

Neural network for RP2 oscillations

Single neuron dynamics

$$C \frac{dV_k}{dt} = -g_L(V_k - V_L) - w_k + g_L \Delta_T \exp\left(\frac{V_k - V^T}{\Delta_T}\right) + I_{in}^k + I_{gap}^{k,m} + \bar{w}_{in} I_{ext} \quad (1)$$

$$\tau_w \frac{dw_k}{dt} = a(V_k - V_L) - w_k \quad (2)$$

Intrinsic heterogeneity: bursters and excitable cells

Synaptic current

$$\tau_s \frac{dI_{in}^k}{dt} = -I_{in}^k + \sum_{i=1}^N \sum_{j=1}^{sp} \delta_i(t - t_j) \quad (3)$$

Gap-junction current

$$I_{gap}^{k,m} = \pm g_{gap}(V_k - V_m) \quad (4)$$

Connectivity

N – number of neurons

S – number of sensors

A – number of actuators

sp – spikes in the spike train

\bar{w}_{in} – vector of sensory input

Indexes

k – index over neurons

i – index over synapses

j – index over spikes

Summation over synaptic connections is organised by sparse connectivity matrix **A**

