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COSC 729 Virtual Reality and its Applications

Project Title: Side Effects

Assignment Due: May 5th, 2021

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Contents

- Goals and objectives
- Modeling
- Functionalities
- Avatar behaviors
- Conclusion
- References



Goals and Objectives

1.1 Introduction

- My anticipated project is to build a first-person shooter game called Side Effects. Side Effects is a first-person shooter game with a psychological horror-infected theme implemented to it.
- The main idea behind the game is that several years after receiving the COVID-19 vaccination, patients will either turn into infected like zombies or will have serious side effects which will make them hallucinate.
- The main character will be a nurse that will have hallucinogenic attacks throughout the game.
- The goal of the game will be to cure these infected patients using a vaccine that utilizes DNA synthesis technology to cure these patients.
- One of the objectives of the game is to survive and find more doses of the vaccine in the asylum.
- Most of this game module is built in Unity and 3ds Max.

1.2 Target Audience

- The main target audience are gamers who are craving for a psychological horror game. Currently there are not many videogames in the market which have a psychological horror theme implemented to them.
- Companies like Xbox game studios, Amazon Lua, Google Stadia (when it existed), and Steam are actively seeking independent developers to make video games like these for their platforms and implementing a VR capability to them increases their market value since there are not many horror games (especially psychological horror games) in the market which have a VR capability associated to them.

1.3 Application Usefulness

- Currently this game is in its pre-alpha state, so there are not many puzzle solving features implemented to the game. In the future more puzzle solving features will be added which will improve the players problem solving skills.
- The players playing this game will also gain knowledge about DNA synthesis and gene therapy which are two new evolving fields in the field of genetics.



Modeling

2.1 Planned Geometry

- Assets such as battery, ammo and health pickups were modeled in 3ds Max. Other assets such as NPCs, infected zombies, syringe, boxes, and the asylum itself and its assets were imported from websites such as CG trader and Turbosquid, and most of these models were either scaled down or up on 3ds Max. The environment and the terrain were built inside the Unity Engine. Figures on the next few slides describe the building of these assets.

