Deliverable F
Prototype I and Customer Feedback

Team F13

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Abstract

In Prototype I, the team began to develop some initial necessary components of the experience. The interactive features – including picking up objects, moving around, and pressing buttons – has been created and were functioning properly during testing, The initial screen and menu was also created which will be the user's first exposure to the experience. Testing of Prototype I was completed and the results of testing show that all elements are working as they should. In Prototype II, the team will focus on creating the environments and animated features in the experience.

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1. Introduction

In Client Meeting 2, the client was presented with the preliminary design for the virtual reality experience. The team explained how the various aspects of the design – storyboard, environment, and user interface - will come together to deliver the intended message. With the feedback received from the client, Prototype I was developed. The focus of Prototype I was to create the initial screen and the menu, and to start development of the environment and interactive functions. A prototype testing plan is outlined to reference throughout the next design stages until the final product is prepared.

2. Customer Feedback

In client meeting 2, the client expressed positive feedback for the suggest virtual reality experience. The client stated that they appreciate our depiction of the autonomous killer robots in a policing scenario. While no major changes were recommended, some minor suggestions were made that the team will look in to implementing to improve the relatability and message of the experience.

The feedback received included:

- The initial radio broadcast could include an interview with the chief of police of the fictitious city. The police chief can be explaining what the autonomous robots will be used for, how they will be implemented across the city, and why this is being done. The police chief can state how the robots have been used in warfare and are now being transitioned to policing.
- In the office scene, posters can be hanging from the walls of the cubicle that support human rights movements, safe policing, and other similar movements.
- During the attack scene, consider shifting to the robot's perspective to show what the robot is confused by and how the algorithm is malfunctioning.
- The final radio broadcast could be a second interview with the chief of police. The chief can be explaining what went wrong, where the breakdown in the system occurred, and how the issues will be handled.

3. Prototype I

3.1 Storyboard

Using the feedback from Client meeting 2, our team decided to remove the car scene and transfer the radio segment to the preceding scene. This will give us more time to focus on the more important elements of the project.

3.2 Environment

For the environment, we have started of on the first scene of the experience: the office. We have worked with the asset and testing has been done with the interactive elements around the office. The main menu is surrounded by its own environment. The house asset included in the Bill of Materials in Deliverable E is no longer available, a new asset will need to be chosen for the front yard scenes.

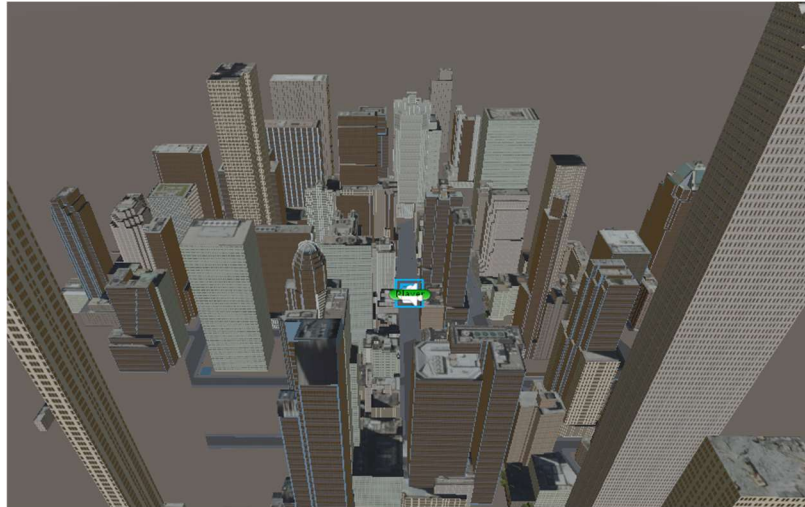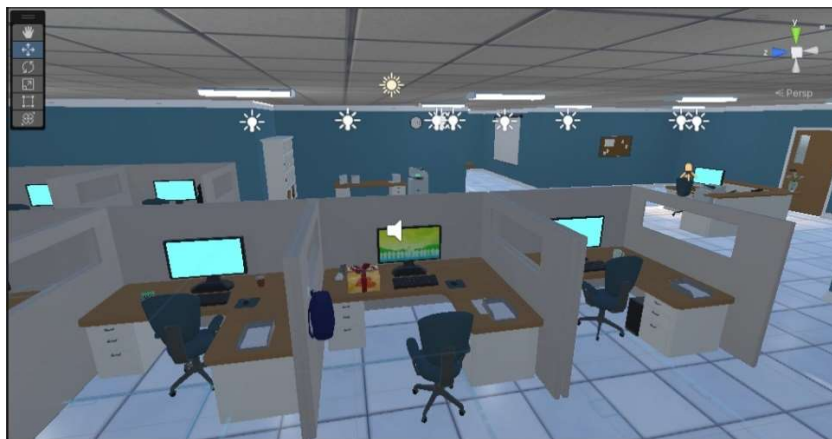*Figure 1: The city environment in which the menu is located.*

Figure 2: View of the user's office desk and the rest of the office.

