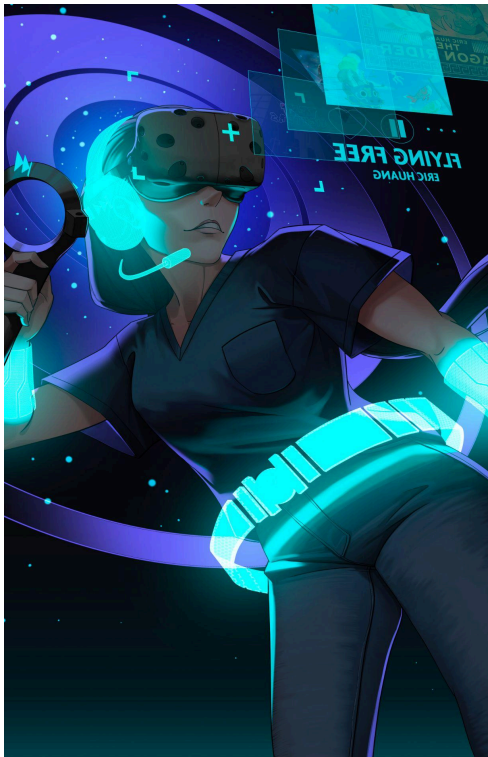


Selected Research and Creative Work

Powen Yao's Selected Research and Creative Work

Research Work



Virtual Equipment System

To explore and understand the use of two key quality traits, Hyperphysicality and Whole Body Interaction, in my thesis, I have built a series of demos, with colleagues and students, centered around the concept of a Virtual Equipment System (VES)[2].

VES for Incoming Data (Sensory Settings)

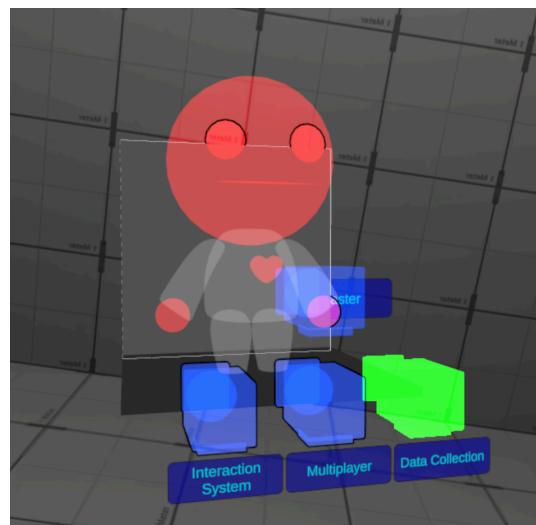
<https://youtu.be/xxcpDdt3TkY>

VES utilizes the user's proprioception and provides equipment associated with different senses through the different parts of the body. E.G., Interaction with Virtual Headphones to change the audio settings.[3][4]

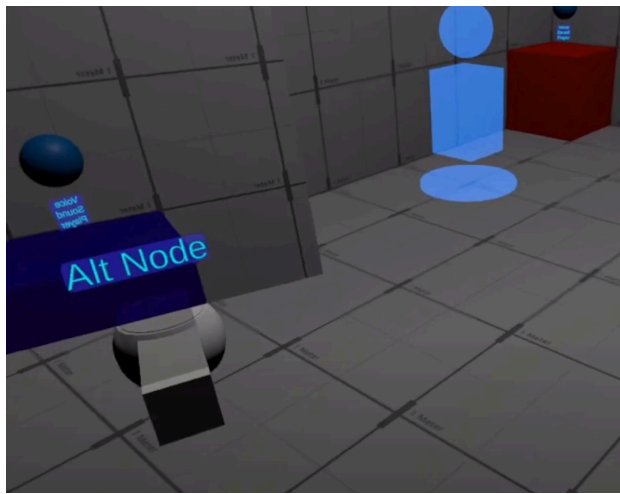
VES for Outgoing Data (Privacy Options)

<https://youtu.be/RazSyF9W1nU>

VES can also be used in the same way but for managing privacy options instead. The user can put on a mask to go into incognito mode. Additionally, the user can also manage their privacy options by interacting with a voodoo doll representing the user and with cameras representing observers.[5]



Selected Research and Creative Work



VES for Agent Management (Avatar Settings)

