Architectures of Intelligence
Assignment 5

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1 Part one

a. A screenshot of the values of ensembles **a**, **b** and **c** can be found at Figure 1.

   Note that ensembles **a** and **b** react to changes rather quickly, while ensemble **c** adjusts more slowly. This is due to the fact that the synaptic constant is set to its default value (5ms) for the connections *stimulus* $\rightarrow a$, $a \rightarrow b$ and $b \rightarrow c$, whereas the connection used to create the simple memory, $c \rightarrow c$, has a synaptic constant set at 100ms.

b. A screenshot of the tuning curves of ensemble **a** can be found at Figure 2.

   The tuning curves represent at which value of x (the input) the neurons respond most frequently. In order to give a good representation of the input value as the output value, many neurons are tuned to different "sections" of the range of the input value, in a way "specializing" in recognizing a specific value and firing most often when their value is the input value. This means that together, the neurons will generate a value that will resemble the input value, as there are 100 neurons – which is plenty to represent a range from -1 to 1.

c.
   - Ensemble **a** has the same value as the stimulus.
   - Ensemble **b** has a value of -0.5, because the connection a $\rightarrow$ b uses the function `centered_square(a)` which takes the value in `a` and applies the function $(a * a - 0.5)$. $0 * 0 - 0.5 = 0.5$
   - Ensemble **c** has a value of around -1.1. This is because the input to c remains non-zero, causing the integrator (i.e. the simple memory) to saturate quickly, meaning it will tend to its extreme value.

2 Part two

A screenshot showing the model running from a tiger can be found at Figure 3.

