H76
VSS 2005

Determining Salience for Complex Objects

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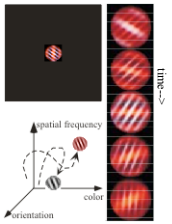
Purpose: Characterize how feature dimensions conspire to determine complex target detectability

Method: Compare performance to a model that treats detection along dimensions independently

Introduction



Attention is often best characterized as 'object-based'; that is, by default, allocated to all features of a target, without loss. (Blaser et al., 2000)

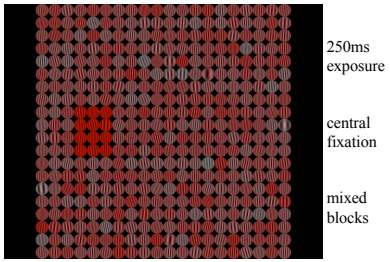
But what of the underlying detection and salience-assignment processes? Do these too operate over multiple dimensions, by default, and without loss? That is, independently?
The answer, at least for singletons, is not really.
(see especially, Nothdurft, 2000)

We revisit the question, with complex objects.

Procedure

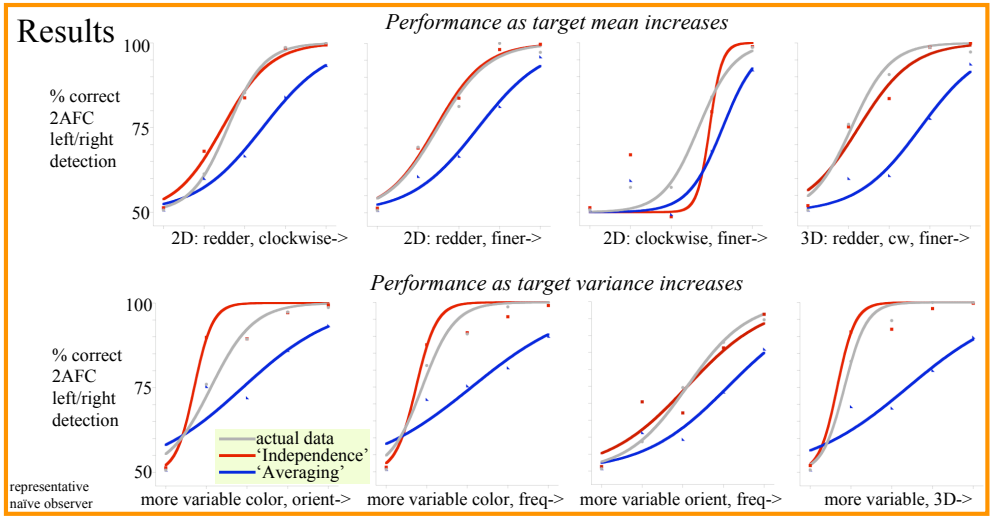
Target detectability was varied by increasing the mean or variance of color, orientation, spatial frequency, or combinations thereof.

In a 2AFC, observers reported whether the target appeared on the left or right side.

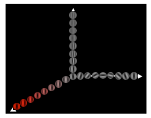


(printed colors are distorted; target exaggerated)

Results



Vasarely stimulus

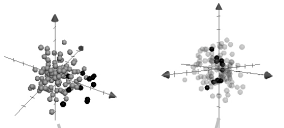


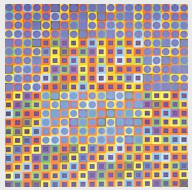
Consists of a compact array of Gabor patches that may vary in color (red saturation), spatial frequency, and/or orientation.

The values for elements of the array were governed by a 3D Gaussian.

A target is defined by changing the statistics of the elements that comprise it, relative to those governing background elements.

In this study, we *increased* the mean or variance, along one (1D), two (2D) or three (3D) dimensions, of a 3x4 target region.

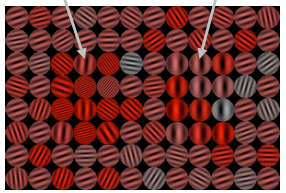




Zebegen, Victor Vasarely

some inspiration

Blue red rocks, Michael Goldsworthy



1D color mean increase 2D orient&sf var *decrease*

not actual stimuli

Models

Independence
Detection is performed simultaneously, and without loss, on each feature dimension.

A target, therefore, is only missed if it is missed along *every* manipulated dimension.

Averaging
Detection can only be performed on a single dimension at a time (switching), or there is total resource sharing between dimensions.

2D and 3D performance is predicted as the average of the relevant 1D conditions.

Conclusions

In nearly every case, for two naïve and one expert observer, actual detection data was not significantly different from Independence.

Observers detect these complex objects by simultaneously, by default, monitoring all manipulated feature dimensions.

Given this we speculate, and are currently directly testing, that detection, like attention, is object-based.

References
Nothdurft, HC (2000). Salience from feature contrast: additivity across dimensions. *Vision Research*. 40(10-12):1183-201.
Blaser, et al. (2000). Tracking an object through feature-space. *Nature*. 408(6809):196-9.