Elevator Pitch
A Media Arts Virtual Reality Short Film

By
Josh Martin

A thesis presented to the Honors College of Middle Tennessee State University in partial fulfillment of the requirements for graduation from the University Honors College
Fall 2019

Elevator Pitch
A Media Arts Virtual Reality Short Film

By
Josh Martin

APPROVED:

_____
Rodrigo Gomez
Assistant Professor, Media Arts Department

_____
Billy Pittard
Media Arts Department Chair

_____
Dr. Philip E. Phillips, Associate Dean
University Honors College

Dedication

To Mom and Dad

Without your constant love and support,

I never would've made it this far.

Table of Contents

Acknowledgments

I want to thank our amazing team of professors and students who helped to make this project a (virtual) reality.

I also want to give special thanks to the Honors College and Dean Vile for all the financial support and opportunities during these four years.

Abstract

The goal of this project was to create an emotionally impactful and visually beautiful Virtual Reality short film. In addition to telling a compelling story, we wanted to utilize and display the cutting edge VR technology granted to the program, as well as show off the skill of our upper-division animation students. The work was done by a team of animators and myself, led by Animation Professors Rodrigo Gomez and Richard Lewis. In addition to the film, I analyze the history of storytelling and how it changes based on the advancement of technology; specifically virtual reality and its potential as a storytelling medium.

Terminology

Virtual Reality: A realistic and immersive simulation of a three-dimensional environment, created using interactive software and hardware and experienced or controlled by the movement of the body. Abbreviation: **VR** (https://www.dictionary.com/)

Unity: Unity is a cross-platform game engine developed by Unity Technologies. (https://en.wikipedia.org/)\

Autodesk Maya: Autodesk Maya is an industry-leading 3D animation software application developed by Autodesk that enables video professionals ...to create highly professional three-dimensional (3D) cinematic animations. (https://www.edulearn.com/)

Diegetic: Existing or occurring within the world of a narrative rather than as something external to that world. (https://merriam-webster.com/)

Documentation of Production

The road to creating this project was a long one, and much of the time was spent carefully planning the direction of the project with the help of the team. Most of the actual animation work was done in 5 weeks over the summer, with 8 students (including myself) and two professors creating all the assets used for the film and assembling them in Unity. After all the characters, objects, and environments were created, the film was sent off to the Recording Industry Department where student volunteers created three-dimensional sound effects and scored the film. In addition to the RIM students, Recording Industry Department Professor John Merchant was on the team as an audio and creative advisor.

In the semester before I submitted my proposal, I approached Professor Rodrigo Gomez about being my thesis advisor and asked if he had any upcoming creative projects on which I could assist him. He had a rough framework for what he wanted this project to be, namely that it would be a VR or AR short film, meant to show off student work as well as display how we were using this expensive technology for which we recently received a grant. My role would be one of creative choices, leadership, organization, and technical animation work. First, we had more than a few brainstorming sessions, toying with ideas of virtually resurrecting extinct dinosaurs, projecting a ghost's journey to the afterlife on a physical room of actors, and elaborate creation myths. We knew we wanted to do something innovative with the medium of Virtual Reality, but that would still be attainable by a small group of students. Eventually, we came onto the idea of a journey in an elevator, where each floor is a new amazing place in the world. We also wanted to

focus on a theme of environmentalism, or at least an appreciation for our natural world as seen through the eyes of a child. We were led to the idea of an elevator as a way of "moving" the experiencer from scene to scene, essentially hiding the changing environment behind the walls of the elevator. Using the tools of VR, we could suggest the experiencer losing themselves in their imagination, as grey elevator walls slide away to reveal lush jungles, dark seascapes, and the expanse of space.

The next major part of the project was taking these ideas and bringing them to the larger group of animation students. I helped with organization, gathering willing volunteers and helping Professor Gomez set up meetings. We took all of our previous ideas, plus fresh ones from the student volunteers, and discussed what we thought worked and what didn't. We had a few meetings like this and eventually, everybody agreed on the elevator story as the most attainable, yet still meaningful and interesting story concept. Professor Gomez and I wrote initial drafts, and these drafts went through multiple revisions and brainstorming meetings with the rest of the team.

Next, I created a score of mood boards, which are collections of images and artwork meant to give an idea of the style, colors, and general atmosphere for all the environments that would be found outside the elevator. In addition to this, I gathered style references, examples of other animated films that had a look we wanted to achieve. As a team, we settled on bright, flat shading, with simplified yet stylized environments. This gave the film a unique and coherent look, while also making it simpler to design and animate. All this took place at the end of the spring 2019 semester, giving us 5 weeks in the summer to focus on creating the bulk of the film.

