Nonlinear Sciences > Adaptation and Self-Organizing Systems

Complete synchronization in coupled Type-I neurons

Nishant Malik, B. Ashok, J. Balakrishnan

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For a system of type-I neurons bidirectionally coupled through a nonlinear feedback mechanism, we discuss the issue of noise-induced complete synchronization (CS). For the inputs to the neurons, we point out that the rate of change of instantaneous frequency with the instantaneous phase of the stochastic inputs to each neuron matches exactly with that for the other in the event of CS of their outputs. Our observation can be exploited in practical situations to produce completely synchronized outputs in artificial devices. For excitatory-excitatory synaptic coupling, a functional dependence for the synchronization error on coupling and noise strengths is obtained. Finally we report an observation of noise-induced CS between non-identical neurons coupled bidirectionally through random non-zero couplings in an all-to- all way in a large neuronal ensemble.

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