ROC curves refute an unequal-variance account of search asymmetry

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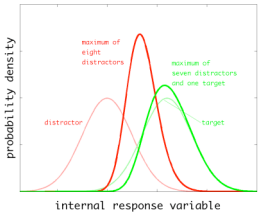
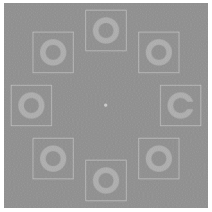
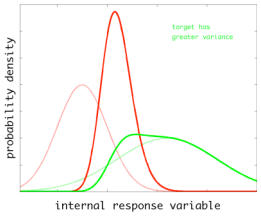
A signal detection account of search asymmetry

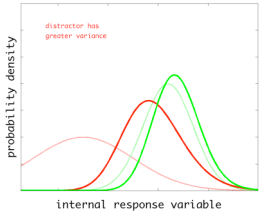
The max rule model: In a visual search task, each target and distractor evokes an internal response in the observer. The observer decides whether the target is present or absent, by checking whether the maximum internal response falls above or below a criterion (Palmer, 2000).

The max rule explains several basic phenomena in visual search. It also accommodates a simple and attractive explanation for search asymmetry: the target and distractor evoke internal response distributions with different variances.





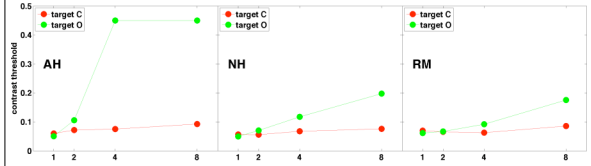




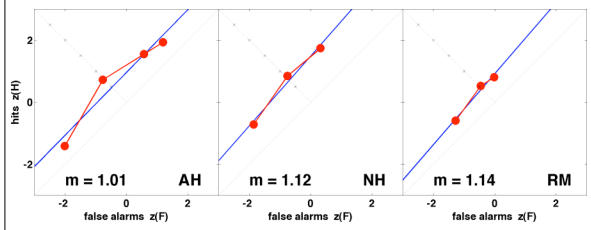
ROC curves at set size one

ROC curves allow us to compare the variances evoked by any two patterns. We measured ROC curves for discrimination between patterns that generate strong asymmetries: letters C and O.

First, to demonstrate a search asymmetry, we measured contrast thresholds for target C's and target O's as a function of set size. We found strong search asymmetries.

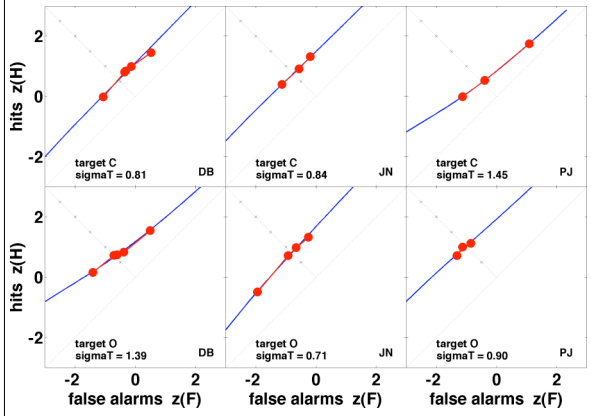


Next, we measured ROC curves at contrast threshold, at set size one. The unequal-variance account predicts that slopes will be much less than one, but in fact they were slightly greater than one.



ROC curves at set size eight

But wait! We measured ROC curves at set size one, whereas search asymmetries occur at higher set sizes. So we measured ROC curves set set size eight as well. Again we found that the variance asymmetry was insufficient to account for the search asymmetry.



Conclusions: see the title!

In that case, why are there search asymmetries?
- different strategies for different targets?
-inter-element interactions?

Plans
- classification images, noise masking, etc.
- vary inter-element distances