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Target Tracking During Interruption in the Multiple Object Tracking Task

David E. Fencsik[1,2], Todd S. Horowitz[1,2], Skyler S. Place[1], Sarah B. Klieger[1], & Jeremy M. Wolfe[1,2]

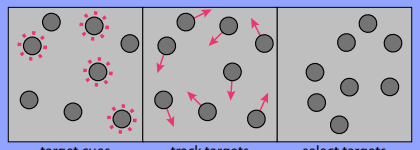
[1]Brigham and Women's Hospital and [2]Harvard Medical School

Email — fencsik@search.bwh.harvard.edu
WWW — http://search.bwh.harvard.edu

Multiple Object Tracking

Observers track a subset of independently moving stimuli.

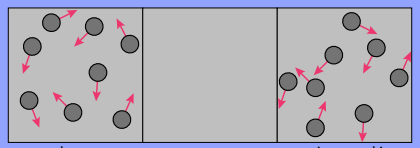
On average, they can track about 4 or 5 separate stimuli (Pylyshyn & Storm, 1988).



Tracking Through a Gap

A brief (300–900 ms) gap in the task barely disrupts tracking (Alvarez et al., in press; Keane & Pylyshyn, VSS2004).

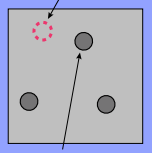
Target recovery following the gap may reveal what types of information can be tracked.



What Information is Tracked?

Spatial Location

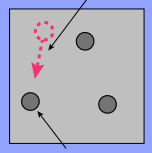
memorized pre-gap target location



closest stimulus: identified as target

Motion Vector

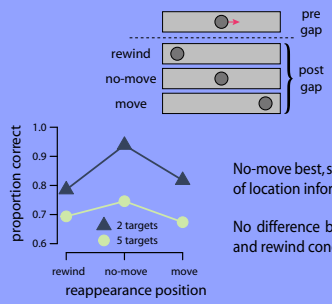
memorized target movement vector



anticipated reappearance position: identified as target

Method: 12 observers (24 in Experiment 3) participated in a within-subject design. There were 10 stimuli in Experiments 1 and 3, and 8 stimuli (4 targets) in Experiment 2. Stimuli moved randomly in straight lines at 8 degrees/s. All reported results were reliable at an alpha-level of .05.

Experiment 1: Location-based target recovery is the most efficient.



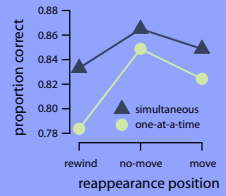
No-move best, supporting use of location information.

No difference between move and rewind conditions.

Experiment 2: Evidence for motion-based recovery when stimuli disappear one-at-a-time.

Tracking through simultaneous disappearance may depend on task-postponement mechanisms (Horowitz et al., VSS2004).

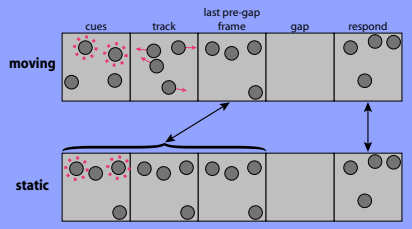
One-at-a-time disappearance likely requires continuous, on-line tracking (Scholl & Pylyshyn, 1999).



Move better than rewind with one-at-a-time disappearance.

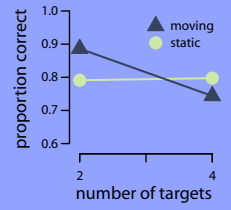
No-move still best in both disappearance conditions.

Experiment 3: Target recovery is worse without motion information before the gap.



Movement during the gap was equivalent across conditions.

In the moving condition, but not in the static condition, motion during the gap could be anticipated.



Pre-gap motion helps with 2 targets but not with 4.

Capacity for location information is at least 4 objects.

Why a crossover? Because pre-gap locations are only briefly available on moving trials.

Summary of Findings

Location information is tracked for at least 4 targets.

Motion information is tracked for around 2 targets.

Simultaneous and one-at-a-time disappearance reveal different patterns of target recovery.

Discussion

Tracking draws on two distinct representations, one that stores only locations and one that stores other information, including motion (see also Horowitz et al., submitted).

Simultaneous disappearance of all objects leads to task postponement, while disappearance of one object involves continuous tracking (see also Horowitz et al., VSS2004).

Both systems track some motion information, but task-postponement mechanisms lose more of it .

References

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