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 period because of the applied function $f(x) = x * x - 0.5$. Ensemble c both combines values of c with a latency of 100 ms, as well as a transformation to the values of b, resulting in a function with an amplitude and period 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

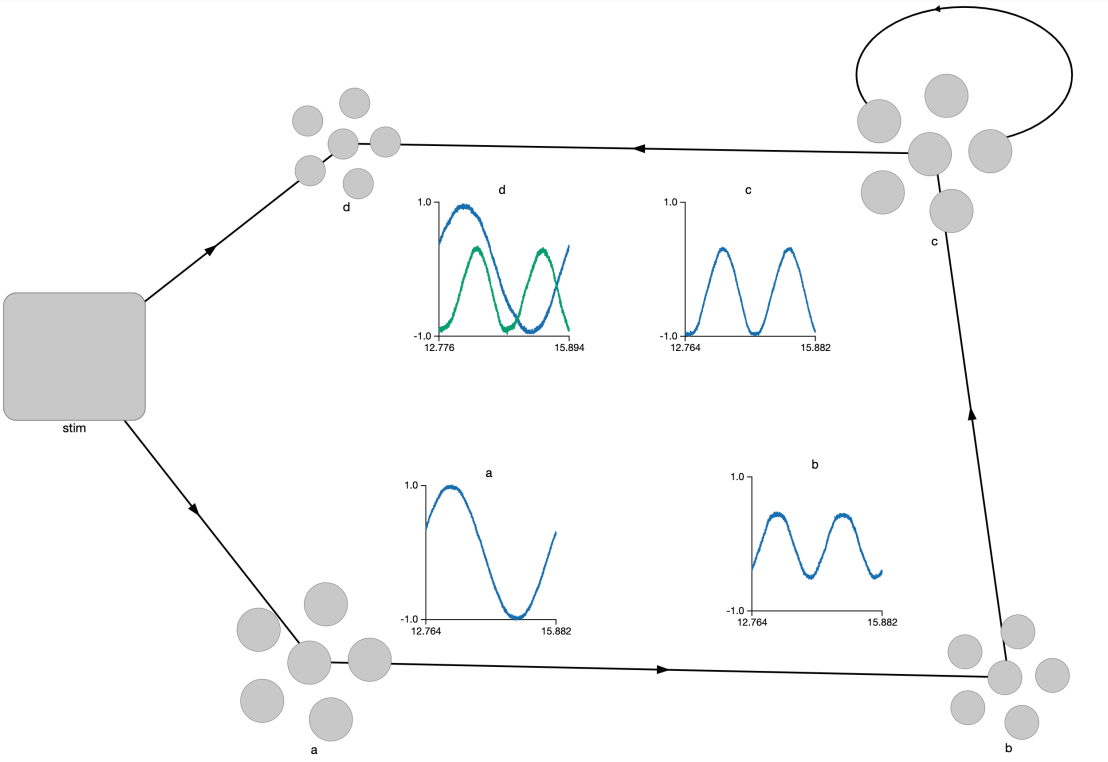

Figure 1: *Screenshot of the nengo model with $f(x) = sin(2 * x)$ as the stimulus.*

