STORY VISUALIZING THROUGH ANIMATION, SOUND AND COMPOSITING FOR 3D ANIMATED SHORT FILM- "ADWAR"

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Multimedia and Creative Technology

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DAFFODIL INTERNATIONAL UNIVERSITY

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SSO

This Project titled **Story Visualizing Through Animation, Sound And Compositing For 3d Animated Short Film- "Adwar"**, submitted by S. M. Monowar Kayser (ID: 181-40-509) to the Department of Multimedia and Creative Technology, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Multimedia and Creative Technology and approved as to its style and contents. The presentation has been held on 13th February, 2022

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Dr. Shaikh Muhammad Allayear, Professor & Head, Department of MCT** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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First I express my heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project successfully.

I really grateful and wish our profound our indebtedness to **Dr. Shaikh Muhammad Allayear**, **Professor & Head**, Department of MCT Daffodil International University, Dhaka. His endless patience ,scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this project.

I would like to express my heartiest gratitude to my team mate, Tonmoy Baroi for his tremendous help to finish our project.
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Finally, I must acknowledge with due respect the constant support and patients of my parents and other family members.

ABSTRACT

ADWAR is a 3D animated short film developed by S. M. Monowar Kayser and Tonmoy Baroi. It's a science fiction story about a rover named ADWAR discovering a new planet that serves as a metaphor for a certain feeling in human existence. Meanwhile, ADWAR found a companion rover named CK-32. However, ADWAR abruptly loses his companionship and returns to his lonely existence. ADWAR advances and ultimately learns something new.

The primary purpose of this little film is to motivate our younger generation, who is particularly susceptible to despair. Existence has its own taste, and individuals must advance in order to fully appreciate the wonder of existence.

The making of the film took around four months to complete. All stages of production have been thoroughly supervised, including pre-production, production, and post-production. It highlights several significant aspects of the project's development, including conducting research on a different planet, managing a large number of polygons, optimizing 3D environment scenes, maintaining a seamless look, using unusual camera angles and a camera rig, utilizing cloud rendering, creating a unique sound design, maximizing monitor resolution, managing the entire project with free tools, and ACES color management.

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CHAPTER 1

INTRODUCTION

1.1 Background

Visualization is a powerful technique for conveying information to an audience. Nowadays, animated films are gaining worldwide popularity as one of the most crucial forms of visual communication. As a result, everyone who looks around will see that the animation industry is growing on a daily basis. Precedence Research estimates that the worldwide animation business will be worth around 642.5 billion dollars by 2030. On the other hand, despite the presence of certain independent artists, the number of animation enterprises and the quality of work in our own nation are very restricted. Quality education and employment are now in high demand in order to participate in and reap the rewards of the global animation industry. Certain flaws in this enterprise are already apparent. A scarcity of high-quality and competent artists has the potential to wreak havoc on the industry. As a result, ADWAR represents a modest contribution to our country.

Throughout the ADWAR development process, the developing team may encounter a number of obstacles; nevertheless, these obstacles will serve as excellent learning opportunities for the team. At the start of the short film, a search for animated films was conducted, but the findings were discouraging. In Bangladesh, we discovered a few animated flicks.

Among the most popular animated films in Bangladesh are Surviving 71, Meena, My Father Mujib, Tomorrow, Chilekothar Shepai - The Smoker, Chacha BahinirAjob Kahini, Murgi Keno Mutant, Detective, Moon Fairy, The Adventures of Montu Miah, The Truth, Shahana and Her Friends, Restoring Sight in Bangladesh, Madman Wonderland, Bodhirer Golpo, Falafel Sundays.

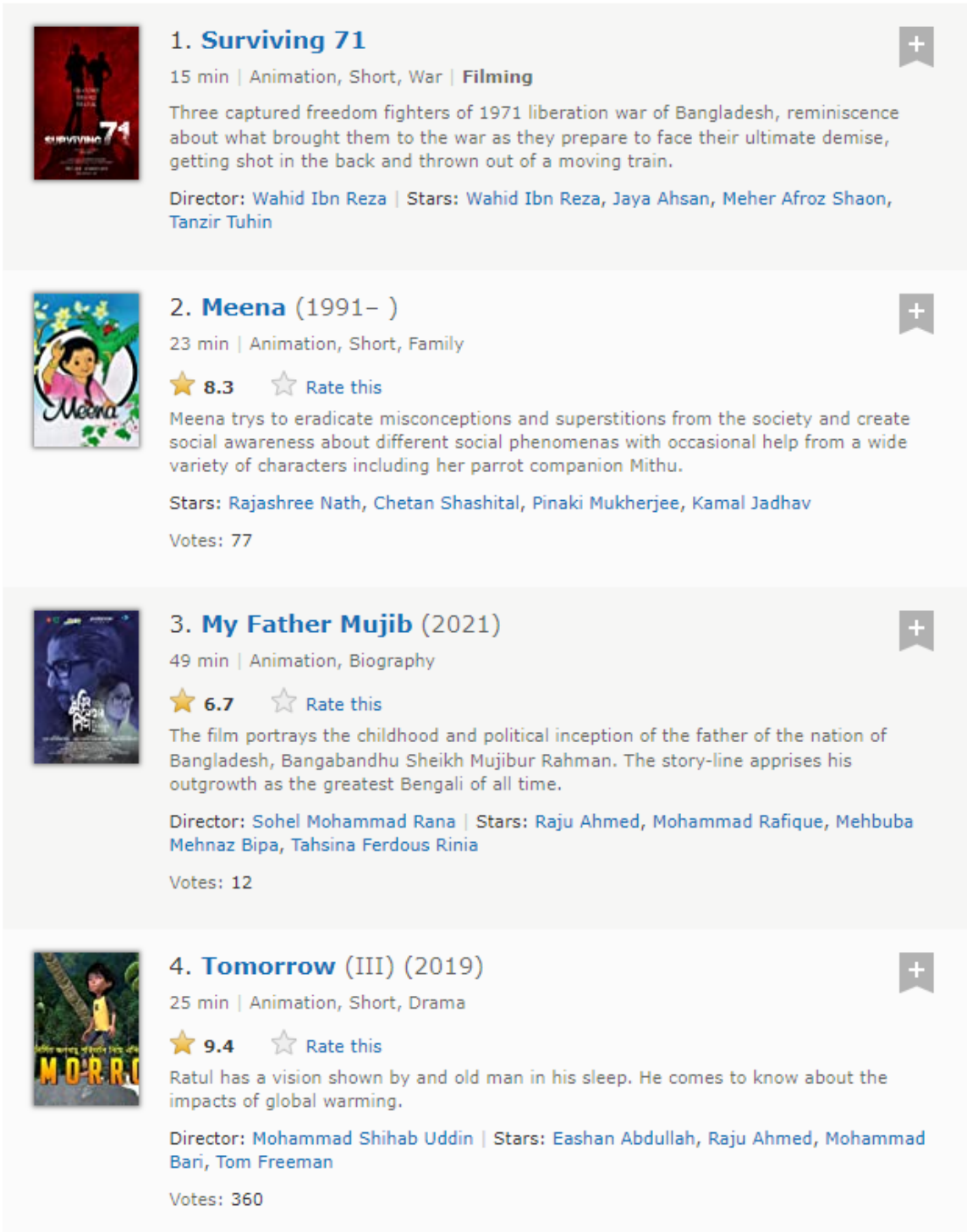

Figure 1.1: A list of animated films produced in Bangladesh (Part-1)

