Event Abstract

A Biophysical Network Model for Action Selection

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The role of basal ganglia in action selection is well-known [1] and there are various neurocomputational models of action selection [2-4] where their interaction with thalamus and cortex is considered as pointed out in [5]. While these models are biologically plausible models, they are more focused on behavioral aspects of action selection and they deal with neural substrates at systems level rather than neuron level. Though they are effective, the biophysical models of thalama-cortical circuits are more informative in explaining the biological aspects of ongoing processes especially in Parkinson's disease [6, 7]. In this work, a biophysical model for striato-thalama-cortical circuit is investigated for action selection. The activation at each neural substrate in the model is obtained and discussed. It is observed that the model is capable of generating bursting behavior and the disinhibition of thalamus by globus pallidus pars internus when an action is selected. The model is composed using both Hodgkin-Huxley and Izhikevich neuron models, in order to figure out the efficiency of these neuron models. Since the model is a nonlinear dynamical system, the analyses are carried out with XPPAUT and the effect of excitatory input is explained with bifurcation diagrams. Thus activation at striato-thalama-cortical circuit is explored using mathematical tools developed for nonlinear dynamical systems.

References

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