

Introduction

Our project is a virtual theater. People can experience watching films on the big screen similar to a movie theater. The user will immerse themselves into exploring a virtual theater from the comfort of their home. The surrounding environment is a replica of what one would see in a theater in real life. The user can follow a similar process of visiting a theater by purchasing tickets and using them to enter the theater. Outside the theater building is a cityscape that gives users the feeling of being in an actual city. In the lobby of the theater there is a ticket booth, tables and chairs, and vending machines. The second floor is also accessible from here. On the second floor you can get a better view of the lobby and look out the windows to the outside world. Inside the actual theater there are rows of chairs that the user can sit on, a big screen, a button to play/pause the movie and authentic theater lighting. There are two theaters like this, each having a different movie and color scheme.

This project is interesting because due to covid-19 movie goers have been unable to experience the magic of a story come to life. Users can enjoy many aspects of a theater without physically being there. They can also feel like they own the theaters since they are the only one there and have full control over the movie being played.

Virtual reality gives the effect of actually being at a theater, watching on the big screen.. The experience tries to feel as close to reality as possible while also adding convenience features such as being able to pause the movie or control the lights. A challenge for virtual reality is ensuring the scene is completely immersive and believable but without exact details it may not allow the user to feel immersed. We tried many different things to replicate the feeling and

quality of a theater. However, for our project we did not have access to a headset so we can't accurately tell how immersive the experience is with a headset.

Related Works

Others in our class had a more game based project. For example, classmates had a running game where the users have to catch items or walk through a castle. Another cool project was a zoo where the user can visit animals and take them for a walk or meet other animals. Another project is a basketball game where the user can hoop and count their score. There was also an arcade project which we thought would be a perfect fit if we added their arcade into the second floor of our theater. Other than that, our project was quite unique. While our movie theater also had user functionality such as the ticket booth purchase and movie theater controls; our project is mainly focused on an accurate experience rather than a game. Some things we improved on the normal theater experience is having full control over the lighting and being able to play or pause the movie at any time.

Design

For our design, the main components were the theater screen, chairs, lighting and ticket booth. One of the main components was our theater screen. We had trouble trying to scale the screen so it wasn't too small or too big. But by guessing and checking we found a size that felt real. We also had to keep in mind the aspect ratio so that the video wouldn't be stretched or squashed when it was on the screen. We also had trouble with getting the screen to show in a dimly lit room since the screen was affected by the lighting in the room. We tried shining a spot light on the screen to brighten it but the center of the screen was brighter than the rest and the

corners were darker than the rest. We opted for making the screen emit its own light so it would be consistently lit up. Another big component was the chairs. We needed to be able to sit in the chairs and we needed them to feel like movie theater chairs. We had some trouble looking for movie theater chairs in the asset store and we didn't have enough time to model them ourselves in something like Blender so we used generic looking chairs instead. We modelled the lights ourselves and even had some lights coming from out of the floor like a real theater. These lights functioned to guide the user around the theater if the lights were dimmed. The ticket booth was modelled from scratch as well. Initially we weren't sure if we wanted to have a ticket booth because we wanted to only include the positive aspects of being at a theater and we thought paying for tickets wasn't very positive. To solve this, we ended up just making the tickets free and you can still get the feeling of giving a ticket to the concierge before entering the theater. We also included street lights and a city outside of the theater so you didn't feel like you were in the middle of nowhere.

At the beginning when you spawn you start at the entrance of the theaters. It starts at the entrance to give the effect of the user's just entering the movie theatre. We have movie posters on the wall to give the feeling of being at a real movie theater. We have the user follow a short path that leads them to the ticket booth where they can read the controls and instructions as well as buy tickets. We have controls for a VR controller posted on the booth as well but they aren't actually implemented; these are just what we would map the buttons to if we had a VR system. We thought this project would be best experienced in VR with an oculus but unfortunately we don't have a VR system. Mouse and keyboard work well enough though. We mapped the controls based on how other games like VR Chat map their controls. We thought that there was no reason to come up with a new control scheme when there was already one that people were

used to. For mapping controls for mouse and keyboard we also referenced VR Chat's control scheme when a user uses mouse and keyboard.

Our design conforms to some of the Oculus Best Practices guide by putting any text or menu indicators on something stationary like a wall rather than on the user's HUD. We also had 3D sound effects that were directional rather than mono. We also had the sound slowly fade out the further away you were from the source. We used sound not only for when the movie is playing but also when the user makes certain actions. For example, if the user grabs a ticket they will hear a ding but if the user takes more tickets than the max number of tickets they can hold, they will hear a bzt sound. This is also true for when they try to enter a theater without any tickets.

Our project would perform the best if the user is in VR. The experience will be as close to real life as we can get. The user should also have a decent computer to run it on so the movie doesn't lag and have a surround sound system for the best theater experience. The worst experience would be on mouse and keyboard, with a low spec system where the application has low fps and the user has a single speaker in front of them.

