نویسندگان:

zeinab Tajik Mansoury - *Motor Control and Computational Neuroscience Laboratory, School of ECE, College of Engineering, University of Tehran, Tehran, Iran*

Fariba Bahrami - *Motor Control and Computational Neuroscience Laboratory, School of ECE, College of Engineering, University of Tehran, Tehran, Iran*

Mahyar Janahmadi - *Neuroscience Research Center and Department of Physiology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

Mehdi Borjkhani - *Electrical Engineering Department, Urmia University of Technology, West Azerbaijan, Iran*

خلاصه مقاله:

Background and Aim : CaMKII (Calcium calmodulin-dependent protein kinase II) is one of the important protein kinases in the hippocampus. Phosphorylation of CaMKII is due to the Ca2+ (calcium II ion) concentration increasing for short term in the postsynaptic neuron. The phosphorylation of CaMKII can lead to LTP (Long Term Potentiation) induction in the synapses. The significance of the CamKII phosphorylation process has motivated some researchers to develop computational models of this process. However, these models are very detailed and complicated and also can not be used for dynamical analysis purposes. So, in this paper, we present our simplified model of CaMKII phosphorylation process. The model does not have unnecessary complexities and can easily be used for dynamical analysis purposes.Methods : Here a Hodgkin-Huxley type approximation method is used to model the CamKII phosphorylation process. We considered the twelve_dimentional nonlinear model of the CamKII phosphorylation (Borjkhani et al.,2018)as a black box, which its input and output are Ca2+ and phosphorylated CamKII, respectively. We inserted different step inputs into the validated model. The outputs were the step responses of a first-order system. Therefore, we recorded steady-state and time constant of response for each concentration of Ca2+. Then we identified nonlinear relation of Ca2+ with the time constant and the nonlinear relation of Ca2+ with steady-state of CaMKII phosphorylation by choosing high adjusted R square models.Results : We calculated the output signal of phosphorylated CaMKII of our first-order model and the twelve_dimentional model for 19 times. We used the hypothesis test with student s t distribution, one of the statistical inference methods(Lyman Ott et al.,1977), to compare our model and the twelve_dimentional model results. We set the equality of mean of the sampling distribution of two models for each time sample as the null hypothesis(H0) and inequality of mean of the sampling distribution of two models for each time sample as the alternative hypothesis(HA). Then we used student s t distribution to find the probability of observation assuming that the H0 is true. So, we calculated the p_value for each time sample. The results show that for 99 percent of time samples, the H0 was not rejected. Therefore, we can confidently state that means of these two model sampling distributions are equal by the significance level of 0.01. Then, our proposed model is validated to be used for the purposes mentioned. Conclusion : The presented simplified

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