Over the summer, production began in full. The team met and had an initial planning meeting, looked over an extended schedule, and broke into smaller teams of two to tackle the different environments of the film. These major environments were the initial apartment lobby and elevator in which the experiencer begins, followed by the first imagination sequence: the bottom of the ocean. In addition, there was a jungle environment, a hot air balloon ride, and the earth's orbit from space. The individual teams then created an asset list, planning out every character and static object that needed to be created in their respective scenes.

The first week's task was concept art and pre-production sketches. All of the teams roughly illustrated the look of the 3D assets to be created, following the style we had established. This included detailed drawings of any animated characters or props, as well as paintings for backgrounds. After all the concept work was finished, we started asset creation. In a nutshell, asset creation involves modeling, texturing, rigging, and animating all of the objects and characters that are in each scene.

To break down the entire process, focusing on one scene helps to sum up all of the steps involved with creating animated assets. For simplicity, we will focus on the underwater scene that Professor Richard Lewis and I created. We started with the concept sketches, illustrating how we envisioned the coral, fish, and whale to look visually. Then, we take these concept sketches and use them as a guide for modeling the 3d shape of the object. For example, creating the body, fins, tail, and eyes for the whale in three-dimensional space. Then, we move on to texturing; painting the colors and fine details of the object. For the whale, this entailed coloring the body and painting on scars and scratches, as well as painting the eye details. The software allows one to do this by unwrapping the model, essentially splitting it and laying it flat so that an artist can take this flat image into Photoshop or a similar software to color it.[1]

For static props that remain stationary in the scene, texturing is the final step. However, for any character that needs to move, a rig and controllers are created. If you think of an animated character as a marionette puppet, the rig is the internal armature that moves to pose the character, and controllers are the strings you pull. With human characters, this rig is very similar to an anatomical human skeleton. However, some characters like the whale, use a simple chain of joints mimicking a spine, and branching joints for the fins.

[1] See app. C and D for models and unwrapped textures respectively.

After the rig is created and tweaked to move well, animating is the last step. This is usually done with the aid of reference footage. For example, I used a plethora of footage of sperm whales swimming to learn how they move and applied that knowledge to make my whale character appear to be swimming in a more or less realistic way. Now, after all of that, the whale character is fully colored, detailed, and swimming. We then take this completed asset, and place it into the final scene.

We assembled each scene in the game development software *Unity*. This is the engine that lets the VR experiencer interact with the world in real-time, and it allows us to arrange and time out all the assets and events. Unity also allows for the addition of sound effects linked to specific objects or environments. As of the fall 2019 semester, a graduate student focusing on sound for video games is creating all of the sound effects and ambient noise for the scenes. An original score is also in the works, and contact with the graduate student composer has been initiated. We are in the very final cleanup stages of the experience at this point and aim to have everything finished in time to demo the experience by the spring 2020 semester.

One of the greatest difficulties of this project was organizing all the files and assets between all the different animators. In the animation program, there are a few shared network drives to which all lab computers have access, and this drive is where all the master copies of the project were stored. In addition to this master copy, an online project management software called “F-Track” was used. This is an industry-standard project management tool, with many professional studios using this or very similar software. It allows for the assignment of each step of production to individual animators,

and for each animator to update the status of each of these steps. Even with all these organizational tools, very often people would have mismatched file versions, and work would need to be re-done. To combat this, very specific asset lists and schedules were created that let every person know exactly what tasks needed to be worked on, and when they needed to be done. In addition to the file management of F-track, we used Discord as a text-based communication tool. Originally designed as an instant messaging and voice chat app for online gaming, this software allowed us to alert each other outside of production hours, as well as communicate about the specifics of each scene.

Overall, all of the student volunteers did incredible work, and Professor Gomez and Lewis were there to help with the more complex tasks. I feel that my organizational and team management skills have improved tremendously through this project, and I learned a plethora of skills and techniques that will help my future career. The thesis process also taught me some valuable time management skills and I feel more confident in my ability to complete large scale, long-form projects individually or with a team.