Some other design decisions that we made were to have the skybox look like it was night time so that the user would feel as if they were in a theater after it closed. We also had buttons specifically mapped so the user can play or pause the movie and control the lights from anywhere within the theater without having to get out of their seat. The seating arrangement was another design choice. We had 5 rows of 10 chairs where the closest row was as close to the screen as you could get before chopping off the corners of the screen from your peripherals. The furthest seat was about as far away from the screen as you could get before the screen started to feel really small.

Implementation

The hardest thing to implement was the video screen. We first tried creating a material that used its albedo as the .mp4 video but materials in unity can't have an mp4 as an albedo. We then created a specific texture meant for videos called a Render Texture. This texture would allow us to use the video as an albedo and then using the video player built into unity we could play the movie. Now the only problem was that the video was affected by the lighting in the room and when the lights were on, the video looked really good but when the lights were off the video was barely visible. We fixed this by adding an emissive property to the material and using the video .mp4 as the albedo for the emission.

The next hardest thing to implement was being able to sit in a chair. We came up with the idea of having the colliders on the chair be shaped like a hollow box with the top missing. This worked and the user was able to jump into the chair which was essentially just an invisible box. We wanted the user to feel more like they were sitting in the chair rather than jumping into the chair so we made the hollow part of the box very small so you couldn't jump into it but if you pressed "F" and tried to interact with the chair it would teleport you inside of this small space in the chair and face your character towards the screen. This gave the feeling of actually sitting in a chair. Each chair uses its own location in the world space to teleport the user to the correct spot and when the user wants to leave the chair the user is teleported back to where they started.

Dimming the lighting was implemented by having the light intensity slowly decrease or increase by .01 for every frame until it reached minimum or maximum set intensity. This feature as well as playing and pausing the video from anywhere in the room just used a collider that covered the room.

Lastly, the ticket booth increased the users number of tickets. When the user tries to enter a theater they are blocked by a wall that asked them for 1 ticket to enter. When the user gives them a ticket the wall is disabled in a script and the user can enter the theater. When the user leaves the theater there is a collider in the main lobby that checks if the user has unlocked either the first or second theater and if they have it will re-enable the wall for that theater and the user has to use another ticket to get back into the theater.

The assets we used were the tables and chairs in the lobby, the vending machines, the chairs in the theater, the streetlights outside the theater and the generic looking buildings outside the theater. All the code we used was created by us.

One issue we had was trying to get sound to play when you got a ticket or unlocked a theater. We kept getting a null reference for the audio sources even though everything looked correct. We used debug log to find out that calling “audio = GetComponent<AudioSource>()” in Start() was returning a null reference. Removing this fixed our issue.

Lessons Learned

We learnt new skills like how to play a movie in Unity and adjusting lightning for the correct effect. We learnt the amount of detail which goes into building the movie theater and good looking 3D spaces in general. Without all the correct details the theater would not have felt like a real theater. Some obstacles we faced were getting null references or other errors in unity and we solved these by using the debug log to print to the console. We became very familiar with some of these errors, what they meant, and how to fix them. We became very good at modelling using unity, especially with little things like stairs where the heights need to increase by a consistent number but the width of each stair needs to be consistent. We learned how to calculate

the exact distance each object needed to be in order to make everything symmetrical. For example we had to calculate how many chairs we could fit in the theater or how wide the hallways would need to be with respect to how many chairs we had with respect to how big the movie screen is.

