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**Phase-locking in electrically coupled non-leaky integrate-and-fire neurons.** (English)

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Summary: The synchronization properties of a pair of oscillating spiking neurons connected by electrical (diffusive) coupling is considered. The intrinsic behavior of the cells is described by the non-leaky integrate-and-fire model with a simple modification to account for the effect of spikes. Dynamics of the two-cell system are reduced to the consideration of a one-dimensional map. Periodic orbits of the map correspond to phase-locked solutions of the paired-cell system.

The bifurcation structure of the map and therefore the phase-locked states in the two-cell system are analyzed. It is shown that increasing the effect of the spikes and increasing the intrinsic frequency of the cells promote synchronous activity. However, in some conditions, increasing the strength of electrical coupling can counter-intuitively lead to the destabilization of synchronous activity and the stabilization of the anti-phase state.

**MSC:**

92C20 Neural biology

92C05 Biophysics

78A70 Biological applications of optics and electromagnetic theory

Cited in 1 Document

**Keywords:**

electrical coupling; phase-locking; integrate-and-fire