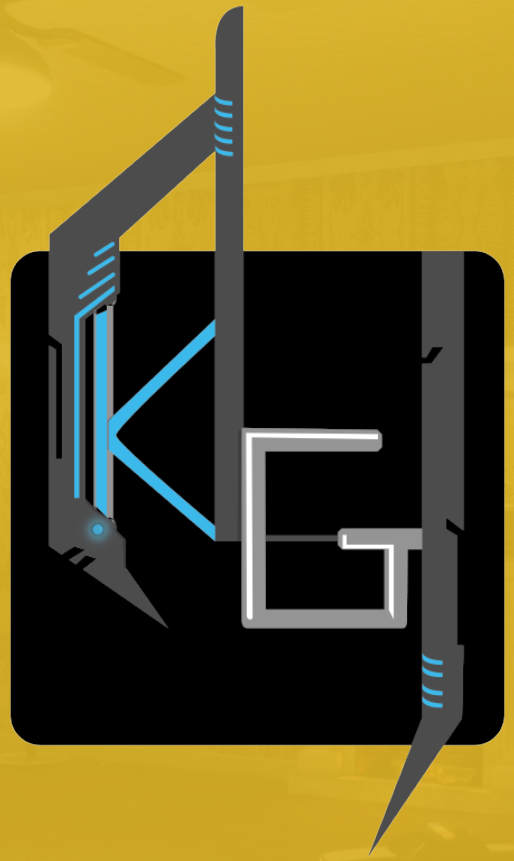

Kevin H Gordon

Process Book

Project Title : Grandma’s Room

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The Project

What is Grandma's Room?

As I was reviewing old 3D assets over the 2018 Christmas break, I noticed that there were a couple of nice game-ready models I had previously not done anything with. This sparked the desire to create a scene in which the majority of these assets could be showcased. In addition to that desire I also wanted to create an environment that is ultimately playable in VR, as my Oculus Rift was sitting idle collecting dust. These two desires is what led me on the path to developing the personal project Grandma's Room.

Though I had plenty of experience in creating hi-resolution assets before, I'd never tried creating a full real-time environment with any of those assets. Christmas was around the corner, so I wanted the piece I create reflect a feeling of the times. This project was the perfect way to push the boundaries of my skill set. As this was a personal project, I had only three goals:

- Create a Christmas Themed Project
- Create one VR interactable asset
- Showcase 3D assets

As this was my first time making a real-time 3D environment from scratch, I made a plethora of mistakes. But even with all of the mistakes and mishaps, a great project came from it. This book will breakdown my process for creating the environment, whiling highlighting some of the successes and failures that came with it. I'll also be breaking down my VR interactable asset, and the technical work that was required for that piece to function in game.

Project Inspiration

As I'm sure was the case for many, the holiday season was a special time of year for me growing up. It seemed to be the one time of year my family was together and united under on roof. Grandma's home was always the central meeting point for my cousins and myself to celebrate the season. As I've grown older however, it's been harder and harder for the family to come together. I wanted this piece to capture the feel of how the family living room was set up growing up. With toys under the tree and a TV front and center, I wanted this piece to feel like home. As thus I began drawing inspiration from multiple sources on family living rooms, including my own life, to create a visual guide for the design.

The other bit of inspiration for this piece was in designing that interactive VR elements. In choosing that element, I had to think critically about what real world objects could work both with the theme while remaining ground in the real world. To find inspiration, I asked informal questions to friends and family about what sounds or devices they remember family interacting with the most when around family. Their insight, combined with general ideas I'd came up with, were invaluable in selecting the interactive VR piece.

Theme - Christmas

In remembering the theme of Christmas, I chose to narrow down the design choice by focusing on living room scenes only. The living room is a big fixture in the home for many, and is typically where the Christmas tree is set up. As such, I chose reference images that fit within the frame of a modern Christmas living room.

Reference
Interactive Inspiration

In finding inspiration for interactive element, I leaned on real world products that served the purpose of bring people together. From asking friends and family what items brought them close with their loved ones; games and music were among their top selections. As such I began to find references for both. I ultimately decided on making music devices a focus for VR interactive elements in this piece.

Inspiration images to the right.

Mapping the Project

Mapping what's important

In designing 3D environments, there's always a layer of uncertainty regarding what designs fit within the world that's being created. The good thing about grounding a project in a real living room setting, is that some assets are simply required for a room to function. The first part of this project involved mapping out what assets, at minimum, have been living room staples for the past 50 years.

In doing this, I found reference from living rooms of different time periods. After examining the images, I formulated the list of required assets to the left.

Selection of reference images featured on the next page.

