UniPRCsim Howto:

Contents

Overview

This document explains how to use uniPRCsim. version 0.00.0041 For installation instructions, see the separate installation document.

Copyright and trademark information

Feedback

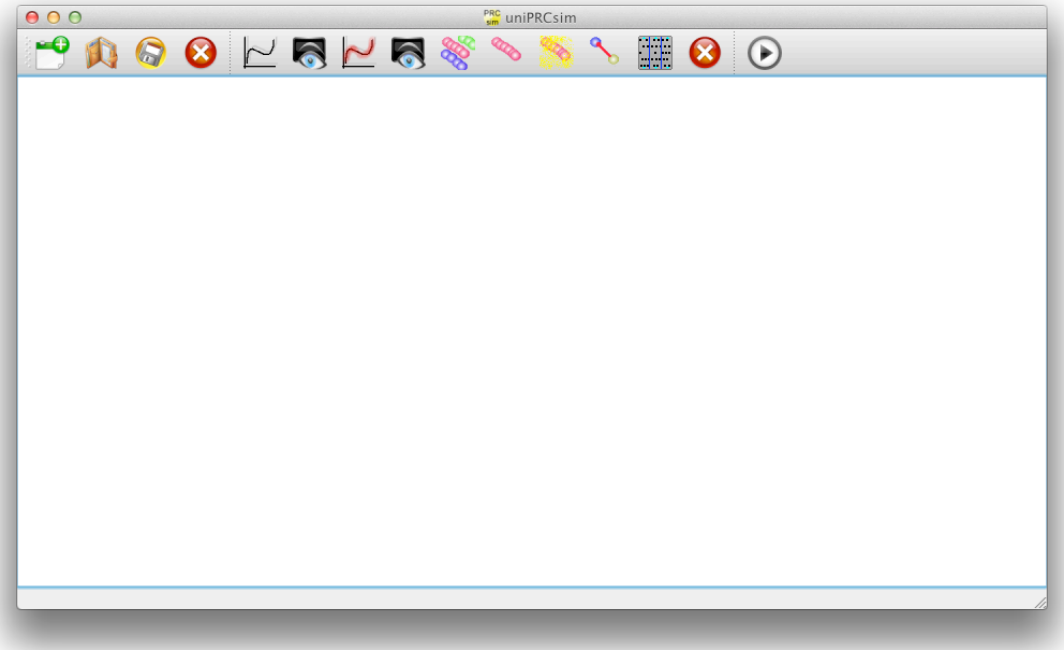
Please direct any comments or suggestions about this document to rtikid@lsuhsc.edu or wtcole4@lsuhsc.edu.

Modifications and updates

This is the first edition. This section will record changes made for future additions.

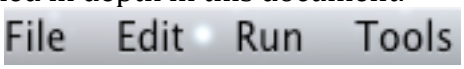
UniPRCsim

The uniPRCsim program is used to model and visualize the interaction between groups of periodically firing neurons that are guided by phase resetting curves.



Menu Bar

The menu bar contains the same options as the toolbar. These options will be explained in depth in this document.