Figure 3: Image of user's desk including the birthday present and Stop Killer Robots image on screen saver.

The gift is interactable using the *Interactable*, *Throwable*, *Rigid Body*, and *Collider* scripts and components that are built-in to Unity and the Steam VR plug-in. The photo on the desktop was obtained from stopkillerrobots.org website and was inserted as an asset and attached to a plane fit onto the monitor.

3.3   User Interface

The main menu and its sub-menus have been created. 3 buttons are present on the main menu screen: Start, Tutorial, and Settings. These elements are interactable using the hand controllers. The user can teleport around the menu using the Touchpad on the HTC Vive hand controller. To make the buttons interactable, invisible 3D objects are placed on the buttons to call the interactive element of the button.

Figure 4: The main menu screen.

The Start buttons uses a script that when pressed, changes to the next scene. It uses the *SceneManagement* class and *LoadScene*() to call the next scene to run. The problem with the *LoadScene* command is that there is a small pause between the scenes, and this may cause very minor performance issues.

```
1    using System.Collections;
2    using System.Collections.Generic;
3    using UnityEngine;
4    using UnityEngine.SceneManagement;
5
6    public class MainMenu : MonoBehaviour
7    {
8        public void Start()
9        {
10           SceneManager.LoadScene("Office");
11       }
12   }
```

Figure 5: Script for the Start button using the SceneManager to load the Office scene.

The Tutorial image uses the interaction of the player with the 3D object to make the tutorial image appear. When this button is clicked, if opened, the Settings page will close before the tutorial image appears.
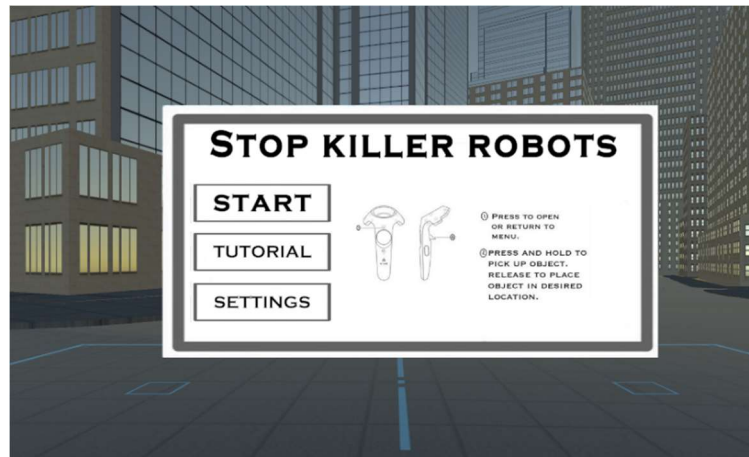

Figure 5: The tutorial menu

The Settings menu includes a volume slider, a button to turn on or off the menu music, and a drop-down menu for language preference. None of these elements are currently functional, they will be refined and completed in future prototypes. The interactivity of the button is once again dependent of a 3D cube on the button with which the user presses to activate the menu.
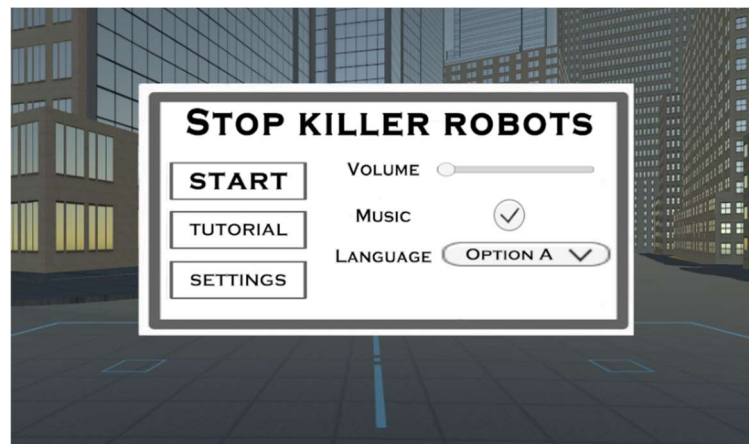

Figure 6: The settings menu with all its options.

4. Bill of Materials

An updated bill of materials can be seen in Table 4.1. From Deliverable E, the cemetery background and present assets have been added, the car asset has been removed, and the NPC Characters has been combined with the Character Animations.