Required Assets

- Coffee Table
- Table Top
- Fireplace/Heating Device
- Couch
- Lamps
- Pictures
- Assorted Chairs
- TV unit
- Shelf

Living Room References

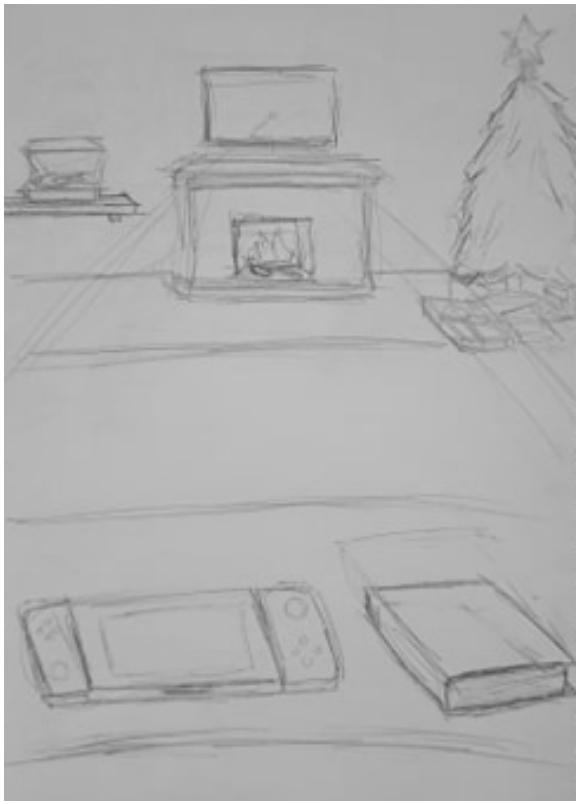
Old Asset Selection

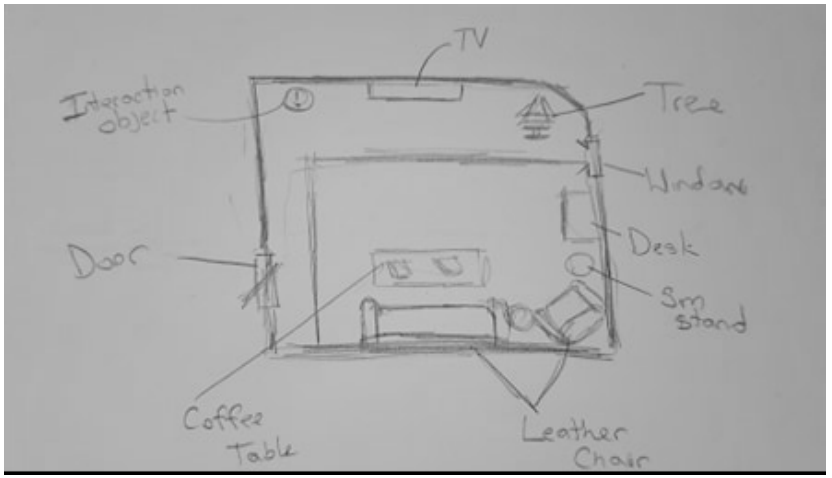
As I stated previously, this project was first created to showcase many of my unused assets in a single scene. As such, the first thing I focused on when beginning the design of this project was identifying key assets. These assets would end up not only being centerpieces, but would influence the overall art direction of the project as well.

The pieces to the right are the main 3 assets that had largely gone unused up until at point. These pieces were deemed to be of sufficient enough quality that they became key assets for this project.

Rough Level Map

To start the level design, I sketched out a floor plan with a rough layout of where objects should go. From there I blocked out the scene in Maya, while adding in the old assets where needed be. These roughs help guide the design process of this project.

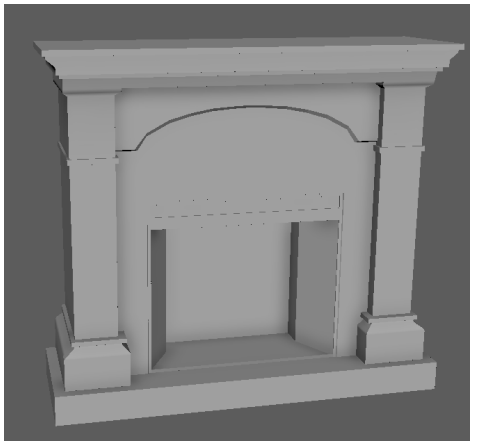




Project Start
Asset Creation

With the scene mapped out, it was time to begin creating the various assets that would be required for this piece. With some of the key assets, such as a couch, TV and game system, already being created; I shifted my attention to developing other assets on the list. The first new asset I modeled for this project was the fireplace.

