Virtual simulation sickness: is vection the only issue?

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Abstract

It is now widely believed that the sickness symptoms often reported during immersion in virtual environments have the visually-induced feeling of motion (vection) as their primary genesis. A person exposed to dissimilar vection conditions, with all other factors held constant, will vary in their symptom reports. Here we investigate the influence of hardware, not software, by examining sickness reports when people are exposed to the same motion whilst wearing different Head-Mounted Displays (HMDs).

In a balanced experiment, 18 susceptible subjects wore each of three non-tracked HMDs (Virtuality Visette II, Dynovisor, virtual i-glasses) to play a hovercraft-racing game which provides apparent motion around all three axes. Following familiarisation with the equipment and task, trials of 20 minutes maximum duration were repeated at intervals of at least a week.

Sickness was assessed by evaluating both the time taken for the onset of nausea, and its final severity. On average, there was no difference between the Visette and Dynovisor in either onset time or severity. However, symptoms took longer to appear, and were less severe, when the i-glasses were worn (both $p<0.001$). This result shows that software is not alone in influencing symptoms, but that hardware can also play a major role.

Introduction

The introduction of widely-available immersive virtual reality (VR) equipment in the 1990s was accompanied by frequent reports of users experiencing unpleasant side effects (Wilson, 1996). In the UK, the Health and Safety Executive instigated an investigation of a wide variety of these adverse effects (Cobb et al., 1996), and the visual aspects of this investigation were performed by the Visual Ergonomics Research Group (VISERG) at Loughborough. This work investigated health and safety problems associated with the wearing of Head Mounted Displays (HMDs), both in terms of the oculomotor changes that were induced by the HMD optical systems (Howarth, 1999) and also the symptoms that accompanied their use (Costello and Howarth, 1996).

In D. de Waard, K.A. Brookhuis, S.M. Sommer, and W.B. Verwey (2003), *Human Factors in the Age of Virtual Reality* (pp. 55 - 62). Maastricht, the Netherlands: Shaker Publishing.