Take the Plunge

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IAT 445 - Immersive Environments
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Introduction

Take the Plunge is a falling simulation that takes place in a desert environment. This simulator hopes to recreate the adrenaline rush associated with high-risk activity in a low risk setting. The environment is composed of 4 towers and jumping off the edge of one tower will bring you to another via fade-to-black teleportaion.. Each tower is a unique design that can be explored with a check point to activate. Activating the checkpoint causes the tower to be illuminated in a coloured light. When all towers have been explored, users have completed our simulation.

Team Members

Adel Ashnaei
Adel provided the textured 3D models for all the towers present in the environment. Each tower contains an animated checkpoint.. He researched visually interesting building and towers in real life and recreated them in Maya. In addition, each tower's checkpoint takes the form of a cube - Adel animated each one. During the final compiling stages, Adel was responsible for adjusting materials and animations in May, exporting each tower and FBX objects, and scripting the Exit scene's sunset and moving stars. . He also provided support in searching for additional 3D assets and audio tracks to add to our environment.
During the VR Showcase on April 14th, 2016 Adel manned the camera and recorded footage of the event at the *Take the Plunge* booth. Following the showcase, he edited all available footage into a comprehensive video summary of our project
(Video is available thorugh the following link: https://youtu.be/bEN4g9YTwjE)

Yu "Rain" Xia
Rain took on the duties of project manager during the final four weeks of the project progress. He headed the time table of internal deadlines for other members and assisted in ensuring design consistency within the simulator. Moreover, he is primarily responsible for all the complex programming present within *Take the Plunge.* Scripting, functionality and project organization fell under his division of work. Rain scripted the first person camera within *Take the Plunge* to face the ground upon jumping from the cliff to emphasize the falling sensation. Moreover, he scripted the box colliders at the base of each tower the triggered the teleportation of the player between towers and the towers to illuminate following a checkpoint activation. Rain input the groundwork for the audio environment for *Take the Plunge* as well and tied the Main Menu, Desert, and Exit scene into a cohesive simulator.

Shannon Tsui
Shannon was the designated team leader and was responsible for providing the necessary hardware for the course (in this case: the Oculus Rift; an adequate PC to run the simulator; and an electric fan for palpable immersion) and maintaining online presence through the team blog. She borrowed assets from Unity's VRSample package to create the main menu and modelled the desert terrain and environment; sandstorm, wind, clouds, lighting. In addition, she assembled the final version of the desert scene by importing Adel's 3D models and Rain's scripts. The animation controllers were implemented at this stage and the corresponding scripts were attached as well. In the final stages, Shannon also assisted in augmenting the audio environment by adding more layers and adjusting volumes, and created the Exit scene based on Adel's existing codes.
During the VR Showcase, Shannon was primarily responsible for introducing users to the simulation, its concept, and assisted them in navigating the virtual space.