2.1 Planned Geometry

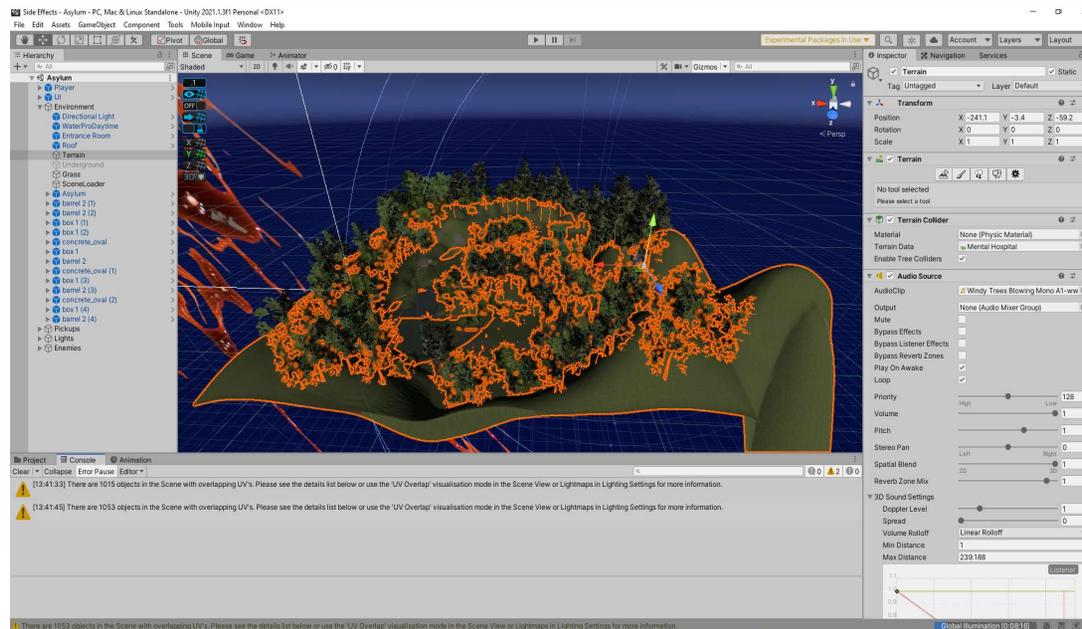


Figure 1: Terrain and Environment building inside Unity

2.1 Planned Geometry

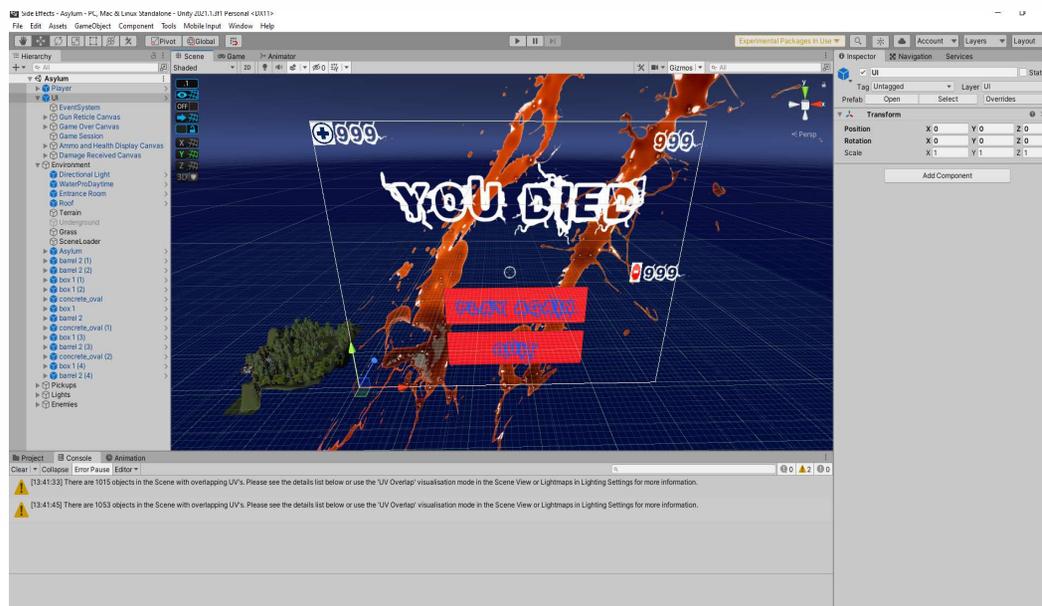


Figure 2: The building of UI canvas in Unity

2.1 Planned Geometry

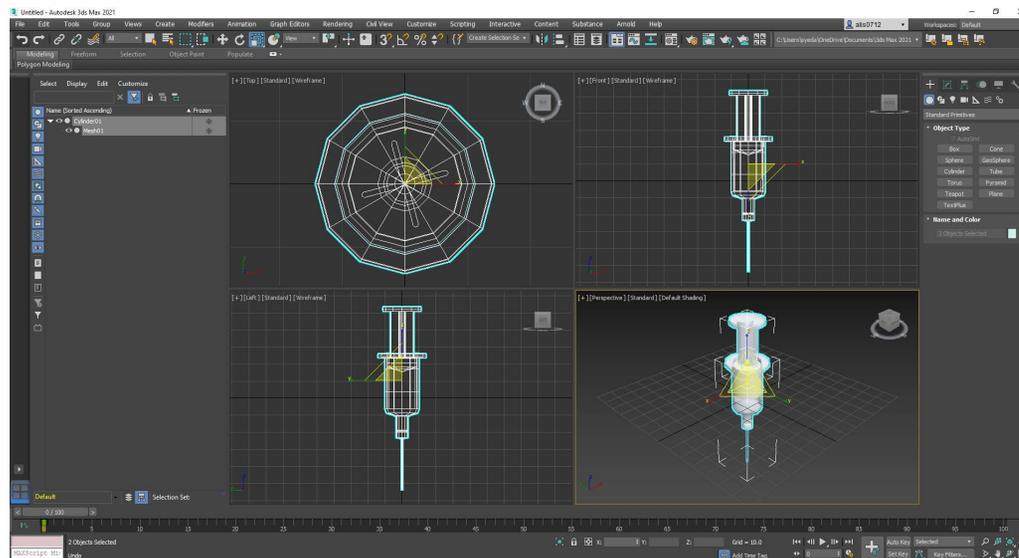


Figure 3: Syringe Model imported from turbosquid and scaled down in 3ds Max

2.1 Planned Geometry

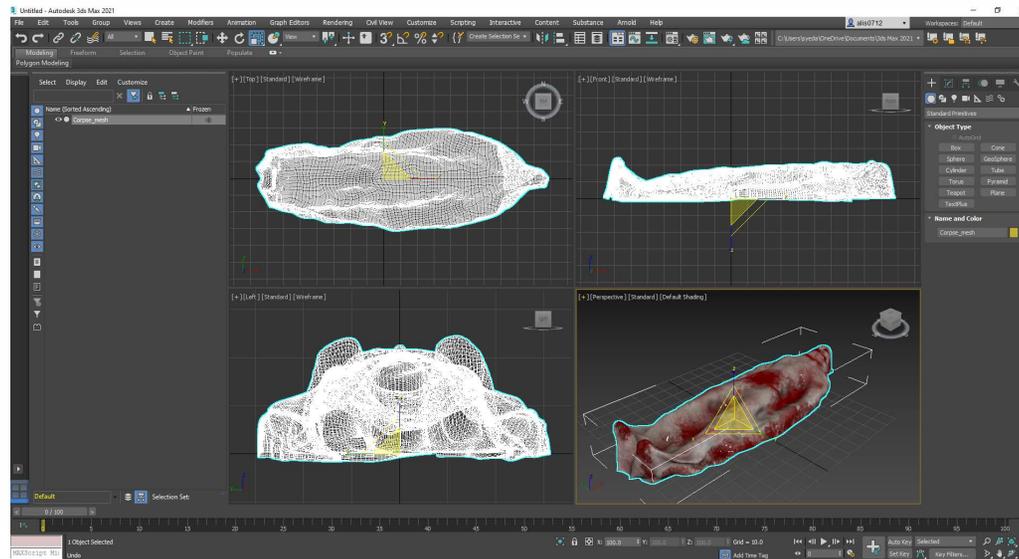


Figure 4: Corpse Model imported from CG trader and scaled down in 3ds Max.

2.1 Planned Geometry

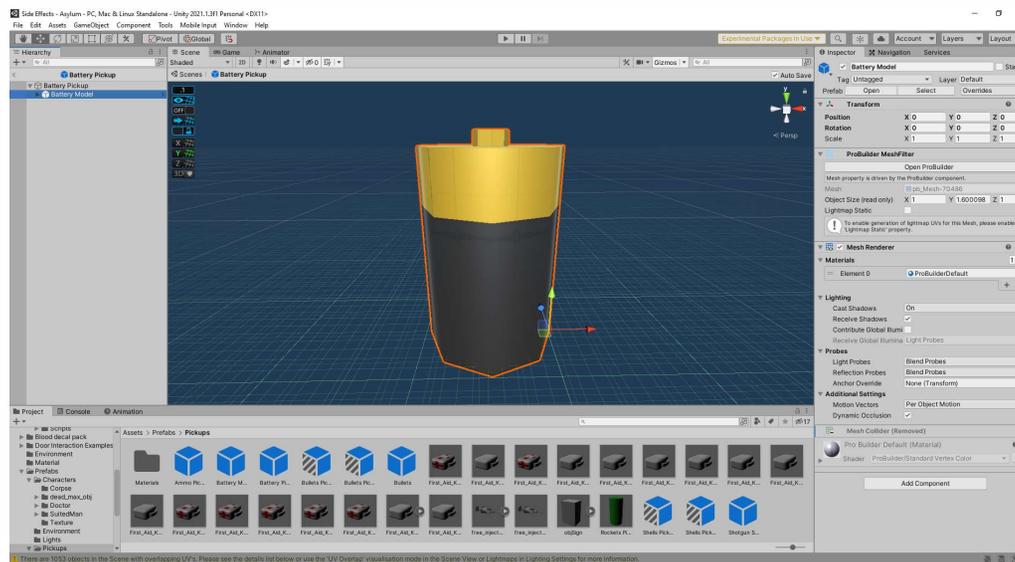


Figure 5: Applying textures to the battery model initially made in 3ds Max.

2.1 Planned Geometry



Figure 6: Zombie asset imported from Unity asset store. The figure shows implementation of Nav mesh agent, animator controller, and capsule collider.

2.2 Application Usage

- As described in section 1.2, the main target audience are gamers. As the game begins, the player will have to navigate through the terrain and enter an abandoned asylum. Inside the asylum the goal of the player will be to navigate around the asylum and find more doses of the vaccine that will cure the infected.
- The player will be given a limited amount of vaccine initially when starting the game and will have to be careful when using it, inventory management will play a key factor when navigating through the terrain and asylum.
- There is a score counter implemented in the game which will let the player know how many infected have been treated. The player will also have a choice to shoot the infected, however, if the player decides to do so, the score will not be updated. Figures on the next few slides describe the game mechanics.

