

1 Materials and Methods

Model.

Quick intro to Currents

Simulations.

Python and stuff (integration)

Initial conditions - $V = -65$, other variables - steady state.

Measures. Simulated for 40 seconds. First 20 seconds were excluded to allow dynamics to reach stable dynamical regime. Measures were calculated within 20-40 seconds.

Measures: Definition of bursting, bursting period, burst width, interburst interval, intraburst interval, spike width, spiking period

Bifurcation Analysis.

Auto 07p

Fast-slow decomposition - dynamics of slow subsystem was frozen, fixed points and bifurcations of the rest was computed for each values of the slow variable. Also stability of the fixed points were extracted. Hopf, saddle-node bifurcations and Periodic orbits were obtained.

Fitting Ion Channel Parameters

As the data from the article is not available online, the values were estimated by taking screenshot, importing the image in Coreldraw and estimating the values using visual inspection and coordinate system of Coreldraw. The fitting was performed using python function *scipy.optimize.curve_fit*. The following plots show the estimated activation/inactivation variables, as well as time constants as a function of test potential V , as provided in (Jeong et al. 2015):

Note 1. The error due to the subjective visual inspection should not be large. I did not estimated the error, but with moving the manually placed dot over the image on the did not have considerable effect in the final values (within the moving range where the manually placed dots were not obviously not overlapping with the ones from the image).

The values of the resulted estimates (plotted in the figures above) are provided in Section ??.

Parameters for steady-state activation variable were estimated by fitting $m_{T,\infty}^3(V)$ (see Equation ??) to the data from electrophysiological recordings presented in (Jeong et al. 2015) (similar

to the procedure described in (Coulter, Huguenard, and Prince 1989)). The steady-state inactivation was estimated by fitting Equation ?? to the data from the same paper.

I-V relationship