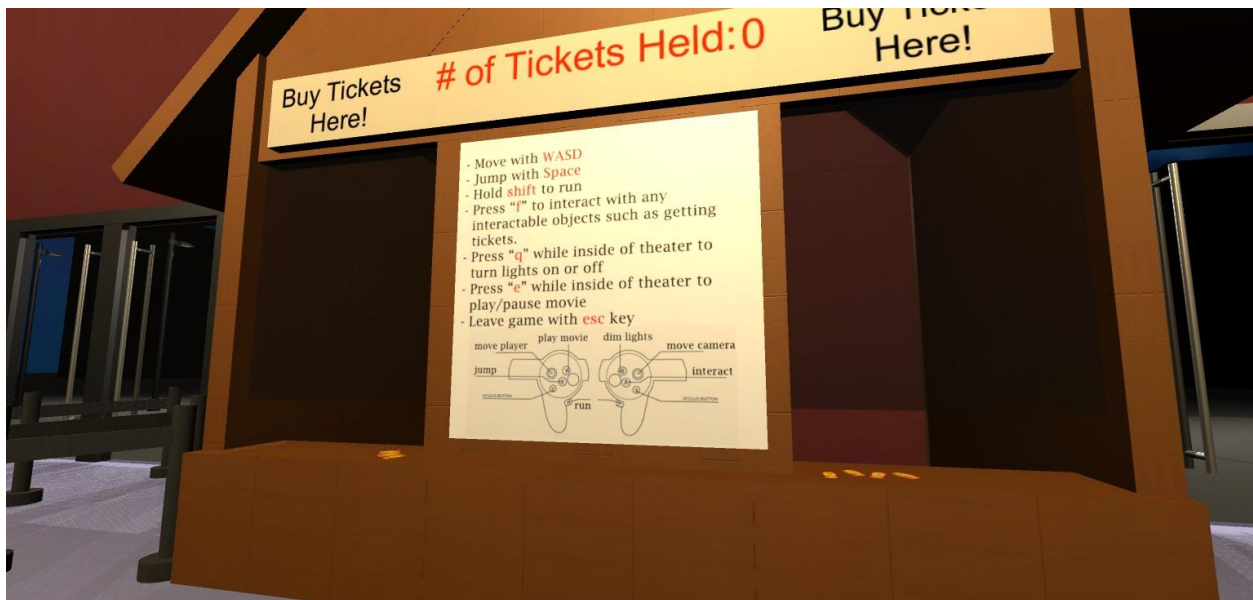
Other classmates seemed to comment on the Bee Movie when it was playing and how they liked it. The movie itself is a very popular meme and so that explains why they liked it so much and that's also why we chose it. Someone commented that the idea behind the movie theater was cool.

We can improve our design by adding a concession stand and having customers choose what they want to eat. There could be a purchase center for the different kinds of foods. Some of the assets we used could look better like having movie theater looking seats rather than chairs. The asset store did have movie theater seats but it cost money so we chose some generic looking seats which were free. It would also be cool if you could change the movie being played in the theater by going up to one of the movie posters and changing the current movie to the movie on the poster. The professor also mentioned that we could add a few more things such as bathrooms or AI people walking around.

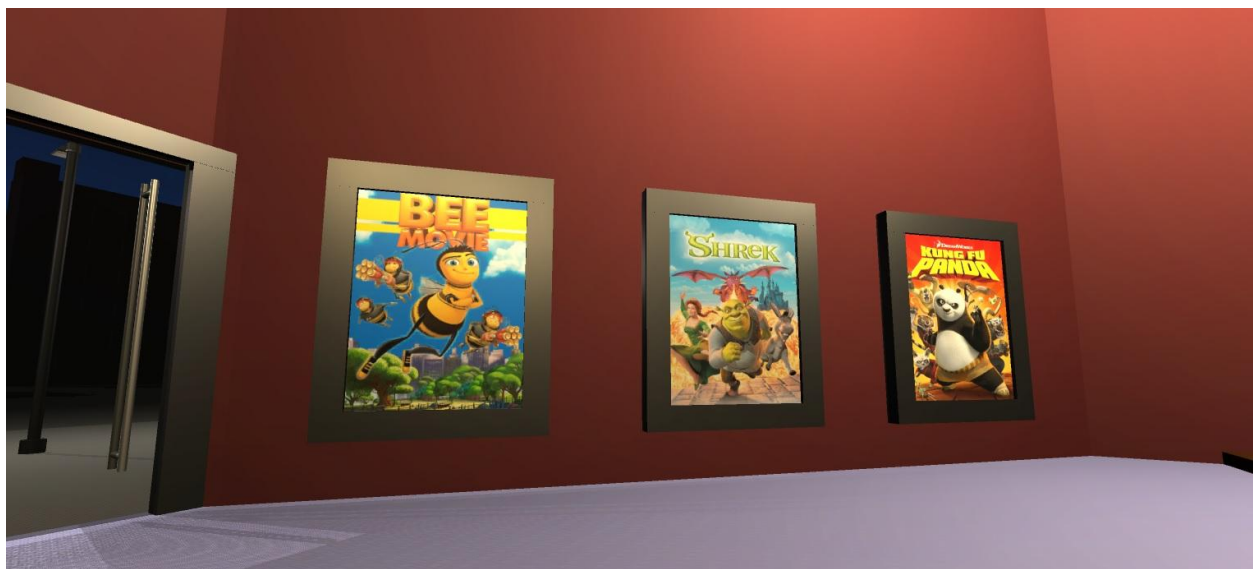
One thing we thought about was how our project would work in the real world if we commercialized it. We thought that if we made it like a Netflix-ish type of application it might actually do well. For example, you could spend like \$10 a month for a subscription and get access to movies that are only being played in theaters and every week or every day the movies that are being shown would change. This was just an idea we had for the practical applications of this project.

We split the work by having one of us hold the main project and the other would model and write scripts and send them to the person holding the main project.

Screenshots



Ticket booth with instructions and controls



Movie posters



Locked theater



Theater with the lights on



Theater with the lights off



A view of the city from inside the theater



Theater chairs and hallway with the lights on



Theater chairs and hallway with the lights off