GRAVITY

Trash Cat

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IDEA

Our goal was to see if the limitations in traditional video games could be overcome through VR. Our focus was the difficulty of using traditional controllers like the Xbox controller, or the PS4 controller for camera control. One of the most common control types in both first and third person games involves using one analog stick to control character motion and another to control the looking direction. In games where precision is important, using a mouse and keyboard design is significantly better. This is because having a cursor that can point at an exact location is much faster and easier to control than using a stick to push the cursor in the general direction of that location.

VR has the ability to improve upon the responsiveness of both the analog stick and keyboard solutions to this problem. Because looking around in VR is done the same way that humans look around in the world, we should be able to find targets even faster than we can with a mouse, since the act of pointing with a mouse requires a person to look at the object first

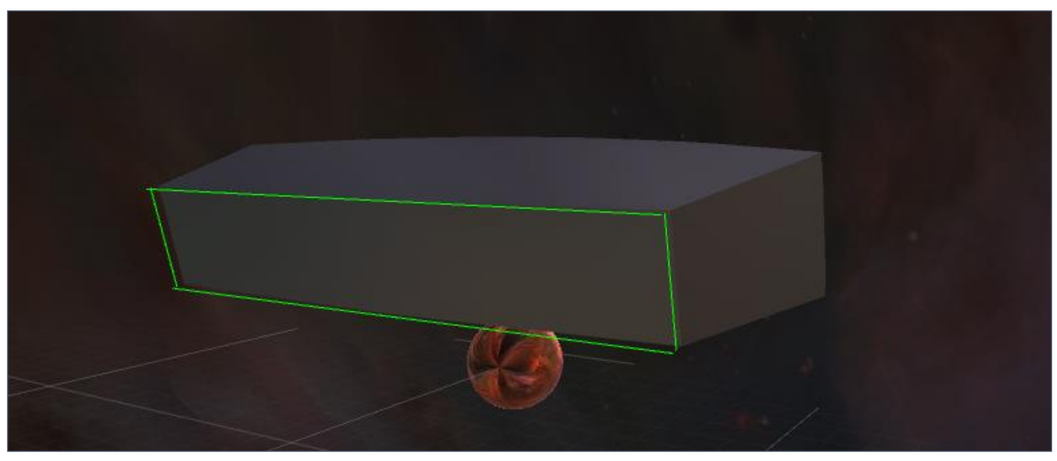
After deciding that we wanted to use this intuitive camera movement as a sort of inspiration, we decided that the world should be a sphere with the player/camera in the center. This allowed us to focus on camera rotations without having to worry about translating the viewer throughout the world. We utilized the facts of spherical geometry to design puzzles. Additionally, we chose a space theme and expanded into taking advantage of VR's immersiveness to add atmosphere.

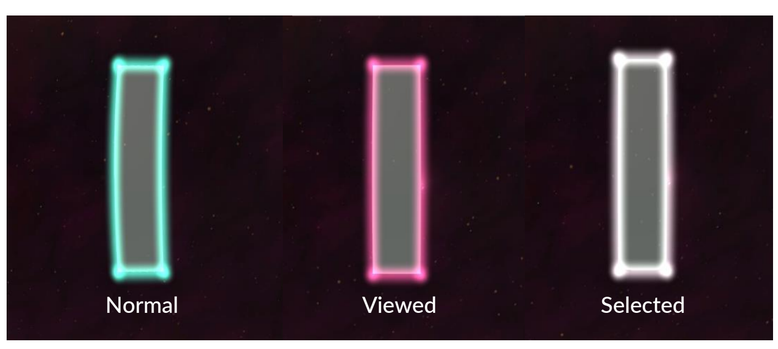
We wanted to directly test our idea about camera controls, with a PS4 DualShock 4 controller which could be connected over Bluetooth to an Android phone. Additionally, we used Google Cardboard and Unity.

ACCOMPLISHMENTS

Overall, the concept of the game is that the player needs to guide the spaceship home through arranging and moving obstacles so that the spaceship can reach it's destination. The obstacles that the player has to plan around are immovable barriers, sliders, wedges, teleporting portals, and enemy spaceships shooting lasers. Levels take place in an inside out sphere that contains all of the game components. The sphere was created in Blender and textures for it were painted in Blender as well. The majority of our development time was creating game components dynamically to construct a wide variety of levels.

