Psychophysical evidence for competition between real and illusory contour processing

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1 Introduction

Contrast and orientation provide vital information about object borders. However, real and illusory contours tend to be used between real (feedforward) and illusory (feedback) contour processing in primate V1 and V2. We tested this psychophysically by presenting illusory contours with and without the presence of real line components. Real lines were varied in contrasts. Detection thresholds for real lines were measured separately for each subject.

Although some cells in visual cortex process both real and illusory contours sequentially, recent studies have suggested competitive interactions between real (feedforward) and illusory (feedback) contour processing in primate V1 and V2. We tested this psychophysically by presenting illusory contours with and without the presence of real line components. Real lines were varied in contrasts. Detection thresholds for real lines were measured separately for each subject.

2 Methods

Stimulus

We used a Kanizsa-type stimulus in a shape discrimination task similar to the one used by Ringach et al. (2001). Orthogonal or parallel real lines were superimposed onto one side of the illusory figure.

Experiment

Discrimination thresholds for the inward vs. outward contour were measured in a 2AFC task.

Subjects

Four subjects between 20 and 27 years participated in this experiment. All of them had normal or corrected to normal vision. Three of the subjects were naive as to the purpose of the experiment.

3 Contrast & Orientation Dependancy

The strength and type of influence of the real lines was measured at different supra- and subthreshold contrasts.

Average of aligned data

Discrimination thresholds for each subject were aligned to detection thresholds for real lines and averaged.

4 Time Dependency

ICs are completed after 200-300 msec (1, 4). When in IC processing do real lines interfere?

We tested the timing of the observed interferences with different presentation times with subthreshold contrasts.

Orthogonal interference acts after Illusory Contour Completion

Orthogonal Interference acts

Parallel Lines Interfere

Orthogonal Lines Sometimes Help

5 Detectability of Real Lines

Do real lines help or hurt? Does orientation matter?

Real lines were varied in contrasts. Detection thresholds for real lines were measured separately for each subject.

Subjects

Five subjects, between 20 and 25 years, participated in this experiment. All of them had normal or corrected to normal vision. Three of the subjects were naive as to the purpose of the experiment.

References


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