A study on mechanisms of Self-Motion perception in primates

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Problem description:
Freely moving animals navigate through a cluttered and perturbed three-dimensional world with ease. Although we use a variety of information for this process, most primates rely on vision first and foremost. Guiding effective movement through the environment is one of the visual system’s most important functions. The pattern of motion that we see allows us to estimate our heading accurately in a variety of environments, despite the added difficulty imposed by our own eye and head movements. The cortical substrates for heading perception include the medial superior temporal area (MST) and the ventral intraparietal area (VIP) which are pools of multimodal sensitive neurons, giving the fact that Self-motion perception is strongly anchored in visual, vestibular, and tactile sensory processing and integration [1]. Signals relevant to self-motion are more widespread than heretofore recognized and seemingly are presented in a multi-sensory domain, and they are multiplexed with other sensory signals, such as vestibular, auditory, and tactile information. This seminar aims to review the neurophysiological mechanisms and computational models of Self-Motion perception e.g. [2] and [1]. We would like to focus on the aspects of Self-Motion Perception that benefits from multimodal sensor-fusion in navigation. The work is expected to review the recent works as a background in order to highlight important problems that remain unsolved and open question marks in the field.

Task:
- Selecting the relevant review papers on the topic.
- Understanding the problem of Self-Motion estimation in cluttered sensory-motor environment.
- Narrowing down into main papers considering three avenues:
  - Behavioral observations
  - Neurophysiological characteristics and functions
  - Computational models
- Finding the conjunction between what Brain says, and what math says about this problem.
- Documentation and report.

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Bibliography:

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