Grocery Shop With Russell

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A Recreational VR Game for People with Autism Spectrum Disorder- ASD

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"Technology is best when it brings people together."

-Matt Mullenweg

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Abstract

Grocery Shop with Russell is a recreational video game designed for people with autism spectrum disorder- ASD. This is a speculative interactive video game that was created and developed on the Unity game engine platform. The person would experience the game environment by wearing an Oculus Rift. The purpose of this prototype is to simulate a visit to a convenience store to make small purchases for the target audience players. I chose to design this simulated environment because I learned from experts in the field of ASD, that convenience stores offer opportunities for young people with ASD to grow their abilities to interact in the world and build social skills.

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Introduction

When I was seven, I had a classmate in my school named Russell. He used to act very weirdly. He had some speech issues. Sometimes he used to make some weird noises, especially when he was angry. Sometimes he was absent from class for days. We used to bully him.

I don't know why Russell always liked me, however, I used to avoid him since I didn't want to be bullied by other kids for being friendly with him. When my mom died, I had to leave that school. Therefore, I never met Russel ever.

Back in 2018, I was making a report on violence against minorities in Bangladesh. The Hindu community is the minority in my country whereas the community with Islamic beliefs is the majority. Burning houses or killing minorities in the name of protecting Islam is very usual in my country.

I was interviewing the minority community whose houses were torched on fire or whose relatives were killed. I interviewed an elderly guy named Tarun Biswas who was the only survivor in his family when his house was torched on fire in 2004, where he lost his wife along with two daughters and an eight-year-old son who was autistic. And guess what I found. His son was the weird kid from my class, Russell. He had ASD, that's why his behavior was beyond our understanding.

Back in my country, Autism is still considered a curse on a family. People try to hide their autistic kids from society. But in recent years the scenario has been changing.

I didn't mention to Russell's dad that I used to bully him whereas he used to consider me a friend. I couldn't say sorry to Russell or his dad for what I did. But it was something that hurts me every day.

In 2021, I experienced Virtual Reality in New York for the first time. A year later, during my Spring-2022 semester, I took the Message Construction course, where I was introduced to the game engine platform Unity. It took almost two weeks to understand the concept of Interactive Digital Media, Unity, Virtual Reality, and Transmedia Storytelling. But once I understood, I was amazed. I was thrilled with the concept that how I can bring my imagination into reality, and how an almost real-life VR game experience can change lives. Day by day, I not only fell in love but became obsessed with this whole concept.

By the end of Fall- 2022, when I was asked to choose a topic for my thesis, I knew that I am going to work on the transmedia storytelling platform Virtual Reality. But what would be my topic? Then the idea of developing a recreational VR game for people with ASD came out. I shared my idea with Professor Dickie Cox and Amanda Stojanov, and they loved it. Therefore, I developed a prototype VR game called *Grocery Shop with Russell*. It's a speculative recreational game designed for people with autism spectrum disorder- ASD. This is a way to say sorry to my childhood friend Russell.

Part 1

Groundwork & Research

Groundwork

About 1 percent of the world population has autism spectrum disorder. Prevalence in the United States is estimated at 1 in 59 births. According to the US census bureau, more than 3.5 million Americans live with an autism spectrum disorder. The prevalence of autism in U.S. children increased by 119.4 percent from 2000 (1 in 150) to 2010 (1 in 68).

Grace Wharton (67) is a retired nurse at Monmouth Medical Center. Her grandson Kyle (10) is among those 3.5 million Americans who have autism spectrum disorder. "I would rather call Kyle a kid with special needs. Not only Kyle but all who have this same condition", says Ms. Wharton.

"You know what Kazi? Kyle understands everything. He can do anything. You can see how friendly he is with you or his surroundings. But he is too afraid to go out to an unknown location, like a restaurant. I sometimes take him grocery shopping with me, but the unfamiliar environment makes him nervous." Ms. Wharton continues.

While discussing Kyle's condition with Shweta Patel (36), an educator at Thorndale Public School, Ontario, Canada says, "These kids are very smart. But they are just scared. Community is a huge deal in their lives. Community is a familiar environment to them."

