
Final: Avatar Simulator

Zach Phillips

5/2/19

Table of Contents

Table of Contents	1
Intent Statement	2
Research History	2
Thesis	2
Mechanics	3
Arm Movements	3
Stance	3
Moves	3
Visual Description	5
Game Video	6
Post Mortem & QA	6
Annotated Bibliography	7

Intent Statement

I intend to create a VR experience where the player feels like they are a controlling element, such as earth, similar to how “benders” would do so in the animated show *Avatar: The Last Airbender*. This will be done mainly through hand gestures and movements.

Research History

When I started this project, I already had the end goal in mind. This system is something that I’ve been dreaming about since I was little, even before VR was really a thing. Having access to the technology and knowhow is a dream come true, but I still needed to know where to start. This is my first, serious try at making a VR experience, and I needed to learn how it differed from standard development.

First, I downloaded the Oculus Unity integration asset pack, which is a lifesaver for development. Everything is easily set up, editable, and understandable. Once I had that working, I started to look for help online. I found a few articles about designing for VR, and they all contained a variety of wonderful pointers that I ended up using. Things such as technical limitations and the physical ergonomics of the headset were all really useful to learn about. After that, I researched the flow and stances of the moves from my main inspiration, *Avatar: The Last Airbender*. These influenced the types of moves and how they were performed, and since all the different stances inside of the show were based on real life martial art techniques, many of them had roots in reality. This made designing for intuition and immersion much easier to do.

Thesis

By using intuitive gestures involving both the hands and arms, the player will feel like they have control over the environment they’re placed in.

Mechanics

I decided to make this system in Unity, using the Oculus Rift as my VR device. There are 3 main mechanics at work in this prototype.

- Stance
- Arm Movements
- Moves

❑ Arm Movements

- ❑ Using their hands, the players can create and execute different moves. Hand movements are divided into 3 different categories, with 3 triggers inside of each of them. There is the Y category, which contains the Low, MidY, and High triggers. Similarly, there is a X category with Left, MidX, and Right, and a Z category with Front, MidZ, and Back. By logging which trigger each hand is in, and then moving the hands to new triggers, the player can fulfil the parameters for a move based on the stance they're in.

❑ Stance

- ❑ A player's stance is determined by their controller inputs. There are two stances in the game currently, Earth and Fire. Earth is activated by making a full fist (index trigger and grip trigger pressed), where as Fire is activated through pointing (just the grip trigger pressed). The two other stances, Water and Air, would be variations of the controls; index trigger only and (possibly) no triggers pressed. Since the stances are based on the user's current inputs, they can be changed at any point, which can cancel a move or extend it to something else.

❑ Moves

- ❑ Everything in the system revolves around moves. These are the outputs of the gestures that the player makes. Currently, there are six moves in the prototype:
 - ❑ Rock Raise requires the player to make a fist with just one hand, and then bring it up through Low, MidX, then High arm locations. This will make a rock explode from the ground, ready to be used.
 - ❑ Rock Wall is similar to Rock Raise, except that it requires both hands to work. This larger movement quickly raises a rock wall around the player to defend them, and slowly sinks back over time.
 - ❑ Large Rock Raise is a larger version of Rock Raise that requires two hands. It can also be split in midair into three smaller rocks, which can then be shot down to the ground.

- ❑ Flame Hands is the first fire move implemented, and it's very simple. By punching while in the correct stance, the player shoots fire from their fingertips. It fades over time.
- ❑ Flame Cannon is a stronger version of Flame Hands that requires both hands to cast. It has double the power, range, and lifetime.
- ❑ Fire Bomb is the last move currently in the game. By turning their hands in a circle in front of their body, the player can summon a fireball. This fireball is launched when the player brings their hands together, shooting it in a wide arc, exploding on contact.

Visual Description



Fire

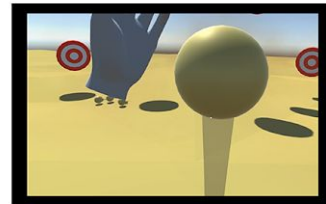
3 Moves Each

Earth

Flame Hands



Rock Raise



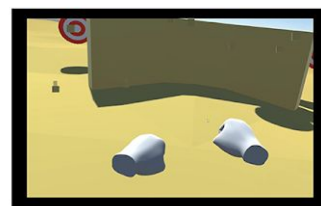
All moves are executed by holding certain button combinations and completing motions.

Flame Cannon

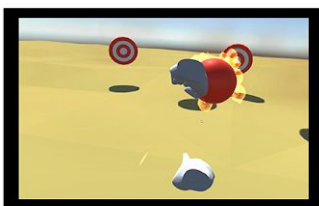


There is a tutorial book in the game to teach players how to complete the moves.