Highlights of our procedurally generated game components are the scripts that given width, height, and depth parameters, will generate a rectangular barrier where one face is curved to match the sphere's surface. A problem we faced with the fixed point position of the player camera was that the barrier's height misled players about where their positions were in relation to other objects. Our solution was to have the barriers more trapezoidal, so that as the distance to the viewer shortened, there would be a smaller face.



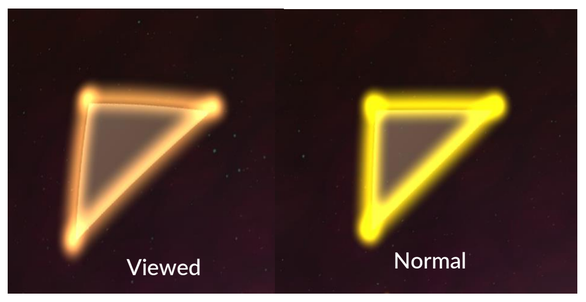


Another highlight was procedurally generating spirals given a number of vertices, the number of rotations, and width between full rotations. These spirals came to represent destinations, and as ways to enter a level.

We made sure to communicate to the player that they could interact with objects through event triggers that changed the shape of the object. This way, the player could discover what changes they could do to the object/

We were able to sync up the DualShock4 Controller and map the appropriate buttons to specific actions. Overall, we were able to create 7 levels.

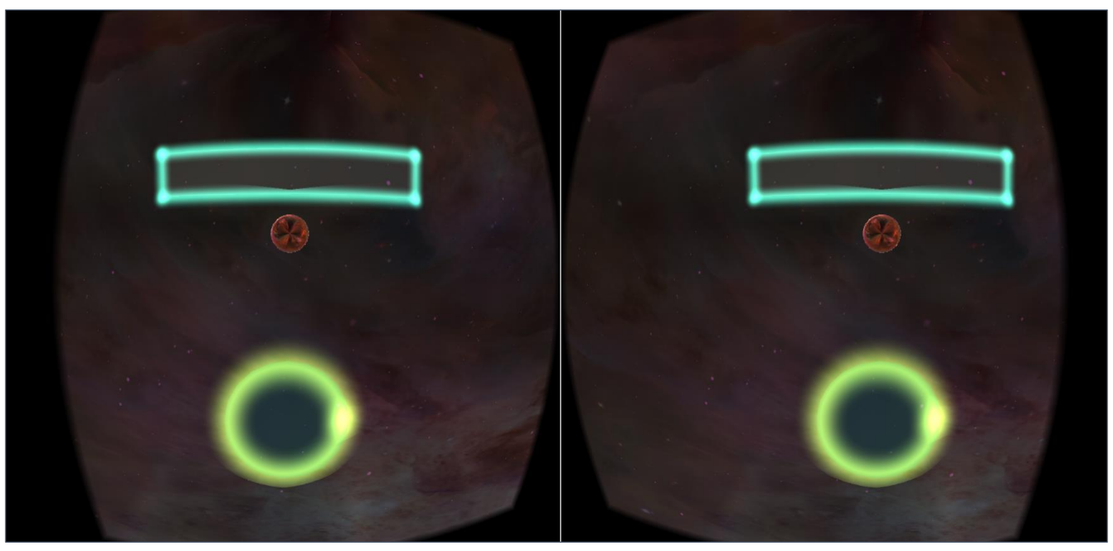
Portals



Wedges

Laser Shots from Enemies

Main Menu



Gameplay

CONCLUSIONS

We found that utilizing the VR controls for camera movement while manipulating game objects was a much improved way of playing the game. While developing, we would often test on our laptops and that was extremely difficult to do with keyboard controls. However, the benefit that VR has over camera controls and the intuitiveness of the gameplay heavily relied on the player having memorized the mappings on the controller. This is not too much to ask of the existing gaming community who use controllers, but for newcomers would go against our goal of more intuitive controls.

Another important thing that we learned is that a large part of the immersiveness that VR imparts relies on the player moving through the space as they interact with the objects in that space. Through movement, the depth and shape of objects are revealed and is a significant part of amplifying the VR experience. VR from a fixed point was a good starting point, but the more engaging uses of VR should leverage movement throughout the space.

ACKNOWLEDGEMENTS

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