The History of Storytelling Media

Storytelling has been a part of human nature for all of human history, but the techniques for telling these stories are constantly advancing as technology changes. With the introduction of each new storytelling medium comes a slew of benefits, but also many challenges. For example, a film can sometimes tell a more compelling story than a novel, but the technical challenges of producing a film are vast compared to writing. The birth of Virtual Reality (VR) has led to storytellers considering the possibilities of using this extremely immersive and groundbreaking technology to better tell stories with the ability to make you truly feel like you are *inside* the film. But much like all the new challenges early filmmakers faced, VR storytelling has its own number of challenges that artists have to overcome to create compelling content. Looking at the path from the simplest methods of storytelling, to the advanced state of visual storytelling media today helps to explain the specific pros and cons of VR as a medium, and how it compares to everything that came before it.

The very earliest example of visual storytelling is the simplest: cave paintings. The Chauvet cave in France contains a 30,000-year-old depiction of bison running, and themes of hunting and survival. While very simplistic, this art depicts everyday life and the world around the artist and gives them the vehicle to express their thoughts. Similar forms of storytelling can be seen in pottery, sculpture, and pictographic language like the Egyptian hieroglyphs. In terms of non-visual storytelling, ancient peoples from all over the world incorporated dance into religious ceremonies, telling tales of gods and men.

While extremely simplistic and lacking the technical challenges of modern storytelling, these are still the core principles that lead us down the road to VR.

The oldest precursor to more modern storytelling comes in the form of ancient Greek theatre. While it is not visual in the same way modern media like film is, these plays still set the groundwork for the structure of storytelling as we know it today. Tragedy theatre started in ancient Greece around 6 BC, being incorporated in religious festivals to tell stories of their gods. Eventually, comedy entered the scene around 4 BC, and the production of these plays continued to escalate and become more complex. These plays influenced writers and future storytellers for ages to come, and the mythos of Greek mythology is still very prevalent.

As move past the ancient era, art and the stories told by humans explode in quantity and complexity. Painting moves from simple figures to complex scenes that portray emotion and character. Oral stories become widespread with innovations like the printing press, allowing written stories to reach further than ever thought. Eventually, in the 1800s, visual media hit its next major milestone with the invention of photography. While very rudimentary at first with its 8-hour exposure time and single print capacity, soon the technology would become accessible and convenient enough for widespread use. Photography, however, is limited in its storytelling ability compared to its successor: film.

The late 1890s saw the birth of "motion pictures" with the invention of video cameras and projectors. The first films were mostly visual variety shows and experiments, with the simple fact of pictures that moved were enough to bewilder and amaze audiences. The Edison Manufacturing Company produced such films with their

kinetoscope, featuring simple actions performed by dancers, boxers, and various animals. The true film pioneer in terms of storytelling was George Méliès, a French illusionist and director. Using his background of parlor tricks, Méliès incorporated some of the visual tricks that would later become ingrained in the language of Film; techniques like multiple exposures, transitional dissolves, and time-lapse photography. He was also extremely ambitious in terms of the stories he would tell. Perhaps the most well known and iconic of his films is 1902's *Le Voyage Dans la Lune* or, *A Trip to the Moon.* Inspired by Jules Verne's science fiction novels, this silent film shows an early idea of spaceflight and the misadventures of a group of moon explorers. This and other films by Méliès were some of the first attempts of long-form storytelling in the medium of film.

Technology only continued to advance over the years, with new elements of Film being added like color and sound that allowed storytellers to create even more elaborate experiences. This development of technology continues into the 21st century with digital photography, computer-generated imagery and special effects allowing directors unprecedented storytelling freedom. All of these new elements allowed storytellers much more freedom, but every new dimension adds more complexity and effort needed to make a compelling result. For example, in 1970, it would have been impossible to make a movie with the scale of Marvel's *Avengers: Endgame.* A massive fantastical world filled to the brim with towering computer-generated creatures and massive battle sequences would be impossibly out of reach technologically and financially for 1970s filmmakers. However, all of these amazing visuals come at the cost of hiring thousands of animators.

Perhaps the closest relative of VR is not film, but video games. While initially very simplistic and gameplay focused, over the years games have shifted to becoming

more of a narrative experience. Games bring an unprecedented level of interactivity to stories, especially more modern video games that give the player meaningful story choices; something that is impossible with traditional film. This interactivity is something that carries over to VR, and many full-fledged VR games have been developed. However, VR can be used to create more traditional, film-like experiences with minimal interactivity to tell a compelling story.

