

# Clipping-Based Virtual Environment

Andrew Lee ([alee18@stanford.edu](mailto:alee18@stanford.edu))

## Motivation

I'm very interested in how VR can allow us to play with physical space. With this project, I want to explore using positional tracking in order to “clip” through objects and see inside them for the purpose of storytelling and creating presence.

Thematically, I want to create a scene that involves a box-like machine in a room that the player can “look into” to discover its inner-workings. The scene I imagine is a miniaturized world within the machine that the user can clip into and explore (Appendix A). This miniature world would have its own skybox and structures that correspond to external features of the machine (e.g., a tube has continuity from the outside of the machine to the inner-world).

If time allows, I want to add interactivity to the “machine” and allow dials or levers to control what’s inside it. For example, a dial could control the day/night cycle within the inner-scene, and adjust its lighting respective to its setting. Or, a small puzzle can require the user to explore the inner scene to solve a problem in the outer one.

## Objectives

1. Create an interactive VR game with orientation and positional tracking using an Oculus Rift CV1
2. Design and create 3D models that join together into a larger scene using Blender (with a “low-poly” style to save time)
3. The user can manipulate the scene by walking around it, moving closer to it, and “looking” into parts of the object (i.e., clipping the camera through the object’s walls).
4. Create an immersive atmosphere using sound, lighting effects, and minimal animation

## Summary of Previous Works

The relative lack of consumer-available positional tracking until recently has forced most games for VR to be explorations of 3D environment *surrounding* the user. For example, many VR 3D “escape room” games require a user to interact with objects in a scene from a central pivot point.

Here’s a sampling of prior work specifically using the ability to clip through physical objects as a tool for learning, storytelling, and interactivity.

*Anatomyou* (<http://dl.acm.org/citation.cfm?id=3012559>; <http://anatomyou.com/>)

- A few learning tools like Anatomyou use physical space to let users clip into and see inside of human organs and biology.

*Lucky's Tale (<https://www.oculus.com/experiences/rift/909129545868758/>)*

- Lucky's Tale is a recent game from Oculus Studios that has a miniature "level select" screen featuring a miniature world the user can clip into parts of and see inside of buildings or trees to find secrets.

*Allumette (<https://www.oculus.com/experiences/rift/926273867499264/>)*

- This VR animation allows the user to clip into various objects to look at smaller scenes and moments. For example, there is a flying ship at the beginning of the film that the user can look into to see the main characters living their lives. The effect is like a dollhouse the user can observe.

### **What is New, Different, or Creative?**

This project explores the creative concept of making the ability to clip through objects the central aspect of a virtual scene. While this has been done with learning tools like Anatomyou, few virtual environments outside of educational tools have done this.

### **Timeline**

*4/29 (Monday)*

- Create a proof of concept with generic Unity shapes demonstrating the inner-world concept.
- Begin working on major 3D modeled objects: the room, the machine, and general inner-world structures.

*4/31 (Wednesday)*

- Continue work on 3D models; gather free/reusable models online (like on Unity Asset Store).

*5/2 (Friday)*

- Have a useable virtual environment made of basic shapes, lighting, and models.
- Begin work on final report

*5/5 (Monday)*

- Major 3D model elements are completed and implemented.

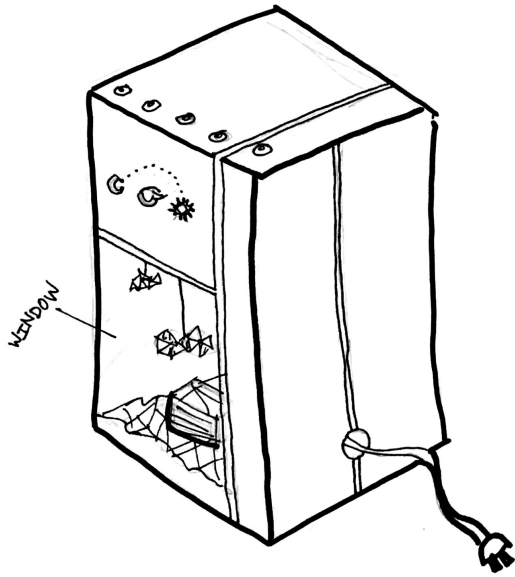
*5/7 (Wednesday)*

- Add polish: sound, effects, lighting, post-processing, etc.
- If time allows, work on interactive elements of the scene (day/night switch, animated tubes, etc.).

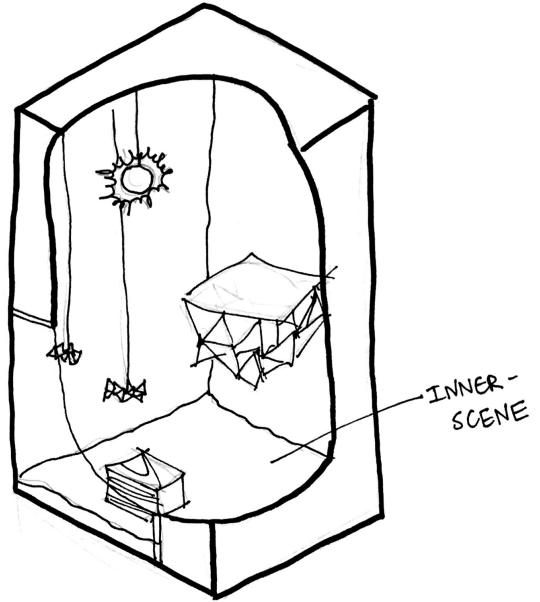
*5/9 (Friday)*

- Completion of the demo scene.
- Finish final report.

# Appendix



STANDARD VIEW



CLIPPED WALL

Appendix A: Demonstration of "clipping" into machine