

Supplementary Material

1 PROOF OF EQ. 10

Here we show the proof of obtaining Eq. 10 from Eq. 9 in the main paper. Following is the Eq. 9 :

$$\mathbf{X}(s) = \mathbf{H}(s)(A'\mathbf{X}(s) + B'\mathbf{U}(s))$$
(S1)

where $\mathbf{H}(s) = \mathcal{L}[h(t)] = \frac{1}{1+s\tau}$. Below is the proof (we replace $\mathbf{H}(s)$ to obtain the following).

$$\mathbf{X}(s) = \frac{1}{1+s\tau} (A' \mathbf{X}(s) + B' \mathbf{U}(s))$$
(S2a)

$$\implies \mathbf{X}(s)(1+s\tau) = A'\mathbf{X}(s) + B'\mathbf{U}(s)$$
(S2b)

$$\implies \mathbf{X}(s) + s\tau \mathbf{X}(s) = A' \mathbf{X}(s) + B' \mathbf{U}(s)$$
(S2c)

$$\Rightarrow \qquad s\tau \mathbf{X}(s) = A' \mathbf{X}(s) - \mathbf{X}(s) + B' \mathbf{U}(s) \tag{S2d}$$

$$s\tau \mathbf{X}(s) = (A' - I)\mathbf{X}(s) + B'\mathbf{U}(s)$$
(S2e)

$$\implies \qquad s\mathbf{X}(s) = \frac{1}{\tau}(A' - I)\mathbf{X}(s) + \frac{1}{\tau}B'\mathbf{U}(s) \qquad (S2f)$$

2 ENERGY CONSUMPTION PLOTS

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b. Plot for the energy consumption analysis of the simple spiking network with N = 100 and N = 4096 neurons

Figure S1. Section 5.3 related energy consumption plots