

Impact of Frame Rate and Refresh Rate on Player Performance and Experience in First Person Shooters

Thema:

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Hintergrund

In Human-Computer Interaction, the term latency refers to the time between a user's action and the system response. This latency is relevant in many HCI contexts, and lower latencies has been shown to be beneficial for both user performance and user experience [1,2,3]. Video games usually try to provide an immersive experience, or a competitive one – both being negatively affected by high latencies [4].

With the video games industry reaching a revenue of 150 billion USD in 2020 [5] and esports being estimated at a revenue of around 25 billion USD [6] there is a significant user base pursuing the lowest latency in their gaming setup. Previous work revealed effects on players' performance for a number of factors, including visual latency [3], network latency [7, 9], different monitor refresh rates [1] or mouse polling rates. Previous work also investigated combinations monitor refresh rates and spatial jitter [8]. The general conclusion is that lower latencies improve player performance and player experience. Consequently, higher refresh rates can be helpful in certain tasks.

While Spjut et al. [1] measured task completion times for typical first-person shooter (FPS) tasks for a variety of refresh rate and input latency conditions, they isolated refresh rate as a variable, artificially increasing input latency at higher refresh rates. Other work has found benefits of higher frame rates [4] but only tested framerates at or below 60 FPS, and/or on 60Hz Screens or lower [10]. So while monitor refresh rates have made leaps reaching up to 390hz [11], and modern multiplayer games are can produce multiple hundred frames per second, there is no conclusive evidence whether frame rates and refresh rates above 60hz have a positive impact on player performance, and how significant

that impact is.

Zielsetzung der Arbeit

The goal of this thesis is to establish how different frame rates at different refresh rates impact performance and experience in multiplayer first-person shooters. Participants will be presented with different tasks representative for FPS gameplay, under varying frame and refresh rates. We measure task performance (player score, accuracy, etc.) and player experience using a questionnaire.

We will test two refresh rates, representative of common monitors on the market: 60Hz and 144Hz. The tested frame rates will be based on the respective monitor refresh rate: 100% of the refresh rate (60 and 144fps), 110%, 150%. This allows us to not only establish whether a higher refresh rate is beneficial for player performance and experience in FPS games but also to establish whether there are benefits of a framerate higher than the monitors refresh rate (Are 110% and 150% better than 100%?) and whether there is a benefit to having frames and refresh rate synced up (Is 100% better than 110%?)

Konkrete Aufgaben

- Surveying related work
- Choosing or developing scenarios for testing player performance
- Determining metrics to measure player performance
- Choosing a questionnaire to measure player experience
- Analyzing results

Erwartete Vorkenntnisse

Keine

Weiterführende Quellen

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