Measuring an Illusion: The Influence of System Performance on Size Perception in Virtual Environments

Abstract:
The effects of system performance variations on people’s estimation of virtual object sizes in a multi-sided back projection virtual reality system have been explored. Seventy-seven participants adjusted the sizes of three subsequently displayed simple virtual shapes to the memorized sizes of corresponding real objects. The sizes of the virtual objects have been calibrated in real space. With low system lag (i.e., high system performance), object sizes were underestimated. With high system lag participants perceived the virtual objects significantly larger than while experiencing the high performance condition. An explanation for this effect relying on a proposed cognitive averaging process of motion-dependent size cues has been suggested. In addition, an increase in estimation variance among participants has been detected when the system lag was increased. A control experiment (real-to-real objects size comparisons) proved good applicability of the estimation method used.