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Segregating targets & nontargets in depth eliminates inhibition of nontargets in Multiple Object Tracking

**Harry H. Haladjian
Carlos Montemayor
Zenon W. Pylyshyn**

**Visual Attention Lab
Rutgers Center for Cognitive Science**

Overview

A decorative graphic at the top of the slide features six circles arranged in a horizontal row. The first circle is solid light blue, the second is an outline, the third is solid light blue, the fourth is an outline, the fifth is solid light blue, and the sixth is an outline. Below the circles is a thick horizontal blue line.

- Attention, inhibition, and visual indexes.
- Multiple Object Tracking (MOT) paradigm.
- Results from the current study on inhibition in a 3D MOT display.
- Conclusions and future direction.

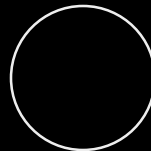
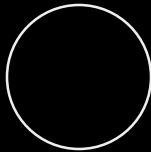
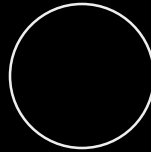
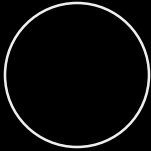
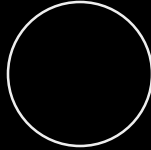
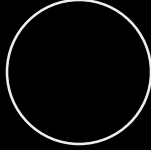
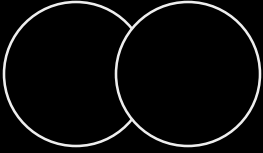
Attention & Inhibition

- Various studies suggest that while attention can be *directed* towards items of interest, **inhibitory processes** also act upon irrelevant objects.
(Ogawa, Takeda, & Yagi, 2002; Theeuwes, Kramer, & Atchley, 2001; Tipper, Driver, & Wheeler, 1991; Watson & Humphreys, 1997)
- Inhibition appears to be object-based and task-specific.
- Inhibition may occur bottom-up through the visual marking of irrelevant objects.

Visual Indexes & MOT

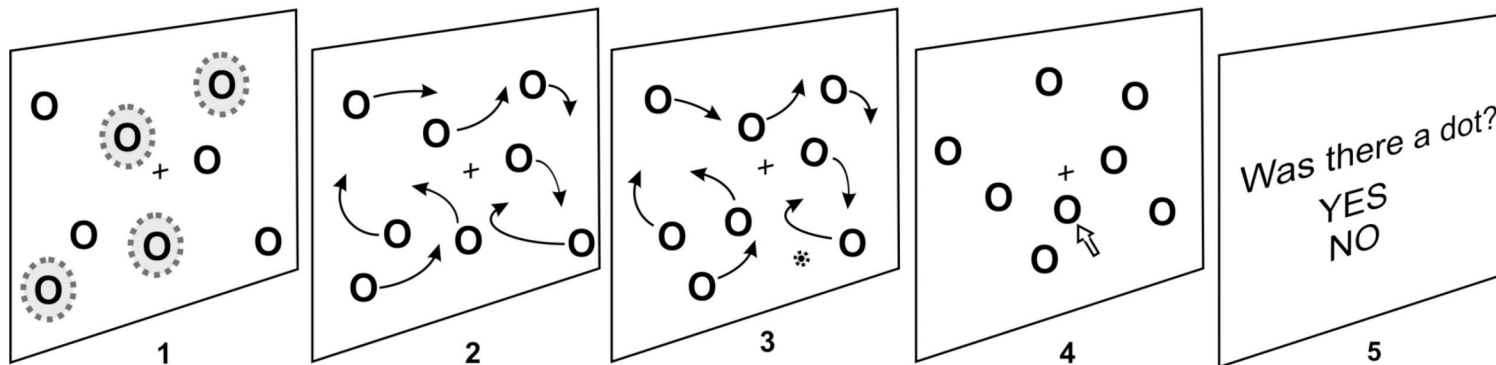


- The Visual Indexing mechanism individuates objects and facilitates the ability to attend to objects. (Pylyshyn & Storm, 1998; Pylyshyn, 2001)
- Multiple Object Tracking (MOT) experiments provide support for these indexes.
- Inhibitory processes can be observed in MOT experiments.



