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# Versus

Independent Study II - Final Report

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## Intro

This semester, I used my independent study opportunity to build a virtual reality game from scratch. I used the research from my previous independent study, along with the many skills I have learned in the Computation Arts program to build it, and I have to say I am quite proud of my work! The game is a simple 1 vs. 1 multiplayer shooter called *Versus*. The development process involved scripting, level design, 3d modelling, gameplay design, and finally a playtest and survey. I will dive into each of these components, as well as this game's importance to my future as a VR developer.

## Gameplay

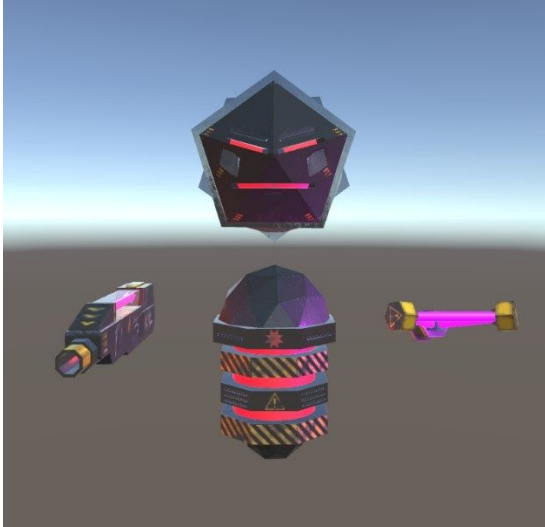
Like I said, the game is a VR game where 2 players are pitted against each other in a shootout. The game is based off of the classic Laser Tag, with a few add ons and differences. One of the main aspects of the game and one that differentiates it from laser tag, is the player's ability to control time. Playing VR games like *Super Hot* it became obvious to me that manipulating time in VR was a really fun and rich mechanic that we had only scratched the surface of. In *Versus* the player currently has the ability to slow down their own bullets, allowing them to stack up bullets, and then release them in a burst at their opponent. I would like to expand the use of time in my game, but at this stage, that is the only use. The second aspect that differentiates it from laser tag is the addition of power ups. While power ups are very common in other video games, in location based party games like laser tag, they have not yet been utilized. These power ups include the **Mega Blast** and the **Shield**. The **Mega Blast** give you

3 huge powerful blasts that deal extra damage towards your opponent. The **Shield** allows you to shoot a orb that expands into a flash shield that you can run up to and crouch behind, giving you some extra cover in battle. The player obtains these power ups by touching them with their blaster. The game's matchmaking system is very simple and has the player simply push a "Battle" button in the main menu, and once they are paired up with another player, they are teleported to either side of a small map.

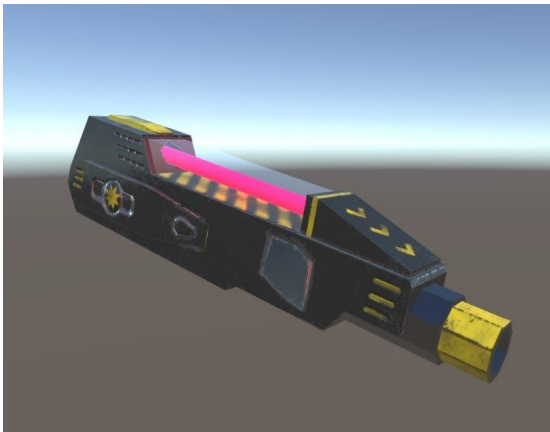
## Oculus Quest

The game is built for the upcoming Oculus Quest VR headset. This headset has 2 very cool features; it is completely wireless, and the computer that runs it is entirely contained within the headset. This yields some very exciting gameplay opportunities that I aim to take advantage of with my game. What it allows you to do is play in spaces that are much larger than we've been able to with current 6DoF (6 Degrees of Freedom) headsets, where you are confined to the length of a wire, or the proximity of a PC with newer wireless adapters. I aim to build a map to the same scale that the user had in real life. This would allow the user to actually run through the map as if it were a real space! While the headset is not out yet I predict this to be extraordinary fun. Being built for the Oculus Rift, the current build cannot include this fun mechanic, but it will be easily ported to the Oculus Quest, something I will cover in another section.

