Simulating Physiological and Morphological Properties of Neurons with SNNAP (Simulator for Neural Networks and Action Potentials)

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How Do I Get SNNAP?
Ifs simple. SNNAP is available free of charge. Just visit the SNNAP web site and download the files.

http://snnap.uth.tmc.edu

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Introduction

Computer simulations are useful tools for teaching neurophysiological principles as well as for research. To make the tools of computational neuroscience more widely available, we previously developed a Simulator for Neural Networks and Action Potentials (SNNAP). With SNNAP, all aspects of developing and running simulations are mediated via a user-friendly, graphical interface and no programming skills are necessary.

SNNAP was designed as a tool for rapidly developing and simulating realistic models of single neurons and small neural networks. The electrical properties of individual neurons are described with Hodgkin-Huxley type ionic currents. The connections among neurons can be electrical, modulatory or chemical, and they can express many forms of plasticity. SNNAP also includes descriptions of intracellular second messengers and ions, which, when turned on, can modulate ionic conductances or synaptic transmission. SNNAP also simulates current flow in multicompartmental models of neurons.

The specific details of the first version of SNNAP were described in Ziv et al. (1994). This poster describes a new version (JAVA Ver. 5.1d) of SNNAP, which is now available.

What Are Some Features SNNAP Ver. 5.1d?

- SNNAP can simulate networks of up to 100 cells and 300 electrical, chemical and modulatory synaptic connections.
- Descriptors for the synthesis of second messengers include sequential interactions as well as converging and diverging interactions. For example, both a modulatory transmitter and the levels of intracellular Ca++ can regulate the synthesis of cAMP.
- Descriptors for chemical synaptic connections can include a voltage-dependent component. For example, a model for a synaptic connection can include an NMDA-like conductance.
- Chemical synaptic connections can include descriptors for a pool of transmitter that is regulated by depletion and mobilization and modulated by intracellular ions and second messengers.
- To simulate multicompartmental cells more accurately, SNNAP incorporates tools that allow users to develop models based on morphological parameters, such as the diameter of a cell body or the width and length of a neuronal process (Fig. 5).
- SNNAP includes a batch mode of operation, which allows the user to assign a series of values to any given parameter or combination of parameters. A new batch editor was developed for the most recent version of SNNAP to facilitate the exploration of parameter space.
- For flexible virtual experiments, cells can be injected with currents that have either steplike or user-defined waveforms.
- SNNAP runs in the JAVA environment, and thus can run on virtually any computer or operating system.

How Do I Get SNNAP?
If you can’t download SNNAP from the web, then we can send you a copy via E-mail or surface mail.

http://snnap.uth.tmc.edu

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Instructions for installing SNNAP are included in README files and in the manual.

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