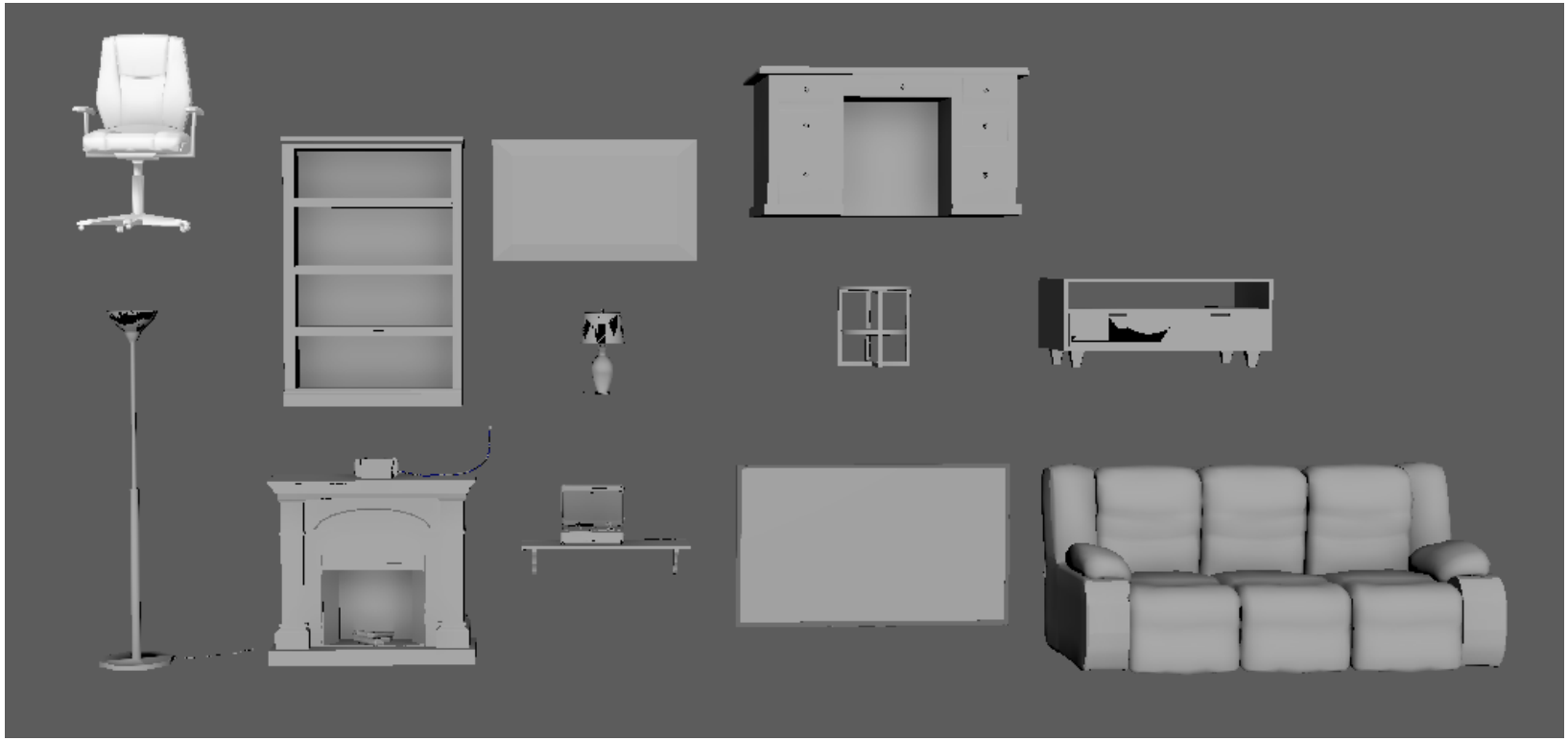
After choosing the reference I'd be modeling off of, I began production. When designing this model, I worked to implement some of the new techniques learned from my prior 3D Design class at SCAD. This technique involved creating normal maps in Photoshop, and using those maps to add fine details to the model. This process was great, as it allowed me to reduce the time spent creating high-res assets as well as reduced overall poly count. Though this may seem like a small feat, the discovery of easy normal map creation was a huge one for me. All other assets in this project was created using the same method.



Modular Set

Shots of this process to the right.

After developing all of the other key assets in this project, using the same All of the models culminated in a modular model set. From this model set, I was able to begin adding assets into a Maya scene the initial placement of assets. Images of the model set and Maya shots below.



Dev Stage 1
Unreal Blocking

Next step in this process was importing the various assets into UE4 to build the scene. As I had created most of the textures for most of my asset up to this point, I imported them as well. At this stage, my sole focus was on importing assets, applying material and placing them into the scene. Once this was done, I worked on adding in the key lights into my scene. Though the scene is dark now, the lighting will inevitably improve down the road.

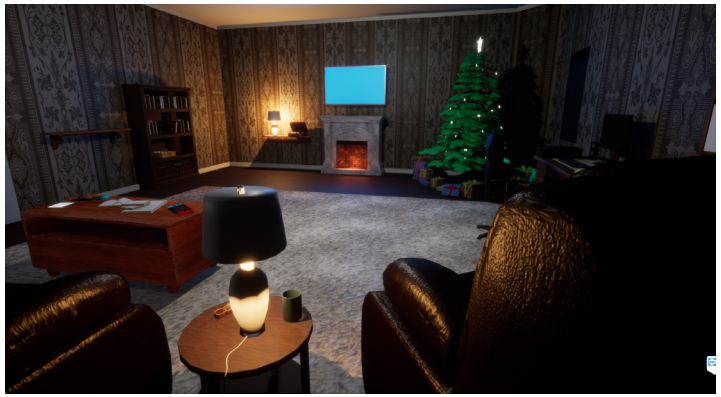
At this stage in my game development education, I was fluent with how to create and assign materials in UE4. I was not, however, experienced with using material instances. Nor did I understand it's significance in streamlining development. While this fact doesn't affect development at this current stage, it did have an impact further down the line. More on this will be discussed later in the book.

Stage 1 Reflections

After completing this stage of Unreal development, I took a step back and reflected on the piece as a whole. I identified a couple of issues and concerns that made the space appear off. Chief among them, were caused by issues with the floor and overall scene lighting. From examining my reference images and looking at pictures of homes I've been in, I found the issue. In addition to the floor feeling slightly flat, most living room homes either have full or sectioned carpeting cover the floor. The carpeting helps break the room up into sections, and causes the room as a whole to feel less empty. The addition of carpeting was a must. Past that, more lights were added to the scene to fill the dark areas.

