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Distance Perception in Immersive Environments – The Role of Photorealism

ABSTRACT. Immersive environments (IE) are being increasingly used in order to perform psychophysical experiments. The versatility in terms of stimuli presentation and control and the less time-consuming procedures are their greatest strengths. However, to ensure that IE results can be generalized to real world scenarios we must first provide evidence that performance in IE is quantitatively indistinguishable from performance in real-world. Our goal was to perceptually validate distance perception for CAVE-like IEs. Participants performed a Frontal Matching Distance Task (Durgin & Li, 2011) in three different conditions: real-world scenario (RWS); photorealistic IE (IEPH) and non-photorealistic IE (IENPH). Underestimation of distance was found across all the conditions, with a significant difference between the three conditions (Wilks' Lambda = .38, $F(2,134) = 110.8$, $p < .01$, significant pairwise differences with $p < .01$). We found a mean error of 2.3 meters for the RWS, 5 meters for the IEPH, and of 6 meters for the IENPH in a pooled data set of 5 participants. Results indicate that while having a photorealistic IE with perspective and stereoscopic depth cues might not be enough to elicit a real-world performance in distance judgment tasks, nevertheless this type of environment minimizes the discrepancy between simulation and real-world when compared with non-photorealistic IEs.

Reference: Silva, C., Mouta, S., Basso, D., Santos, J., & Campos, J. (2015, August). Distance Perception in Immersive Environments-The Role of Photorealism. In *PERCEPTION* (Vol. 44, pp. 321-321).