Keep on rolling: Visual search asymmetries in 3D scenes with motion-defined targets

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Many simple feature searches are asymmetric; that is, finding a target defined by feature value A among distractors with value B is more efficient than finding B among A. In motion, for example, finding moving targets among stationary distractors is more efficient than finding stationary among moving (but see Rosenholtz, 2001). Most previous work involves simple motions in the 2D plane including manipulations of speed (Ivry & Cohen, 1992), rotation (Thornton & Gilden, 2001), expansion, contraction (Takeuchi, 1997), and randomness (Horowitz, et al., 2007). Here, we extend this work to environments with depth, using objects rotating around different axes in 3D environments. Observers searched for targets that were “rolling” about a horizontal axis among distractors “spinning” about a vertical axis or vice versa. Objects appeared to rest on a slanted plane and did not translate along this surface. Set sizes were 4, 8, and 12. Search for rolling targets among spinning distractors was markedly more efficient than search for spinning among rolling (RT x set size slopes: 12 vs 36 msec/item). Half of observers had target-present slopes < 10 msec/item, suggesting that “rolling” may behave like a fundamental feature such as color or orientation. More broadly, these results suggest that more features that guide attention may be waiting to be discovered as we move beyond simple stimuli in the frontal plane.

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