

Figure 1: A network generating a constant value when required. When the recall neuron is activated, the output neuron will generate a pair of spikes coding for value x.

This representation allows us to encode any value between a minimum and a maximum interspike (of T_{min} and $T_{\text{max}} = (T_{\text{min}} + T_{\text{cod}})$). We chose to use a minimum interspike to encode zero for several reasons. If the two spikes encoding a value originate from one unique neuron or are received by a single neuron, this minimum interspike provides time to recover from the first spike before spiking again. T_{min} allows networks to react to the first input spike and propagate a state change before the second encoding spike is received. In the experiments presented in this work, we use $T_{\text{min}} = 10$ ms and $T_{\text{cod}} = 100$ ms.

We could also choose a logarithmic function to allow encoding a large range of values with dynamic precision (precision would be smaller for large values).

To represent signed values, we use two different pathways for the two different signs. Positive values will be encoded by causing a neuron to spike and negative values by eliciting another neuron to spike. We arbitrarily chose to represent zero as a positive value.

To ease the understanding and routing of several networks, each implementing simple operations, we add some interface neurons to these networks. For instance, the input of the networks is materialized by special input neurons and their output by some *output*, *output* + or *output* − neurons. Other special neurons used for interaction between networks are also marked. In all the figures describing networks, neurons in blue are input neurons to the networks and neurons in red are output neurons of the circuit.

The simple network presented in Figure 1 encodes a constant value. It shows the design principles used in the rest of this section. In the network shown in Figure 1, the recall neuron is an input. When a spike is received by *recall*, the constant value encoded in the network is output to the *output* neuron. In this example, the output is generated by two different synaptic connections from *recall* to *output*. They generate two output spikes with the interspike corresponding to the encoded value.