Probabilistic Inference in Multi-Finger Touch

Submission ID 3000132

Submission Type Poster

Topic Neuroscience

Status Submitted

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SUBMISSION DETAILS

Presentation Type Oral Presentation

Presentation Abstract Summary Our remarkable ability to sense and manipulate objects manually requires the integration of sensory inputs that signal both the local events occurring at the fingertips (touch) and the relative positions of the fingers (proprioception). Because touch and proprioception have traditionally been studied separately, little is known about how these fundamental senses interact. Here, we show that ignored vibrations experienced on one finger systematically influence the perceived frequency of attended vibrations experienced on another finger. Moreover, the strength of multi-finger interactions, indexed by bias and threshold changes, depends on the proximity between the fingers: Fingers held further apart interact less than fingers held closely together. To explain these results, we implement a novel scale-and-integrate linear model, which substantially outperforms traditionally-defined optimal and suboptimal linear integration models. The key model features imply that disparities between the target and distractor stimuli, in space and the frequency domain, determine the relative weighting and variance of distractor representations. These collective results reveal the spatial dependencies of inter-finger fusion and attentional filtering in the somatosensory system.

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Keywords

Keywords
proprioception
touch
perception
sensory interactions
cue integration
probabilistic inference
attention