

The Representation of Self-motion Signals in Parietal Cortex

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Abstract:

Self-motion perception is a complex problem requiring signals from both visual and vestibular systems. How the visual and vestibular signals are represented and integrated in the cortex is critical to understand the formation of Self-motion perception. Our studies suggested that visual heading signals is generally represented in an eye-centered reference frame by neurons in various brain areas, the vestibular representation of heading appears to be more diverse. Vestibular signals in parietoinsular vestibular cortex (PIVC) have reference frames that are intermediate between head and body centered. In contrast, dorsal medial superior temporal area (MSTd) neurons show reference frames between head and eye centered but not body centered. We found a hybrid representation in the ventral intraparietal (VIP) area, depending on gaze direction. When gaze remained fixed relative to the body, the vestibular heading tuning of VIP neurons shifted systematically with body orientation, indicating an egocentric, body-centered reference frame. In contrast, when gaze remained fixed relative to the world, this representation changed to be intermediate between body- and world-centered. We conclude that the neural representation of self-motion signals in parietal cortex is flexible, depending on gaze and possibly attentional demands.