Ryan Delaney (37) is an educator at Backyard Players and Friends, a nonprofit organization that helps to develop the skill of people with special needs through recreational activities, agrees with Shweta Patel. Mr. Delaney says, "Whenever these kids step outside of the box, they feel abandoned. They isolate themselves. If somehow, we can make it create a familiar environment, it would be easier for them to adapt and adjust." Both Miss Patel and Mr. Delaney advised me to design a recreational game that might help children with ASD to develop their social skills.

They also suggested learning more about their mental growth and psychology. Therefore, I met Dr. Meghan Meyer, Assistant Professor of the Department of Psychology at the prestigious Columbia University. "Between 10 to 13 is the age for a kid with an autism spectrum disorder when they learn to adapt and adjust to an unfamiliar environment", says Dr. Meyer. She provided me with 28 articles that helped me to come up with my research question and answer.

Research Question

Technology has been dominating humankind since its birth. But the latest innovations have taken it one step further. The fast-growing technology is producing Artificial Intelligence- AI and Artificial Realities- AR nowadays. One of the greatest innovations of the modern era is the *Virtual Reality* application, which is a rapidly emerging transmedia storytelling platform.

Transmedia storytelling is a way of telling single or multiple stories, or even an experience by using digital platforms- such as websites, blogs, animation, podcasts, documentaries, movies, etc. (Foxman et el., 2021). Meanwhile, virtual reality is a computer-operated recreation platform or technology, where people can interact within an environment that is artificially created (Freina & Ott, 2015). The artificial environment is experienced through sensory inducements such as hearing audio or watching video generated by a computer (Dockterman, 2022). This technology is usually experienced with headsets and software where the users can freely move or interact in a 3D environment (Schwabe, 2022).

The definition of virtual reality might sound difficult to the first, second, or third generation of computer users. Therefore, just to make it understandable to those three generations, this paper provides a simple illustrative definition by combining all the following concepts.

Virtual Reality is a technology where a creator can develop or create a surreal world (mostly known as a 3D environment) by using artificial intelligence. The creator has complete freedom to create the world by using their imagination or replicate an environment that exists in the present world. Each world can illustrate an experience. These experiences could be narrative, and these narrations can be explained as a story. Therefore, this quality makes Virtual Reality a transmedia storytelling platform.

Meanwhile, the headset that is used in VR applications, commonly known as an Oculus, gives the viewers almost a real-life experience. That almost real-life experience elicits human emotion (Riva et el., 2007). In the article titled *Affective Interactions Using Virtual Reality: The Link between Presence and Emotions* the authors state, "It is not in real life, but with the help of virtual reality (VR) glasses human brains experience emotionally engaging situations. However, the simulated situations were usually not particularly emotionally arousing and were far removed from the experiences we normally have. About emotions, it is therefore particularly important to create situations that are perceived as real as possible. Only in this way can we assume that the simultaneously measured brain activation comes close to that which occurs in real life. VR glasses provide a remedy here (Riva et el., 2007)."

But what is the point of this emotional elicitation? What is the point if Virtual Reality technology is no help to humans? The humans who created this VR application. The population who are living their lives on technology.

According to the US census bureau, more than 3.5 million of the American population live with autism spectrum disorder, which affects about 1 percent of the world's population. In the United States, 1 in 59 children is born with an autism spectrum disorder.

Autism spectrum disorder- ASD is a disability that is affected by alterations in the brain (Lord et el., 2006). People with ASD may act, talk, engage, and learn differently than most people (Hyman et el., 2020). It is a condition that develops anxiety, causes difficulty in picking up on social cues, and making eye contact (Lord et el., 2006). People with ASD mostly feel estranged and lonely, overwhelmed, and isolated in unfamiliar environments (Handleman et el., 2000). But how Virtual Reality experience might help this protected community? The answer is by developing their social skills (Dechsling et el., 2022). But how to do so? Therefore, this paper decides to impose the following research question.

How Virtual Reality experience can help people with ASD to develop their social skills?

