Human Object Detection in Natural Scenes: Evidence From a New Dot Probe Task
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Background
Object detection entails “what” and “where” an object is

Human and Computer Accuracy on 2AFC

2AFC method used in both human and computer vision
Assesses “what” object was present
Not “where” with respect to a scene border
Allows context-, texture-, &/or feature-based guessing

Goal
Assess “where” an object is relative to a border in naturalistic scene photos using a dot probe on/off task

Methods
Brief masked exposures (741 photos from CoCo Set)
Flickering dot probes near object borders
Half “on” objects; half “off” objects

Task: Was dot probe “on” or “off” the object bounded by the nearest border
- Free of context-based guessing
- Allows signal detection analysis (d’)

Two experiments: 1) colored photos 2) gray scale photos
Colored photos: Dot color chosen to contrast with local area
Gray scale photos: Dot probe was always cyan
Participants viewed each photo once with either “on” or “off” dot
Two versions of each photo: one with “on” dot ; one with “off” dot
Dot location balanced within & between participants

Dot probe task (“where”) provides different information than 2AFC (“what”)

Central dot probe: Between-category differences for gray scale vs. color
Peripheral dot probe: Poor performance on color photos
May impede dot probe and/or scene processing

Summary

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Low d’, High 2AFC

Perceptual organization processes (i.e., grouping, enclosure) affect processing of objects and backgrounds

Low 2AFC, High d’

Dot probe draws attention to the object, marks the relevant location within the scene

Limitations
Dot probe is too large for very small objects
Difficult to equate contrast of dot probes on color & gray scale photos
Replicate with B/W striped dot probes on both types of photos

Future Directions
Integrate “what” and “where” tasks
1st Response: dot “on”? off; 2nd Response: object category (10AFC)
Assess the role of object and scene familiarity in dot probe task
Inverted scenes: Reduce familiarity of both

References


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