Virtual Reality as a Storytelling Medium

History of Virtual Reality

The basic technology behind virtual reality has been in development for hundreds. of years. The earliest attempts at this concept can be seen in panoramic paintings as early as the 1800s. The next distant cousin of VR is the stereoscope. Essentially, using spaced lenses and two photographs from slightly different perspectives, users of the stereoscope could see the illusion of a still image made into a three-dimensional one. Another major technology behind modern VR is head tracking, essentially recording the movement of the experiencer and translating this into the same movement in the virtual space. The first successful example of this was the *Sword of Damocles* in 1968*:* a massive ceiling-mounted headset that displayed primitive 3d models and wireframe.

While impressive for the time, these early attempts at VR were too clunky, impractical, or expensive to properly simulate reality as their creators envisioned. However, with the recent development of the Oculus Rift and HTC Vive, consumer-grade VR has finally broken into the mainstream. Both systems were in development with prototypes around 2012, both consumer-ready headsets came out in the summer of 2016. Running at around relatively reasonable $400-500 and requiring a strong computer to support, these modern headsets delivered in many of the ways that older VR attempts failed. They are lightweight, comfortable, track your head rotation and movement, and allow you to physically interact with your environment through hand controllers. They also perform smoothly enough that you can truly fool your brain into feeling present in the virtual environment.

New Challenges

With this new technology, VR could finally be used by artists to create compelling stories in the way that film had done before it. However, creating "films" that take place in virtual reality is easier said than done. One of the biggest challenges brought by this medium is the fact that you have to consider the 360 degrees around the experiencer, instead of the static frame of film. With film, you see only what the director wants you to see. This also saves time and money, as you only need to consider the things that will be visible from the camera, giving directors the freedom to create sets and hide technology and crew behind the lens. However, with VR, the "camera" is controlled by wherever the viewer chooses to look. This means that you don't only have to create the assets that will be visible from a specific direction, but you need to create a believable 360 environment.

This distinction leads to a question of terminology as well. Generally, one who consumes a film is called a viewer. However, with VR, these stories tend to be referred to as an "experience," and the consumer tends to be more involved in the world than simply viewing the events. The term "experiencer" more properly explains the role of the consumer in regards to VR stories. This attempt to create an immersive experience is at the core of VR content, and if this is done effectively, one can truly make the experiencer feel like one is part of the world one creates.

The issue with immersion is tricking your brain into accepting what it is seeing in VR is real. This can be difficult to achieve, and its effectiveness varies from person to person, but the best way to maintain immersion is to make sure there are no errors that force an experiencer to think about the fact that this is simply a simulation. This ranges

from simple things like making sure everything maintains its appearance regardless of where the experiencer goes or looks, but also the realism of things like lighting and sound. An example of a simple immersive VR experience is *Richie's Plank Experience*. Essentially, in the game, there is a plank stretched between two floors of a high rise building. You are standing on a platform and are instructed to walk across the plank to the other side. You are never in any danger, but the view of this massive drop coupled with wind noises immediately sends your brain into high alert. Some can overcome this feeling of vertigo, while others are affected greatly with a very real fear of falling. This instinctual response is something that is created by proper immersion.

Once you have a convincing, immersive environment, the hardest step is creating a compelling narrative and making sure the experiencer notices what you are trying to show them. With simple VR shorts, characters will move at a constant pattern through the environment, acting out whatever story the artist wants to tell. However, the free will of the experiencer in where they gaze once again causes issues. It is very common for an experiencer to randomly check behind them the moment before a major plot point unfolds in front of them, missing it completely. This issue can be solved in several ways. The artist can limit all their characters and actions to a specific field of vision, but this fails to completely utilize the massive canvas that VR gives you. Another approach is to trick the user into looking where you want them to. This can be done through sound or light cues, grabbing their attention with a loud noise or major change of color. An artist can also use moving characters to create something for the experiencer to follow with their gaze, leading their attention around the space and towards whatever you want them to notice next. For example, in our VR short film during the underwater sequence, there

is a massive whale that swims over the experiencer's head. However, most people do not naturally look up at that intense of an angle. To solve this, we had a smaller fish swim by the user, leading most to follow the fish towards a turtle, that then swims up and over you just in time for you to see the massive whale.

During the VR short production, we had to consider not just the objects visible from the center of the VR space, but also things hidden around corners. For example, there is a fairly straightforward scene in a hallway of an apartment building. With an animated film, the area around the corner and behind the experiencer would not be modeled as it would never be seen. However, with VR, a curious experiencer can easily peek their head around said corner. You have to consider all the ways an experiencer could see behind the curtain, and prevent them from breaking their immersion.

