Techniques for Immersion in Virtual Reality Games

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Aim

This project aims to demonstrate techniques that can create immersive experience in Virtual Reality games using a Head Mounted Display (HMD) and two VR controllers. These techniques don't focus on graphical realism with realistic textures and lighting, but more on the mechanics, controls and usability that can make users feel transported into the virtual world.


Virtual Hands

One example of a technique for immersion is the seamless use of virtual hands. These don't need to be attached to a body to create immersion because the virtual world doesn't follow the same rules as the real world (nor exist in the same physical space). Having a body that could clip into other objects or get stuck can cause frustration and take people out of the experience. Having two disembodied hands that represents the players controllers in-game can make picking up the basics of the game that much more convenient and intuitive.

Visual Feedback & Interaction

Creating immersive games must involve showing players what is happening when interacting with the world, especially when the player is using their hands. The two animations shown below are created when the player presses the grip button to create a fist, or the trigger button to create a pinching pose. This can allow players to intuitively use their virtual controllers to interact with objects in the world like a ball, a door, a chest of drawers, or a tool. In addition, it is essential that object selection for multiple objects in close proximity is optimised. Koutek [1] discusses in an early paper the use of "direct picking", which makes use of a "laser pointer" to select objects, similar to the way the user may select a location to teleport.
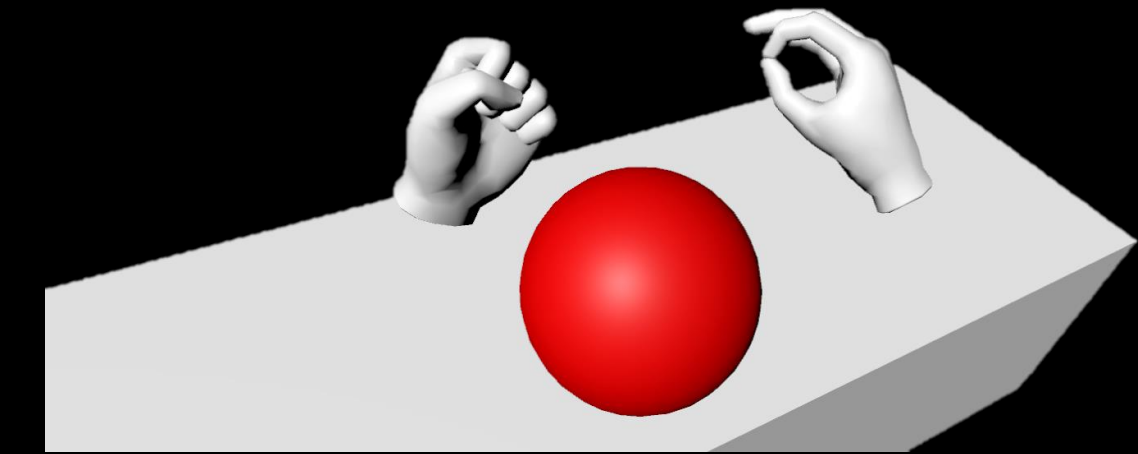
Locomotion

For games that require movement, there are 2 main ways for a player to move around: teleportation and continuous. Teleporting can be implemented by giving a user a ray to aim at a location and pressing a button moves them there. Continuous movement allows players to use the joystick to "walk" around the virtual world. The latter technique can be troubling for some as it can cause motion sickness due to the visual feedback conflicting with what the brain perceives to be the player being stationary in real life, known as "Vection" [2].

Future Work

I would like to add much more functionality to this game demo I am working on. An important hurdle to overcome is a fun and intuitive way of grabbing distant objects. Grabbing things in VR can be difficult for a user as they can't be sure where they are in the real world and would be reluctant to bend or stretch their arms out too far, or they might not be able to reach the desired object. This can be solved by having a type of ray that can link to an object and when the user presses a button, the object moves to their hand.

Technology

unity

oculus

References

[1] M. Koutek, "Scientific visualization in virtual reality: Interaction techniques and application development.", 2003

[2] L. Pirkuliyeca, "Human element of virtual reality: implementing perception psychology into VR design.", 2020