Project Details

Project Description

The user begins the simulation at a center tower within the environment. The image below offers a brief look at the layout of our previously mentioned towers.
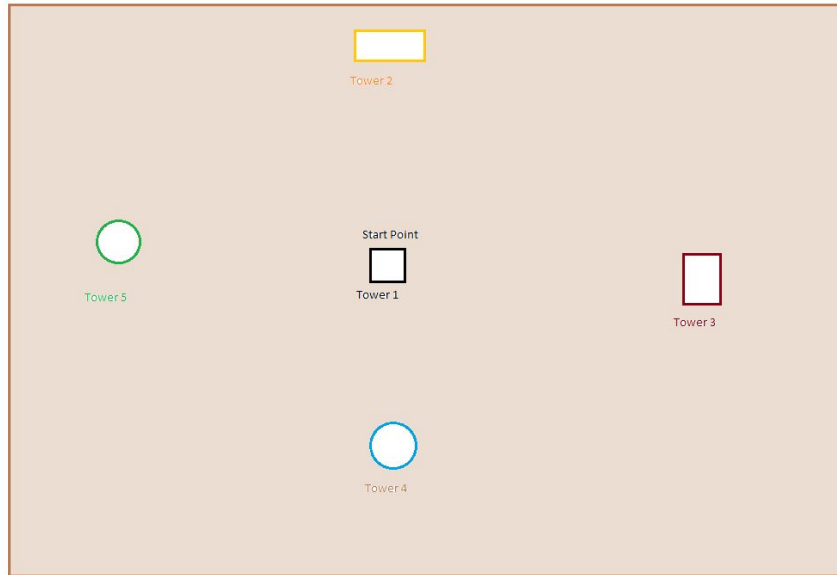
Depending on which edge the user jumps off of , on the center tower, they will be teleported to the tower that edge is facing. For instance, based on the above arrangement, should the user jump from the left side of Tower 1, he would be teleported to Tower 5. Towers 1 to 5 only allow the user to transport back to Tower 1. This interaction can be scene in the below diagram.
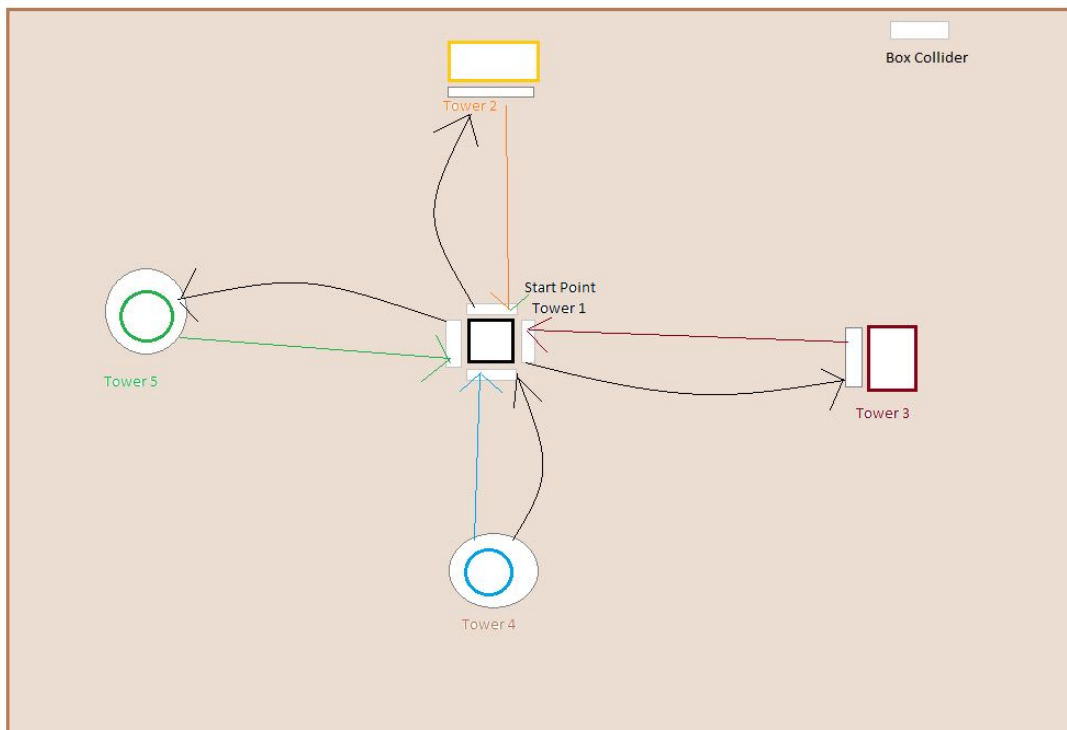
Users can only teleport to another tower by jumping off the one they are on and the teleport only occurs right before the player camera makes contact with the ground. The teleport is made less jarring through the use of fade in and fade out sequence between leaving and arriving at new locations.

The desert environment is enriched with the sound rushing wind matched by the sight of a large rolling dust storm. During the showcase, our team used a fan to embellish the windy environment experience. Moreover, we used skydiving audio tracks for when the players jumped from the towers to enhance the falling sensation and ambient music to create a sense of mystique in the desert.

Each tower is outfitted with an animated cube and close proximity to the player camera triggers the animation via box colliders. The cubes glow and float through the air, encouraging users to move their heads accordingly to keep the cube in their line of sight. This takes advantage of the encompassing VR environment afforded with Oculus Rift.

When all four towers have been *activated*, the player can return to the center tower and then, upon triggering a condition in the player script, is teleported to the end scene.

Project Implementation Process
Take the Plunge is a project that relies largely on collision detection.

The main menu was made by editing the image assets in the Main Menu scene of the Unity VRSamples package. Said Main Menu scene was then linked to our Desert Scene where the falling simulation takes place. All the towers, excluding the one the user first starts on, are imported and animated in Maya. Below each tower is a box collider that triggers a teleportation back to the center tower. Each tower also has an undrawn checkpoint object that signals to Unity where the player should land when they hit a certain collider. Moreover, in order to encourage users to jump off the ledge rather than walk off, all the edges of the towers are blocked off my more colliders.

The FPS camera can been given additional child and parent objects to control the jump animation. The camera animation is attached the the 'E' key and acts in the following way. When the user runs into a collider at the top of a building, an if statement checks to see if the collision is true and the user is given a UI prompt to hit 'E' to jump off the tower. When 'E' is pressed, the camera arcs forward through the air and stops facing the ground while suspended several feet past the edge of the tower before they begin the natural descent to to the ground. When the 'jump area' box collider detects the camera, the player is teleported to the appropriate tower. A canvas up-close and in front of the camera, with a script to manipulate the alpha channel, or opacity, of the canvas creates the illusion of a fade in and fade out during the teleportation process.