The Role of the Experiencer

Another challenging factor of VR filmmaking is the inclusion or exclusion of the experiencer within the story. This relatively minor variable has a massive impact on the way that your story is perceived by the experiencer. VR story-driven experiences can treat the experiencer in one of two ways; diegetic, and non-diegetic.

With a non-diegetic experiencer is not treated as part of the scene. These stories usually take a fly on the wall feel, with the experiencer essentially taking the form of an omniscient camera in the scene. Characters do not interact with the experiencer and instead perform a play around them. This method creates stories more similar to traditional films. The experiencer still has the discretion to look wherever they please, but they cannot interact with the scene or world around them.

When a VR film treats the experiencer diegetically, either the experiencer themselves (or a character they inhabit) "exist" in the virtual space. Events happen to the experiencer directly and characters see or talk directly to the experiencer. In the VR short project, our team concluded that our story would work better with a diegetic experiencer. You inhabit a nameless character, with only one defining characteristic: their relationship with an imaginative young girl leaving you voicemails. Everything else about the character is a blank slate so that the experiencer can insert themselves into the character. With more interactive VR experiences, often the experiencer can also interact with the world around them; moving objects or characters with their hands to solve puzzles or defeat enemies. These types of interactivity lend themselves more to games than films, but one specific short does experiencer interactivity in an innovatively.

Colosse, by Joseph Chen and Fire Panda studio, is a short VR film about a small arctic fisherman whose daily routine gets interrupted by a giant lumbering ice spirit. While its storybook visuals are breathtaking, the real innovation is what they call a "viewer directed" story. Essentially, events happen based on where and what you look at. This very cleverly bypasses the challenges of having the experiencer look where you want them to by making the events happen where they are already looking. This is a

combination of the two methods, with characters unable to perceive the experiencer's presence, but the experiencer still having indirect control over the story.

Conclusion

Overall, the creative freedoms offered by VR in storytelling outweigh the unique challenges of the medium. Maintaining immersion, controlling experiencer attention, and deciding on a diegetic or non-diegetic experiencer all are major challenges with VR storytelling; but the ability for artists to immerse users in a fully-fledged world of their creation is worth the challenges. Professor Gomez's team and I ran into all of these problems during the development of the film, and all of these factors influenced the final product. I feel like having to face these problems firsthand will help me in the future in regards to working on VR projects, and whatever new medium will inevitable follow this one.

Bibliography

Mendoza, Melissa. "The Evolution of Storytelling." Reporter, Rochester Institute of Technology, 1 May 2015, reporter.rit.edu/tech/evolution-storytelling.

T. Huang, V. Le, T. Paine, P. Khorrami and U. Tariq, "Visual Media: History and Perspectives," in IEEE MultiMedia, vol. 21, no. 2, pp. 4-10, Apr.-June 2014.

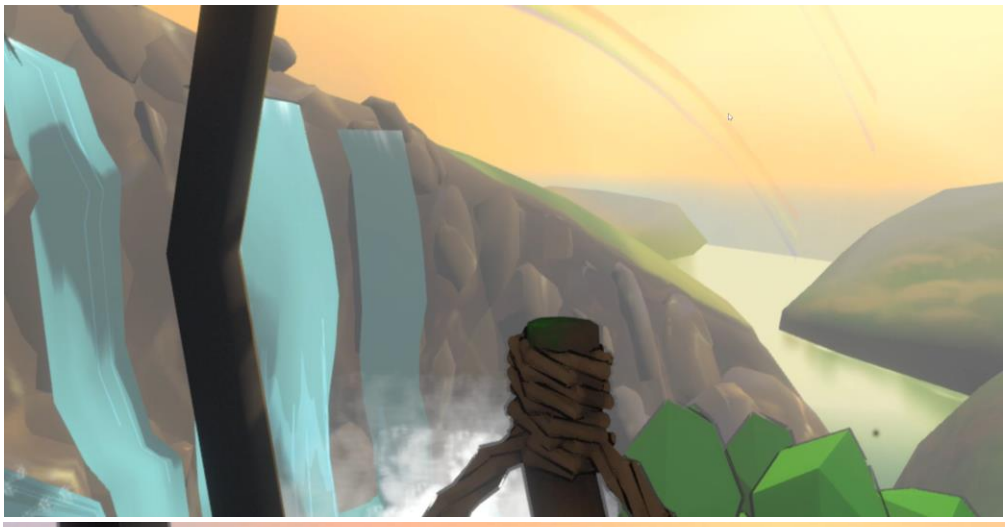
Mahe', Pierre-Yves. "The History of Photography." Nicephore Niepce House Photo Museum, 2012, www.photo-museum.org/photography-history/.

