Kennesaw State University
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Virtual Locomotion Using the HTC Vive and the Effects on Spatial Awareness

CS 4712
User Interface Engineering
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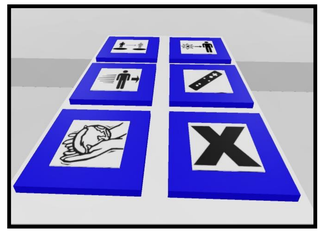
Abstract

- VR - Virtual Reality one of the most popular forms of entertainment
- Allows us to simulate real activities in virtual world as well as discover virtual reality beyond our imagination
- Our study involves the comparison of virtual locomotion to its real world counterpart
- In this study we use HTC Vive that will compare the accuracy of real movement with the virtual locomotion
- We used Unity game development platform and C# programming language to develop our simulation

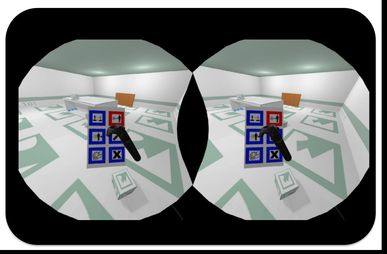
Method

- Our methodology will involve testing the effects of various locomotion techniques which include:
  - Trackpad movement
  - Teleportation
  - Reach and Grab
  - Arm Swing Movement
  - Dash movement

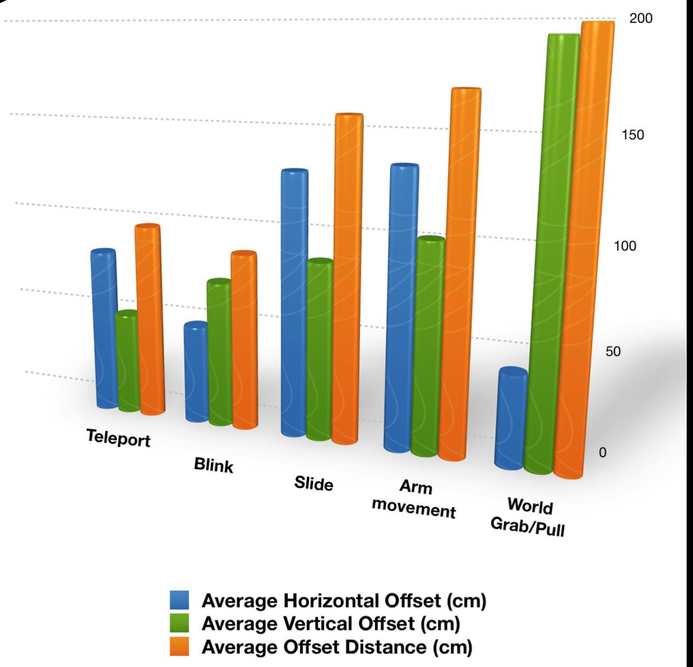


Procedures

- Set up Vive system.
- Identify flag locations in real space relative to virtual space.
- Test simulation.
- Connect participant to Vive system.
- Have participant move through virtual space to identify flag location.
- Have participant plant a flag in real space where they believe the marker was in virtual space.
- Record results.
- Change mode of locomotion.
- Test again.
- Repeat steps 4-9 until all forms of locomotion are tested.
- Repeat procedure with each new test participant.



Results



Participants

- Variety of age groups and levels of technical ability
- Most of our participants were from Kennesaw State University on Marietta Campus
- This group is generally biased towards highly technical users
- Most of our participants included a high concentration of Computer Science majors

Data

Test #	Arm Swing Average Offset (cm)	Point Teleport Average Offset (cm)	Sliding Average Offset (cm)	Pull Movement Average Offset (cm)	Dash Movement Average Offset (cm)
1	151.60	183.85	123.69	235.09	311.19
2	127.12	15.52	248.39	277.52	235.58
3	106.07	126.14	281.84	98.32	22.36
4	17.12	71.22	11.18	155.24	236.54
Avg	99.01	89.10	157.89	170.55	198.55

Apparatus

VR Compatible MSI Laptop

HTC VIVE Virtual Reality Headset

Conclusion

Our conclusion is that locomotion methods that rely on using **the controller's interface** (its buttons and the analog controls) are **the most accurate choice for moving the user through virtual space**.

By comparison, the methods that emulate real movement such as **arm swinging** and **the grab/pull technique** are perhaps more realistic representations of human movement, but are significantly **less accurate** as a drawback. For applications that requires precise movement, it is recommended that movement should rely on the controller's interface.