibrium points is developed by designing suitable impulsive sequences, which reveals that the settling time is dependent on initial state and impulsive effect. From impulsive effect point of view, the stabilizing impulses promote accurate and fast convergence rate of system state and smaller upper bound of settling time estimation via hybrid control schemes. Finally, theoretical results are shown to be effective by an illustrative example.