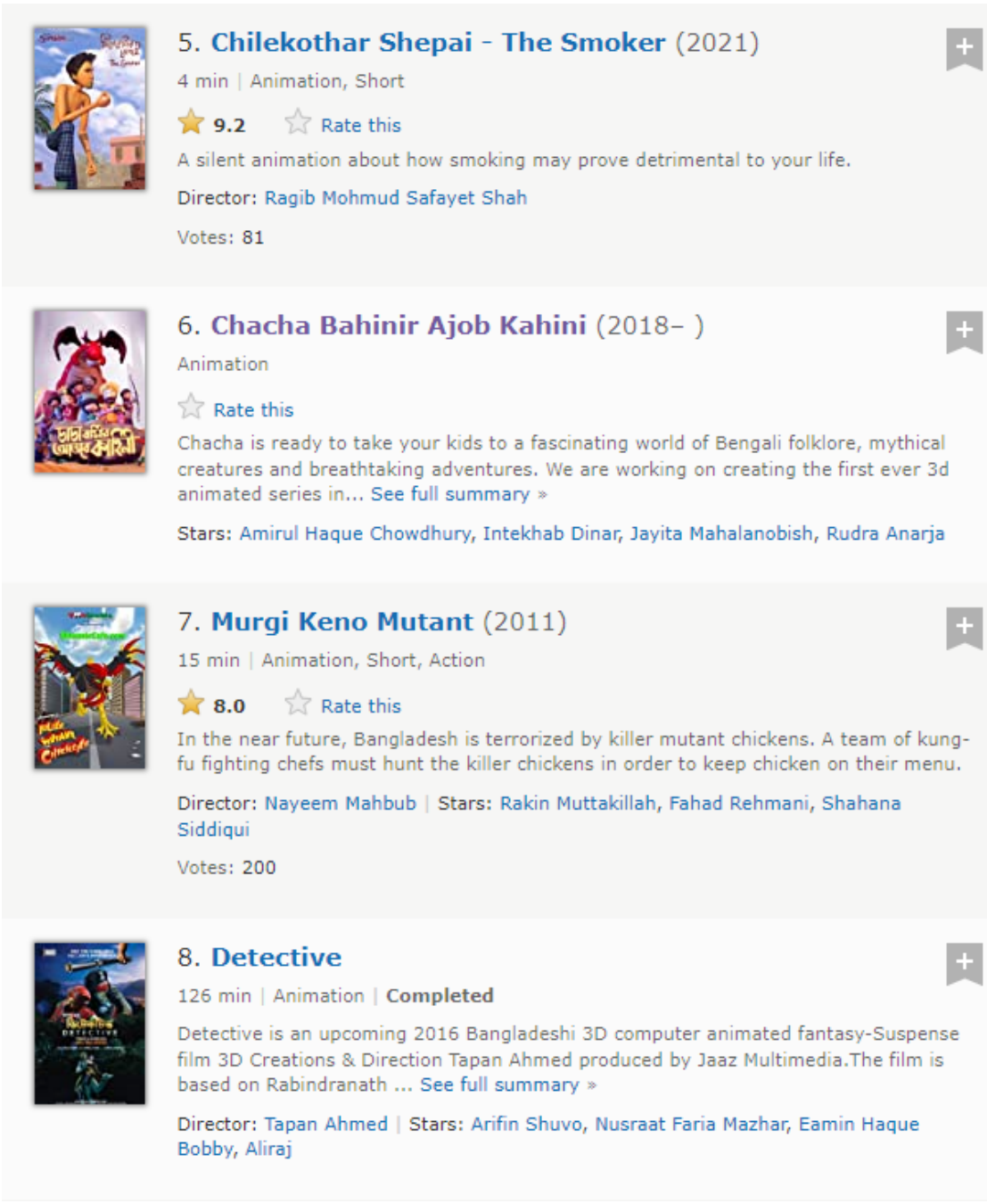

Figure 1.2: A list of animated films produced in Bangladesh (Part-2)

9. **Moon Fairy** (2009)

12 min | Animation, Short, Fantasy

Rate this

A moon fairy can grow wings only if someone praises her from heart. On a spooky Promptville night, it is hard to find people with civility of that kind.

Director: Rezwan Shahriar Sumit | Stars: Tahseen Karim, Sarita Rahman, Rezwan Shahriar Sumit

10. **The Adventures of Montu Miah** (2001–2007)

30 min | Animation, Action, Comedy

Rate this

The story is about Montu Miah, an ant who talks and moves like rural Bangladeshi people. He wears a lungi, a symbol of the rural people of Bangladesh. The protagonists and the villains on ... See full summary »

11. **The Truth** (IV) (2017)

2 min | Animation, Short, Fantasy | **Completed**

Rate this

A short film for the truth of any fiction Movies of the world.

Director: Tirthok Ahsan Rubel

12. **Shahana and Her Friends** (2015 TV Short)

15 min | Animation, Short

Rate this

UNFPA Bangladesh has made 6 tv films regarding `Stop child marriage` campaign in Bangladesh. Shahana is a lead character who will try to stop child marriage with the help of her few friends.

Director: Mohammad Shihab Uddin

Figure 1.3: A list of animated films produced in Bangladesh (Part-3)

Figure 1.4: A list of animated films produced in Bangladesh (Part-4)

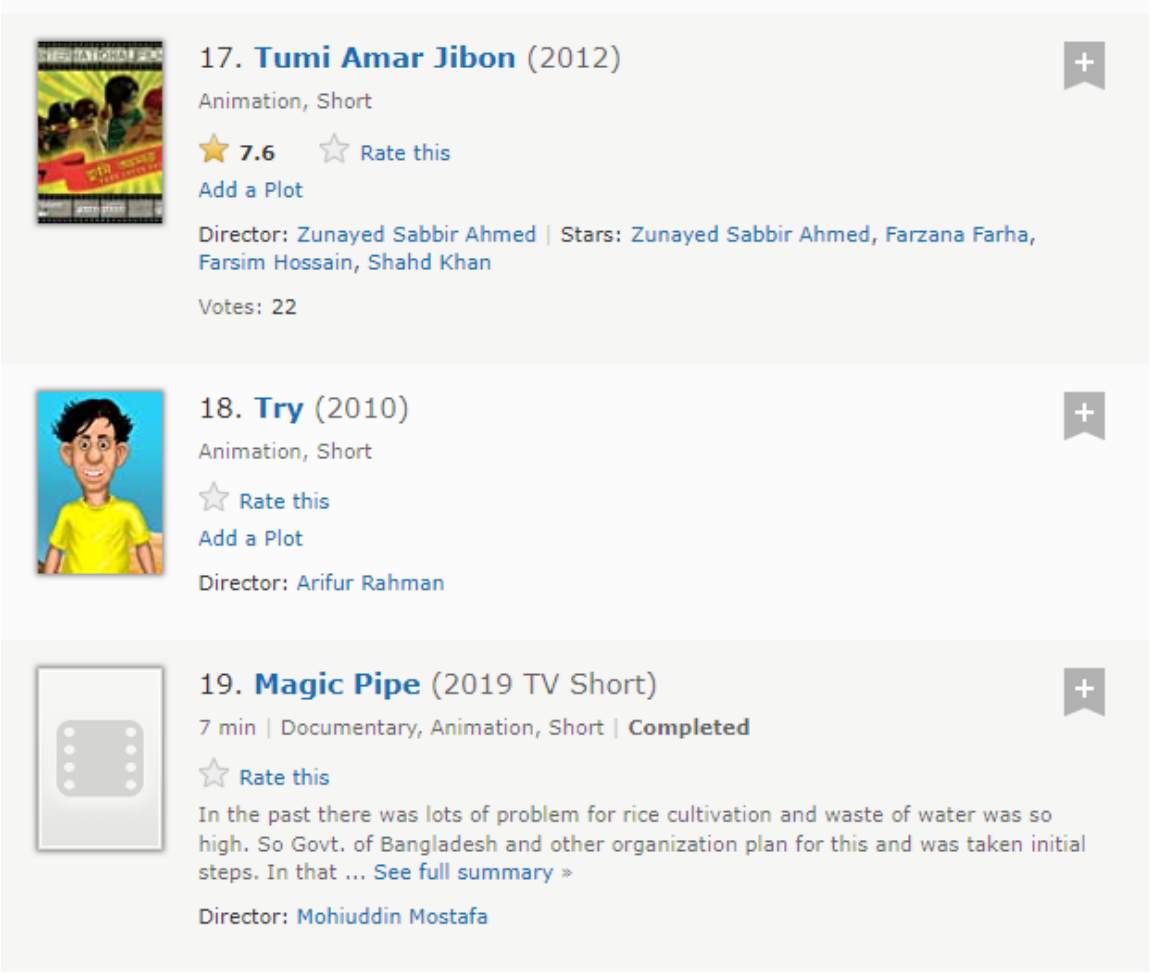

Figure 1.5: A list of animated films produced in Bangladesh (Part-5)

1.2 Motivation

ADWAR reflects the development team's interests, passion, and hard work. The crew's constant objective is to create an animated short film that will be a science fiction film and a symbolic depiction of a specific experience in human existence.