<https://youtu.be/D-LNa6N3rd8>

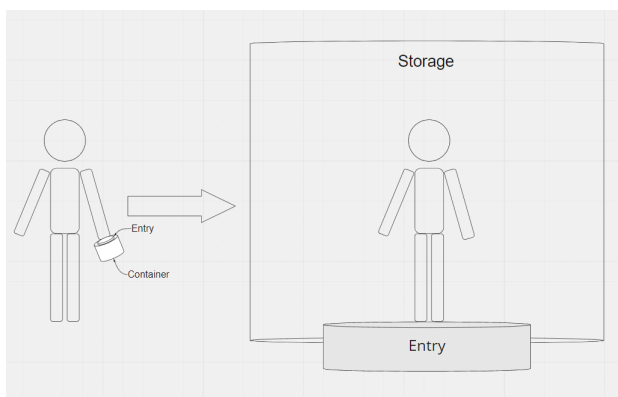
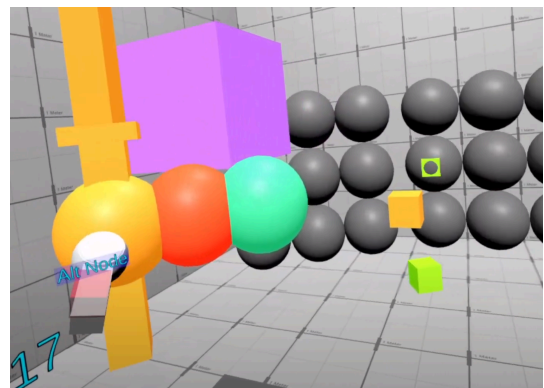
VES can also be used to create additional avatars as well as manipulate multiple avatars so that the user can be simultaneously in multiple locations. Avatars can be based on just audio, visual, or the full capacity of the user.

Peripersonal Equipment

<https://youtu.be/sxZ52EbNGOk>

https://youtu.be/v_IQhw6h6wY

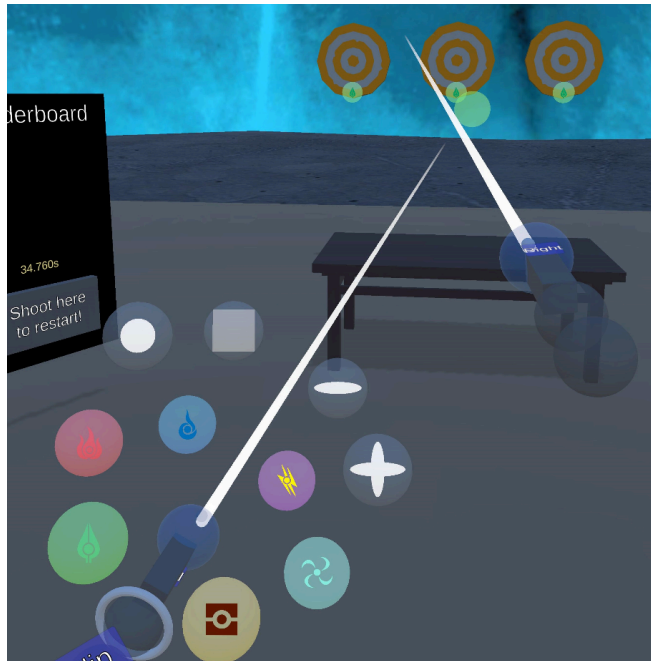
With Hyperphysicality, Virtual Equipment can reside in not just personal space, but also in peripersonal space or even extrapersonal space, allowing developers to make use of additional space around the body.[4][6]



Dimensionality and Extradimensional Storage

Equipment can be filtered, organized, and accessed using different dimensions. Users can enter inventory systems as physical locations to make use of spatial sense and spatial memory.[7]

Selected Research and Creative Work



VES Interaction with different classes of gestures

Users can interact with Virtual Equipment by using motion gestures, surface gestures, and a myriad of other techniques in addition to just moving it spatially as an everyday item. This has led to 1) an ongoing taxonomy paper on gestures in Extended Reality that aims to provide a first step to a unifying taxonomy of gestures and 2) An exploration of spatial interaction in a sandbox with a fantasy backdrop

that we call School of Spatial Sorcery.

[https://drive.google.com/file/d/1J1e2d8vNj9k6Al8xKa7OVqfmz7HmhRWD/view?usp=share link](https://drive.google.com/file/d/1J1e2d8vNj9k6Al8xKa7OVqfmz7HmhRWD/view?usp=share_link)

Selected Research and Creative Work

Creative Work

SpellCrafter (2023)



Video: <https://youtu.be/70iVtr2lJ6A>

Github: <https://github.com/powenyao/SpellCrafter>

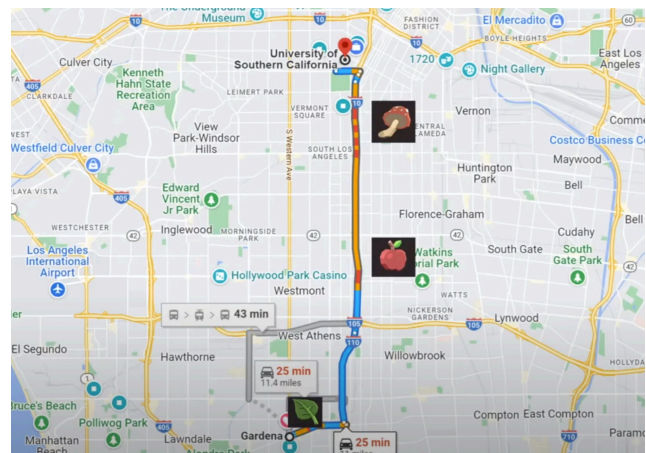
Play: <https://powenyao.github.io/SpellCrafter/Website/index.html>

Recently, I participated in the [Global Game Jam](#) to challenge myself and see what I could do in 48 hours. *Spellcrafter* was made in the Global Game Jam 2023 in a team of 4 for the theme "root." We explored turning a taxonomy of spells into a puzzle game.