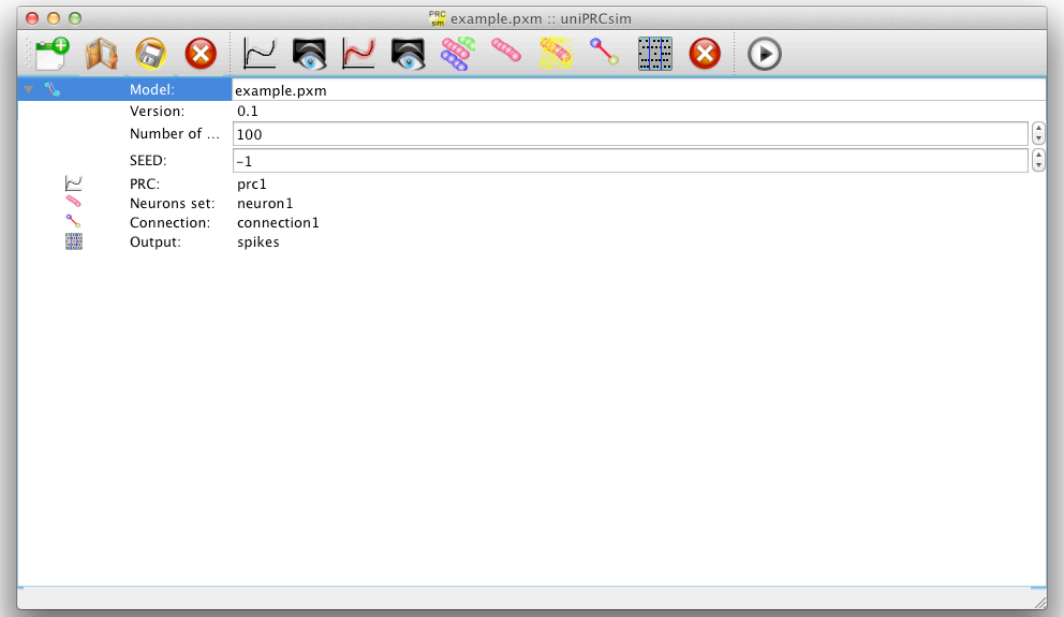
Tool Bar

There are fifteen icons on the toolbar (five of which act on models, and 10 of which act on objects within models). IMPORTANT: When you have selected an object within the logical tree in the main window, you will launch the *editor* for that object by clicking the "Insert or edit selected" button for that object. When you have selected anything else, you will launch the dialog to *create or import a new object* of that type.

Models

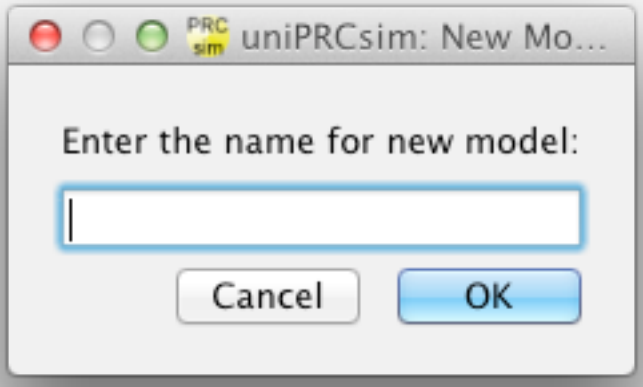
Model Overview

Models are made up of objects and attributes, some of which are required for the model to run. Models require a PRC object, neuron (or noisy neuron) object, connection object, and output object. A simple example of a model with all the required objects can be found in example.pxm. Click the open model button and find it in the folder <*installation directory*>/uniPRCsim/demos.

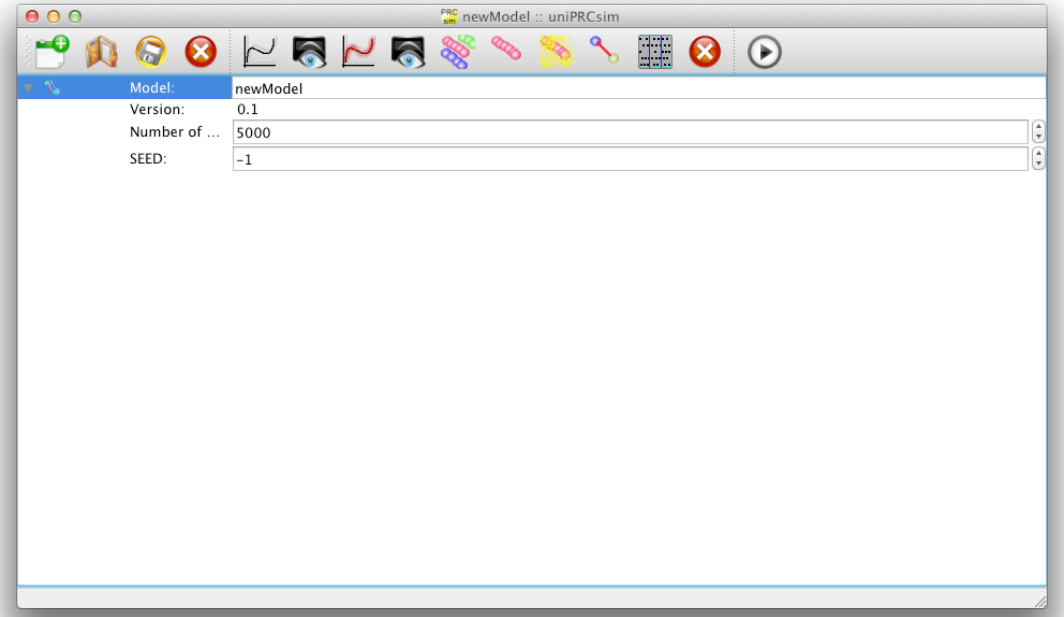


Model Actions

Or models can be created fresh from within UniPRCsim: 



After being created initially, models will not have the required objects to run. The required objects must be added:



Models (or simulations) can be opened from a file (usually extension *.pxm):

Then actions can be performed on the model. You can save the model:

You can close the model:

You can run the model from the end of the tool bar:

Objects within models

Object Overview

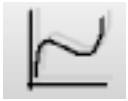
A PRC object, neuron (or noisy neuron) object, connection object, and output object are required for a model to run. An overview of these objects and all possible

objects that can make up a model follows. These objects can be removed as needed with the remove object button.