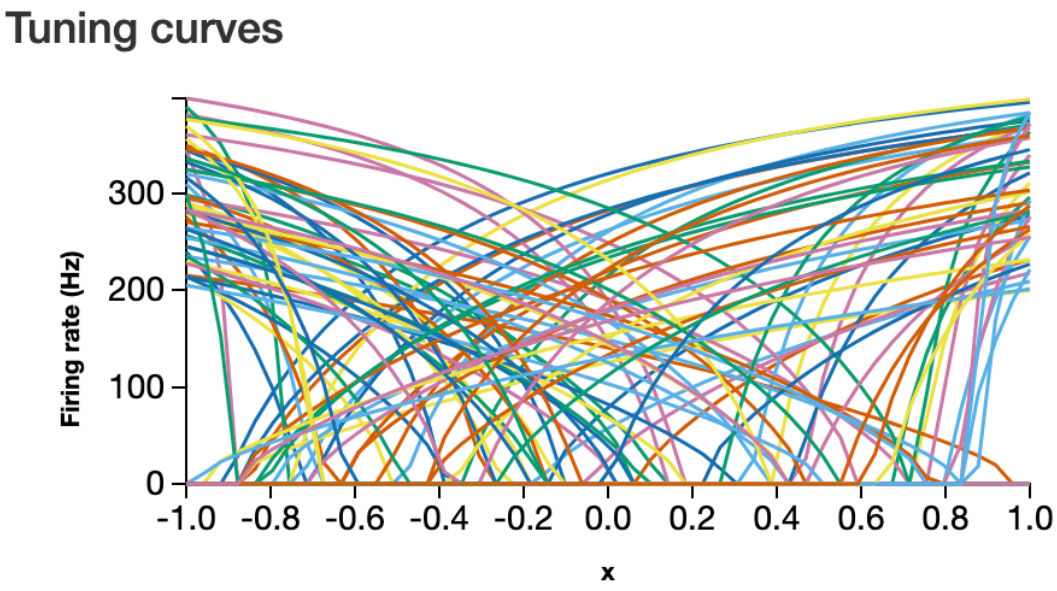

Figure 2: *Screenshot of the tuning curves of ensemble a.*

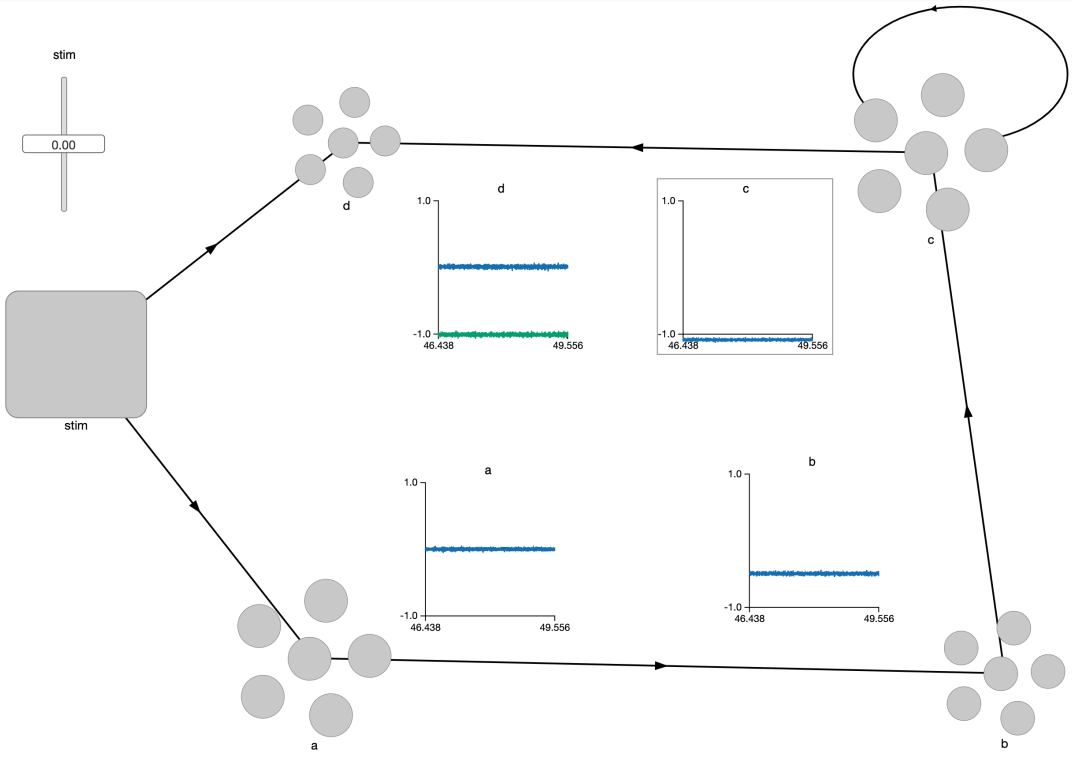

Figure 3: *Screenshot of the nengo model with zero as the stimulus.*