

Architectures of Intelligence

Assignment 4/Part1

Group 13
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INTRODUCTION TO NENGO

VALUES

Figure 1 shows a screenshot of the nengo model of the exercise with $f(x) = \sin(2x)$ as the stimulus. You can see that the values of a represent a slightly modified \sin -function, which is due to the stimulus which can be described as $f(x) = \sin(2x)$. Ensemble b shows a lower amplitude and half the wavelength because of the applied function $f(x) = x * x - 0.5$. Ensemble c both combines values of c with a latency of 0.1 ms, as well as a transformation to the values of b , resulting in a function with an amplitude and wavelength in between those of a and b . Ensemble d shows the original stimulus in blue, which matches the values of a and, the value according to the influence of c in green.

TUNING CURVES

Figure 2 shows a screenshot of the tuning curves of ensemble a . You can see 100 lines, one line representing one firing neuron. Each line $l = f(n)$, describes the average firing rate of the neuron n as a function of the stimulus x . The graph shows a variety of responses to stimulus from -1 to 1 . Some neurons tend to fire more often with higher stimuli, while some fire more often with lower values of x . This results in the pattern which can be observed in the figure.

STIMULUS SET TO ZERO

Figure 3 shows a screenshot of the nengo model of the exercise, where the stimulus is set to zero. The pattern one can observe can be described as follows: the value of a is zero since the stimulus is zero. Because $f(x) = x * x - 0.5$ is applied, the value of b changes to -0.5 . Since the stimulus for ensemble c then is negative and c stimulates itself, this value steadily decreases. The screenshot does not show the behaviour, however, c would normally stay at -0.25 because of the transformation from b to c , but since it feeds negative values to itself, the value decreases. d then mirrors the values of a in blue and c in green because no functions or transformations are applied.

A. ASSIGNMENT 4/PART 1

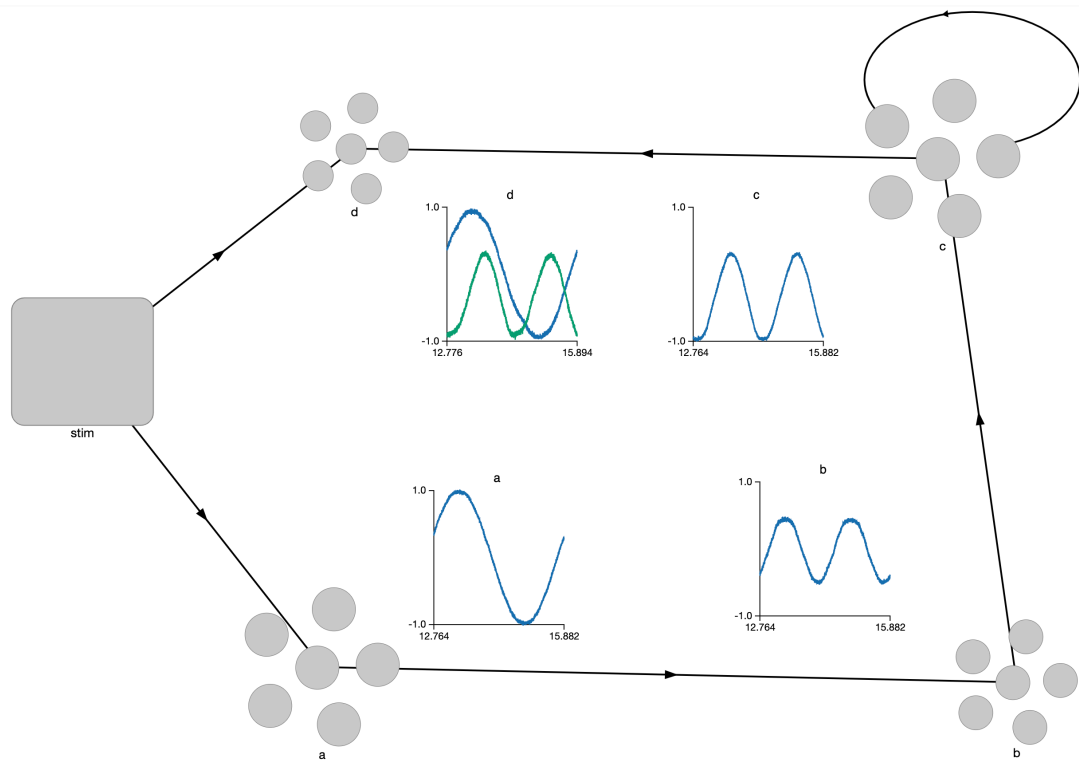


Figure 1: Screenshot of the nengo model with $f(x) = \sin(2 * x)$ as the stimulus.