Important Note on Creating and Editing Objects

When you have selected an object within the logical tree in the main window, you will launch the editor for that object by clicking the "Insert or edit selected" button for that object. If you have selected anything else, you will launch the dialog to create or import a new object of that type.

Object Actions

You can insert or edit a PRC: 

You can preview a PRC with the eye icon(or random PRC with the second eye icon): 

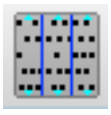
You can insert or edit a random PRC: 

You can insert a population: 

You can insert a neuron set: 

You can insert a noisy neuron set: 

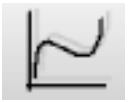
You can insert a connection: 

You can insert an output object: 

You can remove an object from a model: 

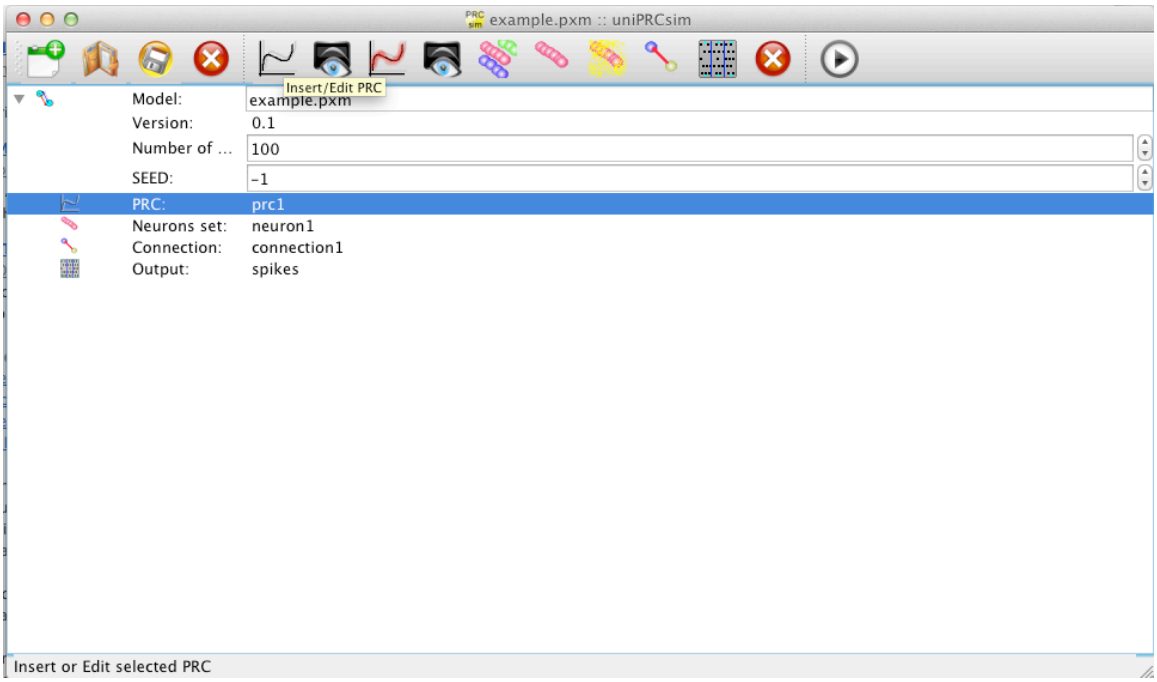
PRC objects

Phase resetting curves can be imported from a file or created fresh from within uniPRCsim in much the same way models can. Click Insert or Edit Selected PRC to either import a PRC from a file or change a PRC that is currently part of the model that you have selected. PRCs can be first or second order. PRCs can have multiple phase change values and conductance (gsyn) values per phase value that could be used to interpolate. PRCs can be previewed by clicking the icon with the eye.

