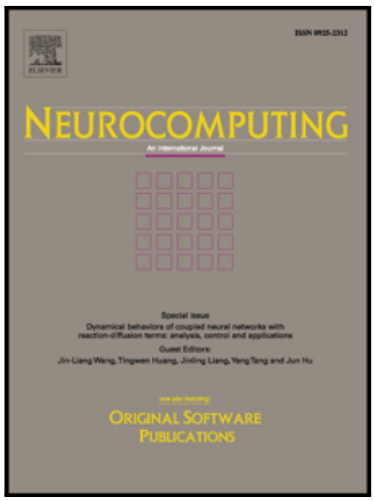

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Inverse stochastic resonance induced by non-Gaussian colored noise

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Abstract: This paper mainly studies the phenomenon of inverse stochastic resonance induced by non-Gaussian noise in a representative Hodgkin-Huxley model. Firstly, spiking manners of neurons under different input currents are investigated and different current thresholds and bifurcation diagram are given. Besides, the limit cycle with different input current are plotted. Then, taking the average firing rate as a measurement, the result shows that a minimum exists in the curve corresponding to the intensity, correlation time and deviation coefficient of non-Gaussian noise, which is named inverse stochastic resonance(ISR). More important, it is found that the mean firing rate will remain unchanged with noise intensity and deviation coefficient when correlation time is sufficiently large and finally trends toward a constant value which is completely determined by input current. Further, the present results will be benefit to investigate the functional roles of randomness in neural spiking.

Key words: non-Gaussian colored noise; inverse stochastic resonance; Hodgkin-Huxley model

1. Introduction

In the central nervous system, the spiking is regarded as a random process because of noise. Randomness is reflected through different kinds of firing behavior of neurons in the absence of any stimulus spontaneously [1]. Previous experiments and theories have uncovered that noise could enhance the testing, integration and transfer efficiency of the signal, such as stochastic resonance and coherence resonance [2-10]. However, recent work report a new inhibition effect of noise on neuronal

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