FORUM

Adaptation in the motion-processing hierarchy: A psychophysical and computational investigation.

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Abstract

The sensory system adapts to recent stimulus history and changes its response characteristics accordingly. It has been shown that neurons at early and late processing stages undergo different types of adaptation-induced changes in their tuning properties. Although these neural changes are related to perceptual aftereffects, two questions remain unanswered: How do changes at different processing levels interact and produce perceptual aftereffects, and why do different levels undergo different changes? To address these questions, my research focused on how the local and global levels of motion processing adapt and produce the motion aftereffect (MAE). In a series of psychophysical experiments, I manipulated the level at which motion adaptation occurs and measured different types of MAE. The results suggest that the generation of a global MAE percept cannot be fully explained by spatial integration of local MAEs. In order to model level-specific perceptual aftereffects, I formulated the computation performed by neurons at different processing levels. My model assumes that neurons at different processing stages make different statistical assumptions, with neuron at higher levels imposing stronger assumptions about the natural environment. Coupling these assumptions with a recently-developed Bayesian model of neural adaptation, I will discuss why neurons at different processing stages undergo different kinds of changes as they adapt.

Host: Hiro. Nakahara Lab for Integrated Theoretical Neuroscience