A long journey into reproducible computational neuroscience research
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In a previous modeling study, Leblois et al. (2006) demonstrated an action selection mechanism in cortico-basal ganglia loops based on competition between the positive feedback, direct pathway through the striatum and the negative feedback, hyperdirect pathway through the subthalamic nucleus.

In Guthrie et al. (2013), authors investigated how multiple level action selection could be performed by the basal ganglia. To do this, the model is extended in a manner consistent with known anatomy and electrophysiology in three main areas. First, two-level decision making has been incorporated, with a cognitive level selecting based on cue shape and a motor level selecting based on cue position. We show that the decision made at the cognitive level can be used to bias the decision at the motor level. We then demonstrate that, for accurate transmission of information between decision-making levels, low excitability of striatal projection neurons is necessary, a generally observed electrophysiological finding. Second, instead of providing a biasing signal between cue choices as an external input to the network, we show that the action selection process can be driven by reasonable levels of noise. Finally, we incorporate dopamine modulated learning at corticostriatal synapses. As learning progresses, the action selection becomes based on learned visual cue values and is not interfered with by the noise that was necessary before learning.

However, the model was not reproducible from the article description...