The project's objective is self-evident. This initiative offers a new beginning for Bangladesh's animation industry, allowing it to enter and develop a position in the worldwide animation market. We are all aware of the global demand for animated films, as well as its size and proportion of the market.

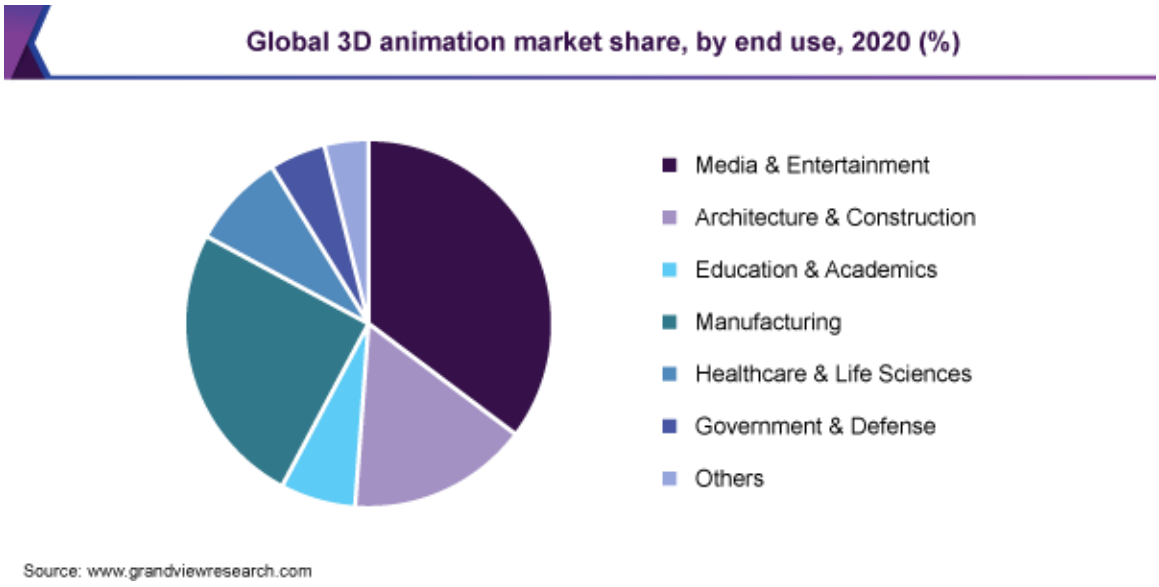

Figure 1.6: The global market share of 3D animation

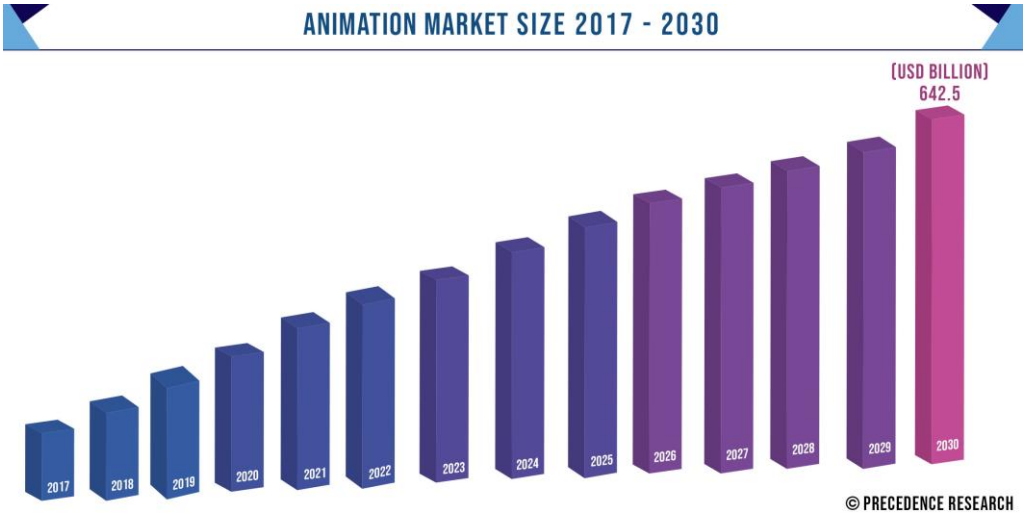

Figure 1.7: The scale of the worldwide animation market

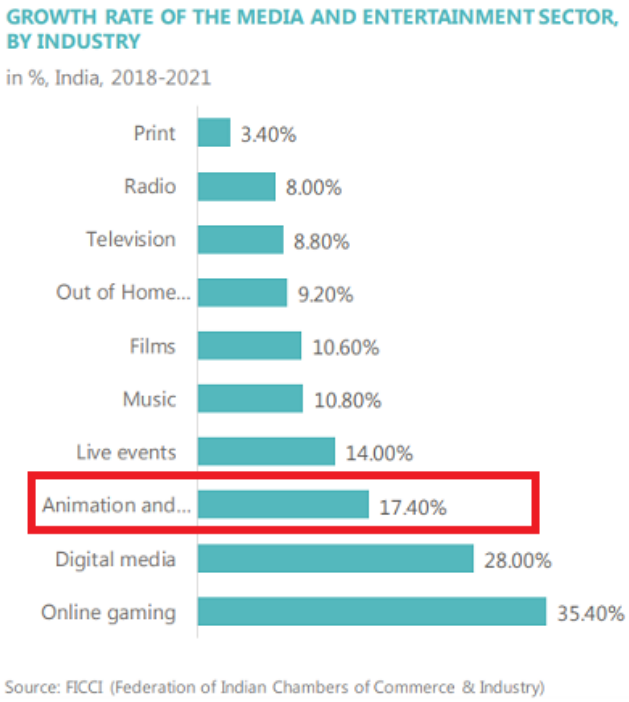

Figure 1.8: The media and entertainment sector's growth rates

1.3 Objectives

The objective of the project is divided into two pieces.

a. From a developmental viewpoint;

b. From an audience standpoint.

From a developmental viewpoint: Bangladesh has a small number of animated films, and just two or three of them are of high quality. To ensure the quality of the animation output, the ADWAR development team adheres to industry best practices.

It should be obvious if we emphasis specific points.

a. To contribute significantly to the animation film industry.

c. Ensure the result is of a high standard of quality.

b. Developing certain shortcuts for quickly generating high-quality work.

d. Consolidating all stages of manufacturing in order to maintain a world-class industry standard.

e. Producing a science-fictional 3D animation based on research.

From an audience standpoint: This short video is a metaphor for a certain emotion in a person's life. It will be a visual portrayal of life's movements that will assist viewers in relating to themselves in order to overcome despair and loneliness.

CHAPTER 2

PREVIOUS WORK

Despite the fact that Bangladesh has a small number of animated films, there are several instances worldwide.

If a person passes the category test, he or she must state that ADWAR is a science fiction and space exploration short film.

WALL.E is an excellent example of a film comparable to ADWAR. WALL.E is somewhat longer than ADWAR due to the inclusion of a short film. WALL.E, on the other hand, was one of the most expensive films. ADWAR is collaboration between just two artists. When the budget and technical components are compared, there is a big discrepancy.

The development team noticed some similarities to a short film titled Planet Unknown. Additionally, there are certain differences to be noted. The entirety of ADWAR is a symbolic representation, whereas Planet Unknown is purely visual narrative. While the characters in these two films are similar in look and behavior, their activities, movement patterns, and appearances are not.

Figure 2.1: WALL.E poster

WALL-E

Theatrical release poster

Directed by	Andrew Stanton
Screenplay by	Andrew Stanton Jim Reardon
Story by	Andrew Stanton Pete Docter
Produced by	Jim Morris
Starring	Ben Burtt Elissa Knight Jeff Garlin Fred Willard John Ratzenberger Kathy Najimy Sigourney Weaver
Cinematography	Jeremy Lasky Danielle Feinberg
Edited by	Stephen Schaffer
Music by	Thomas Newman
Production companies	Walt Disney Pictures Pixar Animation Studios
Distributed by	Walt Disney Studios Motion Pictures
Release date	June 23, 2008 (Los Angeles) June 27, 2008 (United States)
Running time	97 minutes[1]
Country	United States
Language	English
Budget	$180 million[2]
Box office	$521.3 million[3]

Figure 2.2: Synopsis of WALLE

Credits:
Written & Directed by – Shawn Wang
Modelling, Texturing, Animation, Compositing & Editing – Shawn Wang
Music & Sound Design by – Echoic Audio
Composer – Sam Foster
Sound Design by – Tom Gilbert & David Johnston
Special Thanks to – Evolutions
Re-recording Mixer – Will Norie
Faculty Producer – Xinyuan Huang
Faculty Adviser – Yucheng Huang
Special Thanks to System Advisers – Horizon Bian / Sicong Wang / Jiawei Cao

Figure 2.3: Synopsis of Planet Unknown

Figure 2.4: Image from Planet Unknown short film

The ADWAR development team needed to be inspired by the concept art of several artists featured on ArtStation. Additionally, the development team examined many articles and blogs on the NASA website to obtain a better understanding of Mars' geography and other worlds' ecosystems.

