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Visual Search in Cluttered Environments Using Active Viewpoint

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Abstract

Visual clutter impairs visual search in two-dimensional scenes; however, it remains unclear how factors that contribute to clutter unfold in scenes with a three-dimensional structure similar to the real world. We investigated visual search using a head-mounted display that provides stereoscopic depth and allows limited viewpoint adjustment, enabling participants to search for everyday objects in controlled virtual scenes with different degrees of visual clutter. Clutter was manipulated by varying the number of objects and the visual complexity of the background, while the presence of a search target was manipulated independently. Reaction time, accuracy, and eye movements were recorded. Results showed that participants responded faster and made fewer fixations when the number of objects was low and when a target was present, suggesting that while classic factors affecting two-dimensional visual search extend to scenes with naturalistic three-dimensional depth and occlusion, clutter effects depend on specific contributing factors.