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PhD Dissertation Announcement

Mechanisms of Spatial Localization in the Human Visual System

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The accuracy and precision in locating objects are critical for survival of human beings and animals; hence localization of objects is one of the fundamental functions of vision. Even though there have been extensive studies, several illusions of object mis-localizations challenge the researchers and demand a theoretical framework. Attention is known to be a crucial factor in localization performance. The processing strategies of attention that the brain uses to select a spatial location have been investigated by scientists and these studies produce important information about the structure and dynamics of the brain. The broad long term goal of the proposed research is to understand the mechanisms of spatial localization that the brain uses in dynamic vision. Our empirical and modeling work on the illusory mis-localizations suggests that the visual system uses predictive strategies to overcome the temporal limitations of the position processing sub-system. We present a novel neural model and demonstrate that the principles of neural synchronization can be utilized to explain psychophysically measured effects of attention on multiple objects moving in the visual field. Our model suggests that, the influence of attention extends to individual spikes and by modulating the timing of spikes, relevant stimuli are selected over irrelevant stimuli. Our experiments on MOT show that attention has an inhibitory surround which suppresses the distractor moving objects, sharpens the segregation between targets and distractors. Overall, our results suggest that functionally distinct neural mechanisms aid each other to overcome the complexities of the visual computation.

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