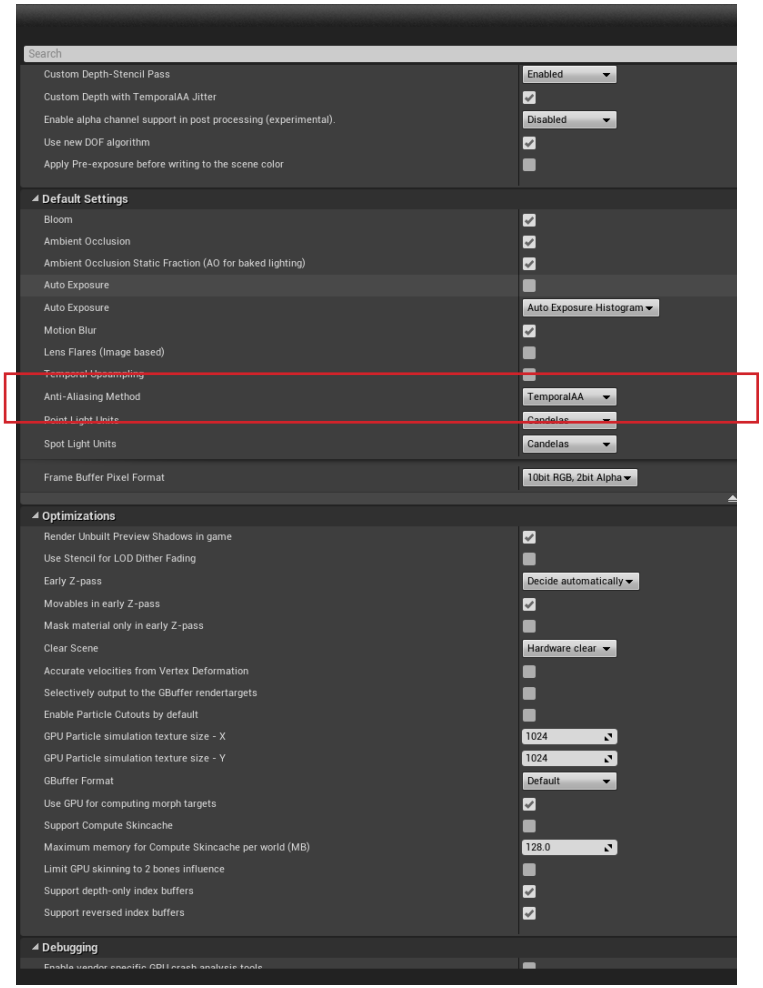
Dev Stage 2
Improving the scene

This stage of the development process I continued adding more assets into this piece. Most notably, the addition of the carpet and floor crowning really brought the piece together. Lighting improvements, as well as light sources, were added to fill dark spots. Fire particles were taken and modified from the UE4 marketplace, and added to the scene. At this stage most of the major assets are imported and placed into the scene.



Controlling Lighting

With all of the elements of this piece coming together there was one core issue that still needed to be address, that issue was lighting. In lighting this project, I found that I often struggled with being able to control the lighting of my scene. Chief issue was the discrepancy between how the scene looks in editor vs. the shift once played in-game. The exposure of the game kept changing and at first I couldn't figure out why. From doing research, I discovered that the reason for this change was due to a default setting with Unreal Engine. The auto exposure feature in Unreal increases the brightness of Unreal scenes during gameplay. For me, it meant that I couldn't control the lighting as I wanted to. As a result, I elected to turn off the setting to regain control of my scene.

