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Direction Discrimination and Pattern Segregation
with
Isoluminant Chromatic Random-Dot
Cinematograms

(色度ランダムドットパターンにおける運動弁別と領域分離)

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ABSTRACT

Upper displacement limits for motion direction discrimination (motion Dmax) and those for pattern segregation of the target (orientation discrimination, segregation Dmax) were separately measured with red-green Braddick type RDC. The stimulus was a 72' x 120' target within a 4' x 4' non-correlated background (pixel size=2').

In EXP I, Dmax was evaluated with various R/G luminance ratios using the method of constant stimuli. It was found that motion Dmax was about 6', 60% of that for black/white RDC, and almost constant over a range of R/G ratio $\pm 10\%$ around isoluminance. Segregation Dmax, however, was as small as 2', less than 1/3 of B/W value, and was more sensitive to small R/G ratio variation. In addition, "reversed phi" was demonstrated at isoluminance; subjects saw motion in reversed direction but with a reduced Dmax when R/G contrast in target was reversed between 2 frames.

In EXP II, Dmax for the two criteria was measured with isoluminant 2-, 3-, and 4-pattern RDC using up-down method. For 2-pattern RDC, motion Dmax was about equal to that obtained in EXP. I, but segregation was difficult to perceive even at the smallest displacement(2'). When number of patterns was increased to 3 or 4, both motion and segregation D max increased. Pattern segregation was quite easy when there were more than 3 patterns.

In EXP III, effects of positional cue on directional discrimination was evaluated using partially correlated RDCs. The treatment somewhat decreased direction Dmax, but motion discrimination was still possible even at longest duration (480 ms).

In EXP IV, effects of dark ISI between frames were evaluated for the two response criteria. It was found that segregation was more susceptible to dark ISI than direction discrimination. Some subjects could not segregate at 2' displacement with only 15 ms ISI.

These results demonstrate that isoluminant stimulation has a differentiating effect on direction discrimination and pattern segregation. The results have substantiated an earlier anecdotal report by Cavanagh et al (1985) and suggest that the two perceptual criteria are mediated by separate mechanisms.

* This Technical Report is based on the poster presentation under the same title at Annual meeting of Association for Research in Vision and Ophthalmology (ARVO), Sarasota, Florida, May 1988.