Is Multiple Object Tracking Color Blind??

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Abstract

The visual system can track objects behind occluders, but inter-item occlusion presents a special problem: Moving stimuli can be confused with one another. Using color to individuate objects does not help. However, this is not because the system cannot use color information.

When color segregates targets from distractors, inter-item occlusion is no longer a problem. This suggests that the challenge of multiple object tracking is segregating targets from distractors rather than individuating objects.

1. Background: Features

Objects can usually be distinguished by various features, including, size, shape and color. Experiments 2 and 3 investigate the effects of a color feature on tracking. Can color improve tracking by individuating objects or by distinguishing a group of targets from distractors?

In prior work, observers had difficulty reporting changes in moving targets among identical distractors (Pylyshyn & Storm, 1988). However, those features might still be used to individuate objects.

2. Background: Occlusion

Depth cues improve tracking when items overlap (Viswanathan & Mingolla, 2002), and occluding surfaces do not impair tracking (Scholl & Pylyshyn, 1999).

Therefore, it has been widely assumed that allowing items to occlude one another should not impair tracking. However, Yantis’ (1992) data suggest otherwise. In Experiment 1, we directly tested this prediction.

We used two types of displays. In one, items “bounced” off each other. In the other, items could occlude each other.

3. Background: Occlusion

It seems surprising that vivid color had no positive effect on tracking. Can tracking use color at all?

In Experiment 3, we gave the tracked set one color and the untracked set another color. As before, colors shifted continuously during each trial.

We tested the hypothesis that tracking cannot use color information at all.

Results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Average Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occlusion</td>
<td>3.50</td>
</tr>
<tr>
<td>Bounce</td>
<td>4.75</td>
</tr>
<tr>
<td>Mixed</td>
<td>4.50</td>
</tr>
</tbody>
</table>

Discussion

We can use this manipulation to test the ability of features to aid tracking. Color is not a feature that is used to individuate objects when tracking.

4. General Conclusions

The visual system can track objects behind occluders, but inter-item occlusion presents a special problem: Moving stimuli can be confused with one another. Using color to individuate objects does not help. However, this is not because the system cannot use color information.

When color segregates targets from distractors, inter-item occlusion is no longer a problem. This suggests that the challenge of multiple object tracking is segregating targets from distractors rather than individuating objects.

References


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