iqr Tutorial 04-Circuits-Neural oscillator

iqr tutorials will provide you with a practical introduction to using the neural simulation software and give you an insight into the principles of connectionist modeling. They are intended to be complementary to the detailed operation manual.
The home page of iqr is at iqr.sourceforge.net. Up to date information, documentation and tips and tricks ca be found in the iqr wiki (sourceforge.net/p/iqr/wiki/Home/).
The repository of iqr packages is here: sourceforge.net/projects/iqr/files/. iqr is open source software. You can browser the entire source code of iqr here: http://sourceforge.net/p/iqr/code/HEAD/tree/. Please contribute to iqr by reporting bug (sourceforge.net/p/iqr/bugs/) and requesting features (sourceforge.net/p/iqr/feature-requests/).

Aims

- Build a simple neural oscillator.

Building the System

A neural oscillator is just a collection of one or more neurons that spike in particular patterns. The simplest way to construct one is to use a single integrate-and-fire neuron which receives excitatory input from a single random spike cell. You should make use of the potential reset on spike to force the membrane potential below threshold each time the neuron spikes so that it can start integrating the input again.

Running the Simulation

- What parameters of the spiking cell do you need to vary to make it spike faster or slower?
- What input cell parameters or synapse parameters do you need to vary to make the spiking neuron spike faster or slower?

Save the simulation and make a copy of it. Now connect it to a second spiking neuron in a different population. The second neuron should then be connected back to the first one; this is a recurrent connection. Define the cell parameters and connection properties so that the two neurons spike alternately. You created a bistable neural oscillator.

- Describe the cell and connection properties of your new circuit.

Save the simulation and make another copy of it. Change your bistable oscillator so that you have a neural "chaser" consisting of five elements that spike in turn. When the last neuron finishes spiking, the first neuron should start spiking again.

- Describe the cell and connection properties of your neural "chaser". sensitive is your circuit to changes in the cell and input parameters?