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## Keeping track of objects while exploring a spatial layout with partial cues: Location-based and direction-based strategies

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### Abstract

Last year at VSS, Bullot, Droulez & Pylyshyn (2003) reported studies using a Modified Traveling Salesman Paradigm (MTSP) in which a virtual vehicle had to visit up to 10 targets once and only once, and in which the invisible targets were identified only by line segments pointing from the vehicle toward each target. We hypothesized that subjects used two distinct strategies: A "location-based strategy", which kept track of where targets were located in screen coordinates, and a "segment-based strategy" that kept track of which segments corresponded to visited targets. We report new studies that further explore these two strategies. Subjects passively observed a computer-controlled virtual vehicle that visited a number of targets. Two forms of display were used: an "Allocentric" display, in which the vehicle moved and the targets remained fixed in screen coordinates, and an "Egocentric" display, in which the vehicle's position on the screen remained fixed while the targets moved -- as if the environment were being viewed by an observer on the vehicle. At the end of each trial, the directional segments were extended to the edge of the screen and subjects were asked to perform two tasks by referring to these segments. In the "status task" observers had to indicate for each segment whether the corresponding target had been visited or not. In the "locating task" they had to locate each target along its directional segment. Performance on these two tasks measures the use of the two hypothesized strategies (segment-based and location-based). Results showed that observers do well on the status task with 4 or 6 targets in both display conditions, but do poorly on the locating task, especially in the egocentric condition when there are more targets. These results are consistent with the hypothesis that in the egocentric condition the MTSP task is carried out primarily by segment-tracking, which can be viewed as a deictic strategy (Ballard et al., 1997; Pylyshyn, 2001).

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