"Today I Will Take the Road Less Travelled" (2022)

Video: <https://youtu.be/R4FzfnSIZpo>

One of the winners of USC Entertainment Technology Center's Competition The Future of Themed Experiences. It is a 3-minute pitch for a geolocation game where players will engage passively rather than actively.



Selected Research and Creative Work

Arkology (2016-2017)

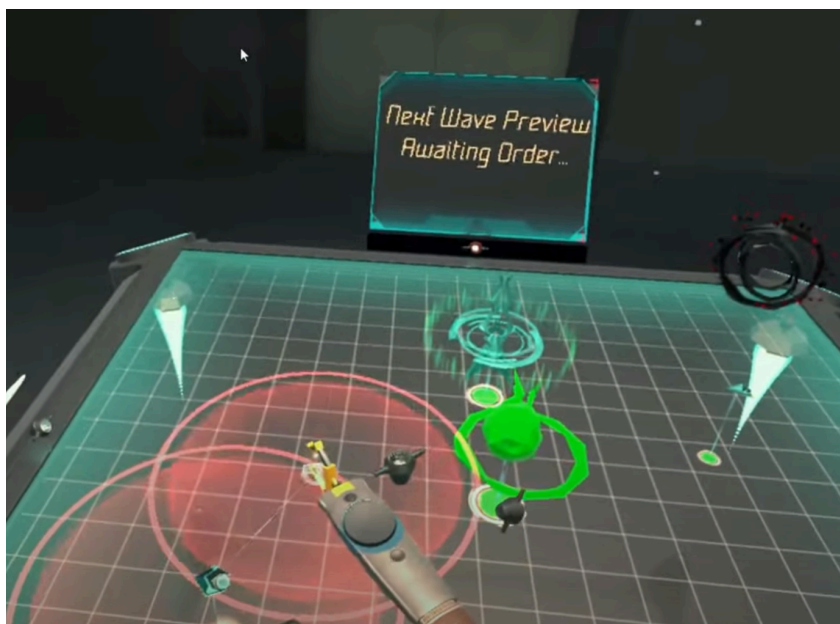
<https://youtu.be/RtwCjpd6eRM>

I led a small team on a Virtual Reality Real-Time Strategy game inspired by the RTS *Homeworld*.

It was my first exploration of user interfaces and user experience for virtual reality. We explored detachable menus, chandelier menus, and a tailored user interface.

It was created in Unity for the HTC Vive with SteamVR plug in.

It was presented at Taipei Game Show, Intel University Game Showcase at GDC, and Tokyo Indie Fest.



Selected Research and Creative Work

Toward the Stars (2014-2015)

<https://youtu.be/xTYO4FJvQT0>

I led a team of 30 people on a cooperative multiplayer action game using Unreal Engine.

Toward the Stars was part of the computer science game master's capstone project and involved an interdisciplinary effort with students from multiple USC departments as well as outside art schools.



It was presented at USC GamePipe Tech Showcase.



Selected Research and Creative Work

CITATION

- [1] Sutherland, Ivan E. "The ultimate display." *Proceedings of the IFIP Congress*. Vol. 2. No. 506-508. 1965.
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- [3] Yao, Powen, et al. "Interfacing with sensory options using a virtual equipment system." *Proceedings of the 2020 ACM Symposium on Spatial User Interaction*. 2020.
- [4] Yao, Powen, Shitong Shen, and Michael Zyda. "Virtual Equipment System: First Evaluation of Egocentric Virtual Equipment for Sensory Settings." *Virtual, Augmented and Mixed Reality: Design and Development: 14th International Conference, VAMR 2022, Held as Part of the 24th HCI International Conference, HCII 2022, Virtual Event, June 26–July 1, 2022, Proceedings, Part I*. Cham: Springer International Publishing, 2022.
- [5] Yao, Powen, Vangelis Lymouridis, and Michael Zyda. "Virtual equipment system: face mask and voodoo doll for user privacy and self-expression options in virtual reality." *2021 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW)*. IEEE, 2021.
- [6] Miller, Mark, et al. "Virtual equipment system: toward peripersonal equipment slots with machine learning." *Proceedings of the 2021 ACM Symposium on Spatial User Interaction*. 2021.
- [7] Yao, Powen, Zhankai Ye, and Michael Zyda. "Virtual Equipment System: Toward Bag of Holding and Other Extradimensional Storage in Extended Reality." *Virtual, Augmented and Mixed Reality: Design and Development: 14th International Conference, VAMR 2022, Held as Part of the 24th HCI International Conference, HCII 2022, Virtual Event, June 26–July 1, 2022, Proceedings, Part I*. Cham: Springer International Publishing, 2022.