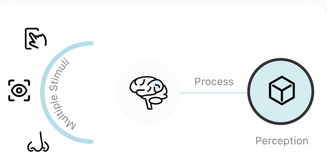
TOUCHABLE

Exploration about Tactile Sensation in Social VR

Tactile sense feedback is an essential part of the interaction in Social VR. It contributes to conveying emotion and enhancing the immersion. This project contains a series of study to explore the way of enhancing immersion and offering suitable feedback by changing tactile sensation in Social VR, resulting in the suitable type of tactile sense feedback, corresponding solution, and statistical conclusion about the solution's effects.

Introduction & Background



Process of Human Perception

Human Perception in Social VR

Human perception is based on a unitary system inside human brain. It processes the information in the multisensory convergence zone. (Calvert, 2001) Also, the simulation of reality decides the immersive level while using VR. (Cai et al., 2020) Existing VR devices offer great visual and audio simulation, resulting in imbalance among multiple sensation and damage of the immersion. It leads to bad experience. There are only a few pieces of research about the tactile sense experience in Social VR. So, this project conducts a series of study to explore the influence factors of the tactile sense experience and the solution to enhance the immersion and offer suitable feedback in Social VR.

Study Methodology

1. Pilot Study

to explore the influence factor.

* Lack of simulation equippment, I use **Wizard of OZ** to apply research stimuli

2. Prototype Test

to test the influence of the haptic types.

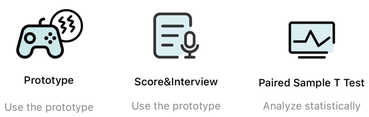


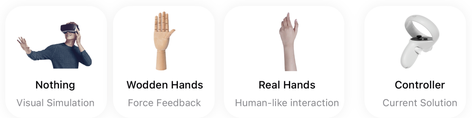
Diagram and Design

Literature Review

Realize the background and related knowledge

Pilot Study

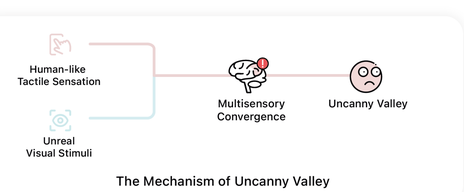
Participants shakes hands with four virtual character in VR Scene. I used the following stuff to shake with them for simulating various tactile sense feedback



After the test, participants gave marks to the experience using Likert Scale and describe the experience during the interview.

The Process of Analysis

I transfered the audio to text and categorized the conversation. Then, I used Cohen's Kappa to validate the confidence of the result. Reading related literatures, the qualitative data and quantitative data shows the effect called Uncanny Valley.

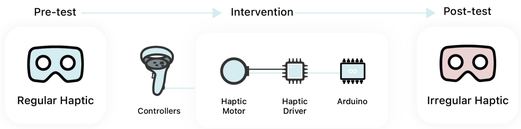


The Mechanism of Uncanny Valley

* To avoid effect of friction, all the participants wear rubber gloves

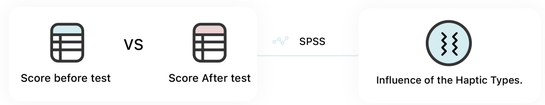
Prototype Test

Based on the pilot study and desk research, I found there are only one kind of vibration as a feedback in current VR application. So, I added a haptic components on Oculus's controller which can provide various vibration.



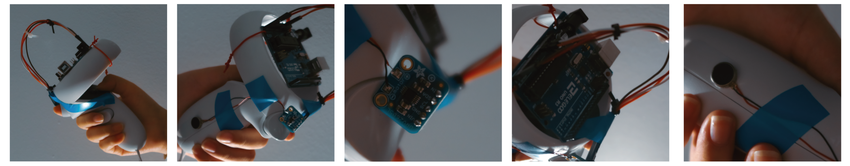
Process of the Prototype Test

Then, I designed this test as a pre-test and post-test experiment. The prototype gives regular vibration and irregular vibration as a feedback while participants are shaking hands. Then, participants gave marks to both experience. Using SPSS, I analysed the data statiscally and draw a conclusion.



* To avoid learning effect and anchoring effect, the sequence is random.

Prototype



Test & Evaluation

Pilot Study: Cohen's Kappa

All the audio files of interview are transferred into text. Two researchers catrgorize them and use Cohen's Kappa to make sure the data analysis is confident.

Prototype Test: SPSS - Paired Sample t Test

I compared the data from the pre-test and post-test and analyse it. All the coresponding data is paired with each other and have statistical meaning.

Research Result

There are 60% of the participants mentioning "Scary" in the description of the experience. It is an effect called Uncanny Valley. 4 of 20 participants mentioned that they do not want to have tactile sensation with loss of other function like movement and click. Limited by the low quality of 3D model in existing Social VR application, human-like tactile sense feedback such as temperature causes Uncanny Valley effect, which can lead to bad experience.

This paired samples t-test was conducted to evaluate whether there was a difference of immersion and feedback after changing the type of vibration. The results revealed that there was not significant difference.

Conclusion

- In current product, the 3D models are low poly. Applying human-like tactile sense feedback can cause the conflicts in the sense of touch and vision. It causes Uncanny Valley effect and uncomfortable experience.
- Changing vibration type cannot impact on the experience. There are not significant difference while applying different types of haptics.
- However, different types of vibration can convery more informtion through different strength and waves. It can enhance the quality of information to improve the experience.

Future Work

Some participants mentioned that different types of vibration make them feel that virtual characters are shaking hands harder or softer, which build a link between the appearance of character and the tactile sense feedback. Therefore, in the future, I will continue to add tactile sense communication into the interaction between users and conduct more studies to see if they can convey more information, enhance the immersion, and improve the quality of feedback.

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