Virtual Reality offers an innovative method for developing the shift and overview of social abilities from one context to another (Zhang et el., 2018). It may be tailored to a child's needs and changed so that social skills can be exercised in a variety of contexts, giving them many more real-world opportunities to do so than they would have in an organized setup (Zhao et el., 2018).

In addition, VR offers fast and accurate feedback to aid in skill adaptation. The Place Illusion, which can be produced through immersive VR, gives users the impression that they are physically present where they see themselves (Zhao et el., 2018), (Zhang et el., 2018) (Dechsling et el., 2022). Place Illusion makes VR more lifelike and makes it possible to test out original scenarios and therapeutic approaches (Dechsling et el., 2022).

The article titled *Neural Mechanisms of behavioral change in young adults with high-functioning autism receiving virtual reality social cognition training: A pilot study* states that the Illusional environment commonly known as real-life experience helps the person with ASD to make feel comfortable in a social situation.

On the other hand, the research titled *Brain Responses to biological motion predicts treatment outcome in young adults with autism receiving Virtual Reality Social Cognition Training: Preliminary Findings* states that the VR experience teaches young adults with autism to communicate effectively. It also helps them interact (Yang et el., 2017).

Therefore, it can be said that the Virtual Reality experience can help people with ASD develop their social skills. The almost real-life experience teaches them to communicate, to interact, and makes them comfortable in a social environment.
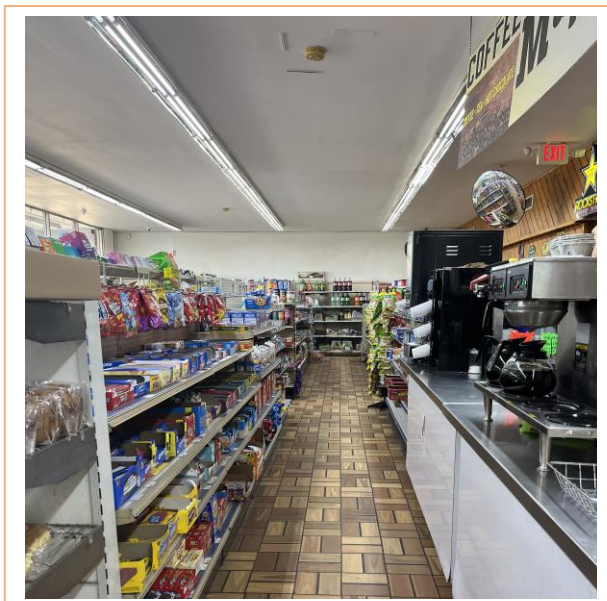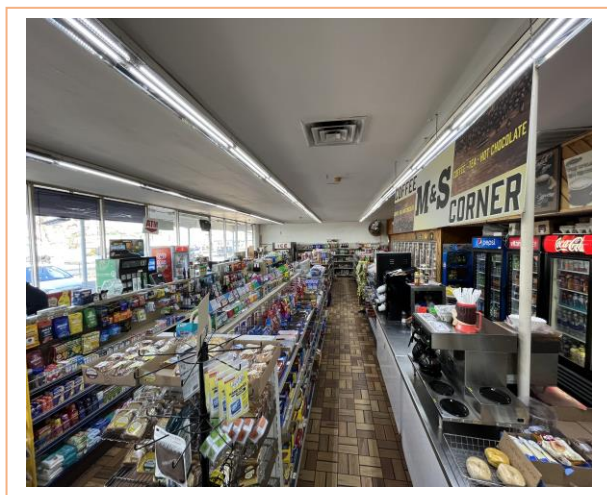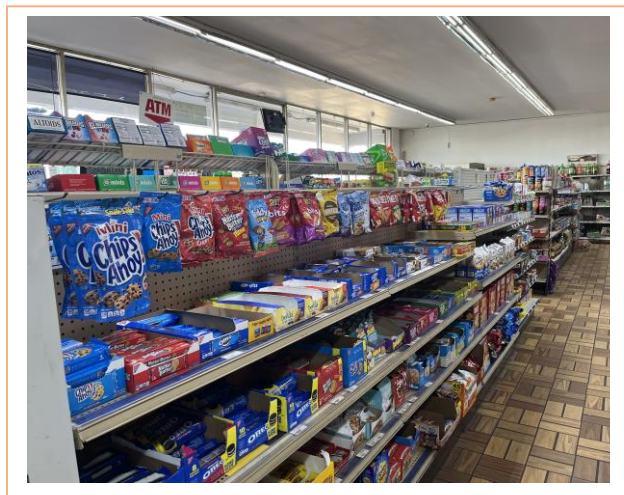
Part 2