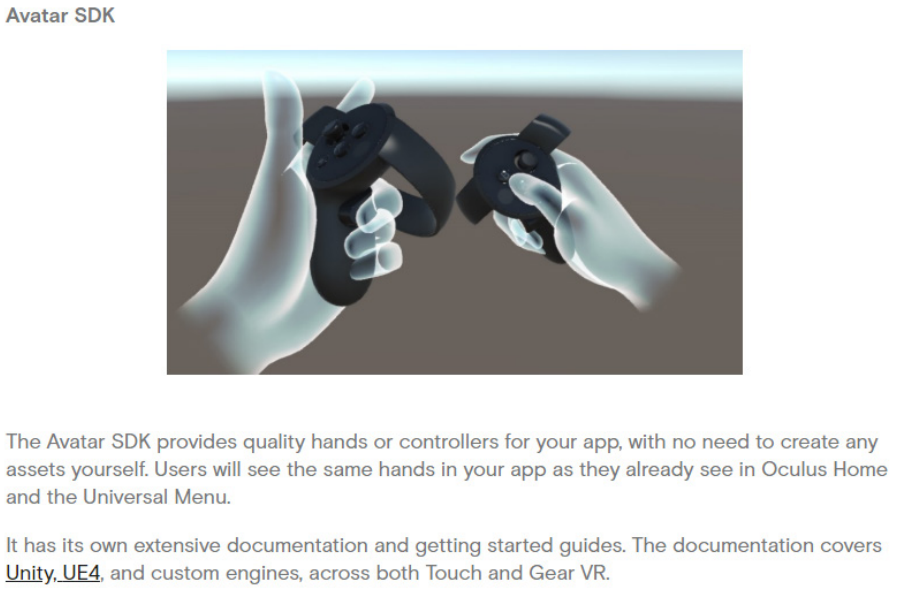


Tech Scripting
VR Functions

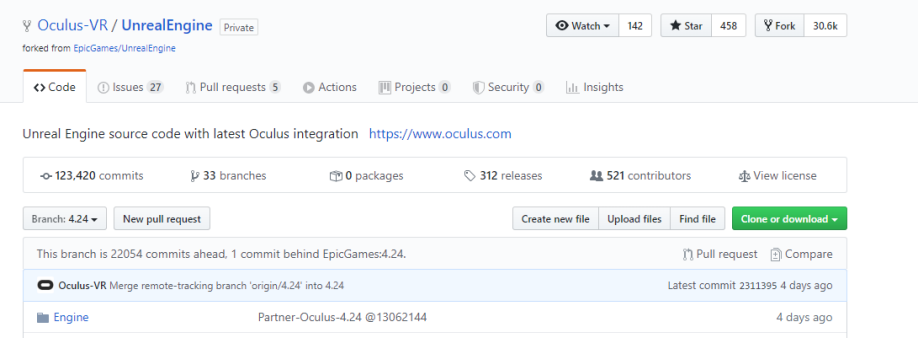
Being sufficiently far in development up to this point, I turned my focus to working on the VR component of this piece. Up to this point I'd been using the default VR game mode provided by Unreal for testing scale in Engine. Though that was the extent of my VR testing, I was under the impression that adding the Oculus Hands integration would be an easy process. Little did I know, the default VR sample map doesn't contain any was to integrate VR hands into a project.

This discovery set me back, as I now had to figure out how to integrate the Oculus Rift settings into my scene. I looked online and found the Avatar SDK that could be imported into an UE4 project. The process for adding this SDK was long winded, and involved navigating several sites until ultimately reaching the GitHub page. Being so far into development, I was worried that adding a new system would break the game. Luckily after a quick re-import and a couple of changed settings, VR hands was ready to go.

