Unveiling User Interactions in VR Environments

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Motivation

As XR technologies advance, the nuances of user interactions, particularly motion engagements, become crucial.

Current XR products provide insight into user preferences, guiding the development of next-gen spatial computing interfaces.

Importance: Rapid evolution of XR tech demands a seamless user experience for widespread adoption. Body tracking is central, influencing the design of XR interfaces and avatar responsiveness.

Meta Quest 3

Study Objective

Objective 1: Understand users' body tracking interaction preferences with current XR products.

Objective 2: Assess implications of these preferences on avatar responsiveness in different XR scenarios.

Rationale: To guide the development of future spatial computing interfaces based on user preferences and expectations.

Target Group: University students without prior VR experience (aged 18-31).

Research Question

Main Question:

How do body-tracking interactions with current XR products shape users' preferences for touch-based input methods in future spatial computing interfaces?

Sub-Question:

Considering traditional vs. body tracking input preferences, how does avatar responsiveness differ in professional (e.g., VR academic discussions) versus entertainment settings (pong)?

Test Method

How?

In our study, we examined ratings for 'overall experience,' 'body tracking/mimicking accuracy,' 'avatar responsiveness,' and 'Motion Capture intuitiveness' from six participants. We calculated the mean and median for each category to understand the central tendencies and distribution of the data. Comparing these values, we assessed data skewness and identified outliers, integrating both quantitative and qualitative analyses. This method allowed us to generate insights and draw conclusions about the VR game's user experience, highlighting strengths and areas for improvement.

Research Design

Target Group:

University students aged 18-31, with no prior consistent VR experience.

Experimental Design:

Two groups - one using traditional input methods, another using body tracking.

Test Tasks

Check-in and pre-test survey: 5 minutes.

Setup and VR/keyboard operations tutorial: 5 minutes.

VRChat avatar selection and initial chat: 2 minutes.

Play pong and chat: 5 minutes.

Play zombie game: 5 minutes.

Switch devices and repeat steps 3-6: 20 minutes.

Conduct interviews: 10 minutes.

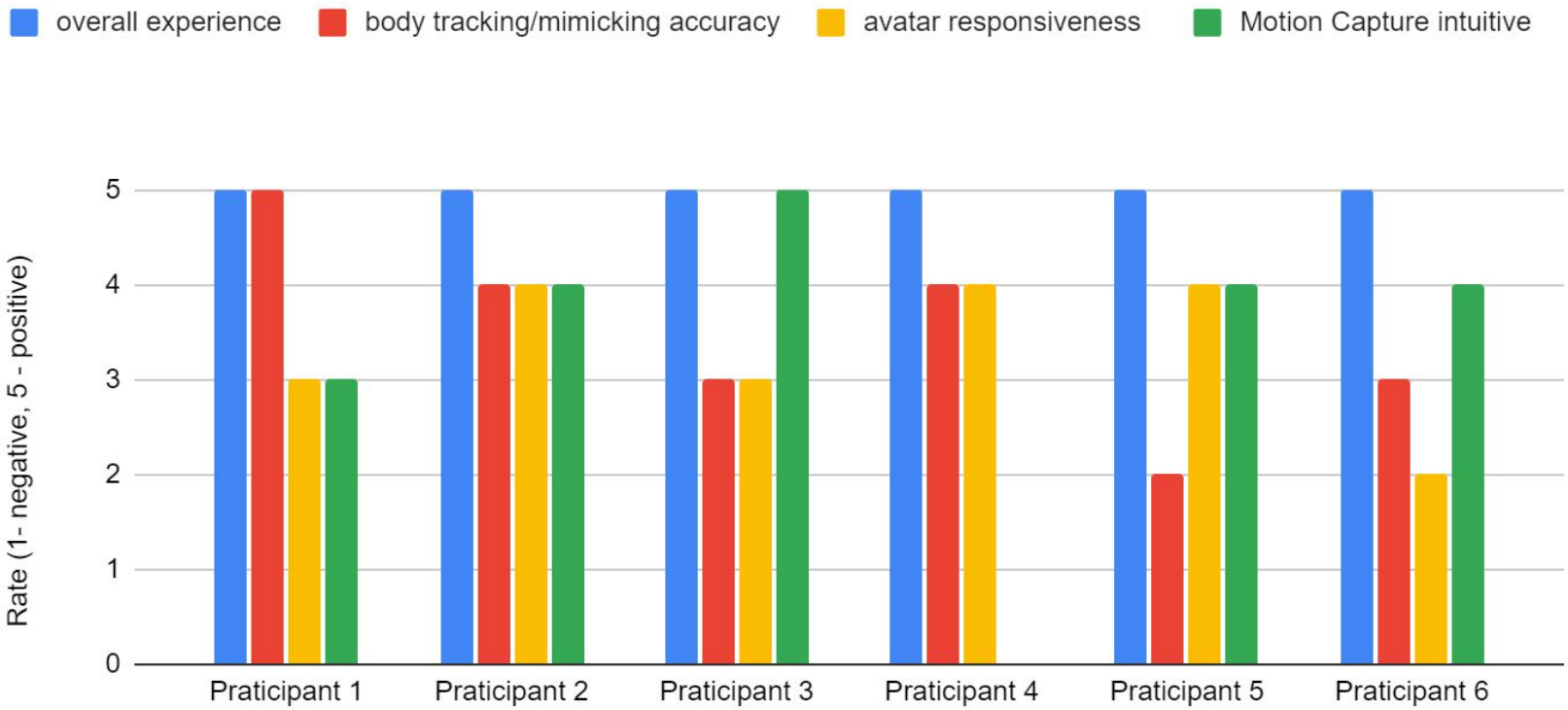
Data Collection

- Pre and post-study questionnaires (Likert scale).
- Direct interviews after activities.
- Behavioral observations during VR tasks.