## Game Objects

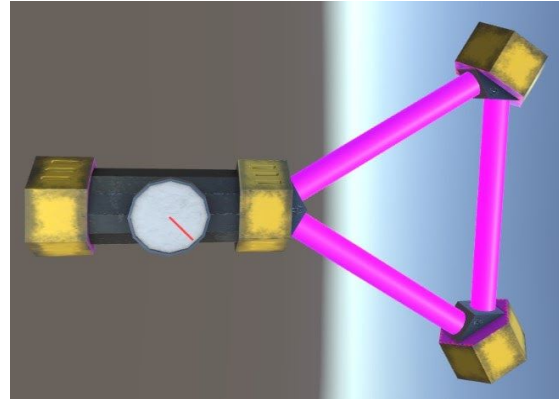


The **Player** is represented by a robot. I chose a robot as it does not hold any race or gender, allowing any user to connect with them, and not leaving anyone out. I tried to get as much character into them as possible by creating human like features like eyebrows. I also included many emissive components as possible so that the opposing player could easily identify them from a distance.

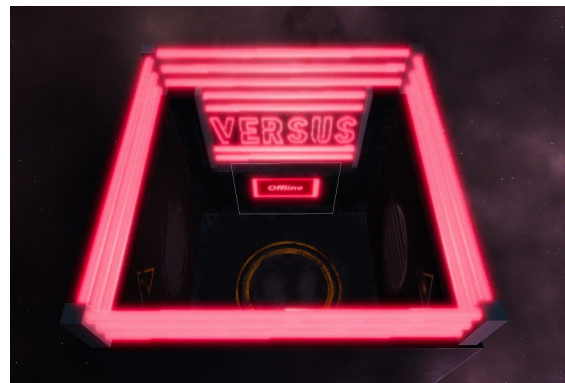


The **Blaster** is the player's main weapon and is held in their right hand (although in the future I would allow them to switch

this to accommodate for all users). The light on the inside is enclosed with glass and changes color based on the power up you grab. It glows red when you have the default lasers.

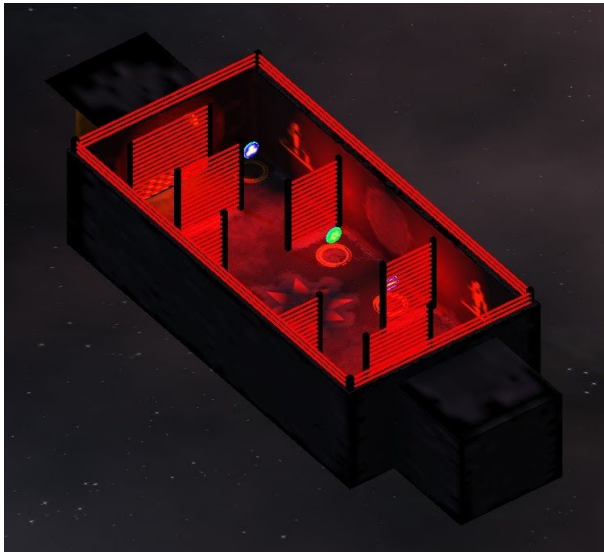


This is your main **Time Manipulation Device**. Like mentioned before it allows the user to slow down their own bullets. In the future I would like it to do much more but that is to come later. I based it on the flux capacitor from the delorean in *Back to the Future* as I figured it would instantly give the feeling of time travel. It has a small clock on it that in the future will spin when activated. I would also like the glowing components to glow only when in use, but alas I did not get this far with small aesthetic details in this semester.



This is the **Main Menu**. It is a simple box that has one button which changes from 'Offline' (when the user has no internet

connection), to 'Battle', and then to 'Cancel' (should the user want to cancel joining a match after pressing battle). In this menu I use the built in Oculus Avatar to make a connection to Oculus's operating system.



The **Map** is a rectangle with 6 laser walls cutting through it. These laser walls are there since in the final version of the game, the user will technically be able to run freely through walls, and now it makes sense that they can, although they will take some damage if they do. This yields more strategy potential for users. When the game starts each user is placed in a small box cut off with these lasers. They see "Get Ready" and then "Battle" in front of their view, inviting them to get battling! I wanted to make the map small, so that when users get access to this game on their Oculus Quests, they can go to a park or a gymnasium and setup the physical space themselves. In the future I would like the map to dynamically change based on the space available to them, but this will require me to get my hands on the Oculus Quest and learn its limits.



## Scripting

Scripting this game was difficult for me. I am not a very proficient coder. That being said I have made huge strides this semester, having to come up with a game and then figure out how to turn gameplay ideas into actual code. I am very proud of building nearly everything in the game from scratch, apart from most of the networking system and VR hardware system. I used a few tutorials on the Photon Networking System from the asset store which gave me access to a free server and various networking tools, like joining a room and then spawning players. Scripts like the blaster, powers ups, health, movement, and UI were handled completely by myself (with a bit of help eliminating bugs from my friend Yash Lalwani).

## Level Design

I had to design this level with many aspects in mind. The main one being that the users will eventually be moving by foot in the real world, so I did not want to make it so large as to be impossible to find a place for. This also meant coming up with creative solutions to the player being able to move through walls. I did this with the laser wall system I described above. I also did not want the players to be able to shoot each other as soon as the game started, so I put a wall in front of their entrances. Various tweaks like these

resulted in the map you see in the game today.

