1 Model and analysis

The presynaptic spike trains were generated by

$$\begin{aligned}
\partial_t p &= p\frac{p_\infty - p}{\tau_p} + h(1-p)\sum_i \alpha(t-t_i) && (1)\\
\partial_t x &= x\frac{x_\infty - x}{\tau_x} - px\sum_i \alpha(t-t_i) && (2)\\
\partial_t q &= \frac{q_\infty(x,p) - q}{\tau_q}, \quad q \in \{q_E, q_I\} && (3)\\
\partial_t v &= -a_{\mathrm{NaK}} \sinh\left(\frac{v - v_{\mathrm{NaK}}}{2v_T}\right) - a_E q_E \sinh\left(\frac{v - v_E}{2v_T}\right) - a_I q_I \sinh\left(\frac{v - v_I}{2v_T}\right) && (4)\\
q_\infty(x,p) &= xp\sum_i \alpha(t - t_i - 3\tau_\alpha) && (5)
\end{aligned}$$

with current amplitudes normalized by membrane capacitance. The parameters used for simulations can be found in Table 1.

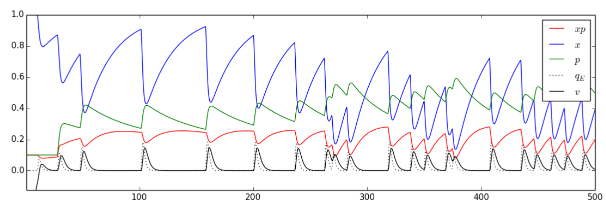

Figure 1: Simulation

References

A. Destexhe, Z. F. Mainen, and T. J. Sejnowski. Synthesis of models for excitable membranes, synaptic transmission and neuromodulation using a common kinetic formalism. *Journal of Computational Neuroscience*, 1(3):195–230, 1994.

A. Destexhe, Z. F. Mainen, and T. J. Sejnowski. *"In Methods in Neuronal Modeling"*, volume I, (2nd Edition), chapter Kinetic Models of Synaptic Transmission. MIT Press, Cambridge, 1998.

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Table 1: Model parameters. All values for fast excitatory and inhibitory synaptic dynamics obtained from Destexhe et al. (1994, 1998) and references therein. The membrane capacitance was assumed to be similar to that of a compartment with either cylindrical or spherical shape having a radius of 5 μm, with a specific membrane capacitance of 0.0075 pF/μ^2 (Mainen et al., 1995).

Parameter	Value(s)	Units	Description
C_m	2.356	pF	Membrane capacitance of postsynaptic membrane compartment
$\bar{a}_{\mathrm{NaK}}$	[1,10]	nA	Maximum amplitude for the current through Na^{+}-K^{+} ATPase
$\bar{a}_E$	[10.0,30.0]	pA	Maximum amplitude for the current mediated by AMPA/kainate receptors
$\bar{a}_I$	[1,3]	pA	Maximum amplitude for the current mediated by GABA$_A$ receptors
h	$[0,1]$	–	Facilitation jump in the probability of release
v_{NaK}	-60	mV	Reversal potential for the Na^{+}-K^{+} ATPase
v_E	0	mV	Reversal potential for fast, excitatory currents mediated by AMPA/kinate receptors
v_I	-70	mV	Reversal potential for fast, inhibitory currents mediated by GABA$_A$ receptors
h	$[0,1]$	–	Facilitation jump in the probability of release
τ_α	$[0,10]$	ms	Time constant for the alpha function describing the activation transients of synaptic release
τ_p	$[10,200]$	ms	Return to baseline time constant for the synaptic probability of release
τ_x	$[10,200]$	ms	Time constant for recovery from synaptic depression
τ_A	$\frac{1000}{1100+190} \approx 0.775$	ms	AMPA/kainate receptor time constant
τ_G	$\frac{1000}{530+180} \approx 1.4$	ms	GABA$_A$ receptor time constant