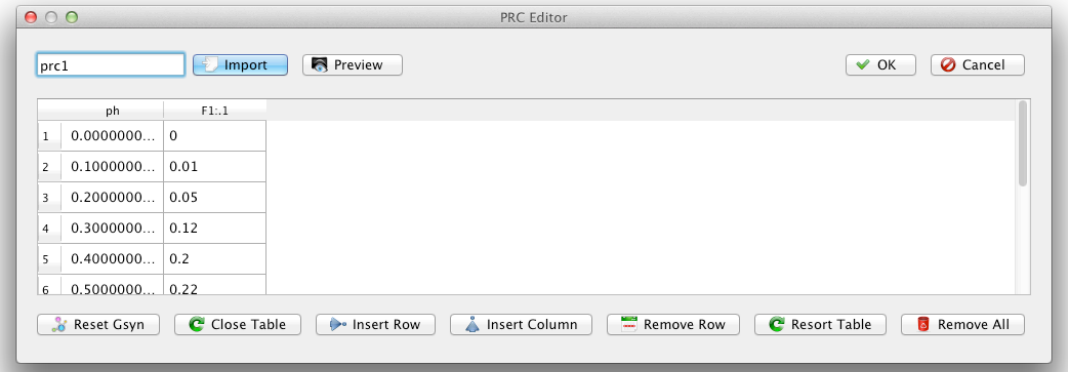


Editing a PRC

Select the PRC:

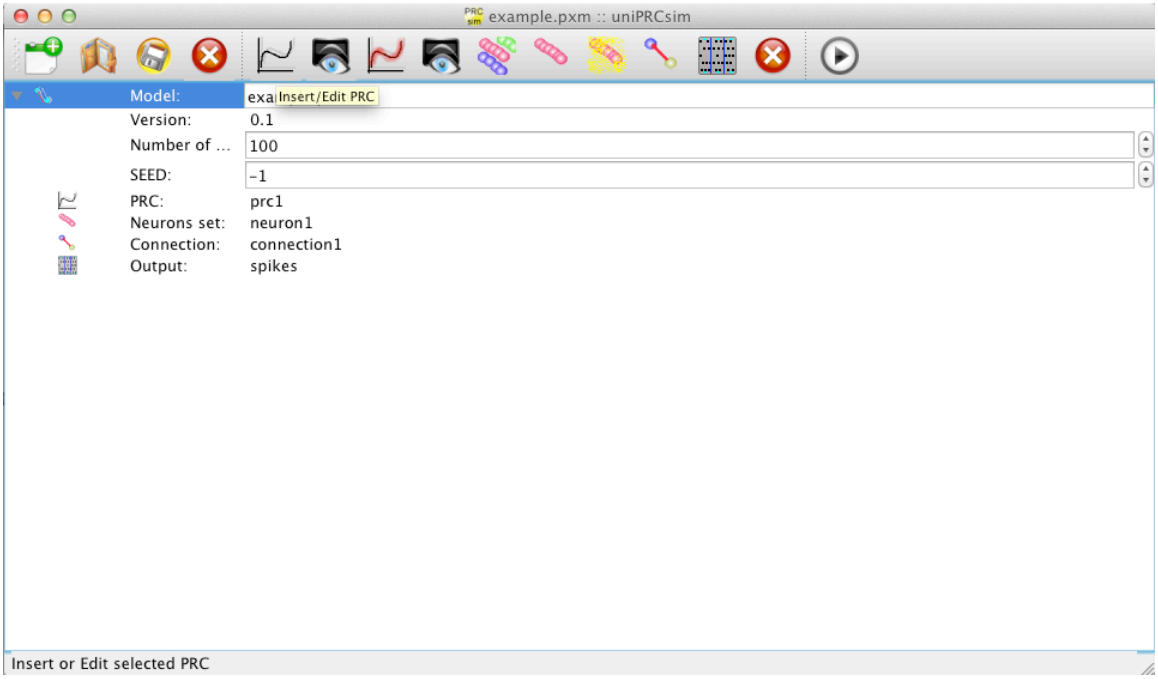


Click “insert or edit selected PRC”. Prc1 will open:

