Implementation of Attentional Bistability in a Computational Model of the Dragonfly Visual System

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Presentation Abstract Summary The dragonfly is notoriously effective at hunting moving prey. Recent research has provided evidence that the selective visual attention of one of the dragonfly's visual neurons plays a key role in the neural mechanisms underlying the dragonfly's hunting ability. In this work, we present a hybrid computational model that includes multi-compartmental spiking neurons of the dragonfly visual system, as well as spike-timing-dependent plasticity (STDP)-based pattern recognition and action selection mechanisms to replicate this predatory behaviour in a simplified simulated environment. We find that under certain conditions two coupled visual neurons are capable of demonstrating bistable switching between input patterns, in agreement with empirical electrophysiological findings that evidence the role of these neurons in target selection. We also demonstrate the feasibility of training an end-to-end dragonfly visual system to map retinal input to motor actions in a biologically plausible way.

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