The Results

Quantitative Data

Quantitative Analysis



Research Outcome

Average

3.5/5	3.33/5	4/5	5/5
body tracking/mimicking accuracy	avatar responsiveness	intuitiveness	Overall experience

Qualitative Data

Insight 01

Challenging Movement and Gesture Capture

Insight 02

Disorientation Between Reality and Virtual Space Due to Inexperience with VR

Insight 03

Disconnection Between Actual and Avatar Movement

Insight 04

Positive Impact of Body Tracking on Experience

Insight 05

Long-term usage of VR may cause physical discomfort

Insight 06

VR + Avatar can be a potential complement for in-person interactions

01

Insight

Challenging Movement and Gesture Capture

Challenges in picking up objects or accurately reflecting hand movements

Many participants noted difficulties with specific movements or gestures being accurately captured by the VR system. Participants noted specific issues such as picking up items and moving their hands. This feedback suggests that while the technology is promising, there are still improvements needed in motion capture for a more seamless and intuitive VR experience.

"When I was trying to play the zombie game, I was not able to move my hands as quickly as I wanted."

"Mainly my hand movements, especially when hand gestures were required."

"The mouse was almost too sensitive to my movements."

02

Insight

Disorientation Between Reality and Virtual Space Due to Inexperience with VR

Challenges in adapting to VR controllers and understanding how to navigate within the virtual environment

An illustrative example of this disorientation is seen in the case of a participant who tried to use both joystick control and physical body movements simultaneously to navigate the VR space. This overlap between physical control and joystick control led to confusion, highlighting the complex interplay between physical and virtual interactions in VR environments.

The lack of familiarity with VR controls and the immersive nature of the experience led to confusion and difficulty in completing tasks effectively.

“Turning with my body vs my controller is the instance where I felt a disconnect between your actual movement and the avatar's movement”

03

Insight

Disconnection Between Actual and Avatar Movement

Participants had mixed experiences regarding the unity between their movements and the avatar's responsiveness

Some felt a strong sense of immersion and found it difficult to differentiate between themselves and their avatars, indicating a high level of responsiveness and immersion. Other participants experienced a disconnect between their actual movements and physical interactions with those of the avatar.

"Using the mouse for certain movements made me feel disconnected"

“Just my hand movements because I feel like when I was like picking up the gun, or like moving it, or like adding ammo, it was a little off.”

“I was once in a while disoriented by the height of my avatar. Because I was either very tall or very short and the other players avatar always contrasted my height. So it was also hard to see my avatar.”

04

Insight

Positive Impact of Body Tracking on Experience

The VR motion capture feature improves the accuracy of avatars

Responses varied regarding how body tracking affected the VR experience. 5 out of 6 participants agreed that using VR motion capture enhanced the experience.

"The body tracking enhanced my experience because it was cool to see how the avatar mimicked my movements."

"depends on the game or activity."

05

Insight

Long-term usage of VR

may cause physical

discomfort

Headaches and dizziness while using VR

Several participants reported physical discomfort such as headaches or dizziness, as well as disorientation while using VR, but it didn't significantly hinder their task completion, highlighting the importance of addressing these issues for VR's long-term adoption.

“I got a headache at some point and kind of dizzy, only because it felt so surreal.“

“Yes i got a little dizzy.“

“Body tracking was pretty good but i got a little dizzy so it was harder to communicate.“

06

Insight

VR + Avatar can be a potential complement for in-person interactions

Opinions were divided on whether participants preferred VR interactions with avatars or traditional in-person interactions

Some thought avatar-based interaction less awkward in initial encounters, while others preferred the natural feel of face-to-face communication. When asked about their preference for VR + avatar or in-person interaction, responses were mixed. This indicates a potential for VR to complement but not completely replace in-person interactions.

"It made the experience less awkward because we were not showing our real faces and were given a set of games in a space we both were new too."

"I would rather interact with people using this technology because i feel that it achieves the same goal of communicating effectively and perhaps even more, experimenting different types of scenarios or "virtual worlds.""

Lessons Learned

01 Formating Ideas

02 AI Bias

03 Ethical Considerations

01

Formating Ideas

GPT Assistant Ideation

ChatGPT significantly aided in shaping our study on XR products by helping to formulate focused research questions and refine our study design. Its insights into participant demographics, data collection methods, and thematic analysis of feedback streamlined our research process and deepened our understanding of user interactions with XR technology.

02

AI Bias

Understanding and Mitigating AI Bias

ChatGPT may inadvertently incorporate biases present in the training data. Researchers should be aware of potential biases and take steps to mitigate them, such as providing diverse training data or carefully reviewing and refining responses. Different types of bias includes Training Data, and Algorithmic Bias.

03

Ethical Considerations

Personal data are used for more related generation

In the data analysis, we feed ChatGPT with the survey and interview answers. The data could include participants' name, age, gender, and personal thoughts. Since ChatGPT is a black box, we have no idea about how the data will be possessed and where it will be sent to. In a academic research, Researchers must consider how their research outcomes may be used by others. They should take steps to prevent the misuse of their work, including the development of guidelines and best practices for responsible AI use.

Privacy

Security

Dehumanization and Misrepresentation

Intellectual Property and Copyright

Thank You!