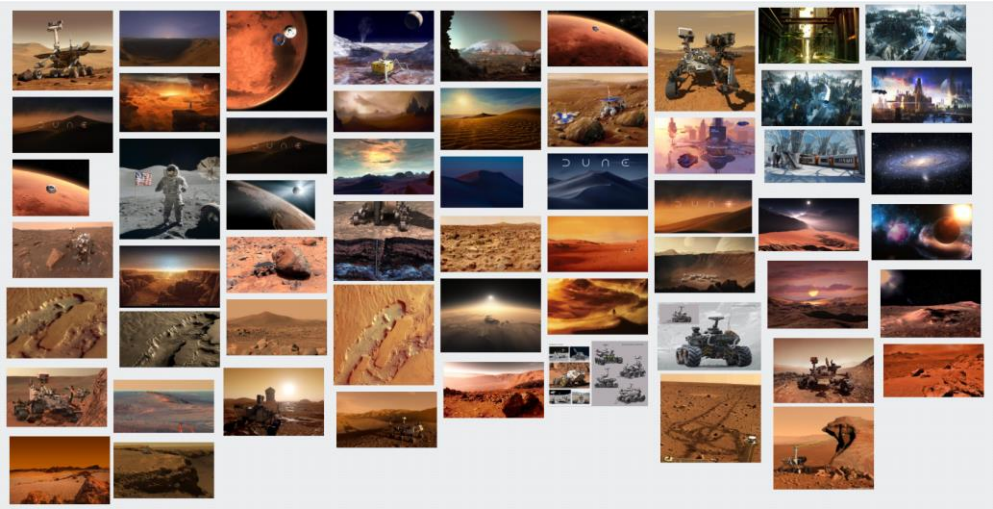

Figure 2.5: Milanote picture depiction

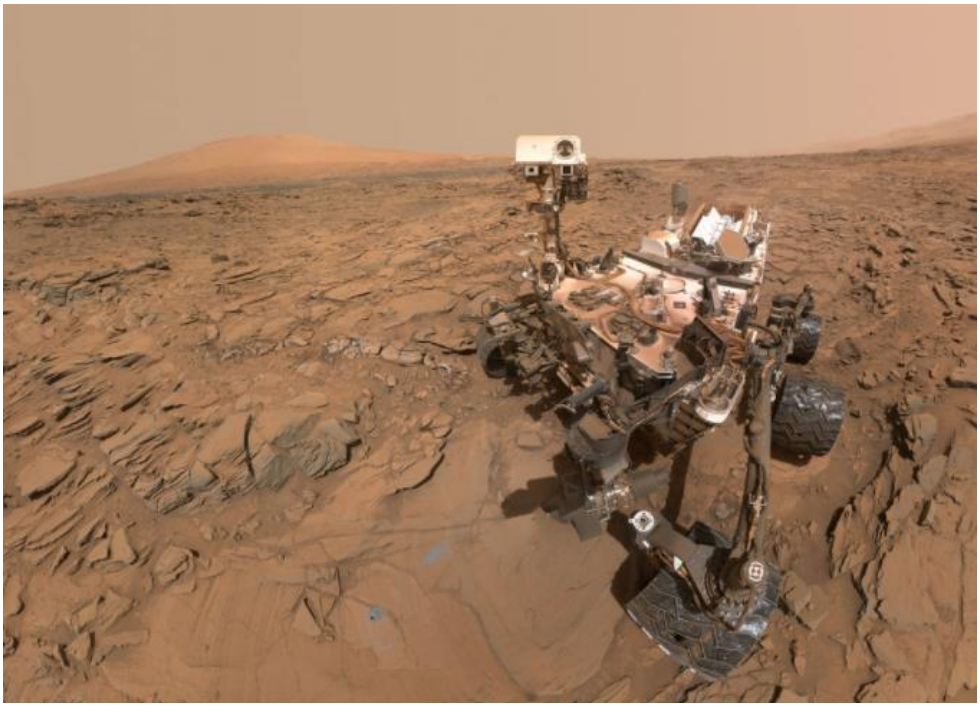

Figure 2.6: Mars image from NASA website

CHAPTER 3

USED SOFTWARE

Each piece of software is classified into one of three groups.

a. Production level software: Adobe After Effects, Adobe Photoshop, Adobe Illustrator, Autodesk Maya, World Creator, RizomUV, Houdini, Substance Painter, Autodesk Arnold, Adobe Media Encoder, Adobe Premier Pro, DaVinci Resolve, HandBreak

b. Project documentation software: Milanote, Microsoft Word, Microsoft Exel.

c. Project management software: Google Drive, Rclone, djv.

3.1 Production level software

According to the project's three production tiers, the software is separated into three stages.

a. Pre-production software: Adobe After Effects, Adobe Photoshop, Adobe Illustrator

b. Production software: Autodesk Maya, World Creator, RizomUV, Houdini, Substance Painter, Autodesk Arnold.

c. Post production software: Adobe After Effects, Adobe Media Encoder, Adobe Premier Pro, DaVinci Resolve, HandBreak.

Figure 3.1: Logo of the used software

3.1.1 Autodesk Maya

Autodesk Maya is a robust 3D program with a layer-based keyframe animation system and a MASH Network System. Additionally, it has ray-trace lighting and rendering, an integrated Arnold renderer, and a bi-frost graph.

3.1.2 World Creator

World Creator is a piece of software created by BiteTheByte, a German firm specializing in real-time landscape and terrain construction, generation, and visualization. It is a procedural program that makes use of non-disruptive workflow, which has become the industry standard for digital content creation and other industries. It supports and interfaces with over 25+ apps, and nearly every major film, visual effect, and game company relies on World Creator's versatility and smooth integration.

3.1.3 RizomUV

This application never ceases to amaze me. Due to the application's history. There are numerous independent programs and plugins available on the internet today. However, the creator of this program is the same as the creator of "Unfold3D," which is used by all Autodesk applications, including Maya, Softimage, Mudbox, and 3ds Max. Remi Arquier created another excellent tool in 2016, which has since dominated the UV unwrapping pipeline. Remi Arquier, on the other hand, did not join Autodesk this time but went alone.

Rizom UV is a robust and self-contained application for unwrapping 3D models in both real and virtual space. It has several intriguing tools for folding, unfolding, relaxing, arranging, layout, distributing, selecting, and aligning, among other things. Additionally, the easy interaction with Maya is a benefit.

3.1.4 Houdini

Houdini is a computer-generated imagery application developed by SideFX, a Toronto-based startup. It is a modification of the PRISMS software suite, which is also a procedural generation tool. Houdini is modeling, rigging, animation, simulation, visual

effects, rendering, and compositing application. However, Houdini is the industry standard for visual effects in the computer graphics business. It is an indispensable program for all visual effects studios, including Walt Disney, Pixar, DreamWorks, ILM, MPC, Sony, and Method Studio.

3.1.5 Substance Painter

Allegorithmic, a French software company, developed Substance Painter, a tool for producing procedural textures. After Adobe acquired Allegorithmic in January 2019, the program was renamed "Adobe Substance Painter." Another significant software company, Adobe, offers the Total Creative Suite, which is a collection of multimedia and creative applications.

3.1.6 Autodesk Arnold

Maya's default rendering engine is Arnold. Solid Angle, a business based in Spain, designed it. However, the creator later agreed to work with Autodesk on the development of this great product, and Autodesk has since purchased Solid Angle. Arnold is a CPU-based renderer that recently added limited Nvidia GPU support. Arnold Renderer has also appeared in a number of high-profile films, including Captain America: The Winter Soldier, Thor, Star Wars, Game of Thrones, and Elysium.