Process images for finding and downloading Avatar SDK to the right

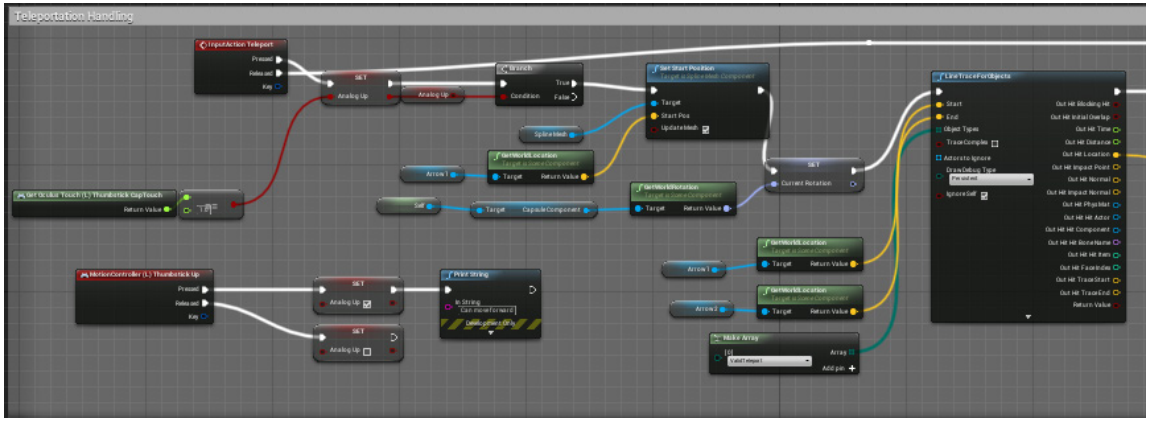


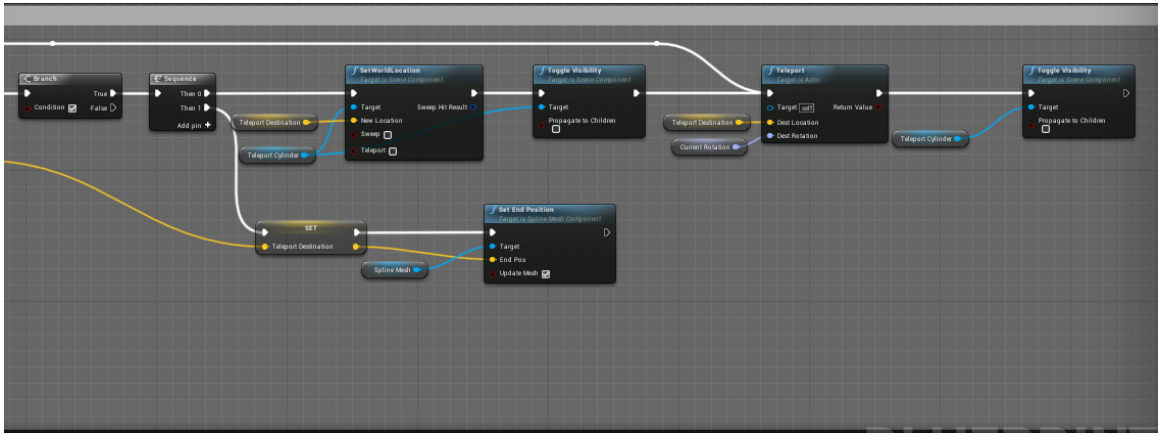
Avatar SDK found in UE4 Documentation



Github for UE4

Scripting Teleportation





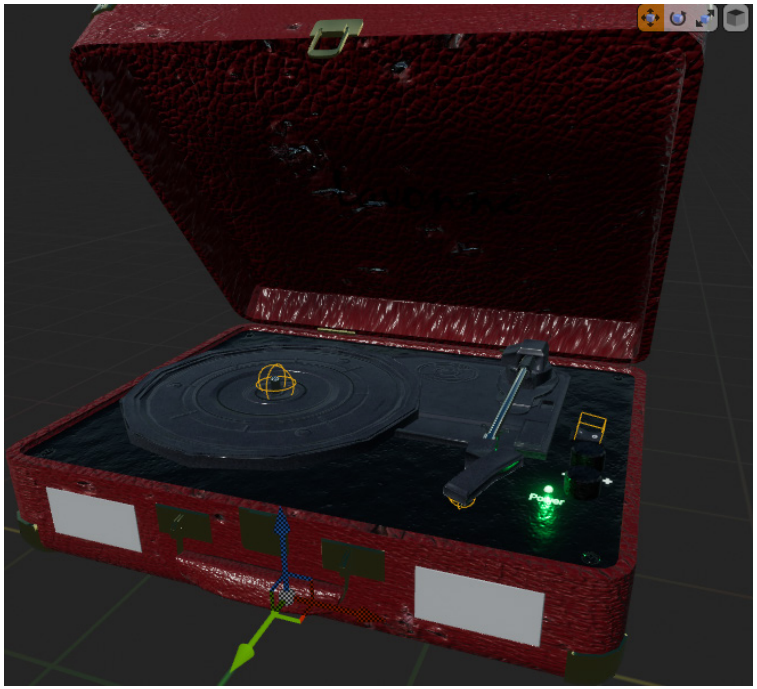
With the hands downloaded I was able to start really testing my scene in VR. Only problem was I couldn't move my character around the scene easily. I needed to create a way to teleport the player. Now the Avatar SDK should contain a blueprint for teleporting in VR, but mine wasn't working. Thus I was led to create a teleportation system from scratch.

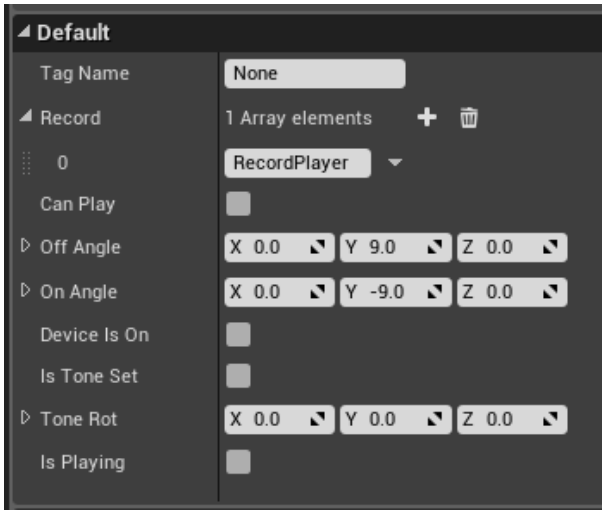
The script works only when the character is pressing the left trigger while moving the analog up. A line is then drawn from the center of the controller to the floor. Typically this wouldn't return a desirable result as the collision type of the floor doesn't match what the script is looking for. As such a new collision type was created in Unreal just for the detect of floor. This allowed the script to detect the floor and teleport the player to each new location. To the left is the code required to get teleportation working in VR.

Interactive Record Player

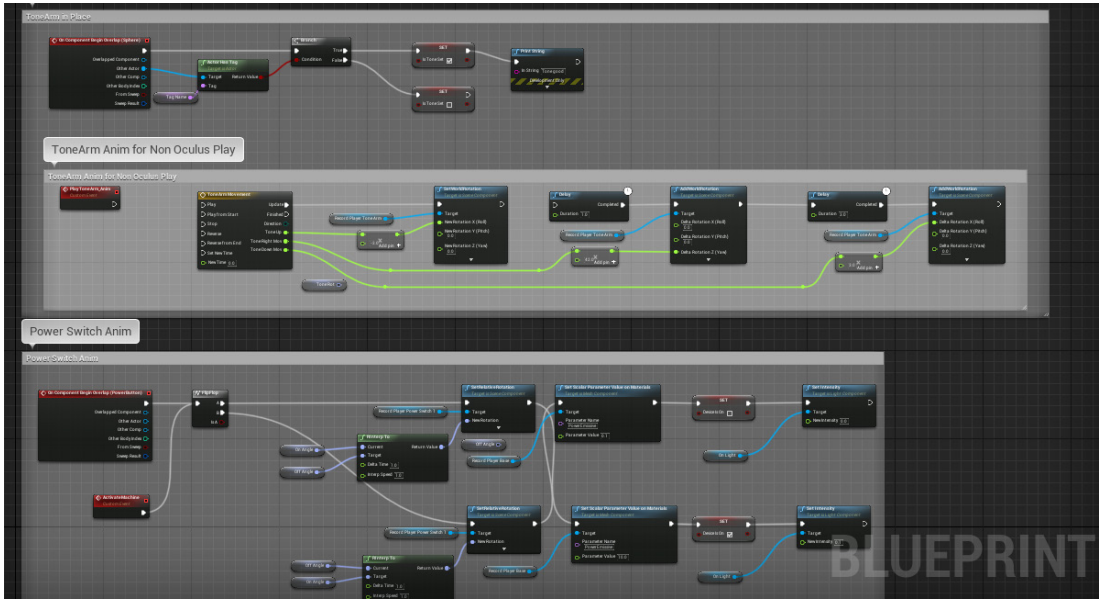
Early in this project, I determined that a music device would be the interactable element in my project. While designing the various models for this project, I determined that I wanted a record player to be that music device. I chose this device purely because I wanted to experiment and see how far I could push the piece technically. I wanted this piece to mimic the real world on a believable scale, as such the scripting for this was meticulously planned out.