The Process

Ideas

After my scholarly research, I had to come up with the idea that what kind of game I want to design and develop. Two of the following people/organizations helped me in this regard.

They gave me the idea that grocery shopping is one of the basics that a person with autism spectrum disorder should learn about. They suggested that I should design a game

Timothy Johnson
CEO & Advisory Board Member
Retail Digital Transformation

Ryan Delaney
Founder & Special Education Teacher
Backyards Players & Friends

that offers a virtual grocery shopping experience that might be helpful for people with ASD. Therefore, I came up with the idea to design the *Grocery Shop with Russell*.

But there was a problem with grocery stores. Each grocery store or supermarket has a different setup. As an example, Trader Joe's has a different setup than Stop & Shop. However, the Convenience Stores offer the same setup in every store. Therefore, I chose to design a simulated environment of a Convenience Store because I learned from experts in the field of ASD, that convenience stores offer opportunities for young people with ASD to grow their abilities to interact in the world and build social skills.
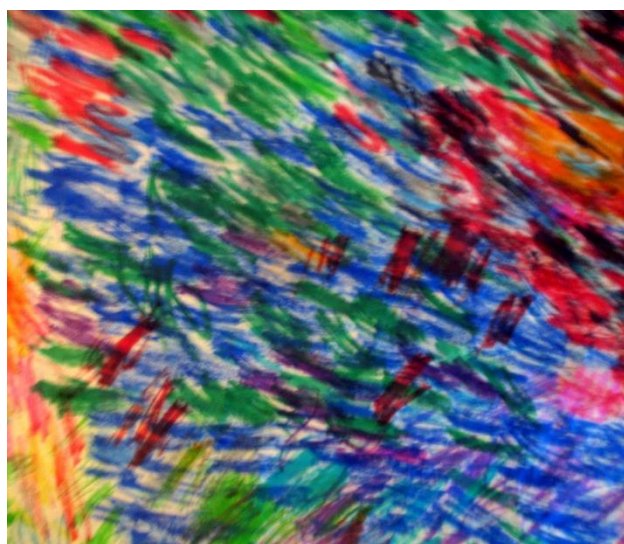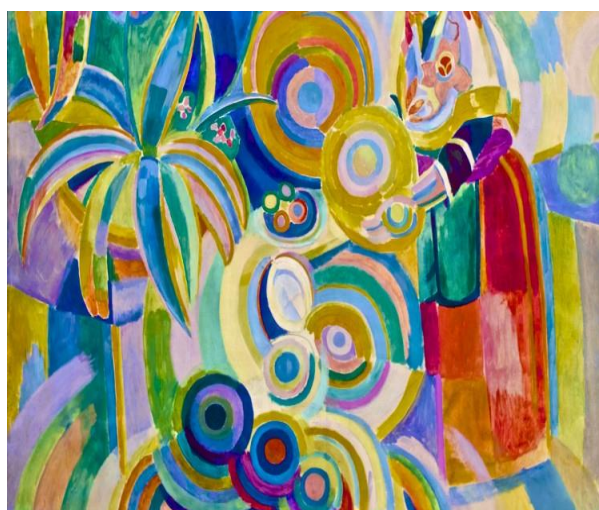
A typical setup of a Convenience Store

Classroom Observation

To get some basic ideas about autism spectrum disorder, I also participated in and observed a classroom experience at Backyard Players and Friends with 38 children who have ASD. I observed that they love colors, and they love to draw and paint. Since autism spectrum disorder makes a person overwhelmed and isolated, they couldn't make eye contact with me on the first day. But during my second trip, they were able to recognize me and acted very friendly. Most of those children love video games. Some of them also experienced VR environments with their parents.