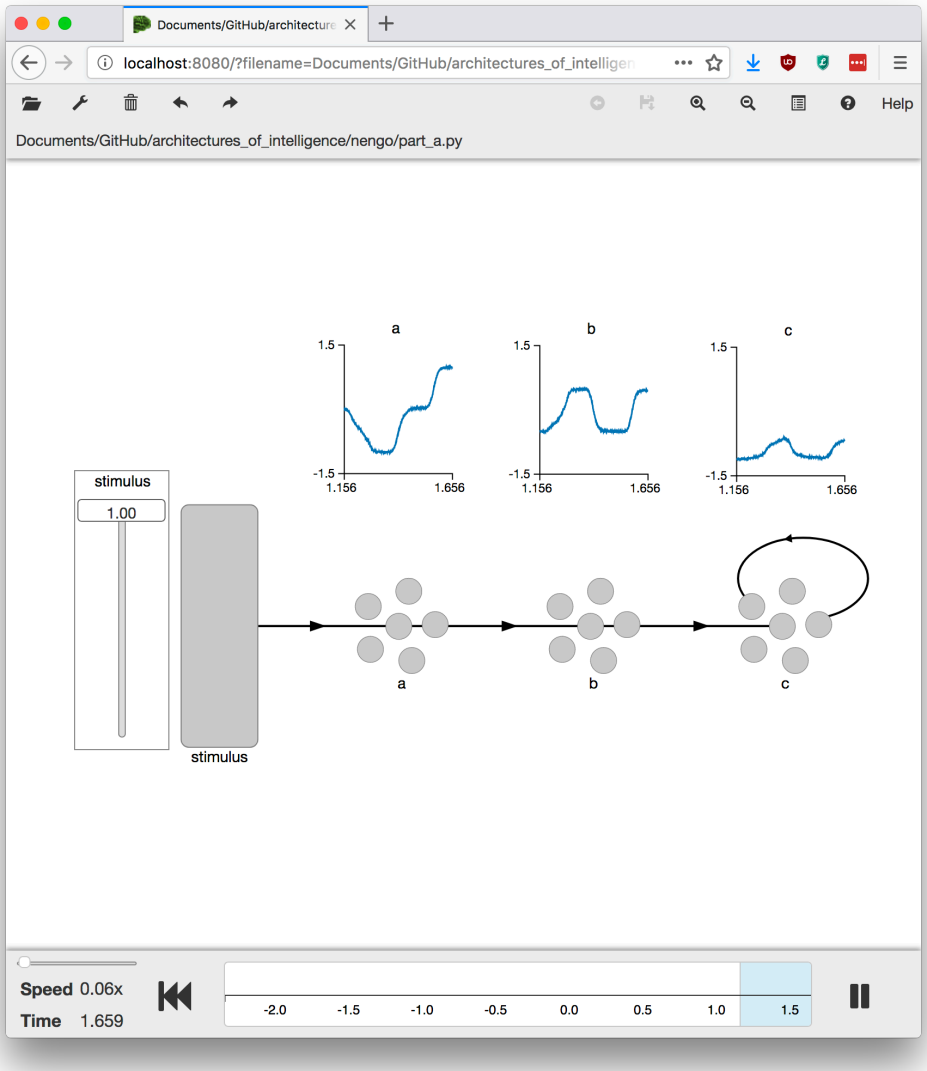

Figure 1: Values for ensembles a, b, and c, while running the model and varying the stimulus, demonstrating the effects of the various connections