Bill of Materials

Bill of Materials					
Item Number	Item Description	URL	Quantity	Unit Price ($)	Extended Price
1	Steam VR	https://store.steampowe	1	$ -	$ -
2	Unity	https://unity.com/	1	$ -	$ -
3	HTC Vive (VR Headset)	https://www.amazon.ca/	1	$ -	$ -
4	Computer/Laptop		1	$ -	$ -
5	Office Background	https://assetstore.unity.c	1	$ 10.00	$ 10.00
6	Home Background		1	$ 5.00	$ 5.00
7	Cemetary Background	https://assetstore.unity.c	1	$ 9.90	$ 9.90
8	Patrol Drone	https://assetstore.unity.c	1	$ -	$ -
9	Autonomous Weapon	https://assetstore.unity.c	1	$ 4.99	$ 4.99
10	Characters and Animations	https://learn.unity.com/t	N/A	$ -	$ -
11	Animations 2	https://www.mixamo.co	1	$ -	$ -
12	Screaming Audio		1	$ -	$ -
13	Party Audio	https://assetstore.unity.c	1	$ -	$ -
14	Machine Gun Audio		1	$ -	$ -
15	Present Asset	https://assetstore.unity.c	1	$ -	$ -
				Total	$ 29.89

5. Prototyping Test Plan

5.1 Testing Summary

Tests conducted for Prototype I are explained in Table 5.1.1. Prototype I consisted of two sets of tests. The objective of test 1 was to confirm that the interactive functions are working – objects can be picked up – and to determine how much area is required to do so. The objective of test 2 was to ensure that the initial user interface is functional – the menu screen was created and buttons on the screen could be pressed to lead to the settings, tutorial, and to start the experience.

Table 5.1.1

Prototype I Test Descriptions

Test ID	Test Objective (Why)	Description of Prototype used and of Basic Test Method (What)	Description of Results to be Recorded and how these results will be used (How)	Estimated Test duration and planned start date (When)
1	Learning how to create interactive elements	Focused Physical, Moving objects: Insert the office asset into the Unity project.	Can objects be picked up? How much space does the user need?	Est. ~ 3 hours Saturday, March 4, 2023

		Add collider component to the floors, walls, and interactable objects. Add rigid body, interactable and throwable script components to the interactable object. Use Steam VR plug-in for built in controls and scripts. Player movement: Create planes where you want the character to be able to move. Add the teleporting script from Steam VR. Add the teleporting area component to the planes you created.		
2	Create the initial user interface	Focused Physical, Interactive user interface: Insert a canvas into any scene. Add panel to the canvas. Add as many buttons as possible, sliders or text as needed. Add UI element component to the buttons. For 'Start' button, create script and use SceneManager.LoadScene("scene name"). Insert script into UI element On Hand Click(). For any other menu button, drag the specific canvas to the respective button On Hand Click() component (ex: Settings canvas to the settings button). Set ActiveBool() to True. Drag other canvas to the component and set ActiveBool() to false. Player movement: Create planes where you want the character to be able to move. Add the teleporting script from Steam VR. Add the teleporting area component to the planes you created.	Can buttons be pressed? How much space does the user need?	Sunday, February 28, 2023 Est. ~ 3 hours

5.2 Summary of Prototyping and Testing

A summary of tests conducted for Prototype I is seen in Table 5.2.1.

Table 5.2.1

Summary of Prototype I Testing

Prototype					Tests		
#	Type	Objective	Fidelity	Feedback	Objective	Result	Time
1	Focused Physical	Interactive Elements (User Interface)	Low	No client/user involved	Picking up Objects	Yes	2 hours March 5, 2023
1	Focused Physical	Menus (User Interface)	Medium	No client/user involved	Pushing Buttons, Scene Transition	Yes	2 hours February 28, 2023
1	Focused Physical	Required Area	Low	No client/user involved	Area Required	1m2	1 hours March 5, 2023

5.3 Testing Results & Comments

A summary of results obtained during testing can be found in Table 5.3.1. The interactive features were all functioning properly during testing. During the tests, we were able to press buttons on the main menu, pick up objects, and move the office chair. During the initial scene, we were also able to move around the city without walking using the controllers to choose a spot to jump to.

Table 5.3.1

Testing Results

Functional Requirement	Measured Value	Target Value	Comment
Interactive	Yes	Yes	The interactive functions tested are functioning
Non-Functional Requirement			
Personalized	No	Yes	Does not meet target value
Constraint			
Required Area	1 m^2	4 m^2	Meets Target Value

6. Prototype II

In Prototype II, the team will focus on the environment and animations. The environment for the front yard scenes and the graveyard scene, as well as the animations for the robot, the player's work colleagues and family, and fake gun will be developed.

7. Conclusion

With the completion of Prototype I, the team is familiarized with the interactive functions of the experience, and the initial user interface has been created. The tests completed to date have been successful, and the team will continue to improve the storyboard, environment, and user interface. In Prototype II, there will be a large focus on developing the environments of multiple scenes, and on developing the animated aspects of the robots and fake guns.