Artworks by Children at Backyard Players and Friends

Platform

To implement my plan, I had to choose a platform. I had experience in both platforms- Unreal Engine and Unity. But compared to Unity, Unreal Engine offers the user a limited option to design. However, the game engine platform Unity offers a user the following options.

- Free to use.

- One of the best things about Unity is that it has a great community that provides many useful resources for users of all levels of experience.

- Cross-platform, which means that one can develop a game for his/her dream platform.

- Unity is a capable game engine providing all the features needed for creating a 2D or 3D game, such as physics, lighting, and sounds.

- Unity has a large store where users can buy or get assets for free.

Therefore, I decided to develop my project on the Unity game engine platform.

My Project on Unity

Character

The game is through a first-person perspective where the user plays as the main character. But to make it interactive another character was needed. Another character gives one the target and the purpose of a game. Therefore, I created a character in the game named Russell.

The character Russell is a 12-year-old kid, who has autism spectrum disorder. Milk is his favorite drink whereas chips and sandwiches are his favorite foods. He loves candies. But his mom doesn't allow him to eat candies frequently. He loves wild animals. Disney World is Russell's favorite place to go.
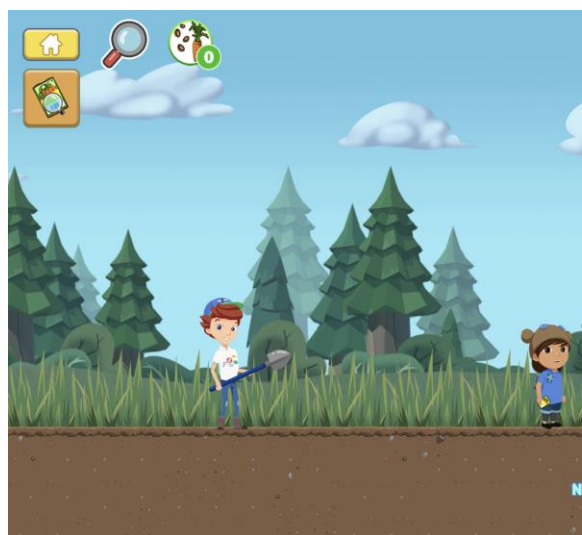
In this game, the character gives the user a task. After completing the task, the user would be rewarded.

Plot

This is the first time I wrote a narrative for a game. I didn't know where to start. But Professor Cox suggested watching the 2D games - PBS Kids. Meanwhile, my friend Abby Brooks helped me to finalize the target of the game.

2D Game- PBS Kids

The first scene starts with the name of the game *Grocery Shop with Russell*. It is a welcoming scene that greets the user with a piece of music. In the second scene the character of the game Russell, who is waiting for the user outside of a convenience store, welcomes you. After introducing himself, he explains the task that was given by his mother. The conversation is as follows.

Hi, I am Russell. I am 12 years old, and I have autism spectrum disorder. My mom has given me a task. She asked me to buy these three products from the grocery store- milk, chips, and a clod sandwich. If I can purchase at least one product, my mom would reward me with my favorite candy. If I can buy two products, she would reward me by taking me to the

zoo. And if I successfully purchase all three products, she promised to take me to Disney World. Would you like to help me? Let's go inside.

Throughout the conversation, Russell gives a user the target of the game. By saying Let's go inside, he encourages the user to play the game. Which is the interactive part.

