STOCHASTIC SENSITIVITY ANALYSIS OF NOISE-INDUCED PHENOMENA IN MORRIS-LECAR MODEL

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We study the stochastic phenomena in the randomly forced two-dimensional Morris-Lecar neuron model.

The Morris-Lecar system is an important model that reproduces a wide range of various types of neural activity and corresponding dynamic regimes. Here, we focus on the two parametric zones: the bistablity zone, where the deterministic system exhibits the coexistence of the stable equilibrium and the stable limit cycle, and the monostability zone, where the only attractor of the deterministic system is the equilibrium. We show that in both cases, random disturbances can induce a special type of activity: mixed-mode oscillations, that is an alternation of small and large amplitude oscillations. The details of probabilistic distribution of random trajectories as well as the interspike intervals statistics are studied.

For a quantitative analysis of this phenomenon, a new approach based on the stochastic sensitivity function (SSF) technique, Mahalanobis distance and confidence domains methods is suggested.

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