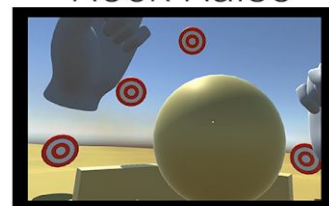
Rock Wall



Fire Bomb



Large Rock Raise



Game Video

I created two videos showing off this system. The first video explains the system as it was in its first iteration, and the second shows off where the project is now.

Explanation: <https://youtu.be/vl7cwxdlDhA>

Current: <https://youtu.be/6QOLXF4Pnn0>

Post Mortem & QA

I was able to get many more testers this time around, but I decided to keep all feedback feedback. This way I could immediately talk with the testers, fix bugs, and change various mechanics in the game instantly. I was also getting much better results compared to forms. I'll compile the main feedback that I got below.

Main Discussion Point 1: It felt intuitive

After explaining how to do the moves and which were available to them, all of my testers were able to execute most of the moves within their first couple tries. After that, they continued to use the moves correctly and experimented with how they interacted with each other. A lot of the testers instinctively crouched down behind the rock wall when they casted it, which was really cool to see.

Main Discussion Point 2: Feels great for a power fantasy

This was the main feedback I got from my testers, and I'm incredibly happy that I achieved this. This systems revolved around players truly feeling like they have control over all of the elements, and to hear that I was successful was a huge relief. While they were a little rocky at first, many of the testers found their favorite moves and got really into the movements. Watching them in real life was awesome, since the testers would subconsciously throw themselves into the moves more and more as they got more invested into the experience.

Main Discussion Point 3: Some of the moves were hard to pull off reliability

This comment came up multiple times, mainly for the harder, later moves. While this was understandably frustrating for the testers, I feel like this would be solved with practice. I had the added advantage of spending a ton of time inside of the system (and

of course, making it), but it was still hard for me at first. With some practice and time, I'm sure all of the testers can pull off all the moves.

To help with this, I added a tutorial book. The book has all the moves listed in both verbal and visual form, so anyone should be able to pick up the system and complete any of the moves without me being there to help. I had a few people test this as well and I was told that it was incredibly helpful.

Based off of all this data, I think that I, without a doubt, meet my intended experience. The mechanics fit well together, and the vast majority of feedback was positive. The concerns that were brought up are easily testable in the future, and I have plans to fix to bypass them.

If I had to rate this as a Success/Failure, I would call it a convincing Success. I proved the system and added enough content for my testers to stay engaged for a play session. In the future, I'm going to add an enemies of various difficulty that will turn this sandbox into a real game. Overall, I'm incredibly happy with what I created, and this was a really fun challenge to take on!

Annotated Bibliography

Wawro, Alex. "Valve Shares Advice On Designing Great VR Game Interactions." Gamasutra.com. N. p., 2019. Web. 12 Apr. 2019.

This Gamasutra article by Alex Wawro has some really nice pointers on how to create an intuitive and immersive game environment inside of VR. Most of the tips are from Valve, and even though the article is from 2015, the information is valid.

The important points in this article are:

- "...don't confuse your player by using unintuitive input methods. For example, "Mapping pointing or interaction with your head can be less than satisfactory....and doing so detracts from its natural task of governing what the user is looking at."
- "Bring interaction to the user, not vice versa," says Malaika; VR is heavily rooted in physical space, and so you have to consider things like a player's height, their mobility (or lack thereof) and the room they'll be playing in when designing your next VR game.

This article is useful due to its base knowledge of VR experiences. This is my first time *really* developing a VR game (I set up a small scene before, but nothing more than that). I'll be able to use the information in this to set up some good base experiences that I can improve on, and to make sure that I'm not making any rookie mistakes with my system.

"Avatar: Last Airbender - Intro Part." YouTube. N. p., 2019. Web. 12 Apr. 2019.

So this is actually just the intro to *Avatar: The Last Airbender*. You might be thinking, "Wow Zach, you're really stretching the definition of 'Research'. To which I say, 'Yeah, probably'".

The important points in this video are:

- Various poses and movements signature to the different elements.