Part 3

Game Development

2D Modeling

To get an idea that how the store would look like in Unity, I sketched the typical store environment by comparing the picture I took from a Convenience store. I used the graphic editor app Procreate to sketch.
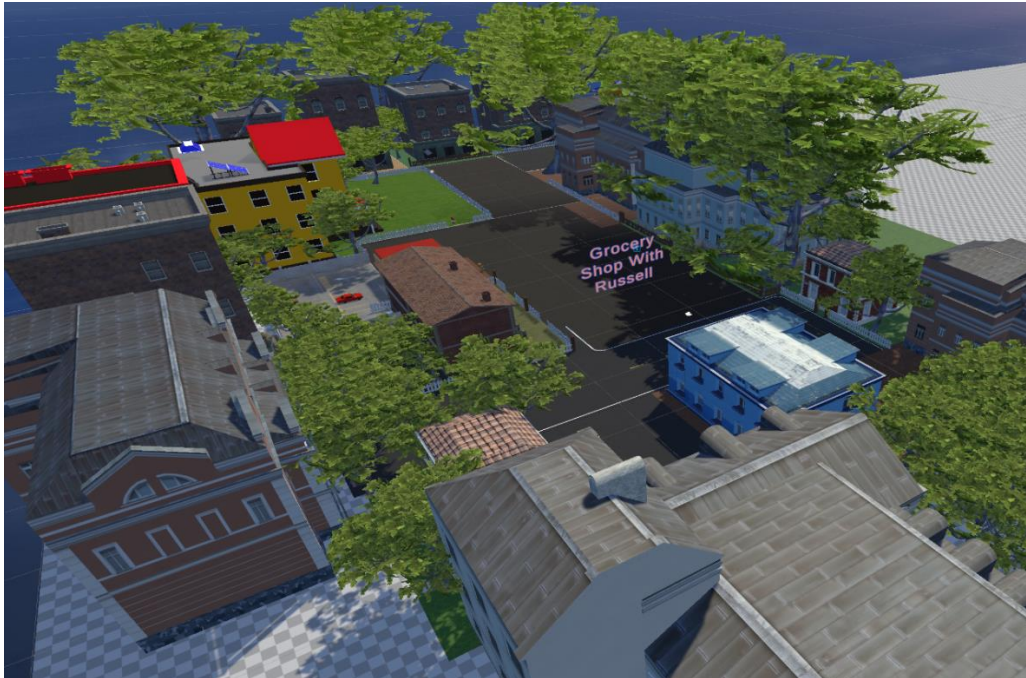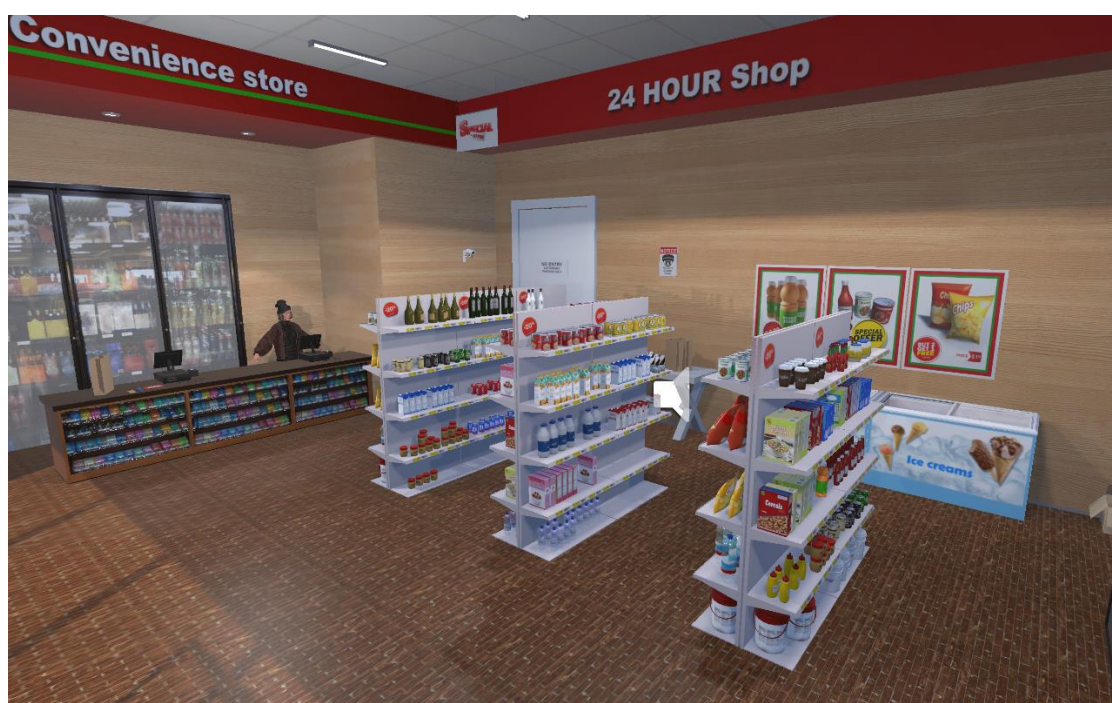
Unity