CHAPTER 4

METHOD OF DEVELOPMENT

To ensure the long-term viability of our project, we followed an industry-standard production line to ensure ADWAR's maximum output.

4.1 Pre-production

Gathering References and Idea

Story Creation

Sound Design

Writing on Voice over

Story Board and animatic

4.2 Production

Creating asset and model

Character design and model

Creating environment

Character rig and animation

Camera animation

Simulation and VFX

Lighting and LookDev

Scene Optimization

Rendering

4.3 Post-production

Recording Voice over

Compositing and Editing

Color Grading

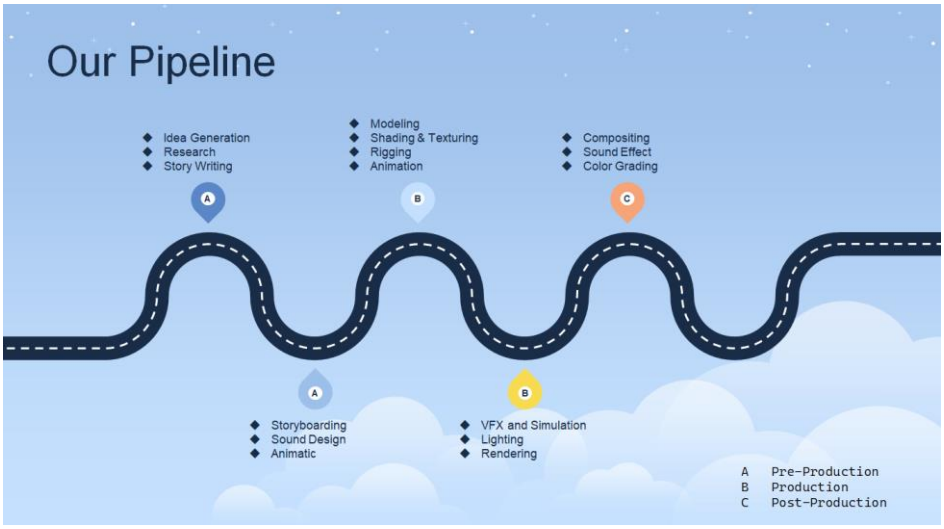

Figure 4.1: Our Pipeline

We also maintained a gantt chart in accordance with our team's strategy to ensure that our project was completed on schedule.

ADWAR (3D Short Film) Time-schedule

Monowar Kayser Moon (181-40-509)
Tonmoy Baroi (181-40-464)

Project Start to End: 9/1/2021 to 1/5/22

TASK	ASSIGNED TO	PROGRESS	START	END	ETA
Pre-production					
Gathering References and Idea	Both	100%	9/1/2021 to 1/5/22	9/14/21	
Story Creation	Both	100%	9/7/21	9/21/21	
Sound Design	Moon	100%	9/25/21	10/10/21	
Writing on Voice over	Moon	...	...	...	TBA
Story Board and animatics	Both	100%	9/25/21	10/12/21	
Production					
Creatingt asset and model	Both	100%	10/12/21	10/31/21	
Character design and model	Both	100%	10/15/21	10/31/21	
Creating environment	Tonmoy	100%	10/21/21	11/2/21	
Character rig and animation	Both	100%	11/12/21	12/7/21	
Camera animation	Moon	100%	11/12/21	12/10/21	
Simulation and VFX	Both	100%	11/15/21	12/18/21	
Lighting And LookDev	Both	100%	11/2/21	11/12/21	
Scene Optimization	Tonmoy	100%	12/15/21	12/25/21	
Rendering	Both	100%	12/8/21	1/2/22	
Post-production					
Recording Voice over	Moon	...	...	...	TBA
Compositing and Editing	Both	100%	1/2/22	1/5/22	
Color Grading	Moon	100%	1/5/22	1/5/22	

Figure 4.2: Timetable for the project

4.1.1 Gathering References and Idea

It has always been a goal of ours to create a science fiction short film. We began watching science fiction films in our youth, so the word was not unfamiliar to us. However, in terms of development and research, we needed to work on it extensively. We visited the ArtStation and NASA websites, as well as a few other odd sites related to space and rovers.

We wanted to create something unique, so we began writing our narrative and completed it in one month, as planned. We attempted to depict our tale in a symbolic video.

4.1.2 Story Creation

We intended to develop a figure who would symbolize human existence, but he would be isolated in a location. He will meet someone and they will become buddies one day. The protagonist's loneliness will fade. However, a calamity strikes and he is forced to return to his prior life. However, he will continue on and discover something new, which is the magic of life and what it teaches us.

4.1.3 Sound Design

Sound design was important for us because we made an animation of two inanimate objects. We had to express their emotions with sounds. We even made a mood board for sounds that enabled us to perform pre-visualization before generating the short video, as it helped us to get into the right mindset for the mood and the feeling we were after. We licensed our music through Epidemic Sound (an online marketplace for stock sound effects).

4.1.4 Writing on Voice over

We meant to create a voice-over for the story but changed our thoughts, so we omit this section.

4.1.5 Story Board

The narrative image sequence was created using Adobe Photoshop and Illustrator. These two applications are considered industry standards for drawing and vectorizing images. The bulk of the drawings were done digitally in Photoshop and Illustrator, with the exception of a few that were created by hand.

Figure 4.3: Creating a narrative illustration in Illustrator

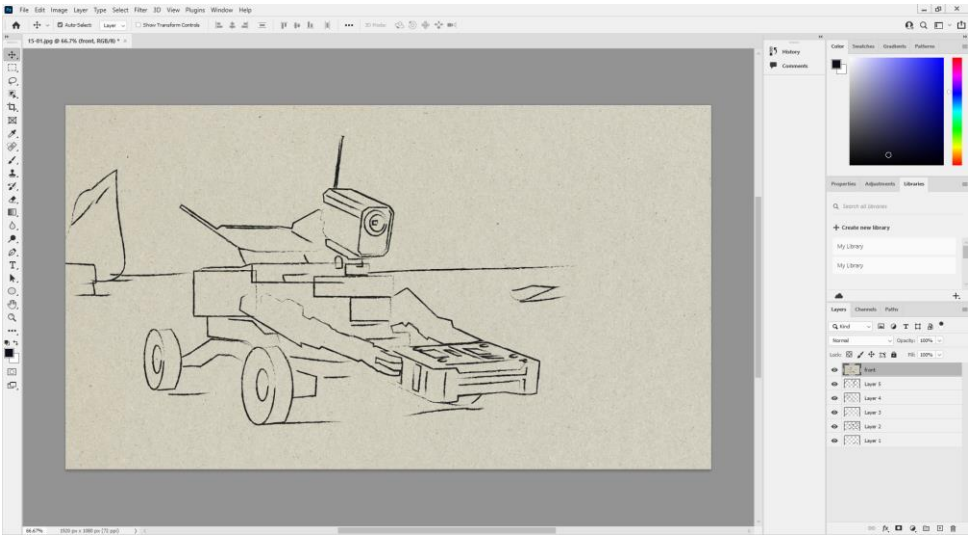

Figure 4.4: Illustration for the storyboard in Photoshop

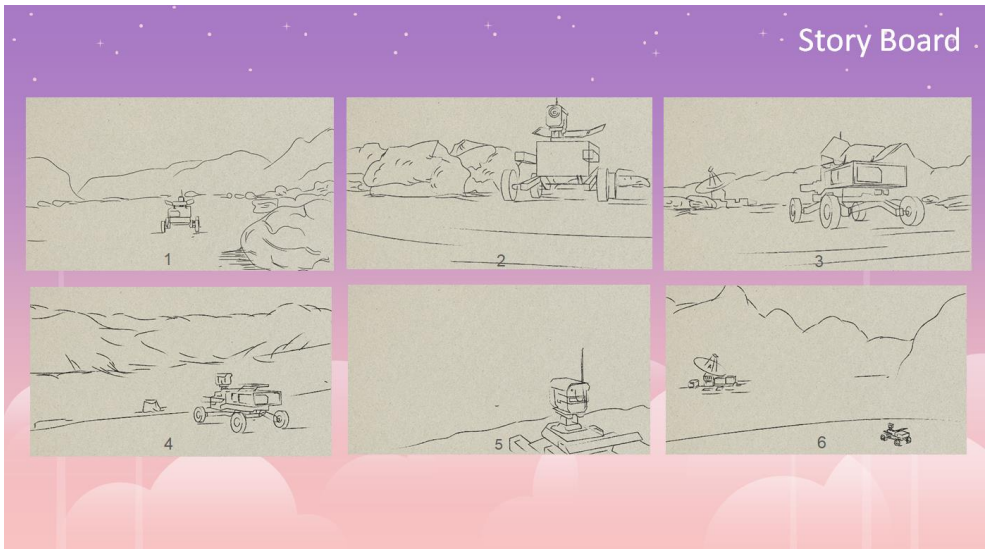

Figure 4.5: Storyboard sequence preview (Part-1)

