

The Impact of Latency and Motion Sickness in VR experiences

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Abstract

Virtual Reality (VR) is increasingly integrated into various fields, offering immersive experiences that are revolutionizing entertainment, education, and training. However, latency, the delay between user input and system response, remains a critical challenge, contributing significantly to motion sickness—a condition that undermines user comfort and safety. This research investigates the impact of different latency levels on the severity of motion sickness in VR environments. A quantitative, experimental design was employed, involving participants with significant experience in VR. They were asked how much motion sickness affected their overall experience and what individual differences they possessed. Statistical analysis, including paired t-tests, z-tests, were conducted to determine the relationship between latency and motion sickness. The results indicate a significant correlation between latency, time of usage and higher motion sickness severity, with specific latency thresholds identified as critical points for user discomfort. This study highlights the importance of minimizing latency in VR systems to enhance user experience and provides insights for developers aiming to reduce motion sickness in immersive environments.

I. Introduction

Virtual reality (VR) is an evolving and expanding technology in today's world. The advantages of virtual reality depend on high levels of immersion and minimal discomfort and latency. VR technologies can engage the viewer or user in a static or dynamic experience. VR users can move by locomotion in the virtual environment. The system's rejection of motion sickness is necessary for VR technologies. The visual latency is one of the common effects that the

users encounter in VR experiences. [1] The latency in VR can cause many side effects, including motion sickness, the virtual objects around the users, and the identification and response delay. This paper aims to measure and discuss the impact latency might cause on the VR user experience, by focusing on the physical discomforts which are traditionally believed to be due to it, mainly nausea and eye strain [2]

One of the primary objectives of VR developers has been to forge a seamless connection between the virtual world and the user's senses. By reducing latency, developers can create a heightened sense of presence, immersing the user in a digital realm that feels strikingly real. Moreover, this reduction in latency enables smoother interactions and more accurate responses, bolstering the user's confidence and eliminating any noticeable

discrepancies that may disrupt the immersive experience. [3] This paper focuses mainly on understanding what impact latency has on users and what is the reason for this latency (network connection, software issues) etc. By examining various factors such as demographics, expertise etc, this research aims to uncover the effect latency has on individuals and how their individual differences might influence it.