### **3D Modelling**

This year I had the benefit of taking 3D production II with Steven Menzies. He taught me a lot and pushed us hard, and it resulted in me becoming quite the proficient 3D modeller. This was really cool for this game as when I needed a blaster, I just made one! This is a big difference to my normal workflow, in which I would get most of my assets from the unity asset store. In this game I modelled and textured everything to have a very low impact on processing. This is because the processor in the upcoming Oculus Quest is the Snapdragon 835, the same found in many smartphones so you can guess that it will not run the same quality as most VR games. I still think I have a ways to come to get the game running and looking good on the quest, but this will be a job for my next independent study.

### **Playtest and Survey**

Originally I had planned to do 2 or 3 playtests in the time of the semester. This was a little to ambitious. I ended up only being able to have the game in a playable state in time for one. That being said it was very fun and I had a good number of players, including friends and a few classmates from the computation arts program. In the end I ended up have 16 responses in my survey. The playtest was actually, surprisingly, the time that I and another user made the connection to laser tag. This will influence the direction of the rest of the games development. I had the users play 1 vs 1 with another user, so I was in very little control. To my delight there were only about 2 game breaking

bugs, and they were easily avoidable once we knew about them. The game was at a point where people really enjoyed it, and most of their comments were about small tweaks and polish. The best part of the playtest was that I actually had some people say “This is fun!” which is pretty much the goal of game making so I am feeling very proud about this. Overall I have some great information to refine and polish my game over the next independent study.

Here is a link to all user’s responses:

[https://docs.google.com/spreadsheets/d/1beZRBp5uqZrj-ckhYhE5IKoNf1XziB32YrpE\\_IQMwos/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1beZRBp5uqZrj-ckhYhE5IKoNf1XziB32YrpE_IQMwos/edit?usp=sharing)

### **Personal Growth**

The most prominent personal gain from this study was in my confidence as a game maker. Making VR games can take a lot longer to make something fun and until this point I had not really made anything I was really proud of. This game gives me something to get behind, promote, and put much more of my time into when I’m done school. Overall it has really just cemented my feelings about becoming a virtual reality developer. I cannot wait to see what this game becomes.

### **Technical Growth**

This study was mostly about applying my technical skills and putting them to the test. I can say that it also helped solidify a lot of the new skills I learned this year, as I had to repeat a lot of things I had just done in other class and at my internship. As mentioned above I had to push myself in scripting, modelling, and game design. I am really feeling like a unity developer now and can walk into future interviews with the confidence to land me some great

positions. I would say my most beneficial technical skill gained was the ability to work with networking and get a working multiplayer game that two users can play from anywhere that has a decent internet connection. This is a very crucial piece of virtual reality development as connecting users at a distance is one of the big promises of virtual reality.

### **Importance**

I think this independent study was the single most important course in the entirety of my university career. It required me to use all of the skills learned in the program by myself with little help. Like mentioned above, this gave me confidence and a product that I can actually get behind. It was my kind of a thesis for my degree. If I was to go without this study I would be left with very little to show future employers that I am truly proud of and I can say I made 100% myself. My instructor Pippin provided firm deadlines and pushed me to figure things out that I would not have done by myself.

### **Work Environment**

I worked mostly out of my room, where I have most of my VR equipment setup. It is a large room allowing me to setup two Oculus Rifts, where I could test my game properly. I had help from my roommates and friends to help test the game at early stages, and my good friend Yash Lalwani helped me about 3 nights for multiple hours. We mostly fixed bugs and got main aspects of scripts working. I scheduled meetings with my supervisor Pippin in order to show him that I was putting in work and to figure out where to go next. These took place at the TAG office in concordia EV building. The playtest was too conducted in my room where I moved

my bed to give users maximum space. I tried to treat my independent study as a class, having to work on it the same day every week. Because I had wednesdays and thursdays free this worked well. Overall I am pleased with the quality of work I was able to produce inside my own home, right next to the attracting lure of VR.

### **Outro**

The process of making this game proved to be very beneficial with the added bonus of the game actually being fun! I am excited to port it over to the Oculus Quest as part of my next independent study. I believe we are at a big turning point for virtual realities break into the mainstream and I am thrilled to have been given the opportunity to try and be a part of it. I would like to take this time to thank both the Computation Arts department and Pippin Barr for their part in this. I will not forget it!

Link to Final Gameplay Footage:

<https://drive.google.com/file/d/1brxG-QSXPbZehFKSZKA-UDj7ZgY7OWMP/view?usp=sharing>