The checkpoint cubes found on each tower each have a box collider component attached that is triggered by the player camera. Upon being triggered, the public boolean in the animation script is changed from false to true, and within the animator controller, the animation of the cube rising is played. Moreover, a code is implemented to create a coloured light emanating from the cube.

When all four animation booleans have been set to true and the player camera is detected to be within the confines of the starting tower, the player will be teleported to our ending scene: a thank you not and sunset animation.

Detailed Workflow

Our initial project timeline, detailing each member's primary duties, can be seen below.

This timeline failed early on in the semester as everyone in the team became caught up in alternative obligations, due to this project's seemingly far away deadline. However, at this point in time, we all agreed that the aesthetic and inspiration for our final project would by the *Journey* video game, developed by Thatgamecompany.

With the deadline for the VR Showcase looming closer, we reorganized ourselves in late March with a new timeline and a more specific and realistic distribution of duties.

INTERACTION FLOW

Start - Top of tower (4 Faces → Obelisk / Sphinx / Statue / OneMore)
      Depending on which monument you are facing on the tower, when you jump you teleport

Jump → Teleport
      Cut to black before hitting the ground (collider + teleport)

Arrive at new location
      Teleport to appropriate monument (hit the ground SFX + camera shake + arrival SFX)
      Animation to show visited location (visible from far away)

Visited all 4 location
      Return to starting tower
      Ending animation

Monuments Interactions
- When you arrive - play animation to log arrival (lights / animated objects)

TEAM ROLES
Aesthetic : Journey (game)

	Adel	Rain	Shannon
Mar 25	Simple model of one building (no texture) -shape & dimensions (scale) -upload reference images/models		-Delete independant menu scene
Mar 26	One complete building model -with textures -Add screenshots of progress to folder	-Functional teleportation -Camera jump attempt (opt) -Camera shake - fix the walk	-Appropriate skybox -Scale of terrain and texture -Add screenshots of progres to folder
	Upload applicable assets/ files into drive		
Mar 27	-Finish animating Building 1 -Upload textures & values -Upload screenshots of progress	-fix camera animation -add blink to teleport	-Develop scene (depth perception) -Birds? Clouds? Interesting falling If able: -Help with building assets -Update blog
		-Menu -point collection	

Take the Plunge began as three separate files: an animated tower in Maya, an animated First-Person Controller Camera in Unity, and a desert terrain in another Unity file.

The desert terrain was the starting point for our simulation and it went through a number of changes regarding: ambient colour, sky boxes, height maps, and scale.

Adel compiled reference images and research through the web to determine what sort of structure to model for the simulator. When Adel was finished modelling, animating and texturing the towers in Autodesk Maya he exported them as FBX files. Shannon imported them into Unity and organized them into the configuration seen in the above images, in addition to editing and implementing the animations through Mecanim. The script was an on and off process and Rain applied and retested various methods of achieving an animated character, blinking, and fades. The script application was done through multiple versions of the desert terrain project, to simplify the number of assets within the scene, and so there are various version floating around.

Adel and Shannon finished compiling all object assets into a singular and cohesive scene before bringing in the completed scripts. From there, Rain still needed to tweak the functionality of the code within the final project file.

When all the code was in place, Shannon and Rain put in the final aesthetic details of sound design, minute adjusting of lighting and particle systems, and timing the animations to complete the project.

Components of the VR application

3D buildings, terrains, particles, audio, C# scripting, colliders, GUI element.
Our VR application is composed of the following:

Single terrain	With applied heightmap and several textures
4 Particle systems	To simulate rolling dust storm and low hanging clouds
3D Buildings	Imported from Autodesk Maya with various textures attached
C# Scripting	To control functionality of camera, teleportations, and animations
Colliders	To herd falling simulation experience, trigger animations, and trigger teleportations
GUI Elements	To inform user of navigation controls
Audio tracks	To create cohesive outdoor environment exploration experience

Issues Encountered

There were a number of issues encountered during the creation of *Take the Plunge*.

By creating a falling simulation, players would be placed at high altitudes within the simulation. However, the terrains in Unity are of finite size and at certain heights and areas of the terrain, the edge of the terrain is very noticeable and it exposes the skybox beneath it. Shannon approached the problem from numerous angles:

      -increasing the size of the terrain, which slowed down the computer

      -decreasing the altitude, which diminished the thrill of falling and created problems in scaling

      -creating an inverted sphere in Autodesk maya and applying a background image as a texture, but it was difficult finding a globe map image of a desert that was not a photo, and creating the image herself proved difficult to get right

The final project features an redrawn skybox with edited horizon to imply an endless horizon of sand dunes.

