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EVENT ABSTRACT

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Local contour integration depends on alignment and orientation of global shapes

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Shape perception in natural scenes relies on integration processes which construct a representation from local image features. An example is contour integration, grouping nearly collinear, aligned edge elements into coherent forms. At the same time, perception is strongly modulated by the global context of a shape: in a previous experiment, we found that reaction times for contours forming horizontal ellipses were shorter than for vertical or oblique ellipses. This horizontal bias in contour perception was also reflected by differences in the EEG potentials recorded from parietal and occipital electrodes.

In this contribution, we first quantify which geometrical factors of the global context contribute to the horizontal bias. Second, we investigate whether the horizontal bias is an effect common to feature integration, or specific to contour integration of oriented edge elements.
In psychophysical experiments observers had to detect contours of locally aligned edge elements, embedded in a background of randomly oriented distractors. The global form of the contours was either a horizontal or a vertical ellipse. To assess differences in the contour percepts, a staircase procedure was used to determine the detection thresholds for horizontal and vertical ellipses with respect to a control parameter.

In our first experiment, the control parameter was the relative alignment (jitter) of the edges to the contour path. We independently varied three global, contextual factors: (A) eccentricity of the center of the contour from the fixation spot (6.68 arcdeg vs. 3.34 arcdeg), (B) radial versus tangential alignment relative to the fixation spot, and (C) display aspect ratio (4:3, horizontal versus 3:4, vertical). In addition to the horizontal bias, only factor (B) had a significant influence on the thresholds; ellipses aligned radially to the fixation spot were easier to detect than tangentially aligned ellipses. The relative strength of this effect depends on the eccentricity of the contours. In an additional task reaction times were measured. Consistently, responses for horizontal stimuli were significantly faster than for vertical stimuli.

In our second experiment, the orientations of all edge elements were random. Contours were now defined by a set of edges with higher contrast, which was the control parameter for the staircase that determined the visibility of their elliptic shapes. We found no perception biases and no reaction time differences for both, horizontal or radially aligned contours.

In summary, we found that shape perception is modulated by both, the alignment of contours to the fixation spot, and their global shape (horizontal versus vertical). Surprisingly, these effects specifically target integration processes of local oriented edge elements.

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