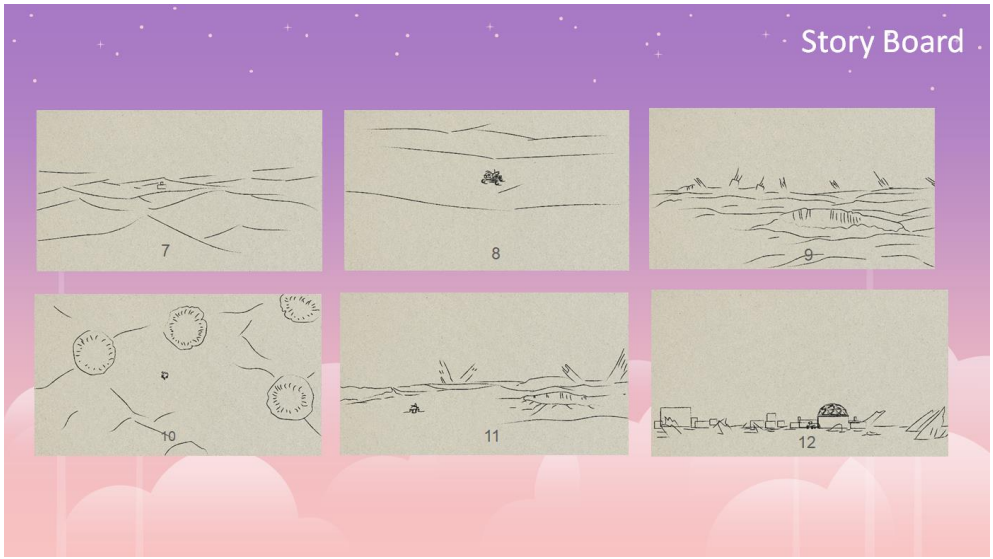

Figure 4.6: Storyboard sequence preview (Part-2)

Figure 4.7: Storyboard sequence preview (Part-3)

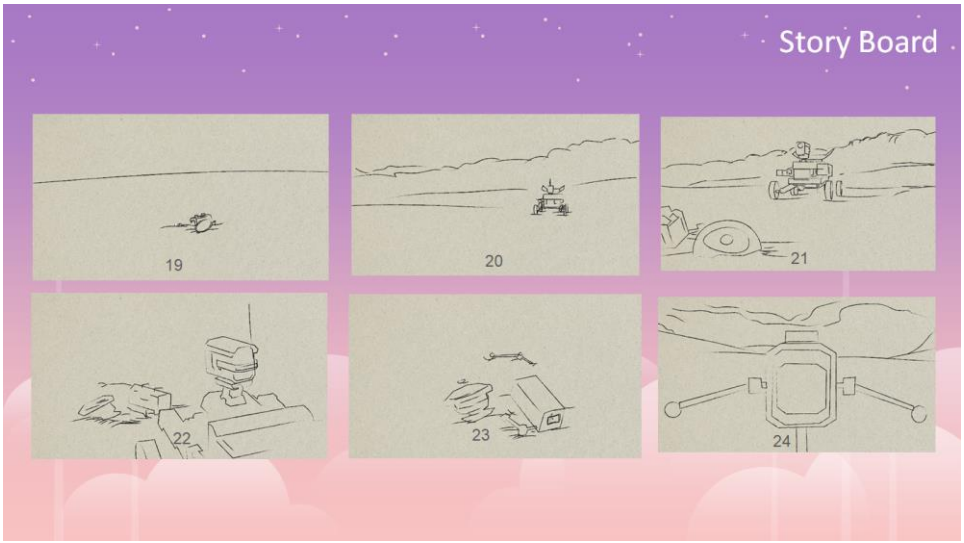

Figure 4.8: Storyboard sequence preview (Part-4)

Figure 4.9: Storyboard sequence preview (Part-5)

Figure 4.10: Storyboard sequence preview (Part-6)

Figure 4.11: Storyboard sequence preview (Part-7)

4.1.6 Adobe After Effects for creating the Animatic

Adobe After Effects was used to create the pre-visualization for ADWAR. Following the completion of the sound design, the drawings were imported into Adobe After Effects and integrated with the audio.

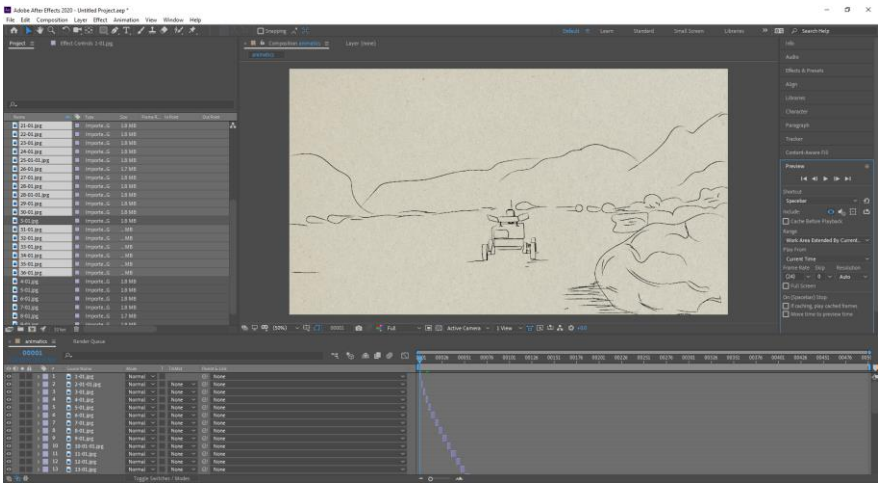

Figure 4.12: Animatic in Adobe After Effects

4.2 Production

4.2.1 Creating asset model and character

We used Autodesk Maya to develop components, models, and characters. Due to the fact that the film has two characters named ADWAR and CK-32, we spent more time modeling ADWAR and CK-32 than we did other models. Despite the apparent significance of the features, the modeling procedure was uncomplicated. Extrude and bevel were often used commands to bring the modeling process to a close.

4.2.2 Creating environment

There are numerous landscape design and terrain creation programs available. for example, World Generator, VUE Extreme, and Terragen. However, we selected WC due to its robust procedural workflow and seamless interface with any DCC, in our case Maya and Houdini. World Creator may generate float 32-bit output for many maps. WC has the ability to export our landscape as a float 32bit height map or as a high-poly geo mesh. This enables us to observe and edit our surroundings in real time, thanks to a built-in real-time renderer that can utilize both the CPU and GPU. Due to the fact that it consumes nearly all available system resources, we occasionally experience lagging as well. However, when taken with a grain of salt, WC can create an excellent landscape.

4.2.3 UV Mapping

For better texture, UV mapping is essential. We sometimes omit this step, but if UV isn't properly unfolded, it might cause problems. Any type of texture basis shading or PBR shading is not possible. Multi-UDIM tiling is supported in Maya. Multi UDIM tiling comes extremely handy when working on large, complex models that demand a lot of Texal density.

4.2.4 Texturing

Two industry-standard apps are now available. Foundry's Mari is a product, and Foundry's Substance Painter is a product they developed. Both of them are capable of developing and shading our model. Substance Painter, on the other hand, was chosen because of its close integration with Maya, Houdini, and other DCC products.

Substance Painter is a layering application using a texture-based approach. It's a simple and easy-to-use tool for texturing models and other three-dimensional objects. It uses both OpenGL and the Ray Tracing Renderer, called "IRay," to create a real-time viewing experience. OpenGL, on the other hand, is much faster than Iray. It does, however, enable for bespoke or third-party renderer engines if desired.