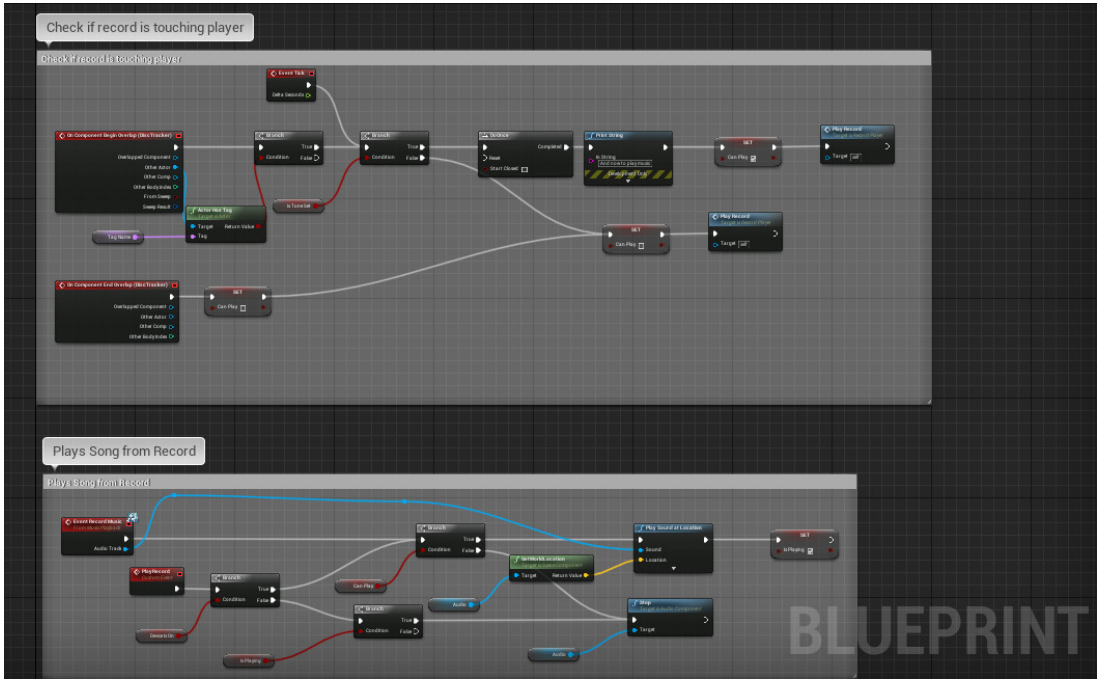
In preparation for scripting, I created several small collision objects around key components of the record player. These components would be integral toward making this assets believable in the game. In addition, I created a set of specific collision blocking object to ensure the piece would work as expected. The UE4 scripting of this piece is explained on the next page.





UE4 Scripting





The code to the right represents all of the components that make up this record player. For the record player to play music, three conditions have to be true. First the record player has to be switched on. Once the record player is on, the center of the record has to overlap with the metal rod. This is to make sure the record is properly on the player. Finally, once the tone arm is placed on top of the record music will play from the device.

The music that the record plays is determined by the individual record, as each record has a unique music ID assigned to it. This was a complex technical piece to create, but in the end it was largely successful.

Initial Renders

When I initially started this project, I did so with only 2-3 weeks to spare before Christmas day. The original intent was to get this piece finished and released in time for Christmas, so I could share my work with family and friends. A bonus Christmas surprise for all of my loved ones. By the time Christmas hit, I had reached a great milestone where the piece looked sufficiently good, and worked as intended technically.

The pictures to the right represent my final designs for the project up to that point.