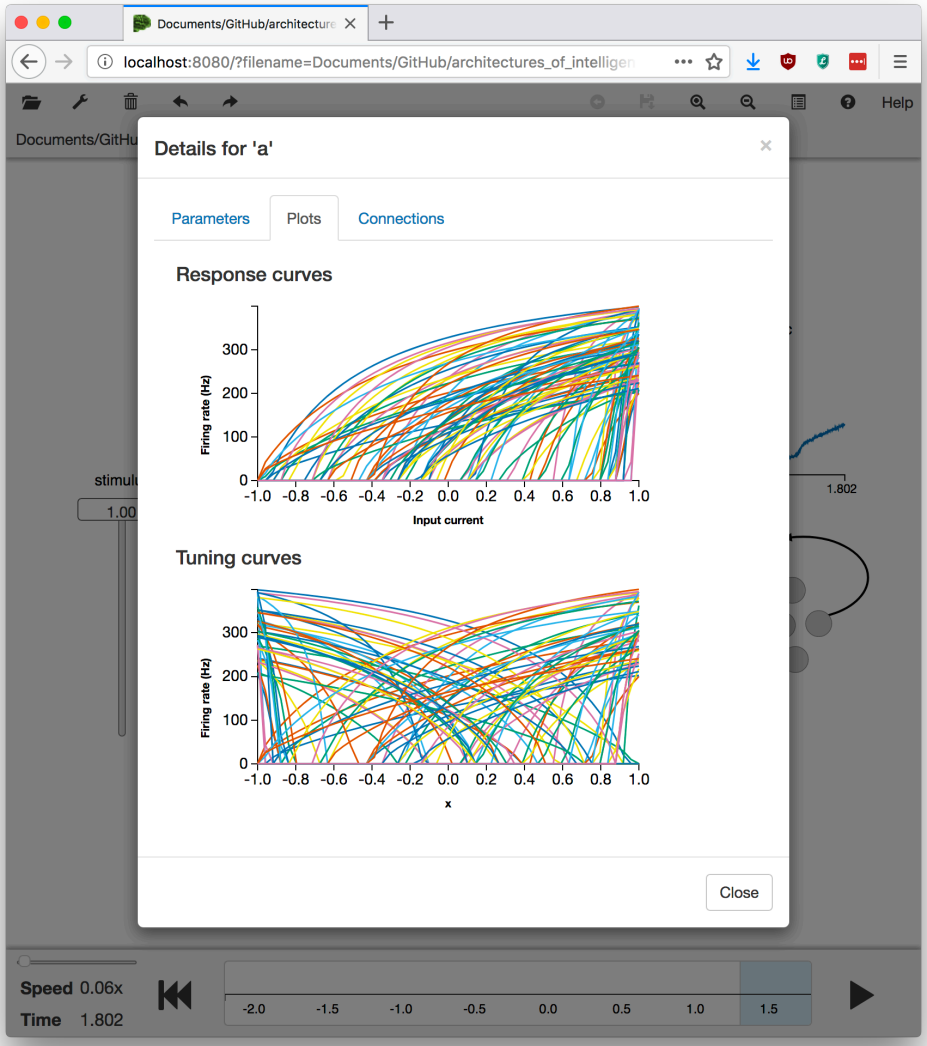

Figure 2: A screenshot of the tuning curves of ensemble **a**

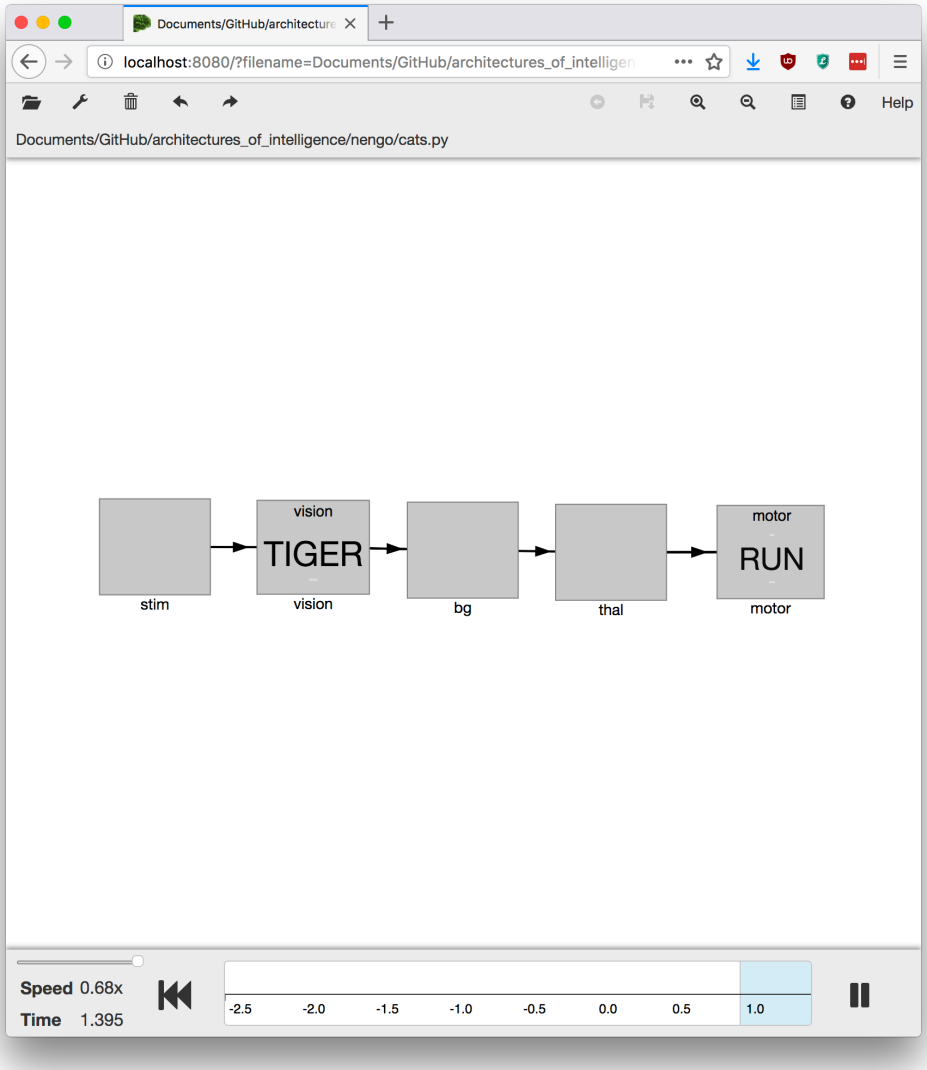

Figure 3: A screenshot showing the model running from a tiger