2.2 Application Usage

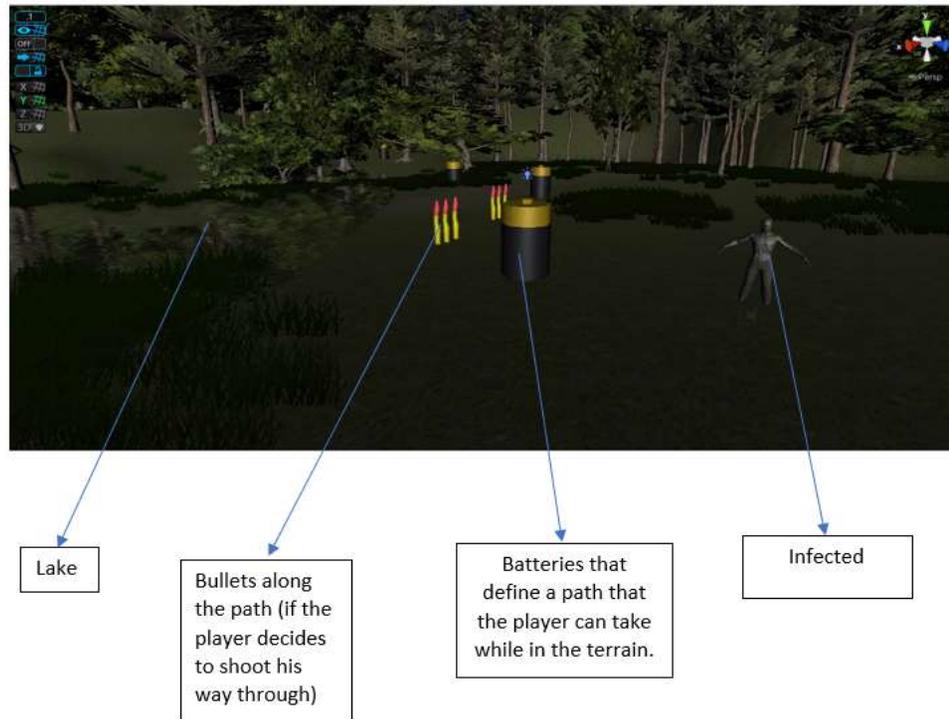


Figure 7: A figure describing the path the player undertakes while in the terrain

2.2 Application Usage

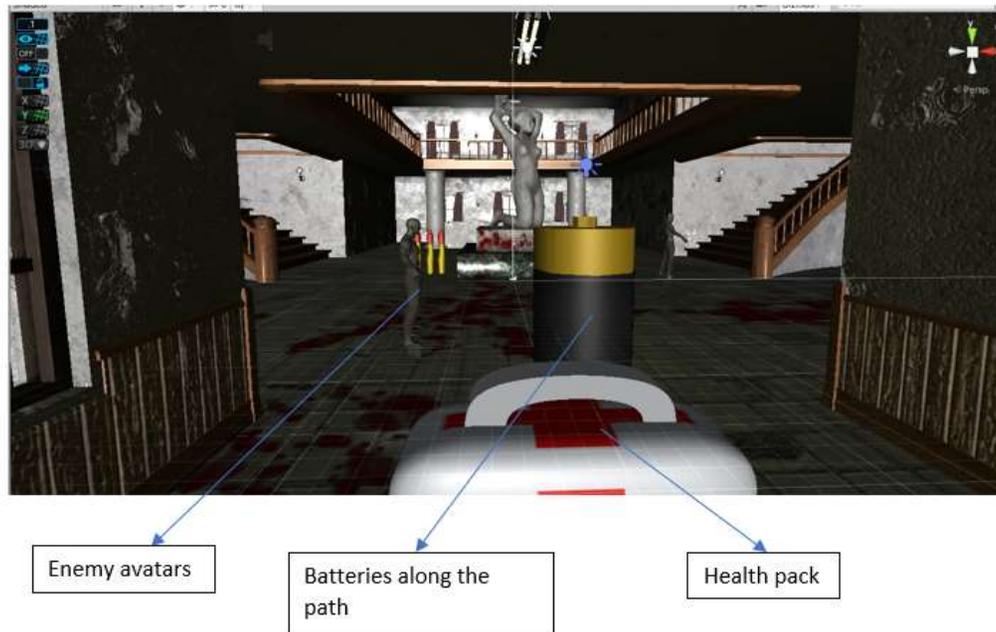


Figure 8: A figure describing the path the player undertakes while in the asylum. Health packs and batteries are added along the path to gain health and luminosity.

