Homework 4; Psych 186B, Winter 2018

Marshall Briggs

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1 Code explanation

I structured my code similarly to the way the book structured the sample Pascal program, splitting it up into distinct sections.

1. Initialize parameters: Setting the initial values used throughout the program. Max Inhibition = 2.0; Length Constant = 2; Number of Neurons = 80; Number of Iterations = 50; Minimum fire rate = 0; Maximum Fire Rate = 100; Epsilon = 1/500.

2. Generate initial state vector: Generate the initial firing rates defined in the book examples. For the simple lateral inhibition examples, state(20:60) = 40, state(1:20) state(60:80) = 40. For the winner take all network examples, the initial firing rates were setup with two peaks.

3. Make inhibitory weights: I generated the distances for the first neuron, then transformed those distances into

$$distance(i) = -maxinhibition * e^{(-distances(i)/lengthconstant)}$$

Later, I generated the inhibitory weights for each neuron by circular shifting the weights vector for the original first neuron.

4. Make new state vector: Finally, I computed the new state vector after each iteration by adding each piece of the new Delta State vector to it, after adjusting the new vector to make sure none of the firing rates were outside the range of the min-max values.
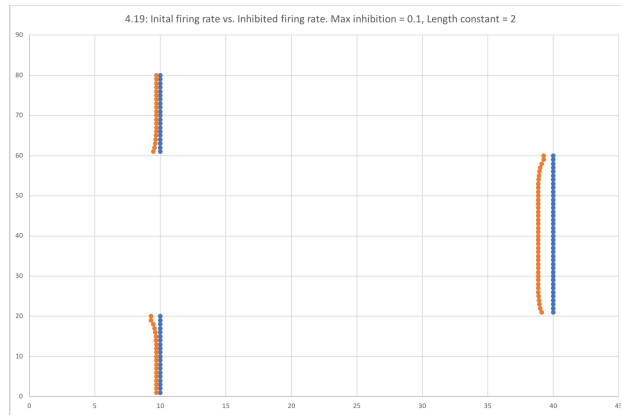
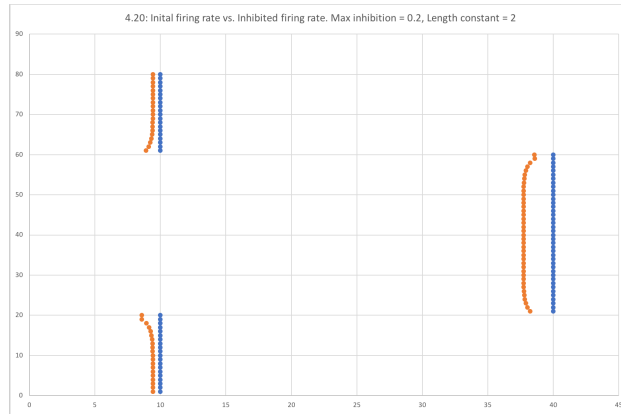Figure 1: 4.19. Simple Lateral Inhibition: Maximum Inhibition: 0.1

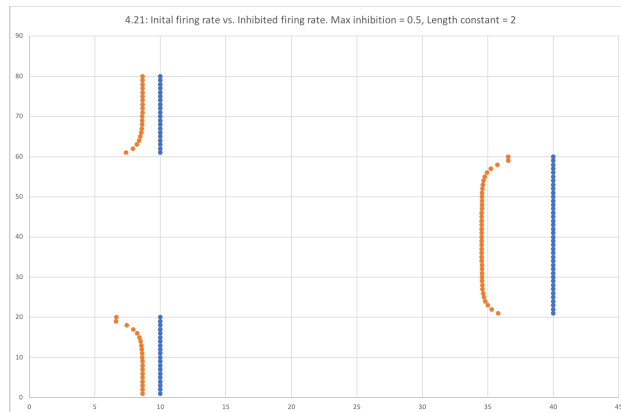Figure 2: 4.20. Simple Lateral Inhibition: Maximum Inhibition: 0.2

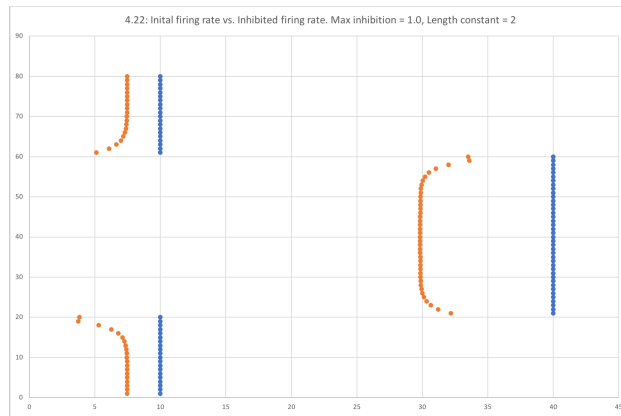Figure 3: 4.21. Simple Lateral Inhibition: Maximum Inhibition: 0.5