Tracking Studies on Inhibition

- Probe-dot detection design allows to further explore how attention and inhibition operate.
(Watson & Humphreys, 1997, 1998)
- Typical set-up of MOT with probe-dot task:



Tracking Studies on Inhibition

- Tracking targets benefits from the inhibition of identical distractors (nontargets). (Pylyshyn, 2006; Reilly, Pylyshyn, & King, 2005)
 - Moving *square* and *circle* nontargets are both equally inhibited (since both interfere with tracking task).
 - Static nontargets in MOT are not inhibited.

What Is Inhibited?



- Is inhibition required if distractors are **pre-attentively separable** in early vision?
- Is such inhibition **task-specific**?

What Is Inhibited?



- To test for pre-attentive separation of objects, the current study incorporated **stereo depth cues** in a 3D tracking and probe-detection task.
 - Experiment was programmed using MatLab 6.5 with Psychtoolbox 2.54 on a Windows-based PC.
 - Crystal Eyes shutter glasses.

Experimental Design

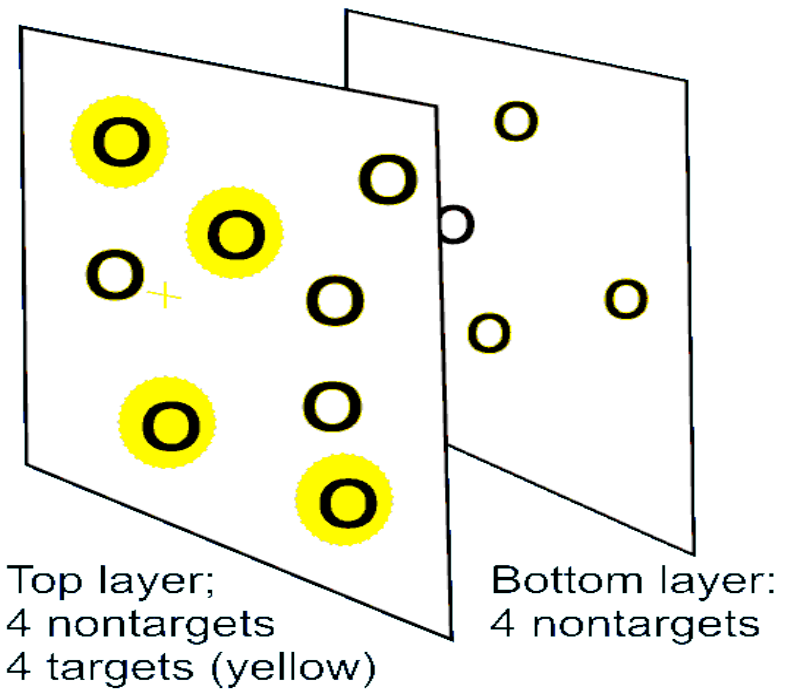
- 12 objects per trial; 4 targets/4 nontargets on front plane, and 4 nontargets on back plane.
- DV = Probe detection; probe dot occurred in 50% of trials:

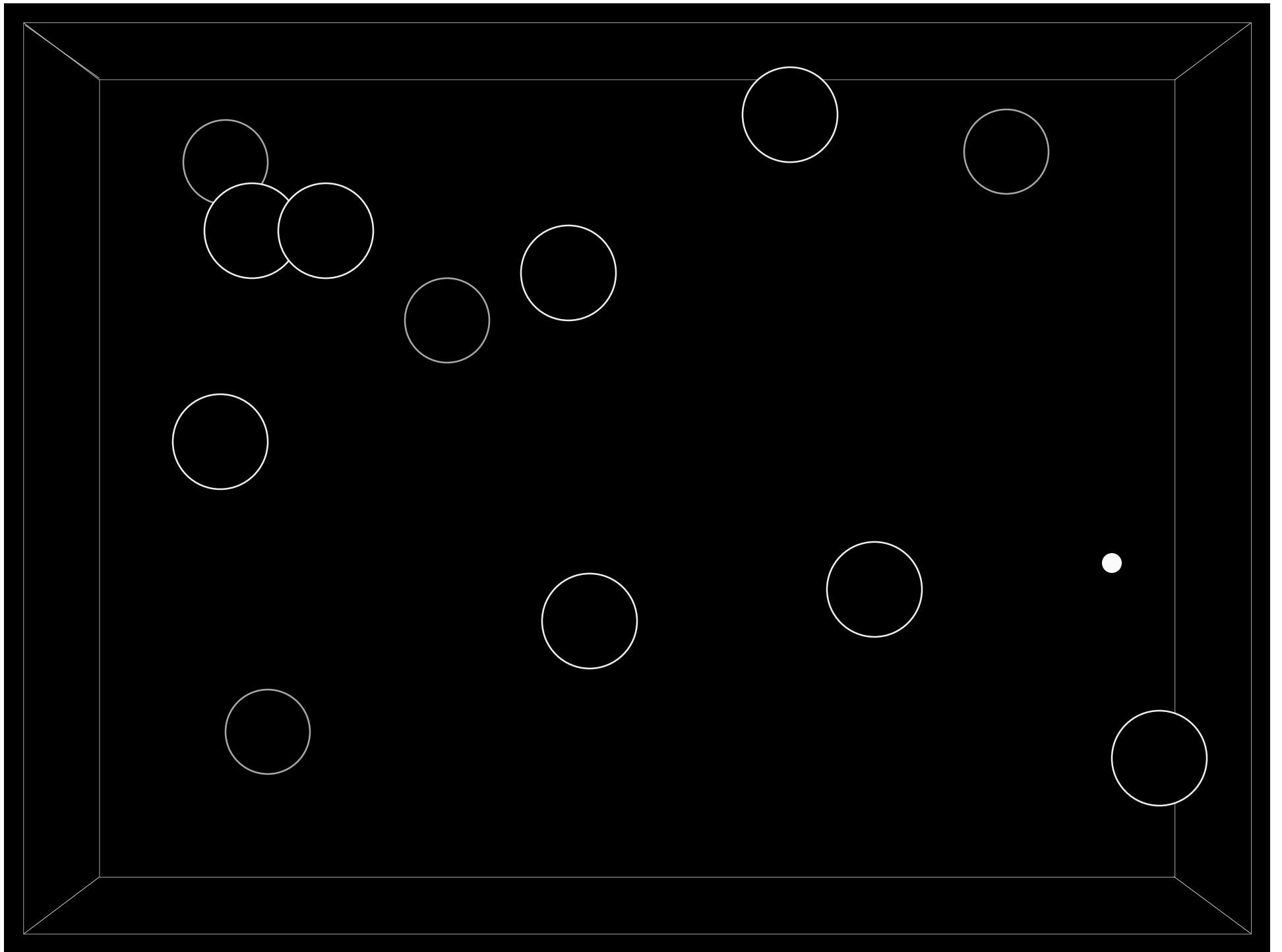
📁 Front Targets

📄 Front Nontargets

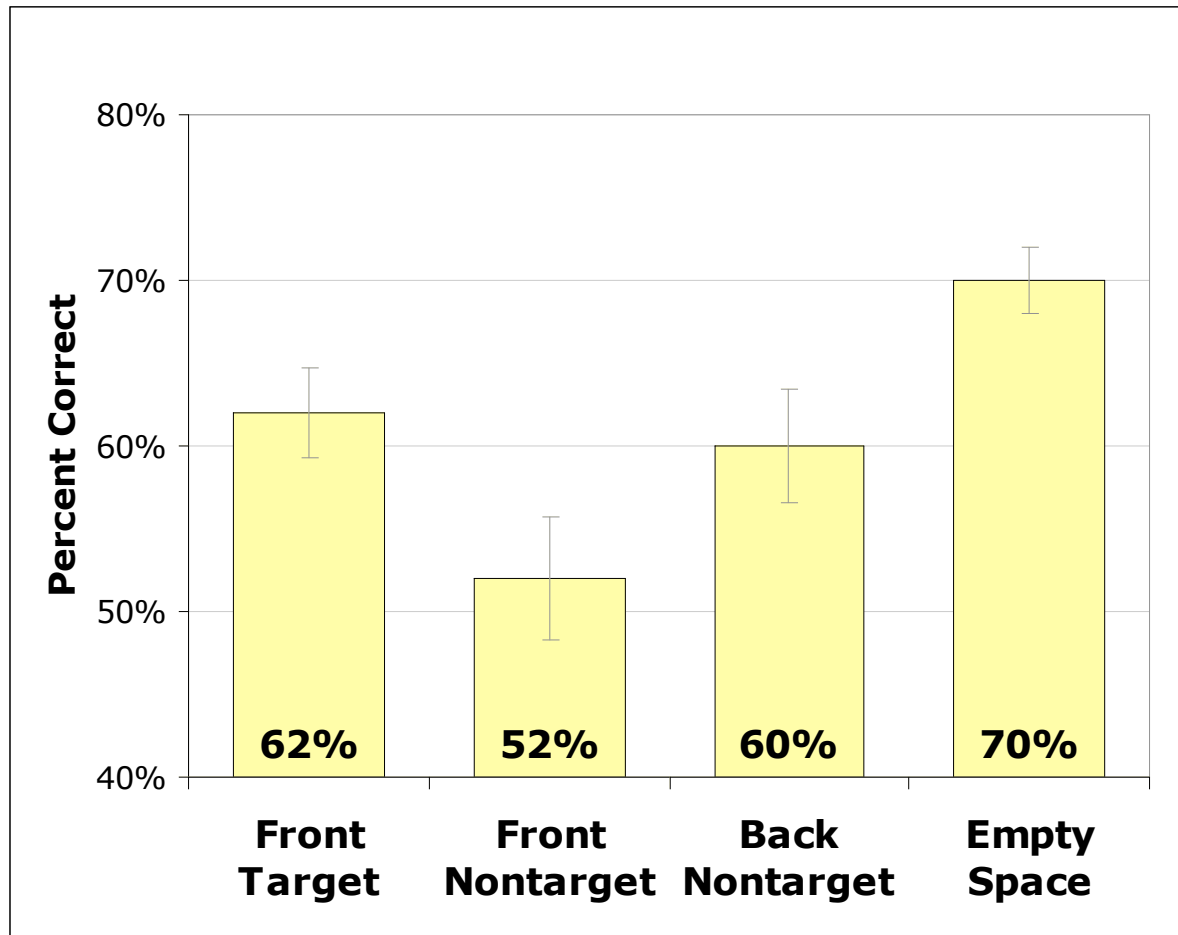
📄 Back Nontargets

📄 Empty Space

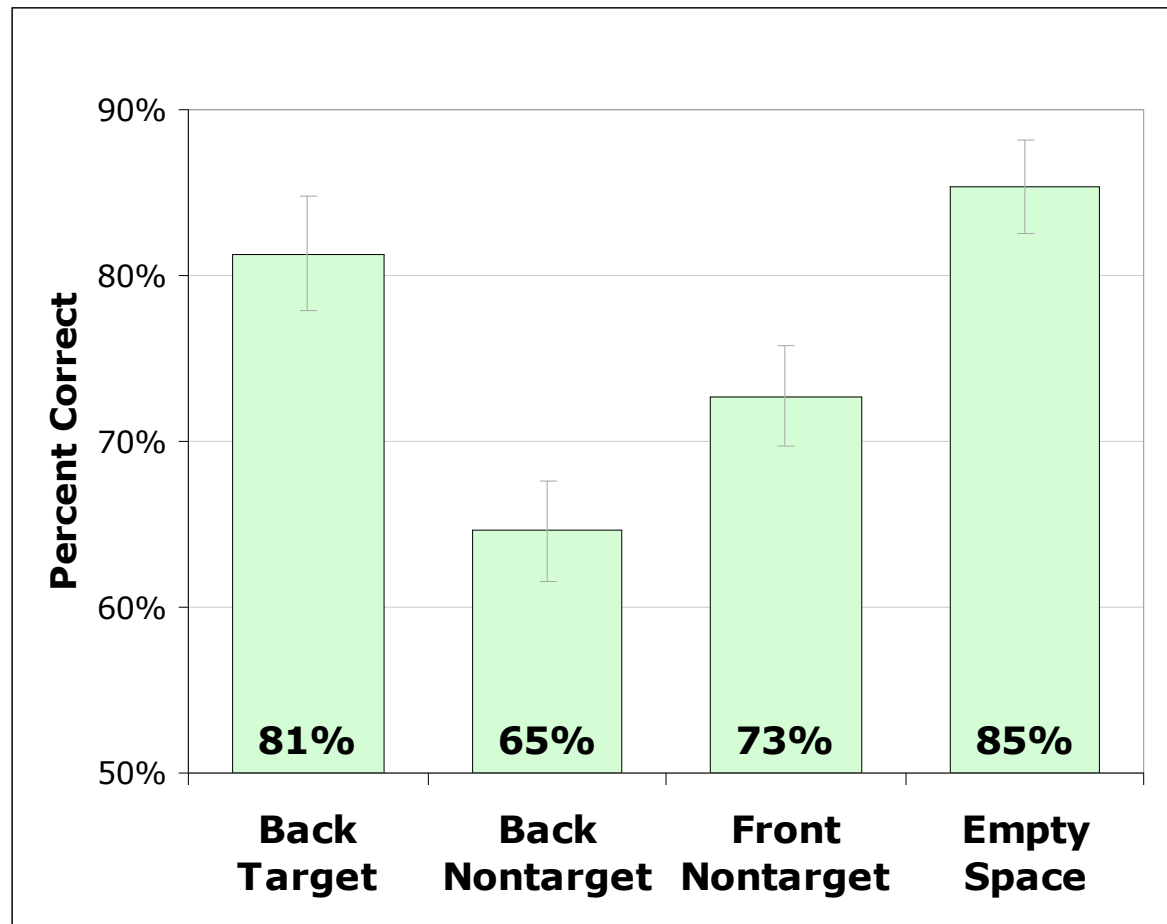




Probe Detection Results (n=15)



Alternate Plane - Probe Detection Results (n=13)



Conclusion

A decorative graphic at the top of the slide features five circles arranged horizontally. The first circle on the left is solid light blue. The second circle is a white outline. The third circle is solid light blue. The fourth circle is a white outline. The fifth circle on the right is solid light blue. Below the circles is a thick horizontal blue line that spans the width of the slide.

- Probe-dot detection was significantly lower on the distractors (nontargets) that appeared on the same depth plane as the targets; **nontargets on a different depth plane did not exhibit inhibition.**
- Inhibition is not required when nontargets can be pre-attentively separated from targets.
- This finding supports the view that **inhibition can be task-specific.**

Concluding Remarks



- Inhibition is not required when task-irrelevant objects in a visual scene can be segregated pre-attentively in early vision.
- Future studies:
 - How does inhibition spread during tracking task of targets on two depth planes?



Thank you!

Visual Attention Lab
Rutgers Center for Cognitive Science
<http://ruccs.rutgers.edu/finstlab/>

Zenon Pylyshyn (Principal Investigator)
Carlos Montemayor (Graduate Student)
Ryan McKendrick (Undergraduate Student)
Allan Kugel (Lab Programmer)

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