

Parameter	Value	Units	Description
N	100	-	Number of neurons per population
dt	1	ms	Integration time step
T	50	ms	Stimulus pulse duration
τ_{stim}	50	ms	Decay constant of stimulus
τ_w	40	ms	Time window for firing rate integration
p_r	40	Hz	Rate of Poisson stimulus pulse
ρ	1/7	-	Fractional change of synaptic activation
τ_s^E, τ_s^I	80, 10	ms	Time constant for synaptic activation for excitatory (EE) and inhibitory (EI, IE) connections
g_L	.01	μS	Leak conductance
C_m	20 x g_L	nF	Membrane capacitance
E_L	-60	mV	Leak reversal potential
E_E, E_I	-5, -70	mV	Excitatory and inhibitory reversal potentials
V_{th}	-55	mV	Spiking threshold potential
V_{rest}	-60	mV	Resting potential
V_{hold}	-61	mV	Reset potential
t_{ref}	2	ms	Absolute refractory period
τ_p, τ_d	2000, 1000	ms	LTP/LTD eligibility trace time constant
T_p^{max}, T_d^{max}	0.95, 1	-	Saturation level, LTP/LTD eligibility trace (scaled relative to $T_d^{max} = 1$)
η_p, η_d	1, 0.55	ms^{-1}	Activation rate, LTP/LTD eligibility trace (scaled relative to $\eta_p = 1$)
τ_p^{FF}, τ_d^{FF}	200, 800	ms	LTP/LTD eligibility trace time constant, feed forward connections
$T_p^{max,FF}, T_d^{max,FF}$	0.98, 1	-	Saturation level, LTP/LTD eligibility trace, feed forward connections (scaled relative to $T_d^{max} = 1$)
η_p^{FF}, η_d^{FF}	0.44, 0.33	ms^{-1}	Activation rate, LTP/LTD eligibility trace, feed forward connections (scaled relative to $\eta_p = 1$)
T_{reward}	25	ms	Duration of neuromodulator presentation upon change in stimulus
T_{tr}	25	ms	Duration of refractory period for traces following neuromodulator presentation
η	.0045(recurrent) , .08 (feed-forward)	ms^{-1}	Learning rates, recurrent and feed forward connections
ϕ	0.3	-	Sparsity of fixed connections
W_{EE}^{MT}, W_{EI}^{MT}	.02, .7	μS	Synaptic connection strength, Timer to Messenger excitatory to excitatory (EE) and inhibitory to excitatory (EI) connections
W_{EI}^{TT}, W_{EI}^{MM}	1, 1	μS	Synaptic connection strength, intercolumnar Timer-Timer and Messenger-Messenger inhibitory to excitatory (EI) connections
W_{IE}^{TT}, W_{IE}^{MM}	.002, .01	μS	Synaptic connection strength, intracolumnar Timer-Timer and Messenger-Messenger excitatory to inhibitory (IE) connections

Supplementary File 1. Table of Main Model Parameters. For full code, see <http://modeldb.yale.edu/266774>