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## **On the dynamic interplay between perception and action - a connectionist perspective**

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# Appendix

HiTEC incorporates realistic neuronal integration/decay properties, non-linear response (output) functions of excitatory and inhibitory neural units, as well realistic voltage-dependency of feedback connections and associative Hebbian learning. Incorporating these realistic neural properties implies various parameters in the model. The default values for all parameters are listed in Table 4.

**Table 4.** Default parameter values for HiTEC simulations

<b>Category</b>	<b>Parameter</b>	<b>Default value</b>
External inputs	External input sensory codes	0.5 <sup>a</sup>
	External input motor codes (during learning)	0.3
Sensory weights	Sensory – feature forward	0.4 <sup>b</sup>
	Sensory – feature backward	3.0
Stimulus features	Feature –task forward	1.3 <sup>c</sup>
	Feature – task backward	0.2
Response features	Task – feature forward (location, intensity, etc.)	1.3
	Task – feature forward (other)	0.9 <sup>d</sup>
	Task – feature backward	0.2
Inhibition	Excitatory to inhibitory paired unit	1.25
	Inhibitory to other excitatory codes within layer	-0.75
Code parameters	$d_a$ decay parameter	0.1 <sup>e</sup>
	$q_a$ sigmoid parameter in response function	0.9
	$n_a$ sigmoid parameter in response function	4
	$\gamma_{exc}$ scale parameter	0.9 <sup>f</sup>
	$\gamma_{inh}$ scale parameter	0.9 <sup>g</sup>
Noise	Mean	0.025
	Standard deviation	0.015
Code thresholds	Voltage threshold ( $V_T$ )	0.5
	Learning threshold ( $LT$ )	0.6 <sup>h</sup>
	Response threshold for motor code selection	0.6
Learned weights	Learning rate ( $LR$ )	0.1
	Weight decay ( $d_w$ )	0.0005
	Weight scale factor ( $\varphi$ )	0.8 <sup>i</sup>
General parameters	Action effects trials	10 trials per motor code
	Action effect duration (= cycles of weight learning)	50 cycles

**Exceptions (see Table 4)**

- a. 0.6 in Simulation 6
- b. 0.45 in Simulation 4 for the sensory to feature connections (visual to word); 0.3 for 'forward' and 'backward' in Simulation 6
- c. 1.5 in Simulation 6
- d. 0.55 in Simulation 2 and 0.6 in Simulation 3
- e. 0.2 for sensory codes (all simulations)
- f. 0.8 for sensory codes in Simulations 1 to 5; all codes 1.0 in Simulation 6
- g. 0.8 for sensory codes in Simulations 1 to 5; all codes 1.0 in Simulation 6
- h. 0.5 for Simulations 1 and 2
- i. 1.0 in Simulation 6

Note that we have attempted to eliminate various scaling parameters in the model instance used for Simulation 6. That is,  $\gamma_{exc}$ ,  $\gamma_{inh}$  and have been set to 1.0. In order to retain the model dynamics, some of the other parameters were adjusted accordingly: external input and task-feature (other) weights.