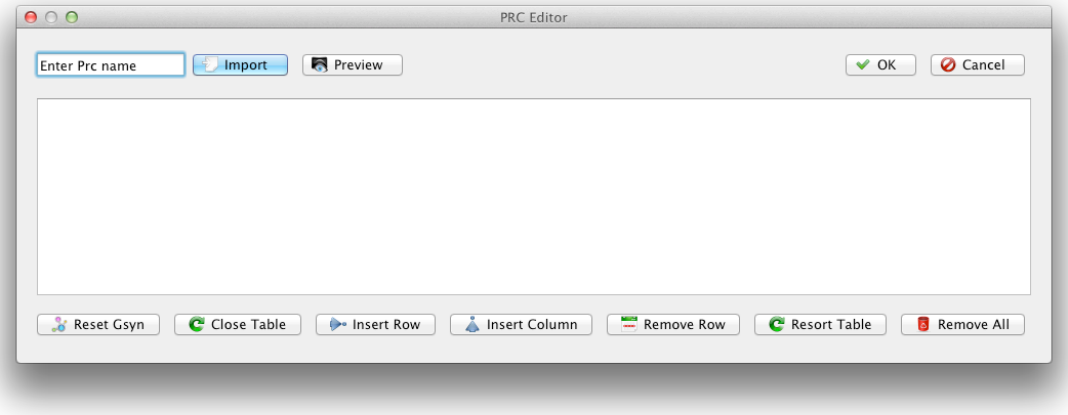


Inserting a new PRC

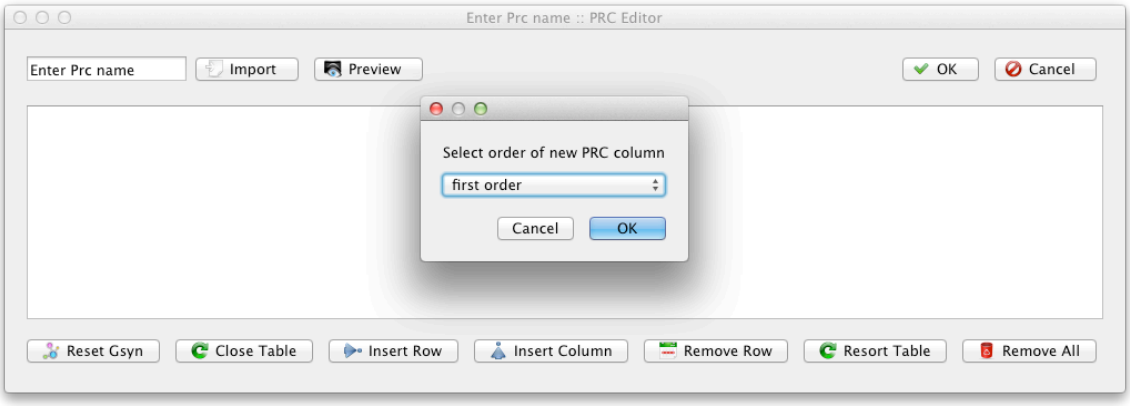
If you select something other than the PRC in the model and click insert:



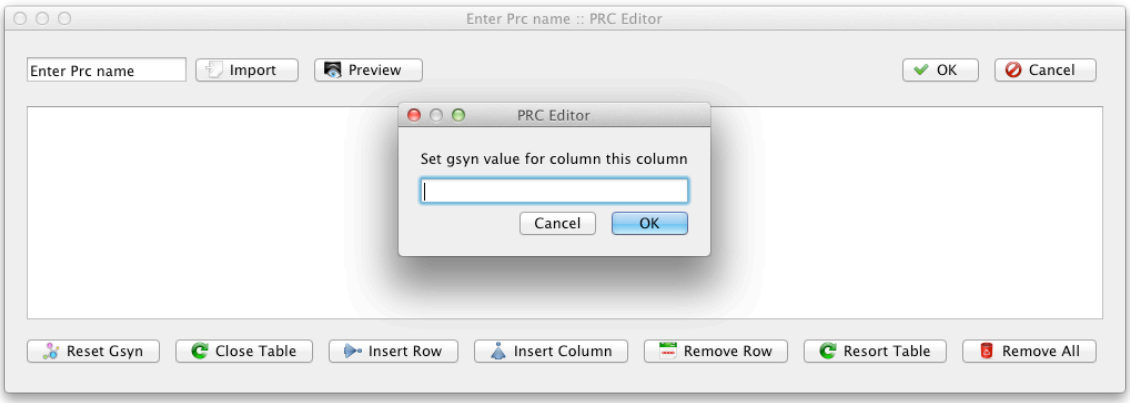
You will open the dialog for a new PRC:



