Computational Neurodynamics

Exercise Sheet 5 (Unassessed)
Synchronisation

All files for these exercises can be found online at

https://github.com/pmediano/ComputationalNeurodynamics

Question 1

a) Start up Python and run `Sync2Run.py`; You should obtain raster plots and mean firing rate results similar to those for two uncoupled populations in Topic 8 (Synchronous Oscillation: Sources). Inspect the relevant code and make sure you understand it.

b) Write a function to calculate the power spectrum of the mean firing rate of each excitatory population. Plot the results and verify they match those in the slides.

c) Introduce cross-population excitatory to inhibitory coupling (as in the slides). Make raster plots and calculate the power spectrum of each excitatory population. You should obtain results similar to those shown in the slides of Topic 8.

Question 2.

a) Modify `Sync2Connect` so that the coupling between the two populations is excitatory to excitatory, not excitatory to inhibitory. In other words, the arrangement should be like in the figure below. Modify the excitatory to inhibitory and inhibitory to excitatory delays within the two PING populations to be both 5ms. Set all the excitatory to excitatory scaling factors to 5.

b) Now run the network and plot its power spectrum as before. What is the result?