Binocular interactions in center-surround modulation: measurement and modeling

Pi-Chun Huang
National Cheng Kung University

Keywords: ; ; ; ; ; ; ;

Abstract: The responses of neurons in the primary visual cortex (V1) are modulated by stimuli outside their classical receptive fields. This same phenomenon, called center-surround modulation, has also been found in psychophysical studies in cases where a visual target's detectability is influenced by its surroundings. However, whether the surround modulation occurs only after binocular integration (at or after V1) is still considered to be controversial. In order to investigate this, using a pattern masking paradigm, the detection threshold of the target (horizontal Gabor, 2 cpd) is systematically measured under different mask and surround contrasts in order to derive the visual system's contrast-response functions. The modulation effects are compared under different eye origin combinations, and a two-stage binocular contrast gain control model is adopted so that "lesions" in the pathways of the model can be generated to compare the behavioral results. The model not only successfully described the results but also showed that the surrounding suppression occurred before binocular summation and interocular suppression were involved.