2.2 Application Usage

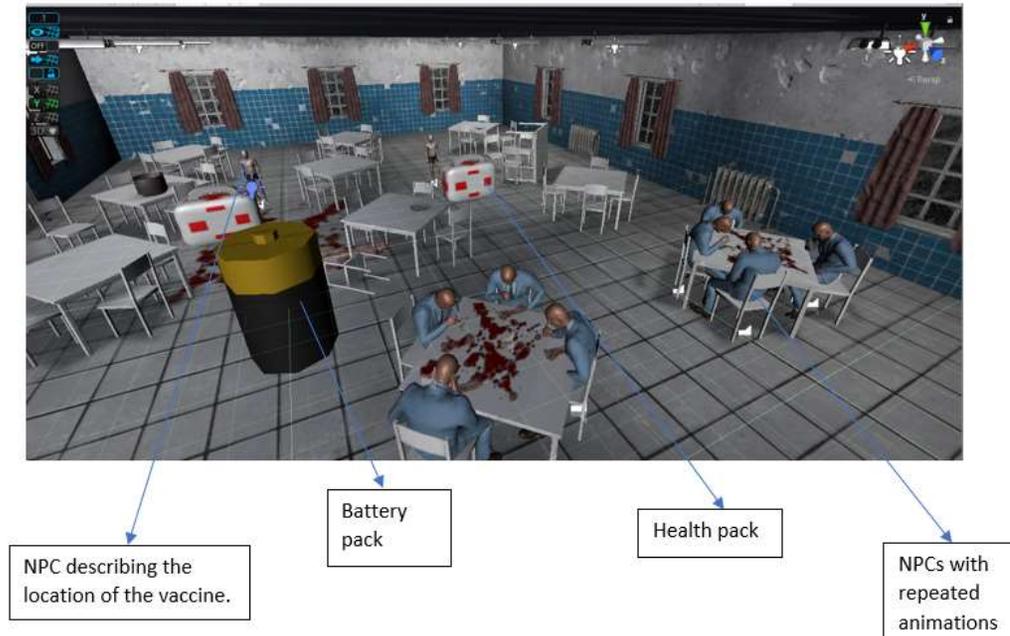


Figure 9: A figure describing the path the player undertakes while in the asylum. The player will meet an NPC which will guide him to the location of the vaccine.

2.3 Programming



- Several programs were written in C# which provided specific competences within the game.
- The list of programs created are provided below:
 - Ammo
 - AmmoPickup
 - AmmoType
 - AsylumInside
 - BatteryPickup
 - DeathHandler
 - DisplayDamage
 - DoorScript
 - EnemyAI
 - EnemyAttack
 - EnemyHealth
 - FlashLight
 - HealthPickup
 - Move
 - PlayerHealth
 - SceneChanger
 - SceneLoader
 - SyringePickup
 - TerrainSounds
 - Weapon
 - WeaponSwitcher

2.3 Programming



```
6 public class WeaponSwitcher : MonoBehaviour
7 {
8     [SerializeField] int currentWeapon = 0;
9     // Start is called before the first frame update
10    void Start()
11    {
12        SetWeaponActive();
13    }
14
15    // Update is called once per frame
16    void Update()
17    {
18        int previousWeapon = currentWeapon;
19        ProcessKeyInput();
20        ProcessScrollWheel();
21
22        if(previousWeapon != currentWeapon)
23        {
24            SetWeaponActive();
25        }
26    }
27
28
29    private void ProcessScrollWheel()
30    {
31        if(Input.GetAxis("Mouse ScrollWheel") < 0)
32        {
33            if (currentWeapon >= transform.childCount - 1)
34            {
35                currentWeapon = 0;
36            }
37            else
38            {
39                currentWeapon++;
40            }
41        }
42
43        if (Input.GetAxis("Mouse ScrollWheel") > 0)
```

Figure 10: A figure describing the WeaponSwitcher C# program.

2.3 Programming

```
7 public class Weapon : MonoBehaviour
8 {
9     [SerializeField] Camera FPCamera;
10    [SerializeField] float range = 100f;
11    [SerializeField] float damage = 30f;
12    [SerializeField] ParticleSystem muzzleFlash;
13    [SerializeField] GameObject hitEffect;
14    [SerializeField] Ammo ammoSlot;
15    [SerializeField] AmmoType ammoType;
16    [SerializeField] float timeBetweenShots = 0.5f;
17    [SerializeField] TextMeshProUGUI ammoText;
18
19    bool canShoot = true;
20    AudioSource shootingSound;
21
22    @ Unity Message | 0 references
23    void Start()
24    {
25        shootingSound = GetComponent<AudioSource>();
26    }
27
28    @ Unity Message | 0 references
29    private void OnEnable()
30    {
31        canShoot = true;
32    }
33
34    @ Unity Message | 0 references
35    void Update()
36    {
37        DisplayAmmo();
38        if (Input.GetMouseButtonDown(0) && canShoot == true)
39        {
40            StartCoroutine(Shoot());
41            shootingSound.Play();
42            if (ammoSlot.GetCurrentAmmo(ammoType) == 0)
43            {
44                shootingSound.Stop();
45            }
46        }
47    }
48
49    1 reference
50    private void DisplayAmmo()
51    {
```

Figure 11: A figure describing the Weapon C# program.