Substance would allow MultiUDIM if we wanted it (Mari workflow). Because of the higher Texal Density, we were obliged to use MultiUDIM UV. At least five UDIM tiles are present in the geometries of both of our robots. We'll utilize the Substance Painter function to tone this model. Substance Painter can currently produce textures with a resolution of up to 8K. All of our texture files are also available in two resolutions: 1K and 4K. To speed up the rendering process, we used a 1K texture in our project.

4.2.5 Rigging

We didn't have any human characters or personalities, which raises the question, "Why do we need rigging?" As a result, even if we don't have any human protagonists, our story will be carried on by robots/droids. Auto can also be used to identify this Droid. These are items that, like Human Figure Auto, should not be animated without a suitable rig. We needed to correctly rig our droid figure for effective animation because there are various sophisticated and interconnected components that contribute to the movement of autos. We make use of the features that come with Maya 2022. Nurbs/Curves is the controller.

Mesh control with automatic Orientation, Rotation, and Direction Constraints, "Maya," and "Deform." Finally, for more advanced rigging, Mel Expression (a Maya programming language) is accessible. Our model was rigged in a way that allowed it to be resized without causing the mesh or rig to break. Our gear has a feature that allows us

to alter the speed. In response to bodily movement, it will automate the spinning of the wheel.

4.2.6 Animation

We imported and tested the rigged characters prior to animation. The two characters were animated in line with the storyboard. This work was done through the use of keyframe animation. Additionally, multiple reference videos were used to precisely show the rovers' movement in the animation.

Figure 4.13: Rover's falling video

4.2.7 Volumetric Simulation

Our Short Film contains a sequence in which our Droid character encounters difficulties due to a large storm. We require a volumetric simulation for that scenario, but it is very impossible to produce with Maya. We migrated to SideFX Houdini from Maya since the Maya volume tool is not standard or procedural.

We are seeking for a volumetric simulation. And Houdini has the most effective solver for this, which is called "Pyro." Pyro is a solution that is capable to readily handling volumetricimulation. Due to the procedural aspect of this software, it has become significantly easier for us to conduct study, test, practice, and retrace our steps.

4.2.8 Lighting

3D Lighting is an important part in the 3D or VFX pipeline. A proper lighting is essential for better render outcome. We used only Hdri lighting and Directional lighting in our scene because all of our storyline refers to the outdoor environment.

4.2.9 Scene Optimization

Initially every scene file in our project became larger in size with the higher poly count. But with the use of Houdini we reduced our Geometry file up to 60%. If we did not optimize our scene file enough Rendering those scene would be much harder.

4.2.10 LookDev

Before rendering we had to ensure our scene quality and consistency throughout the story line. We can't just lookdev and render out shots one by one without proper lookdev or visual development. In lookdev process we had to correct color, light intensity, Reflection, Reflection, Ambient Ovulation, Normal Value and so many other scenes.

4.2.11 Rendering

Rendering is the process of using the CPU or GPU to create photorealistic or non-photorealistic images of a 3D object or scene. Rendering is the end result of a 3D/CG/VFX pipeline that includes Geometry Mesh, Particles, Volume, ViewPlane, Texture, Light, and Shading Data.

Our major rendering engine is Arnold Renderer. With certain limitations, GPU rendering is now supported in recent versions of Arnold. As a result, we chose Arnold with GPU rendering. We didn't use the GUI version of Arnold to keep our workflow smooth and efficient. To render scenes, we leverage Arnold's command line functionality.

4.3. Post Production

4.3.1 Compositing and Editing

Individual EXR files including numerous utility passes were used to create our renderings. Adobe After Effects was used to compose the music for this short film. We used the ACES workflow for color management. We had to use an After Effects plugin that supports OCIO because the ACES workflow isn't natively included into the software. OCIO, also known as Open Color IO, was created by Sony Pictures ImageWorks, a Hollywood visual effects studio.

The video was edited with Adobe Premiere Pro. To begin, we sequenced the After Effects footage that had been exported. The cuts and transitions were guided by the storyboard. The timeline of the footage was also remapped using Premiere Pro. The title animation and bottom thirds were also created in Premiere Pro.

4.3.2 Color Grading

For color grading, we utilized Da Vinci Resolve. When it comes to color grading, Da Vinci Resolve is unmatched. Nowadays, all Hollywood films utilize Resolve for color grading. Due to its incredible capabilities, it has become the industry standard. As a result, we wanted to give our short video our all and employed Da Vinci Resolve. The results are incredible, and we are quite delighted to have achieved them.

We created a mood board in which we gathered all the reference photographs we could find online, both genuine images from NASA and beautiful images created by other aspiring artists on the Art Station, which served as inspiration for our color grading. Our color palette is predominantly comparable and complimentary, which is quite esthetically pleasing.

CHAPTER 5

CONTRIBUTION

It was always a dream to work on such an interesting project like ADWAR. From my childhood, watching cartoons and movies was a hobby. From there, it became a great passion to work on 3D animation and movies. Time flies, and it is now the time to show some of your thoughts thru an animated film like ADWAR. Science and technology are also other parts that help me think like a logical thinker. It also made me a problem solver. On the other hand, art influenced me so much that I could find myself in this way. Light, shadow, color, composition, perspective, these things are now vital parts of my life.

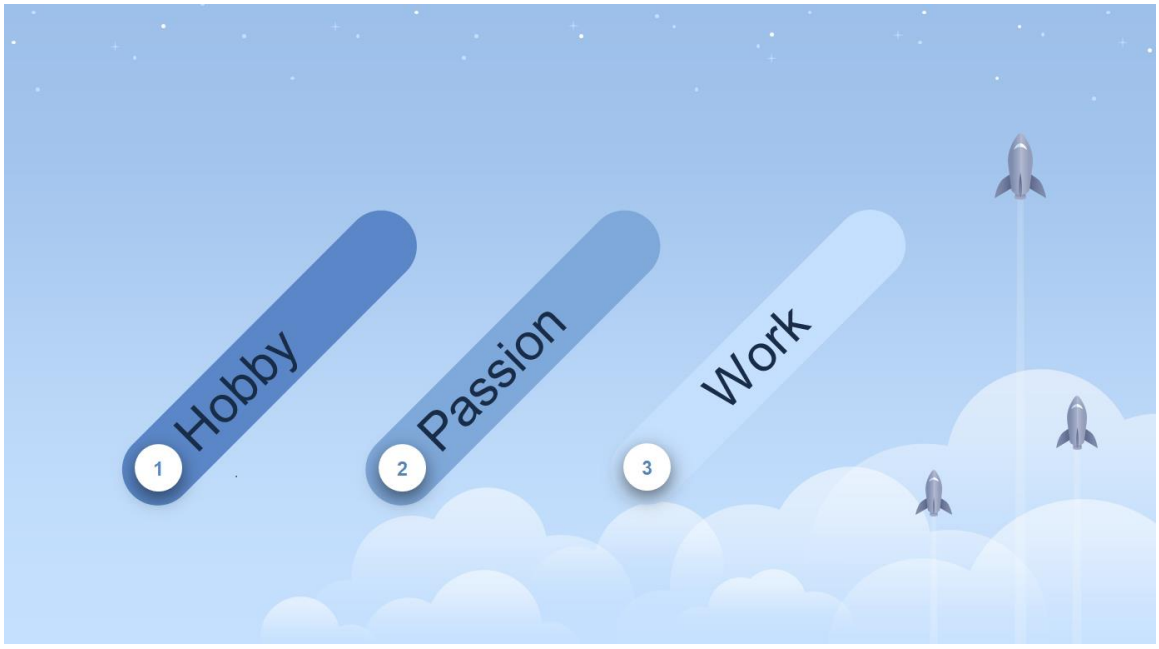

Figure 5.1: Project motivation

5.1 Pre-Production

I gave it my all on my end. Because this is a small group effort with only two participants.

5.1.1 Research and Development

Research is crucial to the growth of any type of work. Without study, obtaining the intended result is nearly impossible.

Because our team chose to make a science fiction picture, it was a significant difficulty to display our film logically in a way that communicated a message to the audience.

I began watching science fiction films, such as Lightyear , Big Hero 6, WALLE, Space Jam: A New Legacy, Space Jam, Treasure Planet, and Ron's Gone Wrong. These films aided me in developing concepts such as ADWAR.

To boost my inspiration, I gathered photographs from ArtStation, which proved quite beneficial. Additionally, in Milanote. I compiled all of the images and put them together in a mood board for the team. Environment, color, light, and shadow are all crucial parts of inspiration.