After creating my Terrain and fixing my First-Person Controller, I started downloading my assets from Unity Asset Store. I found the skybox, houses, trees, and some basic objects in Unity Asset Store.
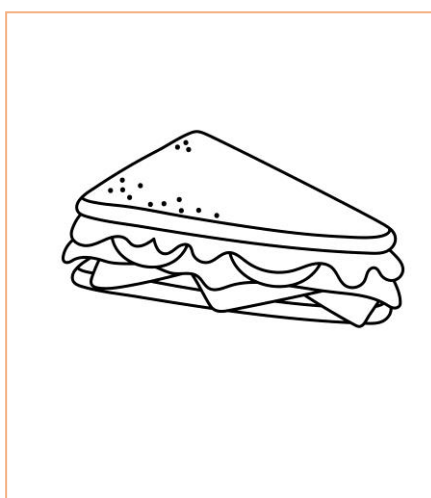
3D Modeling

I couldn't find the game character and the target objects- milk, chips, and cold sandwiches. Therefore, I decided to create my assets. I used reference images to design and model those 3D objects in Blender. Blender is a 3D modeling platform that allows a designer to sketch in 2D and then develop 3D models. I followed the tutorial to learn about developing 3D models.
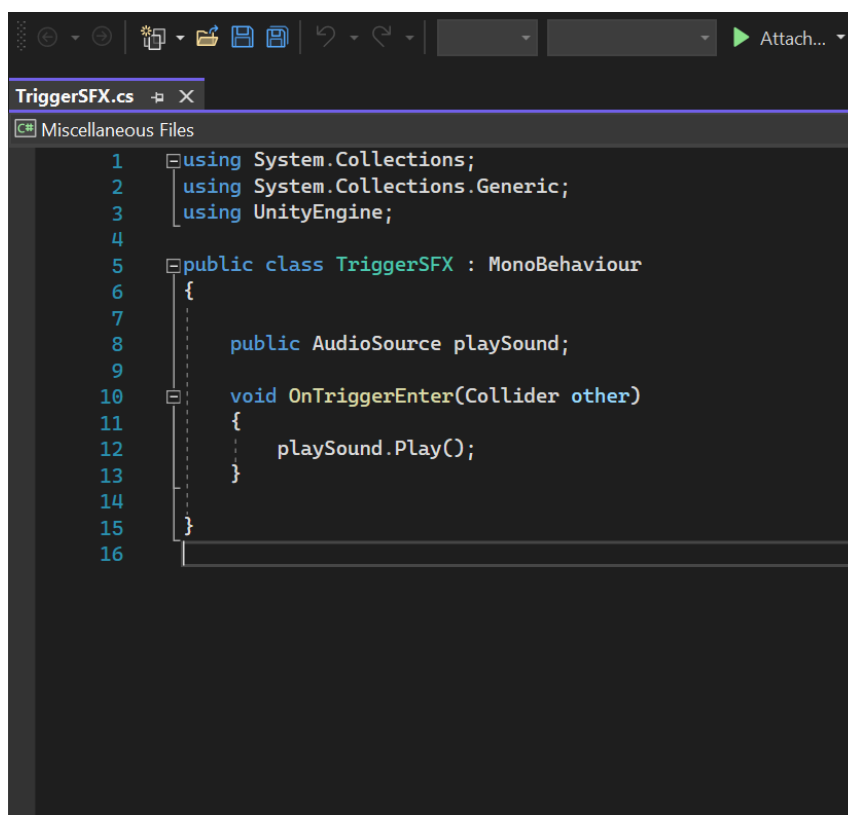
Creating Russell