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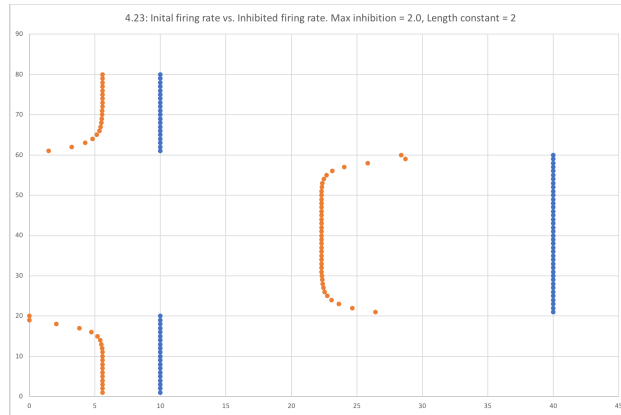Figure 4: 4.22. Simple Lateral Inhibition: Maximum Inhibition: 1.0

Figure 5: 4.23. Simple Lateral Inhibition: Maximum Inhibition: 2.0
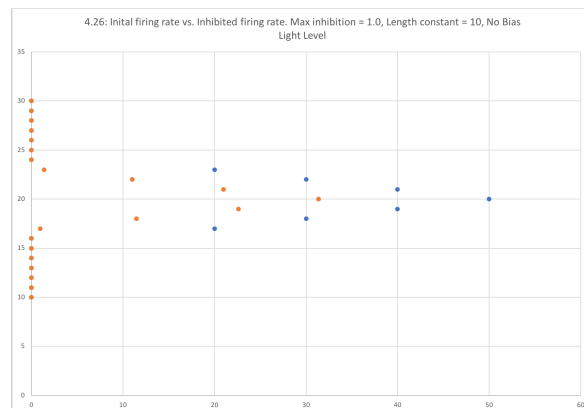

Figure 6: 4.26. Winner Take All Network: Single Peak, No Bias
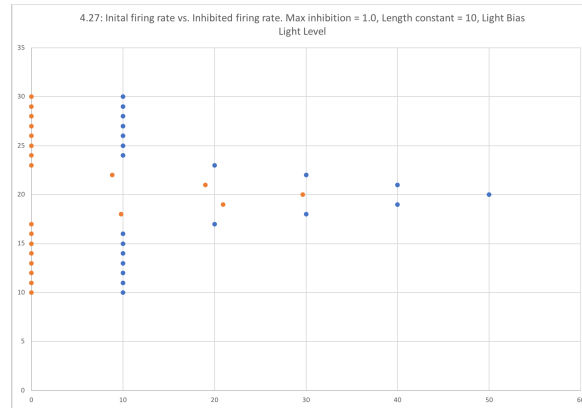
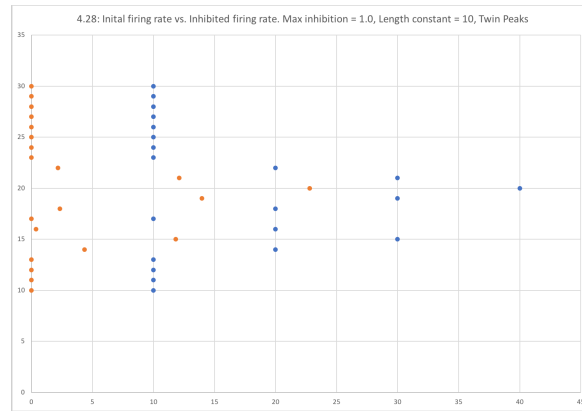Figure 7: 4.27. Winner Take All Network: Single Peak, Light Bias

Figure 8: 4.28. Winner Take All Network: Twin Peaks, Maximum Inhibition: 1.0

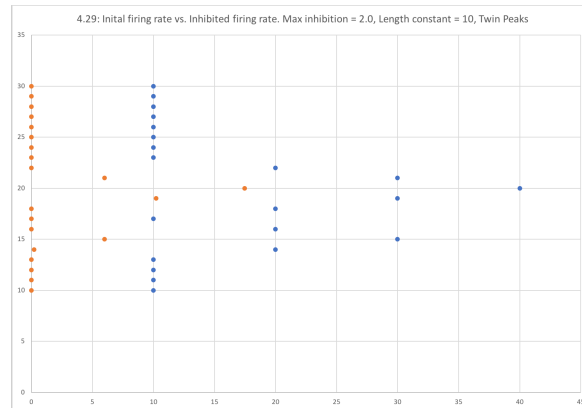4.29: Inital firing rate vs. Inhibited firing rate. Max inhibition = 2.0, Length constant = 10, Twin Peaks

Figure 9: 4.29. Winner Take All Network: Twin Peaks, Maximum Inhibition: 2.0