Homework3

- **Q1**: Neuron Model

A) Using the simple neuron model, change the value of the background noise (neurs[0].noise.g_e0=xx) to get a spontaneous firing rate of about 7Hz. Save 10 seconds worth of spontaneous activity (spont7.txt), and use the matlab function you previously created to print the firing rate, CV and CV2. Make sure to indicate what value of neurs[0].noise.g_e0 you have used.

B) In Matlab, create two 4Hz sinewave stimuli of total amplitude 2 nA centered at 0.2, lasting 10 and 250 seconds respectively (0.1 ms time step). Use the 10 second stimulus to find the value *Amp32* and *Amp100* corresponding to a 32% and 100% contrasts as in (Reich et. al 1997). Show your best result.
Restart Neuron, set the Tstop to 250,000ms, set the noise level with the value you found in A, and Reproduce Fig 1 of this paper as best you can using the 250 sec long stimulus (will take a while to run!). Make sure to indicate the value of all the parameters you changed/introduced.
Notes:
- Use the functions InsertVStim(0) and ReadStimVec(0) to stimulate the neuron with the sine wave stimulus, see your class notes.
- When generating inputs (e.g. sinewave), make sure the time step of your stimulus matches the time step of NEURON (by default, dt=0.1ms), and that the first number in the file is the total number of points in the sinewave (100000, 2500000). See the README file that came with the simpleneuron model.

- **Q2**: Working with Real Data! (courtesy Rob de Ruyter van Steveninck)

SpikesSFLY1506.txt contains a continuous recording of a fly H1 neuron stimulated by repeated presentation of a 5 sec long moving stimulus **rpfv1440_5sRvel.txt**. The stimulus is sampled at 500 Hz.

A) Compute the firing rate, CV, CV2 of the spike train. Plot and comment the ISI return map. Plot and comment on the response of the neuron to repeats of the stimulus (each repeat is one trial).

B) Compute and plot the fano factor Vs T (bin size, up to 2 secs). Compute the spike triggered stimulus average in a 400 ms window (you case use just one trial). Compare to (Teich et al 1996).

C) (optional) Plot the PSTH, and show that you chose a reasonable bin size.

Note: please turn in a single zipped file containing your code, a single word/pdf file with all relevant graphs, profusely commented.