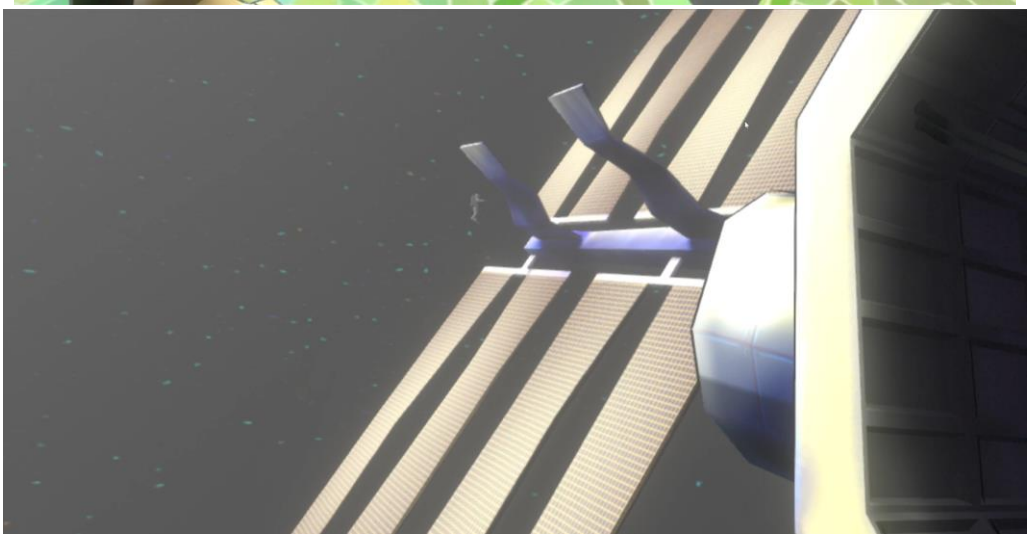
Donovan, Jack. Mastering Oculus Rift Development. Packt Publishing, 2017. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=e000xna&AN=1463880&site=ehost-live&scope=site.

Bucher, John. Storytelling for Virtual Reality. [Electronic Resource]. Focal Press, 2017