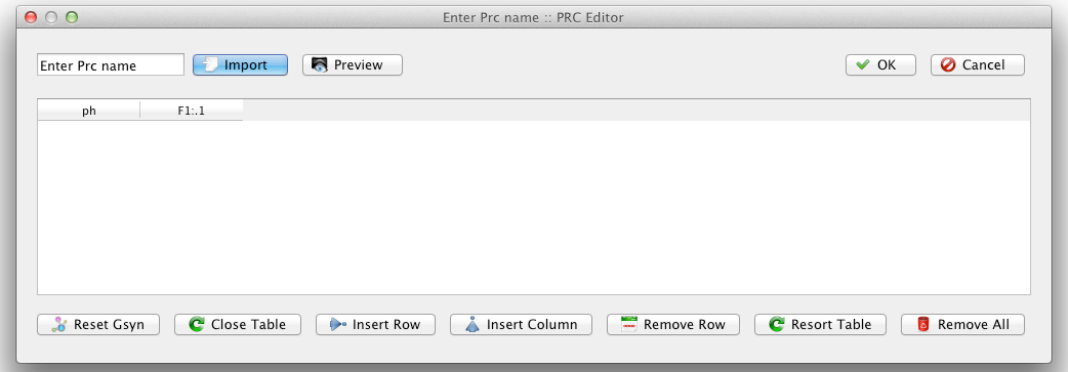
Click import to get a PRC previously created PRC from a file or click insert column to build a new one:



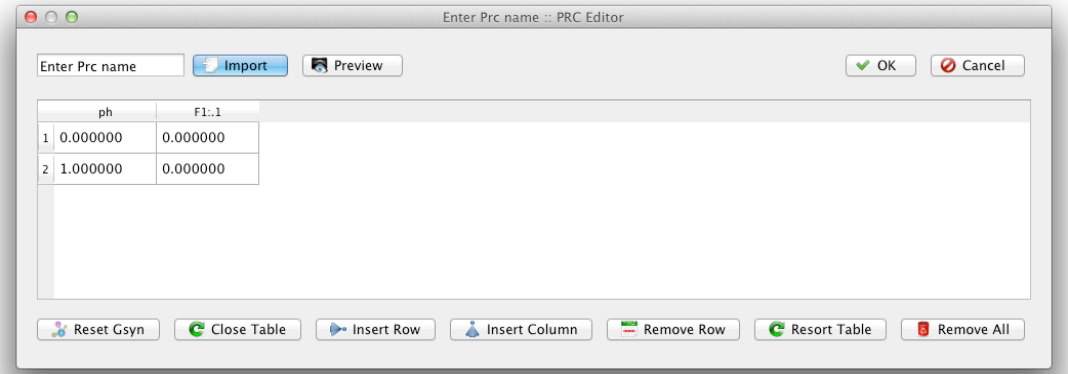
Select the order and the gsyn value you want:



Now you that you have created the necessary columns, insert rows with the data until you have completed your PRC.



At least two rows, with values 0 and 1 representing the beginning and end phase (ph) values ought to be entered.



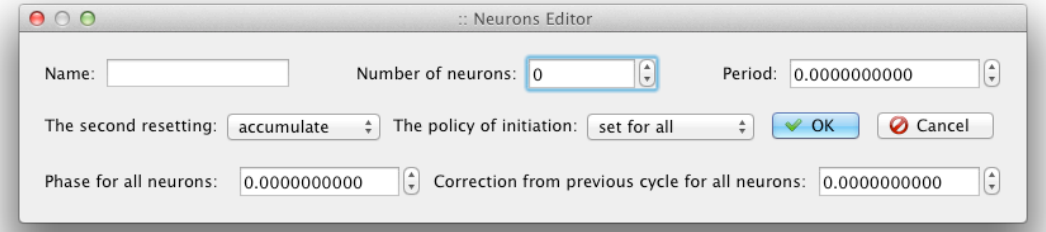
Enter a new name in the top left and click OK. This new PRC can then be applied to a connection.

Neuron objects or Noisy Neuron objects

Sets of neurons can be inserted from within the program. Although neurons cannot be imported from a file, they are often included as part of model files. Sets of noisy neurons can be treated similarly to other neurons but with parameters for the noise.

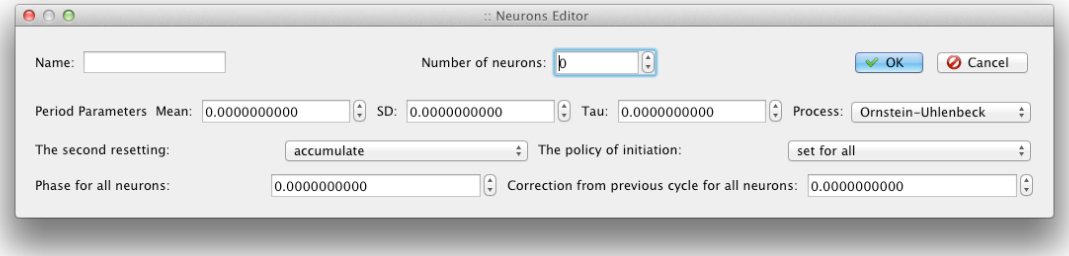
Creating a Neuron Object

You should enter a name, and the number and period must be greater than zero.