Functionalities

3.1 Vision

• There were several key functionalities added to the game that allows the player to feel more immersed into the environment and they are provided below:

In terms of vision the game has the following features:

- Terrain with grass, trees, and hills
- Abandoned Asylum
- Abandoned health containers
- Ammo placements
- Battery placements
- Syringe placements
- Infected Avatars
- NPC Avatars
- First person character with a syringe/weapon

3.1 Vision

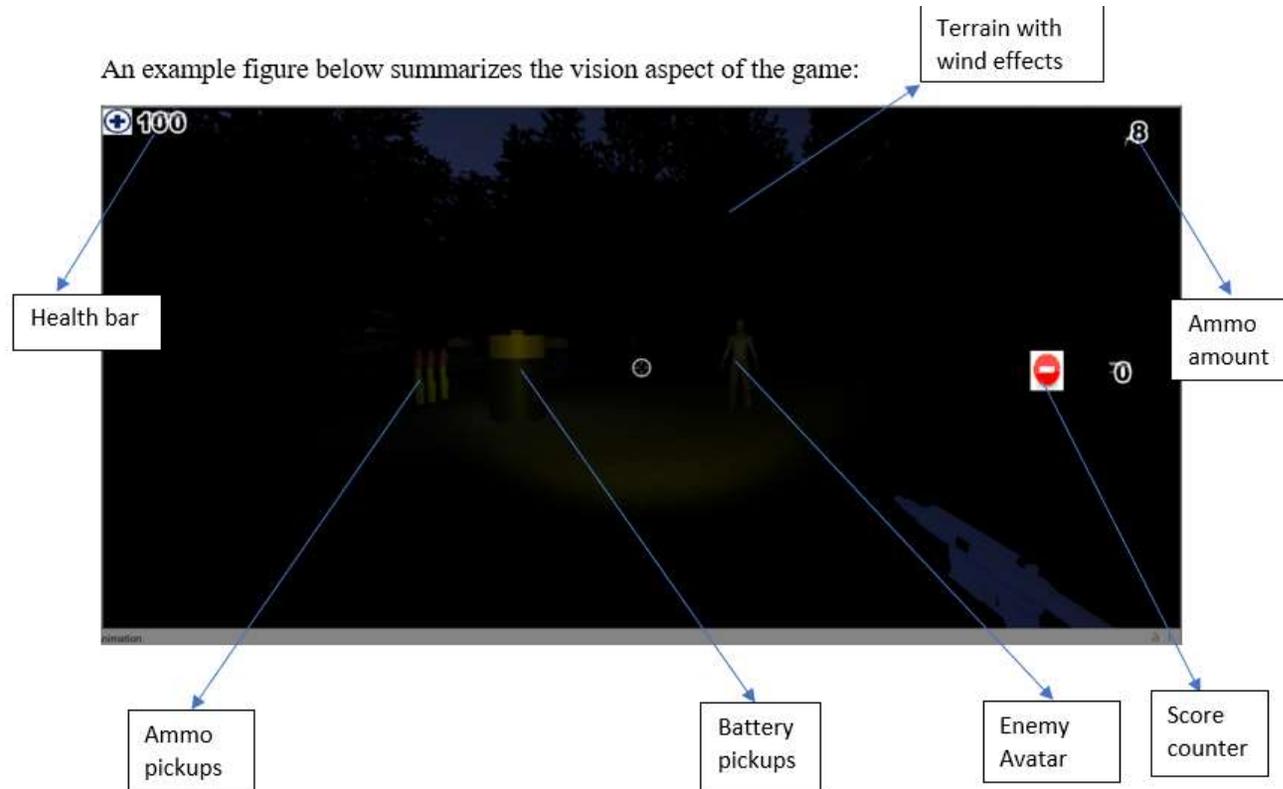


Figure 12: Example screenshot obtained upon play mode.

3.2 Sound



- There is an eerie music playing in the background while in the asylum and in the terrain along with sounds of winds, lake, grass, and random hallucinogenic sounds.
- The weapons or syringe have their own sound effect implemented to them, and they are played upon firing. The infected avatars have their own sound effects such as howling or growling when they find the player. There are footstep sounds in the terrain and the asylum.

