To investigate how virtual reality can influence motor responses via deception of the sensory nervous system in order to aid navigation around a virtual plane.

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Keywords:

1. Introduction

Virtual reality is a new-wave medium, which at present provides visual experiences via optical immersion. For the future, it has a copious range of potential applications within i.e. the education, gaming and medical industries. Through analysis of participant estimation both within a real and virtual environment, I intend to discover how virtual reality can influence motor responses via deception of the sensory nervous system and aid navigation around a virtual plane. Evidently monetary barriers to virtual reality depreciate as cost of its hardware decreases, this suggests an increase in potential consumers. Yet, the emancipatory confounds of VR restrict exploration and varied motion, which in turn breaks the illusion of walking around a real domain. This problem has been addressed with add-on hardware such as the Virtuix Omni. However two key obstacles face a 3rd party hardware solution (such as the Omni). Metaphorically its integration with developed software and literally its potential size.

1.1. Aim

1. To investigate how virtual reality can influence motor responses via deception of the sensory nervous system and aid navigation around a virtual plane.

1.2. Objectives:

- Select a sensory system.

- Develop a scenario, which forces a participant to rely on the sensory system to achieve a given goal.
- Develop a VR system, which presents the scenario and manipulates environmental input to deceive the given sensory system.
- Construct one or a set of experiments, which utilise the system to gather participant results.

2. Literature Review

From a high level, visual input contributes greatly to sensory information. Utilization of VR's visual component to simulate scenarios and gather results seems logical and is evident in a vast amount of research.

Research, which uses visual stimuli to convey presence in a virtual environment, provides a coherent foundation that the project aim is achievable. Umeki and Doi (1997) suggest distance estimation in a virtual room is similar to that of in a real room. The 1997 experiment was conducted using a single 21-inch monitor to display virtual scenes. Yet, their research alone presents how a virtual environment can be perceived in a similar way to the real world. This indicates deception of the sensory nervous system can be achieved using basic hardware. From this, the use of Unity 5 the HTC Vive may produce results which, suggest a greater influence on a users perception.

Heydariana explores the performance of office space activities in both real and virtual envirnments. Even with increased complexity over distance estimation, results indicate differences in performance to be non significant. This re-enforces the idea of presence within VR. However participants described unrealistic navigation within their virtual environment. From this navigation seems like a theme within VR, which limits a higher sense of presence within VR.

Vection, according to Bernhard E.Riecke can significantly enhance self-motion perception within VR. His study suggests the illusion of self motion can be facilitated via the use of low cost locomotive interfaces, without psychical walking or complex motion. However another study by Timofey Grechkin suggests a rotate and walk technique. In his study, if a user is attempting to reach an out of bounds target t the user is then prompted to go to a sub target I. As they walk to I the world rotates to encompass the t again. Both studies deceive a participants visual sensory information to

enhance the feeling within a virtual space. However a combination of both physical and virtual locomotion etc etc

To facilitate the illusion of locomotion Turchet argues that the rendering of a virtual body has to be consistent with the user's body. Prior research has demonstrated the possibility of identifying a walkers gender (Li et al, 1991) and emotions (Bresin R, 2006) based solely on auditory data. As a result, auditory input of a participant's anthropomorphic appearance could be a key part in simulating presence and locomotion within a virtual environment.

3. Academic Literature (Links For Now)

https://www.ncbi.nlm.nih.gov/pubmed/25450453 - manipulating the speed of visual flow in VR. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0016128 Fat belly illusion http://jov.arvojournals.org/article.aspx?articleid=2213267 Self motion - Vection - Environment moving instead of using a physical- https://preview.overleaf.com/public/fbhyjxvbzytd/images/4f4ac10f87906f8963fff3436185e49c8eed0 tool, like an omni http://ieeexplore.ieee.org/document/7504714/ walking model for enhancing redirection in VR http://ieeexplore.ieee.org.proxy.library.lincoln.ac.uk/xpls/icp.jsp?a - Reorientation techniques for VR (space utilisation) http://content.ebscohost.com/ContentServer.a Sep7M4zdnyOLCmr06ep69Ss6e4TLOWxWXSContentCustomer=dGJyMPGqtlGzrbFMuePfgeyx4 http://www.sciencedirect.com.proxy.library.lincoln.ac.uk/science/article/pii/S0926580515000606?r

http://content.ebscohost.com/ContentServer.asp?EbscoContent=dGJyMNLr40Sep7Y4zdnyOL

http://link.springer.com.proxy.library.lincoln.ac.uk/article/10.1007