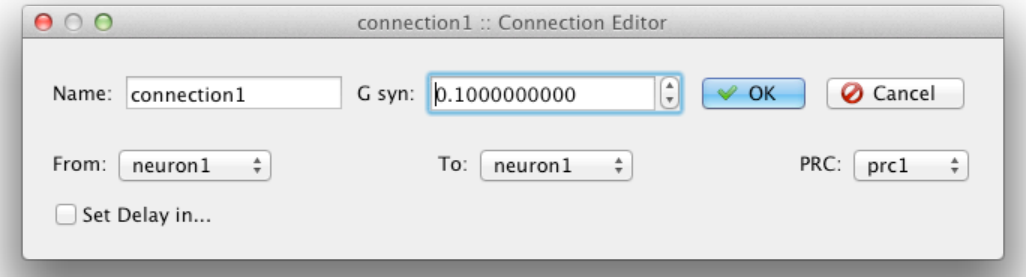
Creating a Noisy Neuron Object

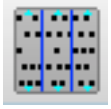
Like a normal neuron object, a noisy neuron should have a name, and a number and period both greater than zero. It must also have a tau value greater than zero.



Connection objects

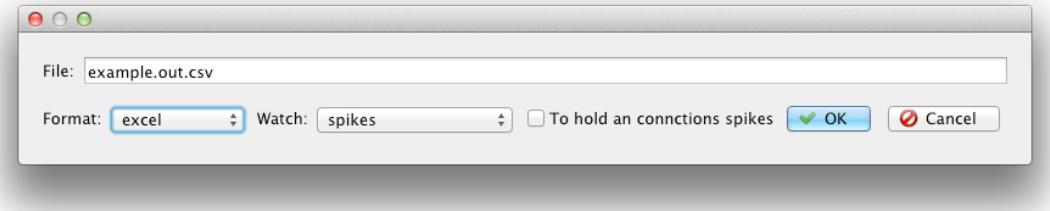
Connections specify the sender and receiver for two sets of periodically firing neurons, the PRC used for interpolation and the conductance value between them.





Output objects

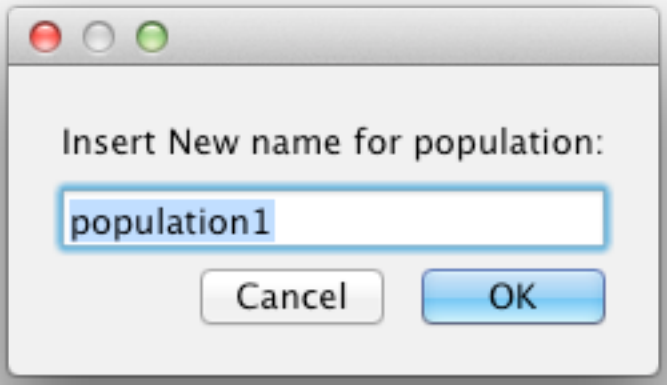
Output objects specify information to be recorded by the model. Options include spikes, periods and phases (among more specific options) and they can be recorded in various formats (Excel, Excel tab-delimited, xml, or data). Output objects must be included. You can include an empty output object just to get the raster diagram after a simulation run. If the model does not have an Excel-formatted spikes output, the raster diagram will not appear. If you include an object with phase output, you can explore it in the phase viewer (Tools - >Show Phase). Please note that if you have previously run a simulation and you open this model again, it isn't necessary run the model to see the raster plot, just click Tools->Show Graphs.