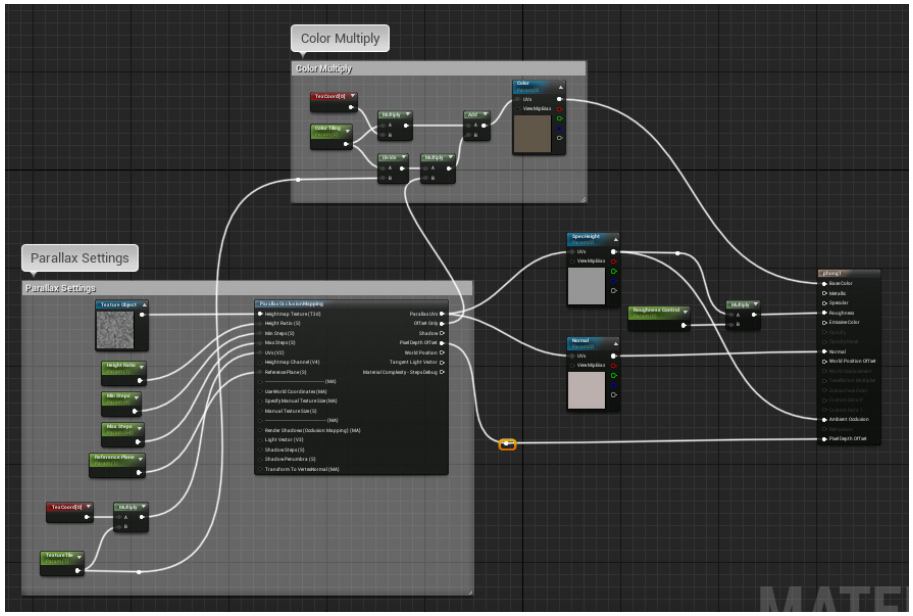
Initial Reflections

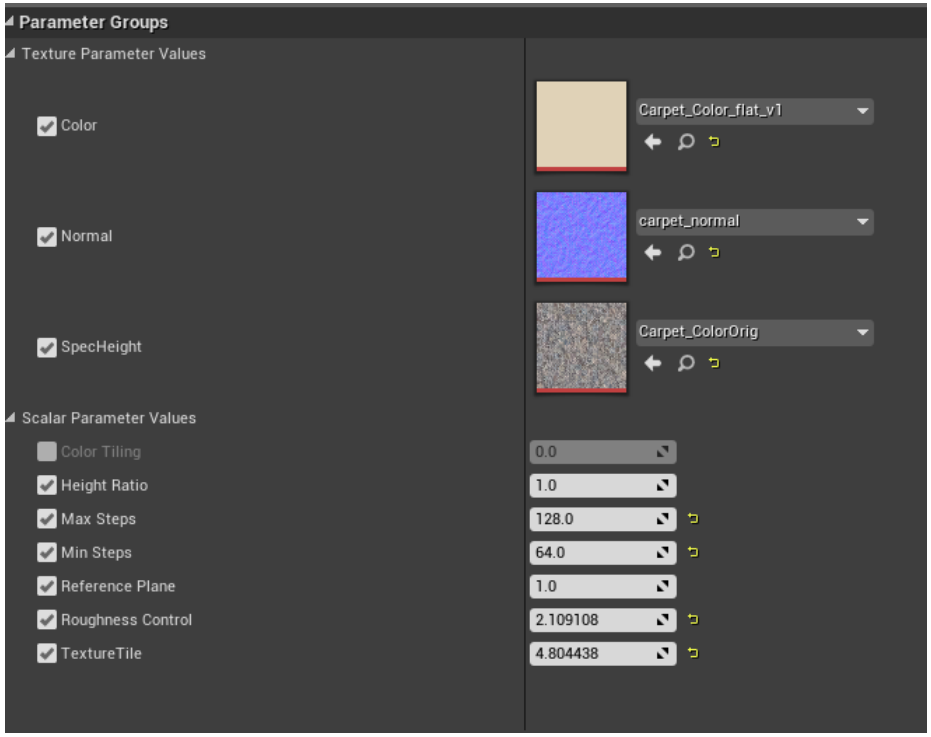
After my arbitrary deadline had ended, I still had a burning desire to continue working on the piece. While I elected to spend the rest of that break spending time with family, as soon as I got back on campus I went straight back to work. I first started by getting feedback from Professor Shami on what he thought of the piece thus far, and what should be improved. He advised me to first look up parallax occlusion and add it to the carpet. Then, as this was an environment piece, there should be dynamic moving elements in the showcase. Finally the lighting needed to be much brighter if the piece was going to work. I began working on those elements in earnest.

Final Push
Parallax Occlusion

Though I knew what parallax occlusion was in theory, in practice I'd never gotten it to work up to this point. I began search the web for tutorials and documentation on how to create parallax in UE4. Though this process took time, including a few programming misdirects, I landed on a tutorial that was able to tell me how Parallax should be created in engine.

After following the tutorial, I was able to create carpet that appeared to have more depth to it. This also allows for the lighting to interact with the carpet in a much more believable way. Shots of the material scripting featured to the right. Before and after of carpet featured on next page.





Parallax Scripting

Before shot of carpet. Notice carpet fabric looks more flat in this piece.

After shot of carpet. Carpet appearance is closer to real life and shadows are occluding more naturally.

Final Rendering

With the final major technical hurdle passed, it was time to refocus on the lighting. To address lighting issues in the scene, I first started by adjusting the intensity and light radius on my spot lights. This allowed me to gain not only increased lighting, but a softer overall light tone. In addition, the ceiling fan that I added as a dynamic asset doubled as an new light source. From there a post process volume allowed me to set the overall color tone and brightness of the scene.

Images of the final result to the right

Final Reflections

I learned a great deal in this project, most important among them was the importance of material instances. Later in the development of this project, I had to re-create the majority of my materials as time I created a material Unreal would take 10-15 minutes to all compile shaders. After making material instances, this time was reduced by over half. Aside from that I'm proud of the technical aspect of this piece, as it allowed me the chance to test VR interaction in Unreal Engine. The was a great piece to work on and design.

Special Thanks

Special thanks to all of my friends, family and professors who've supported me throughout the years. Without them, none of the work featured in this book would be possible!


REMEMBER
WHY YOU
STARTED


REMEMBER
WHY YOU
STARTED
POLICE