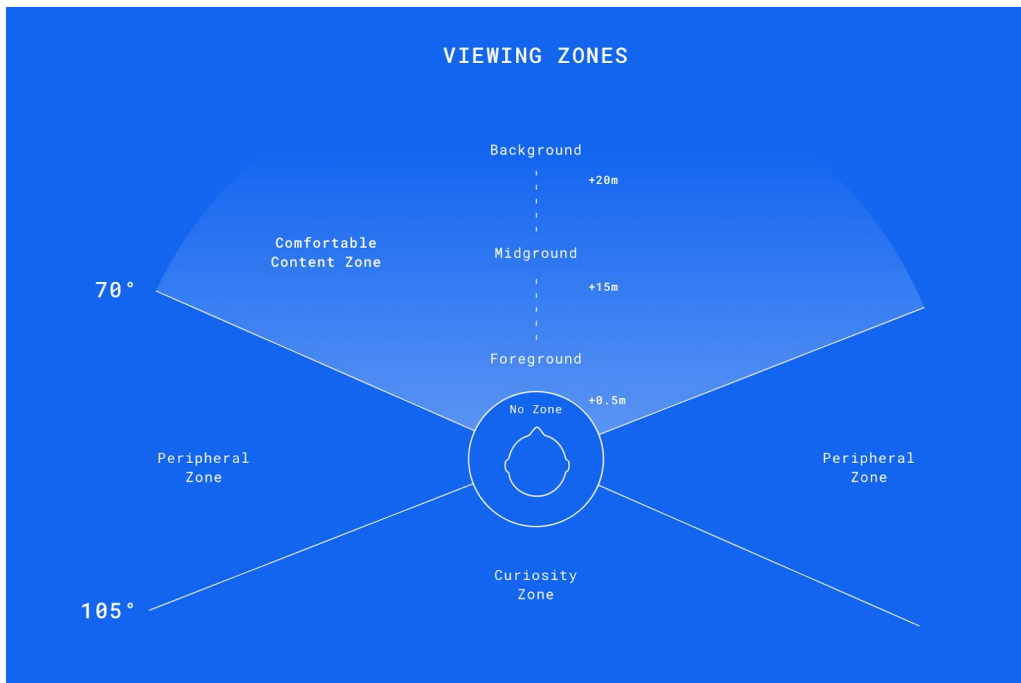
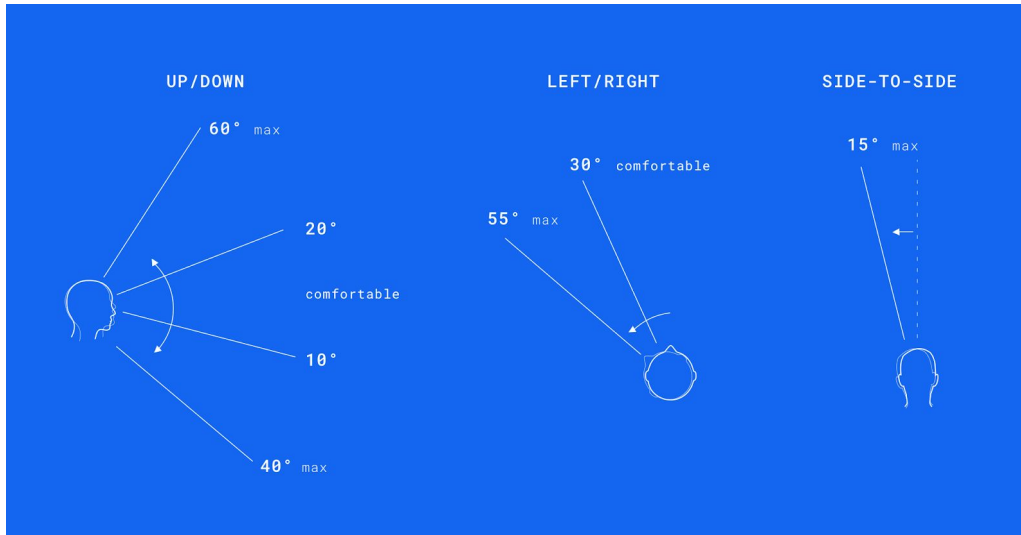
So why did I list this? Avatar is the main inspiration for this system, and I think it would be criminal to not list it somewhere in my research. The four different elements come with different fighting styles, and different stances. Looking at how the characters moved, the interaction of the elements with the world, and how all the elements are channelled will give me a lot of ideas for moves that the player can pull off. Plus, it's an excuse to watch the series over again.

"Designing For VR: A Beginners Guide." Marvel Blog. N. p., 2018. Web. 12 Apr. 2019.

This is a beginners document on making an experience in VR. It covers getting started, various tools, restrictions and freedoms, and other ways of planning how the user will interact with the experience.

The important points in this article are:

- "Just like in the physical world, people can easily get uncomfortable in small, large, or high spaces (claustrophobia/agoraphobia/vertigo), so it's important to understand scale when designing in VR. If you design a space that's too big, users may get lost. If a space is too small, users may get claustrophobic."



As I mentioned before, this is my first time making a full experience for VR, and this will help me stay on track with more of the physical restraints. It mentions the ergonomics of VR which was really interesting to me, since I never really thought about the range of movement/view and the weight of the headset and controllers. While I want to make sure that I create a fun and immersive experience, I need to keep in mind that physical actions can be tiring over time, especially if they're repetitive.

"Getting Started With VR Development - Unity." Unity. N. p., 2019. Web. 12 Apr. 2019.

Unity provides a lot of useful documentation on their website, and this page about VR development is no exception.

The important points on this page are:

- A technical checklist for scene set up
- Another technical checklist for testing
- The scripting API

While the previous source was for the physical aspects of learning VR, this is for the technical side. Unity gives some great pointers on how to set up the system and the project for optimal results, and this links to the scripting API which is something I'll be referencing a lot.