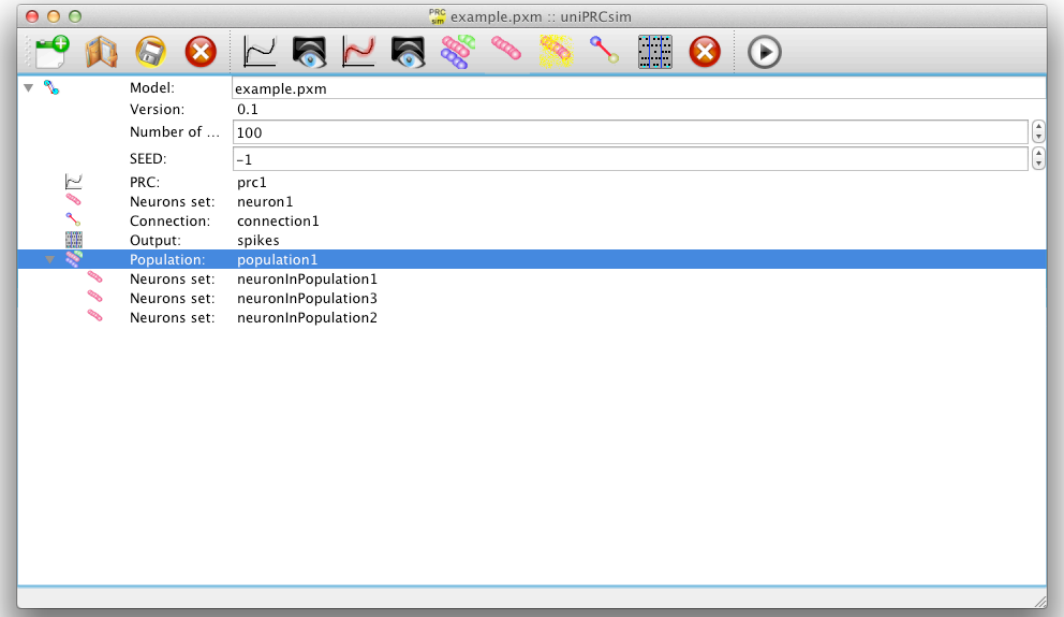
Population objects

Populations are made from one or more neuron objects and are a way to connect neurons without being restricted to one-to-one connections. For example, if there were two groups of four neurons with a connection from each neuron in the first group to each neuron in the second group, this setup could be accomplished by making each group a population with only one connection between them.

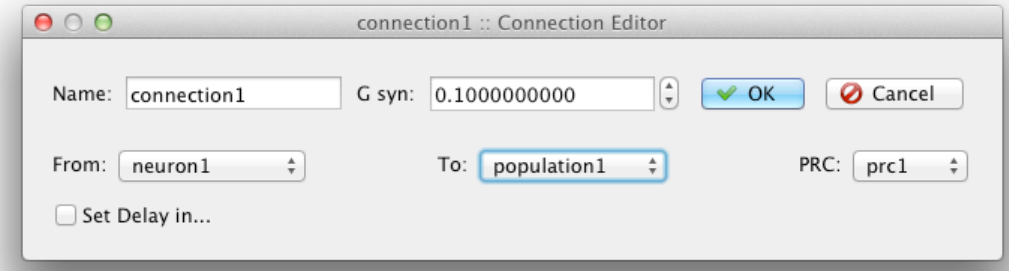
Create a population:

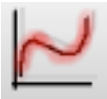


Select the population from the model tree and click insert neuron (or noisy neuron), following the instructions about inserting neuron objects.



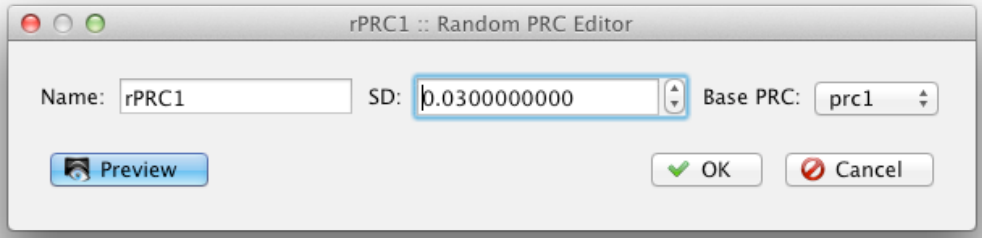
Once the population contains neurons, the population can be used with a connection.





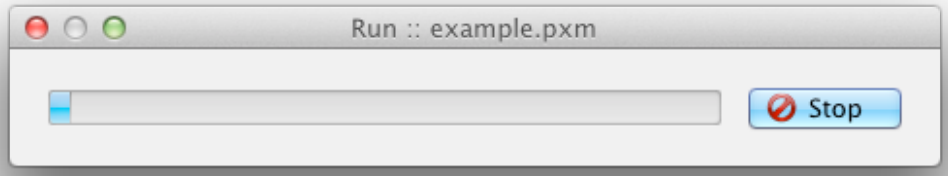
Random PRC objects

Random Phase Resetting Curves are generated from non-random PRCs and a user provided standard deviation. If no standard deviation is provided, then the random PRC will act in the same way the Base PRC does.



Running the Model

Running a model with an Excel-formatted spikes output will produce a raster plot. Depending on the complexity of your model, it may take some time.



The plot will look different depending on your model.