Tuning curves

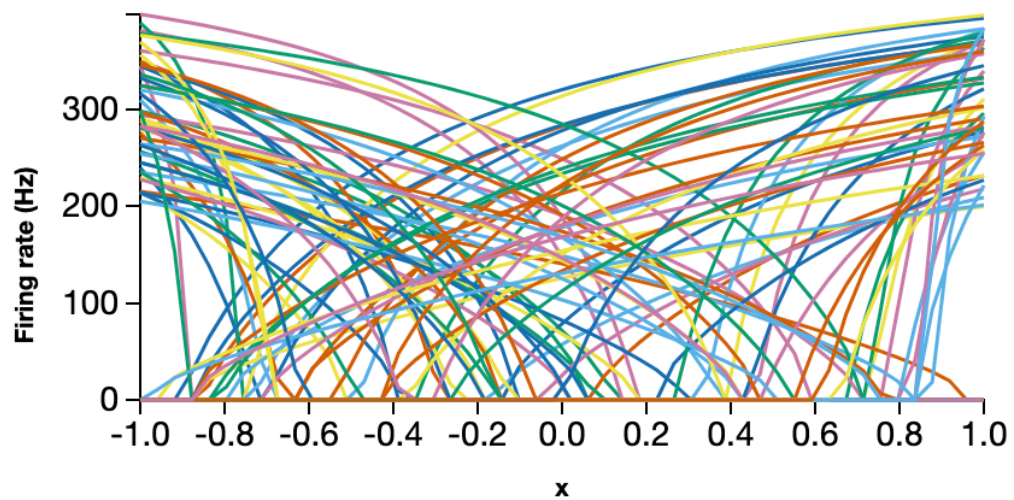


Figure 2: Screenshot of the tuning curves of ensemble a.

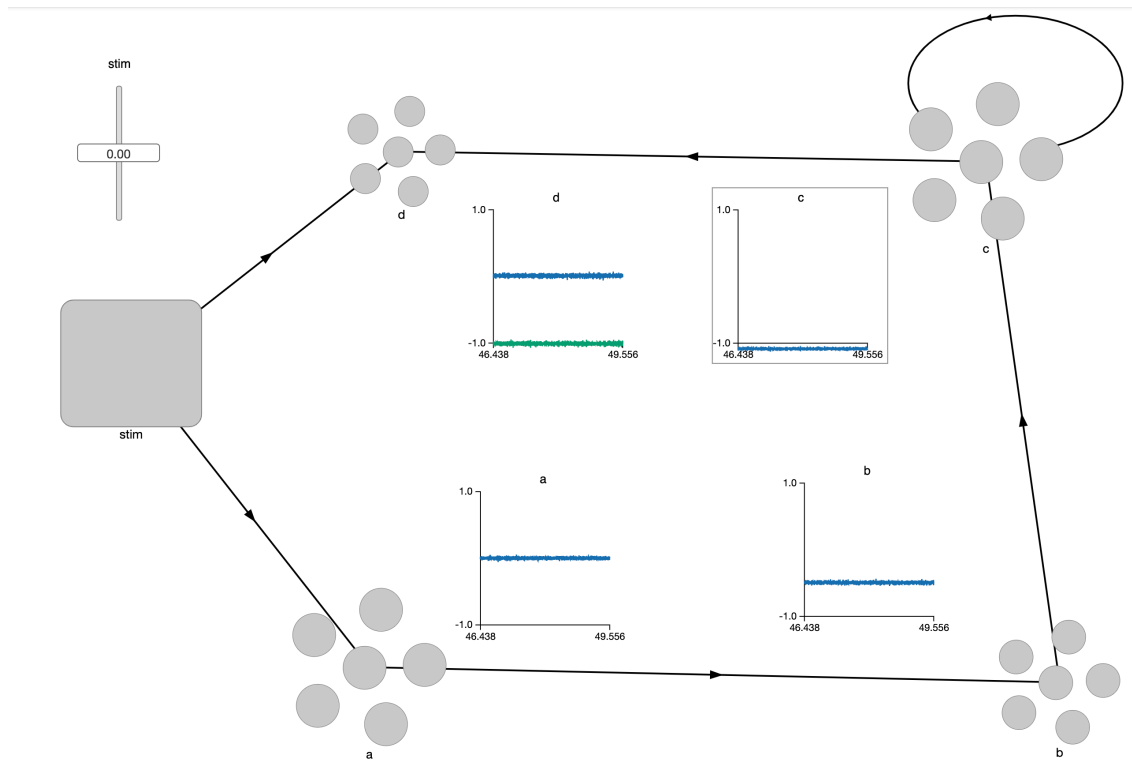


Figure 3: Screenshot of the nengo model with zero as the stimulus.