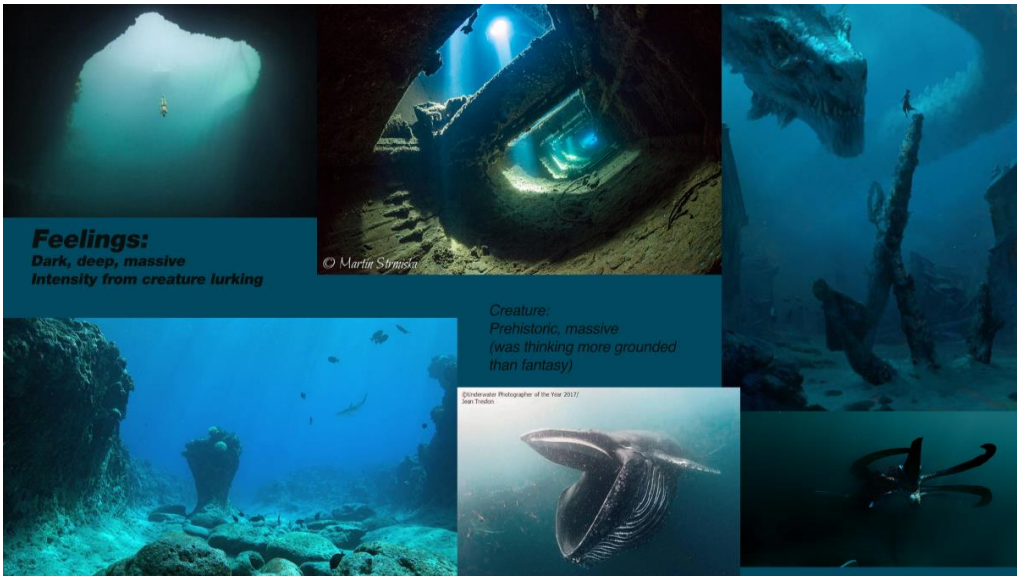
Appendices

Appendix A: Stills of each environment present in the film





Appendix A: Mood Boards

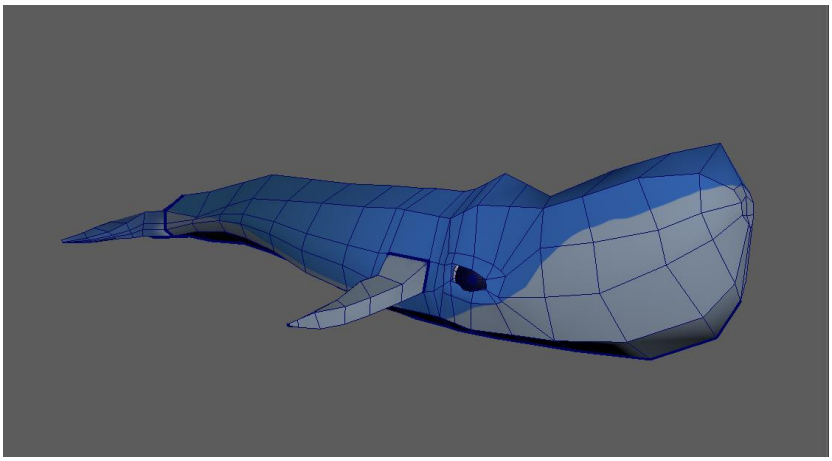


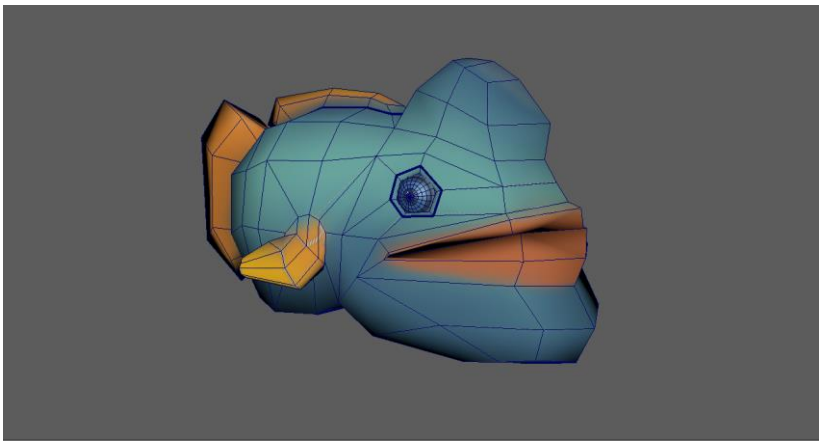
Appendix B

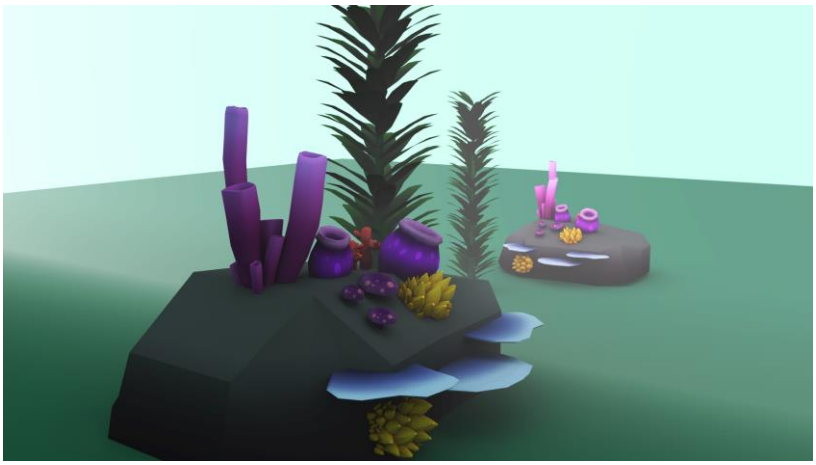
Early Concept Sketches

Appendix C

Completed Models

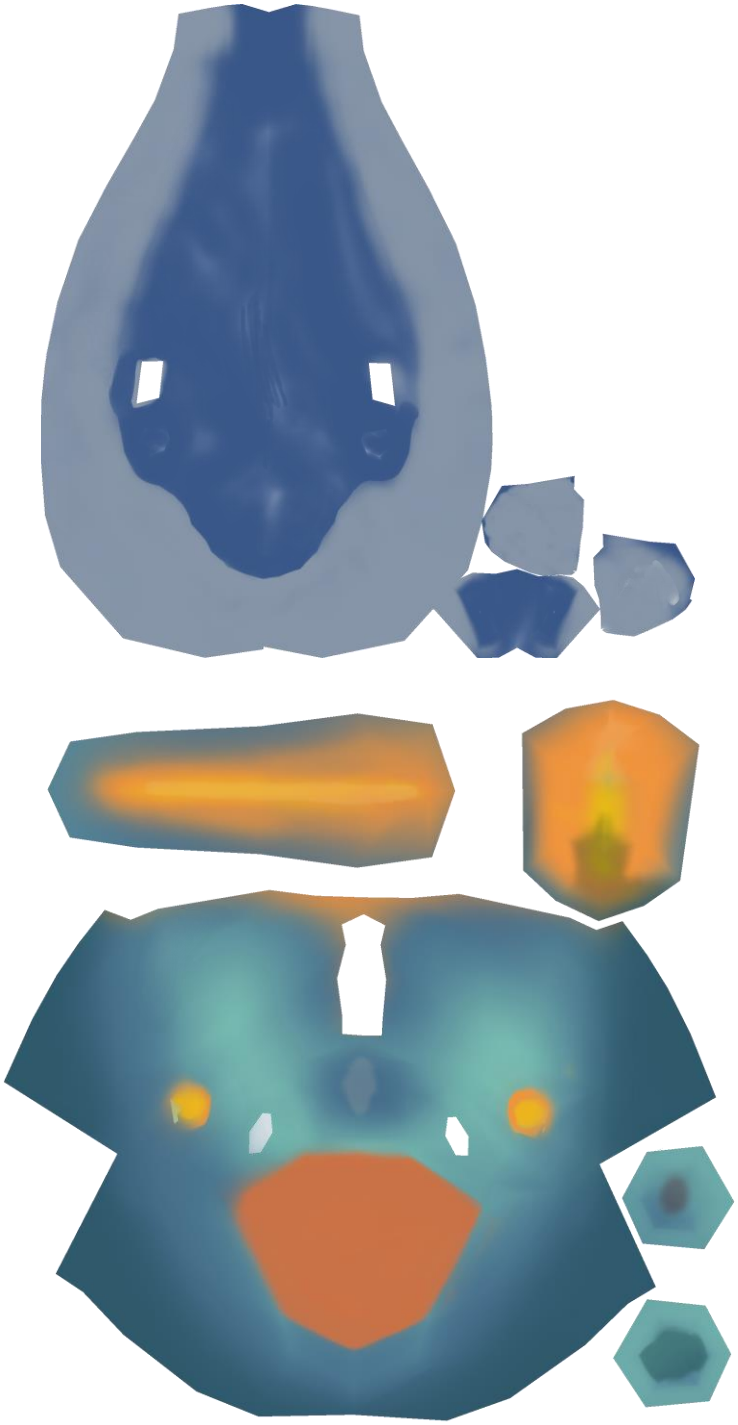






Appendix D

Unwrapped Texture File Examples



Appendix E
Sample Script Page

1. INT. ELEVATOR.

Experiencer starts inside of a standard elevator. The exterior of the elevator shows the hallway of an apartment building. The elevator door closes. A cellphone dings. A recording plays.

Phone's voice

You have 6 new messages.

Message one.

Beep sound plays, then a Child's voice quickly starts. He says hello and leaves the first message

Child

Hey! I know you can't talk right now, but I'm wondering if you're gonna be here soon. I know, I know, you said you were coming later, but I couldn't wait. Oh… it's going to be amazing. Hurry up!!!

Call Ends.

Phone's voice

End of first message

Elevator shows a sign showing it is going up. Phone's message #2 plays.

Phone's voice

Next message

Child

(a bit more impatient)

Hi… Are you almost here? I can't wait anymore. I have a whole adventure planned, and you know what, I know where we're gonna go first.

Elevator dings. Door opens.

Appendix F

Portion of Summer Schedule

Immersive Story - Animated Short
SCHEDULE SUMMER SESSION

Summer Semester 2019	Week 01- June 03 to June 07					Week 02- June 10 to June 14					Week 01- June 17 to June 21					Week 01- June 24 to June 28				
Task	Day 01	Day 02	Day 03	Day 04	Day 05	Day 06	Day 07	Day 08	Day 09	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15	Day 16	Day 17	Day 18	Day 19	Day 20
Subteams definition																				
Tasks assignment																				
Pipeline definition																				
Subteam Underwater																				
Concept art and design																				
Voice editing																				
Model blocking of 3D assets																				
3D Model detailing and ajustement																				
Sample proxy VR setup*																				
Texturing of assets																				
Unity research and testing																				
Testing of textures in VR engine																				
3d model setup for animation																				
Animation of assets																				
Exporting and test of final assets																				
Corrective animations																				
Animation and sample programing in VR engine																				