Excitatory vs Inhibitory F-I Curves were generated by

% <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4766297/>

In which the author uses two sets of HH model parameters to describe each neuron type. I put these equations through an ODE45 solver at many input currents to generate the following plots.

C:\Users\HB\Documents\GitHub\Microstimulation-Model\Images\test\F-I Curves.tif

Very hard to fit for these. We could fit it like this:

C:\Users\HB\Documents\GitHub\Microstimulation-Model\Images\test\F-I Curves-Fits.tif

Where

Y(inhibitory) = 66.33.\*x.^(0.3029)-32.87;

Y(excitatory) = 392.8.\*x.^(0.09521)-403.8;

C:\Users\HB\Documents\GitHub\Microstimulation-Model\Images\test\50%dist1.tifC:\Users\HB\Documents\GitHub\Microstimulation-Model\Images\test\50%distc.tif

Optimization update:

Changed to new particle swarm algorithm from the optimization toolbox in matlab, it seems to work better than the current algorithm but I am not able to store iterative data (only view it). The nonmotion/motion ratio of type 4 has decreased from ~3 down to nearly a ~1 ratio, which indicates this is a better algorithm. No change has been found on the other stalling types however.

In order to test that this could not be an issue with initial conditions, I regenerated the neuron map. This proved to not solve the issue however. The issue does not seem to lie with the optimization algorithm itself.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Algorithm Type** | **MS Only** | **Opto Only** | **MS + Opto (ALL+)** | **MS + Opto (ALL -)** |
| **PSO** | 5.25 | 5.25 | 5.25 | 1.0699 |
| **Simulated annealing** | 4 | 4 | 4 | 3.28 |
| **Direct Search** | 4 | 4 | 4 | 2.62 |

I tested fmincon, simulated annealing, and finally direct search. None of these algorithms were able to find different solutions for types 1-3.

Changed the thresholds to use the first 50 neurons instead of the first 500. Now we get a solution for MS, but no solution for anything else.

C:\Users\HB\Documents\GitHub\Microstimulation-Model\Images\test\solms.tif