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Spike Sorting by Spectral Analysis of Single Action Potentials

GENESIS on Unix – simulation of intracellular membrane potential and its transformation into spike-trains, and extracellular field potential.

MATLAB on Microsoft Windows – Spectral analysis and spike-sorting.

Summary

GENESIS code	
`markovchanspikes.g`	Creates Na^+ and K^+ channels undergoing Markov kinetics.
`spikegen.g`	Generates stochastic membrane potential.
`cell.p`	Defines cell for `spikegen.g`.
`xcspikegen.g`	Generates stochastic field potential.
`xcell1.p`	Defines cell A for `xcspikegen.g`.
`xcell2.p`	Defines cell B for `xcspikegen.g`.
`makespikes.g`	Transforms membrane potential into spike train.

Shell scripts	
`makespikes.sh`	Converts membrane potential files into format for transformation into spike trains.
`runspikes.sh`	Calls `makespikes.g` for multiple transformations.

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MATLAB code	Common Library for all MATLAB modules
datatable.m	Defines parameters for computation for each simulation.
apspectrum.m	Computes spectrogram for an action potential.
apspecfit.m	Fits curve for spectrogram.
getapshape.m	Compute shape attributes.
getapfrate.m	Compute time-varying firing rate.

MATLAB code	Data manipulation scripts
mergecur.m **mergesod.m** **mergepot.m**	Combines simulation output and their corresponding spike trains into one file – one for each variable parameter.
mergedata.m	Merges simulation data - common for mergecur.m, mergesod.m and mergepot.m.
addspikes.m	Adds spike-peak indicator to membrane potential.
mfp.m	Build pathname based on information in the data table.

MATLAB code	Action potential analysis
analyzecur.m **analyzesod.m** **analyzepot.m**	Computes spectrogram of the averaged action potential of a intracellular membrane potential recording and its attributes as a function of the variable parameters
analyzeaps.m	Common to **analyzecur.m, analyzesod.m** and **analyzepot.m**
apsum.com	Extract action potential from membrane potential and spike train, and computes average.
apsumcom.com	Prepare data for computation by apspum.m.
apspeccom.m	Prepare data for computation by apspectrum.m.
apspecfitcom.com	Prepare data for computation by apspecfit.m.
apspecattr.m	Plots spectral attributes against variable parameters.

MATLAB code	Spike-sorting
`sortall.m`	Calls `sortspikesxc.m` for all sorts.
`sortspikesxc.m`	Common setup for spike-sorting. Calls `sortspikes.m.`
`sortspikes.m`	Performs spike-sorting.
`captureaps.com`	Extracts action potentials given a field potential recording.
`detectspikes.m`	Detect action potential peaks in a field potential recording.
`apextract.m`	Extract action potentials from a field potential recording given peak locations.
`plotcluster.m`	Plot spectral attributes clustering diagrams.