

Random weights in neural network models for chaos in spontaneously bursting Hippocampal slices

¹S. Selvarajan and ²A. Nanayakkara.,

¹*Department of Physical Science, Vavuniya Campus of the University of Jaffna, Vavuniya,* ²*Institute of Fundamental Studies, Hantana, Kandy*

A Neural Network model was used to simulate stochastic population bursting by introducing random weights at different stages of the simulation. It was found that maps of interspike intervals (ISI) exhibit recurrent unstable-periodic-orbit (UPO) like trajectories similar to those found in experiments on hippocampal slices. The network behavior is found to be very sensitive to the network parameters and hence choice of parameter values for simulating the model is very narrow. To simulate the effects of high Potassium medium, the network is "chemically kindled" through a Hebbian learning mechanics switched on throughout the simulation under random inhibition. Generation of these new excitatory synapses creates a new high-activity (epileptic) attractor of the network dynamics. It was observed the kindled network makes occasional, spontaneous, short-lived excursions to the high activity attractor, similar to the spontaneous population bursting observed in slice experiment. Periodic Pacing (PP) control method was used to control chaos from the network.