3.2 Sound

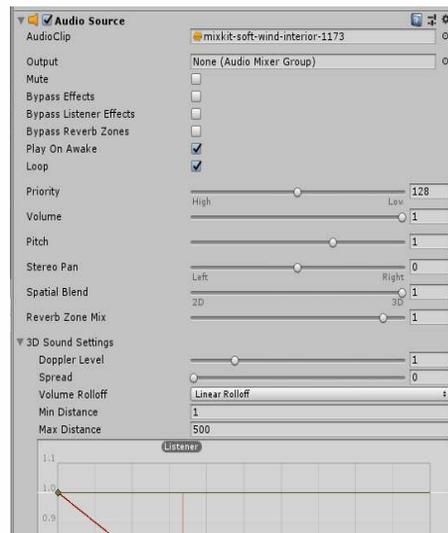


Figure 13: An example of an audio source added to the terrain.

3.3 Animation

- There are animations associated to the enemy avatar along with several NPCs. The enemy avatars have an idle, walk, and attack animations as provided in the figure below. The NPCs animations range from terrified to eating.
- There are animations associated to the terrain itself such as moving of the trees, grass, etc. When the player approaches a door there is a door opening animation.

3.3 Animation Path

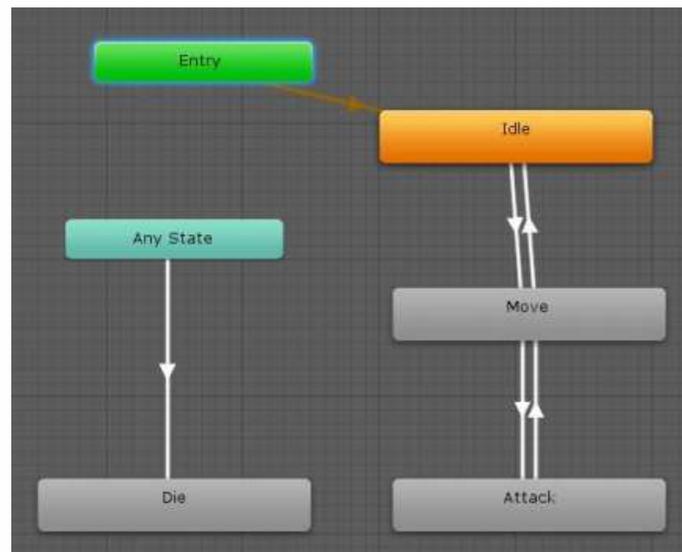


Figure 14: Animation path for zombie avatar

3.3 Animation



Figure 15: Attack animation from the zombie avatar along with NPC's terrified animation. The speaker around the avatars verify that a sound effect is implemented to it.

3.4 Interactivity

- There are several trigger events in the game. When the player approaches close to the asylum door it transitions the player from the terrain environment to the asylum. Similarly, there are triggers placed in the asylum and the terrain which upon entering produces footstep sounds.
- Also, when the player attacks the enemy avatar, it will cause the enemy avatar to come towards the player. Similarly, when the player is within the proximity AI of the infected avatar, it triggers the infected to come towards the player.
- When the player dies, it triggers a game over scene and will prompt the player to restart the game or exit the game.
- Also, when the player picks up a battery, it triggers the flashlight luminosity to increase in value and angle. Likewise, when the player's approaches close to one of the NPCs in the mess hall or cinema room it triggers a voice that guides the player. Examples of triggers are given on the next slide:

3.4 Interactivity

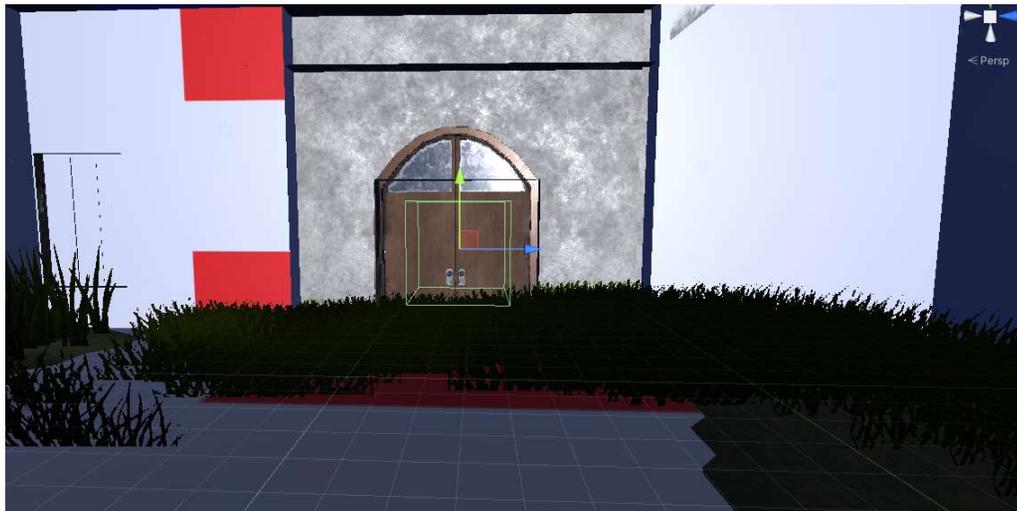


Figure 16: An example of a trigger event that upon entering changes the scene from the terrain to the asylum.