Another problem came from animating the player camera. Rain needed to control the swing of the player camera when the correct key was hit and it often skewed the orientation of the player screen after the teleportation. This resulted in slanted camera view or clipping through meshes. In addition, if the jump key was pressed away from a tower edge, the camera would simply burrow into the mesh of whatever it was standing on.

Rain was able to solve this problem through a complex system of angular math and conditional statements, however, in the final built, the camera animation function is not present. This greatly decreased the provided thrill of a fall because users were not immediately aware that they were falling, due to our faraway horizon and slow ease in drop afforded from the gradual gravitational acceleration. Also, many users did not think to look down at these points, which afforded the greatest sensation of falling.

Continuing on this point, we found that many users did not utilize the 360 view supported by the Oculus Rift to look around the environment. Our cubes were animated to float upwards and out of the forward view of players - inviting them to look upwards to follow the movement of the cube. However, very few users watched the rising cubes and assumed that the disappeared after leaving their field of view or simply did not care. This portion of the final project was mostly out of our control however, outside of us reminding users the screen would move to follow the direction of their gaze in the virtual environment. The user feedback we received will help us improve *Take the Plunge* and further applications.

Overall, this IAT 445 project was a great learning experience and introduction into the backend side of virtual reality. We are extremely grateful for this opportunity, especially seeing how augmented and virtual reality are beginning to gain new roots in a variety of different industries - retail, architecture, and gaming- in the news.

References

Please refer to excel sheet on next page.

Asset Name	Asset Type	Source		Publisher
Ancient Ruins (unused in final)	models/materials/environment	Asset Store		NEKCOM Entertainment
Yughues Free Sand Materials	Materials	Asset Store		Nobiax/Yughues
Desert Sandbox LITE	models/materials/environment	Asset Store		Aquarius Max
concrete	texture	http://cdn.sunroom.co.nz/sycha.com/wp-content/uploads/2010/03/concrete-920.jpg		
grunge dust and dirt overlay	texture	http://www.graphicsfuel.com/2015/11/10-free-dust-dirt-overlay-textures/		graphics fuel
concrete	texture	http://www.lynda.com/3ds-Max-tutorials/Creating-Textures-Formed-Concrete/173752-2.html		lynda.com
door	texture	http://img04.deviantart.net/491d/i/2010/090/5/8/medieval_door_left_texture_by_goodtextures.jpg		
roof	texture	http://roofingfourseasons.goodplumbinginc.com/wp-content/gallery/roof/background-roof-tile-2.jpg		
brick	texture	http://previews.123rf.com/images/somchaisom/somchaisom1306/somchaisom130600062/20533129-closeup-of-yellow-sand-stone-wall-gold-sand-brick-wall-for-background-or-texture-Stock-Photo.jpg		
other sounds	SFX	YouTube Audio Library		
wind-Mark-DiAngelo	SFX	http://soundbible.com/1810-Wind.html		
wind-soundbible.com	SFX	http://soundbible.com/1247-Wind.html		
Glass Ping Sound	SFX	http://soundbible.com/2084-Glass-Ping.html		
more winds	SFX	https://www.freesoundeffects.com/free-sounds/wind-sounds-10041/		
skydiving wind	SFX	https://www.freesound.org/people/Huggy13ear/sounds/138970/		
Nevada City		YouTube Audio Library		
Cylinder Five		Cylinder Five by Chris Zabriskie is licensed under a Creative Commons Attribution licence (https://creativecommons.org/licenses/by/4.0/)		
		Source: http://chriszabriskie.com/cylinders/		
		Artist: http://chriszabriskie.com/		
Touchpoint		You're free to use this song and monetise your video, but you must include the following in your video description:		
		Touchpoint by Audionautix is licensed under a Creative Commons Attribution licence (https://creativecommons.org/licenses/by/4.0/)		
		Artist: http://audionautix.com/		
Electrical Sweep Sound	SFX	http://soundbible.com/1795-Electrical-Sweep.html		
Appear Sound	SFX	http://soundbible.com/1686-Appear.html		
Computer Magic Sound	SFX	http://soundbible.com/1630-Computer-Magic.html		
Magic Wand Noise Sound	SFX	http://soundbible.com/474-Magic-Wand-Noise.html		
Long Walk by Ketsa	Audio track	http://freemusicarchive.org/music/Ketsa/Changing_Seasons/Long_Walk		
Howling Wind SFX	Audio Track	https://www.youtube.com/watch?v=67eQHYcAUoM		
Skydiving SFX	Audiot track	https://www.youtube.com/watch?v=qMpHMSqmo_o		