Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Application of real time systems to the analysis of neuronal dynamics[1] GENNADY CYMBALYUK, ANDREY SHILNIKOV, Georgia State University — Neurons exhibit various activity regimes and transitions in between. The central pattern generator controlling the leech's heartbeat contains identified pairs of mutually inhibitory neurons (Calabrese et al. 1995). We describe real time systems approaches to the analysis of their activity. The hybrid system consists of a living neuron and a model neuron (or an artificial silicon neuron) interacting in the real time. Dynamic clamp is used to implement artificial ionic currents and synapses in the system (Sharp et al. 1993). Our study determines the mechanisms underlying and regulating bursting activity, based on intrinsic membrane dynamics and network interactions. The complexity of endogenous dynamics originates from the diversity of ionic currents operating on different time scales. Hybrid system analysis and slow-fast dynamical systems analysis have been combined in our studies of bursting, its origin and transformations in heart interneurons both as single cells and in the mutually inhibitory configuration.

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Date submitted: 27 Nov 2007 Electronic form version 1.4