Audio Trigger

Unity offers you to add multiple audios in the game environment by using Audio Source (Game Object> Audio Source). But the problem is if one uses multiple sources, the game engine platform doesn't allow him/her to control those audios. What I meant; those audios would keep playing and would overlap. Since I had a narrative plot and I had three different scenes where I wanted to play audio, I had to come up with a plan. I followed the tutorials and learned how to trigger audio in Unity. After that, I wrote my script on C# and set three different points where the first person (the user) would trigger, and the audio would play. The triggering points were the first scene (Grocery Shop with Russell), the task point (welcome speech by Russell), and entering the grocery shop (Welcome).

```csharp
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class TriggerSFX : MonoBehaviour
{

    public AudioSource playSound;

    void OnTriggerEnter(Collider other)
    {
        playSound.Play();
    }

}
```

Scripting for Triggering Audio

Triggering Steps

Here are the steps on how to trigger audio in Unity.

Step 1
GameObject > Create Empty > Rename (Sound)

Step 2
Drag your audio inside the newly created and renamed Sound folder.

Step 3

Drag the Sound folder inside FirstPersonController

Step 4
GameObject> 3D Object> Cube> Rename the Cube (Trigger)

Step 5

Right Click Your Mouse> Create> C# >Rename (TriggerSFX)> Paste the following code-

```
using System.Collections;

using System.Collections.Generic;

using UnityEngine;

public class TriggerSFX: MonoBehaviour

{

public AudioSource playSound;

void OnTriggerEnter(Collider other)

{
playSound.Play();
}

}
```

Drag the TriggerSFX script inside the Trigger folder.

Click Trigger> Check Box Collider> Check "Is Trigger".

Drag your Sound folder and paste it into TriggerSFX (under Box Collider) "Play Sound" space.

Double Click Sound Folder> uncheck "Play on Awake" under Audio Source.

Oculus Development

After developing my design, I downloaded the Oculus app from Unity Asset Store. In order to connect it with Oculus Headset, I had to import my Unity project. In my build settings, I had to switch my platform from Mac to Windows. With the help of Professor Stojanov, I was able to do it. But the problem is it wasn't connecting to the Oculus Rift. Or more accurately, we couldn't see anything through Oculus Rift. So, Professor Cox changed the camera from First Person Controller to Oculus Camera. And it worked. To use the controller, we had to drag the controller option from the asset to the project.

Final Production

To see the final production (Prototype), please click the link.

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Part 4

Closing Statement

Limitations

This kind of game requires time and human resources to develop. I tried to cover everything such as 3D modeling, designing, and coding in a very short period. The only thing I couldn't make it is how to trigger an object. Meanwhile, it is a speculative prototype. Therefore, can't tell how it is going to work on children with autism spectrum disorder. However, I shared this prototype with some VR and ASD experts and received some initial feedback from VR and ASD experts about this project design. The experts that I shared the prototype with said that it makes strong use of holding focus using details where details for needed and it is a great example of a "social story" which is a narrative aid for helping ASD process new experiences. However, given that this is a speculative prototype, ultimately, I would like to share this prototype with kids with ASD in order to see if the game's design choices informed by the literature review are meaningful. I hope this entertainment-oriented game would be able to help young people with ASD to feel less isolated in unfamiliar environments.

Reflection

I have gathered a whole new experience throughout the project. Every step was very challenging. I always thought I knew everything about Unity, I knew everything about design. But this project taught me how limited my knowledge was.

I can't express how frustrated I was when I kept failing to write my programming script for triggering audio. At one point, I decided to quit. It took four and a half hours to write a successful script. But when I succeeded, the feeling was heavenly. Now doing research and writing programing language is one of my favorite tasks.

There were limitations but I was able to develop what I wanted. I have learned a lot throughout this project that I am proud of.

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I would like to thank all my collaborators who helped me throughout the journey.

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