Abstract
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Receptive Field Shifts in Area MT during Smooth and Rapid Eye Movements

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Although visual perception is generally quite robust against our ever present eye movements, there are cracks in this perceptual stability. For instance, briefly flashed objects are often mislocalized in the direction of both smooth and rapid eye movements. This perceptual mislocalization is hoped to provide insight into mechanisms that provide us with a stable percept outside the laboratory.

Changes in receptive field (RF) location have been studied as neural correlates of perceptual mislocalization. We developed a technique to map RF dynamics. We presented a rapidly alternating pattern of black and white bars and reverse correlated the neural activity with this stimulus. With this method we estimated the RF - here defined as the average stimulus that preceded a spike – in a quantitative manner.

We used this method in the macaque middle temporal area (MT). During fixation, our results matched those obtained with more traditional methods of RF mapping. Following this validation, we then mapped the dynamics of RFs during eye movements. We used a field of horizontally moving dots to induce optokinetic nystagmus (OKN): a typical alternation of slow following-movements interspersed with rapid backward eye movements.

During the smooth eye movements, we found a clear shift in the spatial receptive field of MT cells in the direction of the eye movement. Briefly before the rapid saccadic eye movements, some receptive fields additionally shifted and expanded in the direction of the saccade. These RF changes were of the appropriate size and showed dynamics similar to the mislocalization observed in behavioral experiments.