3.5 Sensor

- There are several sensors in the game. The infected avatar has a proximity AI associated to them which are constrained to a radius, and so when the player comes closer to that radius, it triggers the infected to come towards the player.
- There are proximity sensors around the pickups, so when the player approaches close to the pickups it destroys the gameobject notifying the player that they have indeed picked up something. Also, the flashlight's luminosity reduces overtime which will notify the player to pickup more batteries to maintain the flashlight's radiance.

3.5 Sensor



Figure 17: The player's flashlight decreases overtime.

3.6 Avatars

- There are several avatars in the game which include infected avatars along with NPCs with different animations.
- When the player approaches one of the NPC avatars in the mess hall and cinema hall, and presses the T key on the keyboard, the NPC provides guidance on where the player needs to go next.

3.6 Avatars



Pressing the T-key
on this avatar will
guide the player

NPCs avatar with
repeated animations

Figure 18: Avatar with animations. Pressing the T-key on one of the avatars guides the player.

Avatar Behaviors

4. Avatar Behaviors

- The enemy avatar's behavior ranges from idle to attack. When they are either provoked or when the player is within the proximity AI their behavior changes from idle to move to attack if they are close to the player.
- Likewise, for the NPCs the behaviors range from terrified to eating. They are several NPCs who are terrified and are screaming and shouting. There are several who are in pain or are hallucinating, and lastly there are several NPCs who are viciously eating.



Conclusion

6. Conclusion

- As mentioned in slide 4, this game module is currently in its pre-alpha state. There is still a lot more work that needs to be done. I am hoping to implement more sensory features such as flashing of the health bar when the player's health approaches close to zero or the flashing of the ammo bar, when the bullets or the doses reach close to zero.
- I am also hoping to improve the overall graphics of the game (if it is possible in Unity) to make it more interesting and real. There will be puzzle elements in the game that will enhance the player's problem-solving capabilities, along with information pertaining to genetics, microbiology, and DNA synthesis. I am also hoping to implement a cutscene at several points in the game to make it more interactive and entertaining.
- As discussed in slide 5, currently there are not many games in the market that have a psychological horror theme implemented to them, and it is a rarity when it comes to implementing VR capability to these genres of videogames, which is one of the reasons why companies like Xbox game studios are seeking independent developers to help make these genres of games for their platforms.



References

References



Assets:

- <https://www.turbosquid.com/3d-models/aid-kit-fbx-free/622126>
- <https://www.turbosquid.com/3d-models/3d-model-pharmacy-sign-1174966>
- <https://www.turbosquid.com/3d-models/corpse-creepiness-model-1540195>
- <https://www.turbosquid.com/3d-models/scanned-man-surgical-doctor-3d-model-1624551>
- <https://www.turbosquid.com/3d-models/3d-character-medical-worker-uniform-model-1703700>
- <https://www.turbosquid.com/3d-models/3d-packed-meat-model-1486220>
- <https://www.turbosquid.com/3d-models/cartoon-injector-3ds-free/411969>
- <https://www.turbosquid.com/3d-models/syringe-c4d-free/505091>
- <https://www.turbosquid.com/3d-models/victim-patient-obj-free/834793>
- <https://assetstore.unity.com/packages/3d/characters/humanoids/zombie-30232>
- <https://www.cgtrader.com/free-3d-models/interior/hall/asylum-hallway>

Animations:

- <https://www.mixamo.com/#/>

Code:

- <https://answers.unity.com/questions/938221/basic-enemy-ai-in-c.html>
- <https://docs.unity3d.com/ScriptReference/SceneManagement.SceneManager.LoadScene.html>
- <https://forum.unity.com/threads/ammo-pick-up.253459/>
- <https://answers.unity.com/questions/589666/how-to-switch-weaponsc.html>
- <https://answers.unity.com/questions/977751/how-to-make-a-flashlight-toggleable-in-c.html>
- <https://learn.unity.com/tutorial/let-s-try-shooting-with-raycasts>