

Interaction between Avatar Body Type and Latency in Virtual Reality

Thema:

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Hintergrund

Latency is generally described as the time delay between the cause and the effect of a desired outcome in an observed system [1]. In video games, latency is an important factor and affects the experience as well as the performance of the player. Especially fast-paced games, such as 3D shooters, depend on low latency [2, 3, 4].

The effects of latency can also be observed for virtual reality games [5]. In these games, an important focus lies on how players perceive themselves and the world [6, 7, 8]. Avatars in virtual reality should feel natural to the player. Therefore, a diverse representation of players, e.g. by taking into account factors such as gender or grade of realism, is advised [9].

However, it is unclear if diverse types of avatars also affect the perceived latency of the player. Previous work investigated the influence of motion speed on perceived latency [10]. An avatar that looks and feels more agile could therefore be perceived as more responsive.

A way to encourage the players to move and to differentiate movements for all body types more effectively is by designing an exergame. They require the player to be agile to beat them and latency can affect players more directly since they move around a lot more compared to other types of games. Exergames and research about them have become more popular in recent years as virtual reality devices have become more affordable for regular consumers to increase their enjoyment for regular training [11, 12]. Current research for virtual reality exergames focuses on different types of avatars and their effects on factors such as physical performance or identification, but not on latency [13, 14].

The assumption that the body type influences perceived latency could also work the other way around, in that the latency could affect the perception of the avatar. The hypothesis for our work will therefore be bidirectional

Zielsetzung der Arbeit

This work investigates if the body type of an avatar influences the perceived latency of players in virtual reality and if the latency influences the perception of an avatar. Two different avatars will be created that differ in body type (agile/slender and heavy/bulky) and gender (to account for differences with female and male avatar builds). These avatars will then be implemented into a virtual reality exergame. The exergame will be controlled by using a motion capture suit that will be worn by participants.

A pre-study will be developed and conducted to select suitable avatars (for the agile and bulky variables) who maximize the effect on the dependent variable:

- Goal: Find suitable avatars for the main study based on impressions from the participants. The selected avatars will strongly represent or influence the dependent variable for our main study.
- Present the participants with several different avatars (current estimate: 16)
- Participants choose the avatars who best represent the desired parameters for our study (agility, mass, muscles, BMI). The height of the avatars does not change.
- Questions: How fast can this avatar complete a certain task (mention the tasks that will be used for our main study, currently catching/swatting wasps and Yoga)? How agile is this avatar? Estimate the BMI for this avatar.
- Participants should also be questioned about their experience with our tasks (especially Yoga) and about their body types.

The main study, based on the results and the chosen avatars from the pre-study, will then measure the latency and perceived latency for the avatars. A two by two design with body type (bulky/agile) and latency (low/high) will be used. The latency will be controlled and manipulated for all body types to investigate possible differences and to test our bidirectional hypothesis. To account for differences between genders, a between subjects design will be used. Presence (IPQ), game experience (GEQ), game enjoyment (EEQ) and performance (task time/success) will be used to measure the difference.

Three tasks will be implemented to measure performance, enjoyment and presence:

- A playful task which consists of swatting/catching wasps or a similar playful activity in VR
- A sports and fitness oriented task which consists of doing Yoga poses in VR

- A third task/activity which benefits bulky avatars and does not require haptic feedback to be effective in VR

The results will then be analyzed. The body type of the player, their skin color or other factors need to be addressed when analyzing the data or during the selection of study participants.

Konkrete Aufgaben

- Literature review
- Developing a study design
- Creating and implementing the avatars in a VR environment
- Conducting the pre-study
- Evaluating the results from the pre-study and selecting the avatars
- Creating or adjusting the VR environments/games for each task
- Conducting the study for every task (swatting/catching wasps, Yoga, possibly a task which favors a bulky avatar)
- Evaluating the results of the study
- Writing the thesis

Erwartete Vorkenntnisse

- Experience in 3D Modelling
- Programming in Unity and C#
- Designing, implementing and evaluating empirical studies

Weiterführende Quellen

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