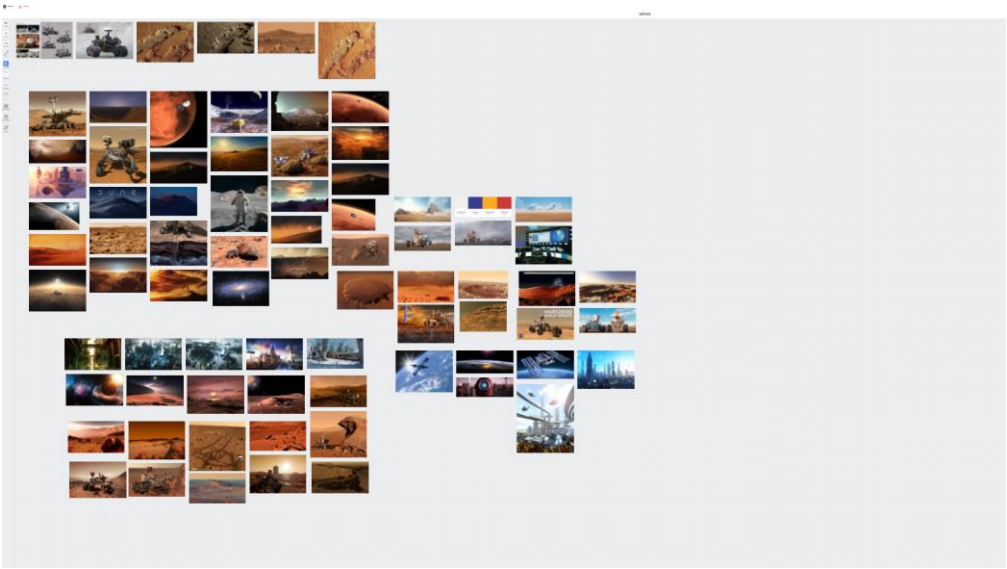

Figure 5.2: Images in Milanote

I visited several websites that assisted me in learning about the environment on the other world. I spent more time on Mars in particular.

Figure 5.3: Surface of Mars (Part-1)

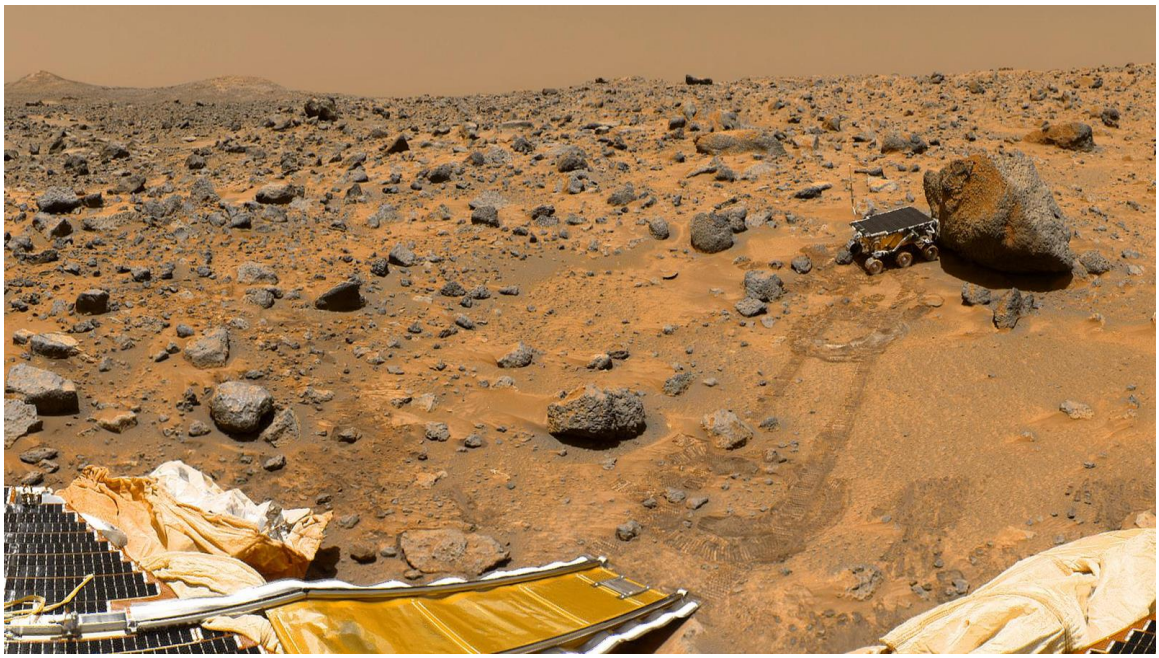

Figure 5.4: Surface of Mars (Part-2)

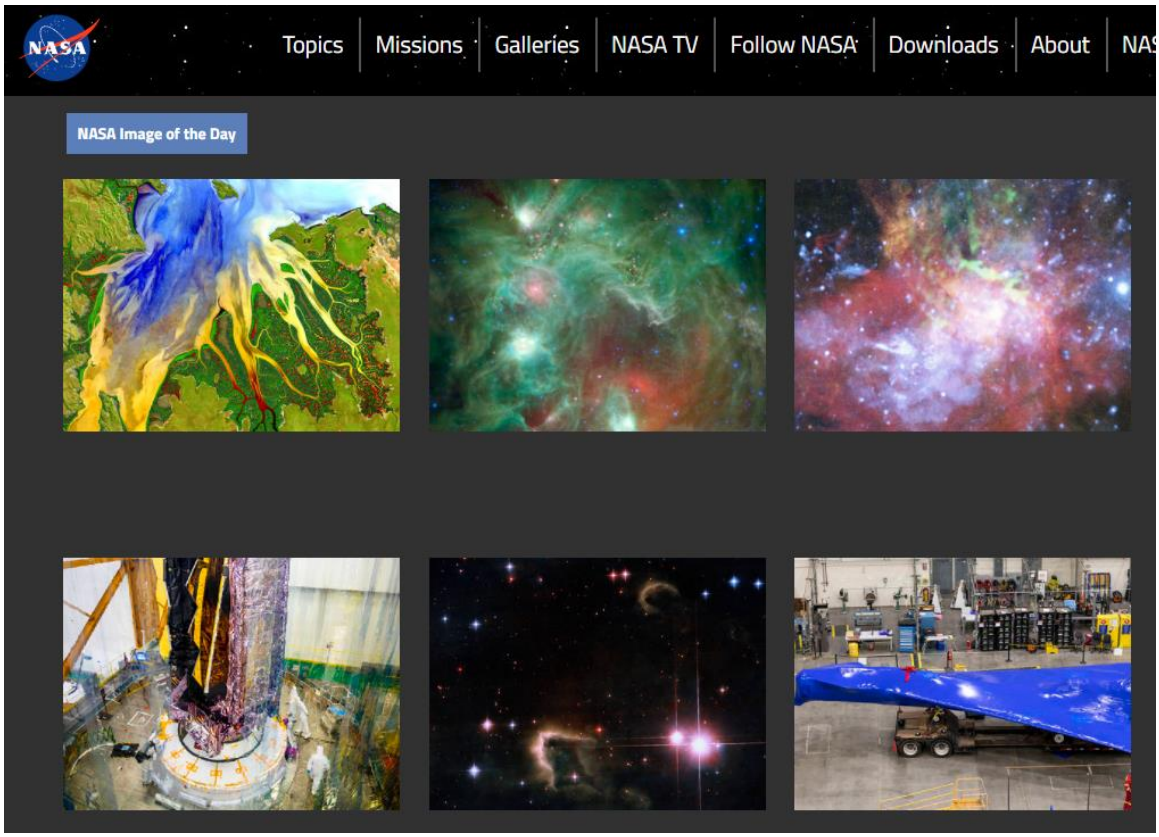

Figure 5.5: Image galleries of NASA

5.1.2 Story Creation

We intended to make a film about Mars's ecology; however after doing some study on Mars, I discovered that there are some obstacles. Due to the fact that we were attempting to create a half-realistic depiction, we needed to find a planet where the rover could easily follow a plot. Additionally, there is some unpaid labor on an unknown planet. Additionally, a YouTube short film titled Planet Unknown influenced me. This film has altered my perspective significantly. I wrote a tale with the assistance of a teammate that reflected our wants and desires.

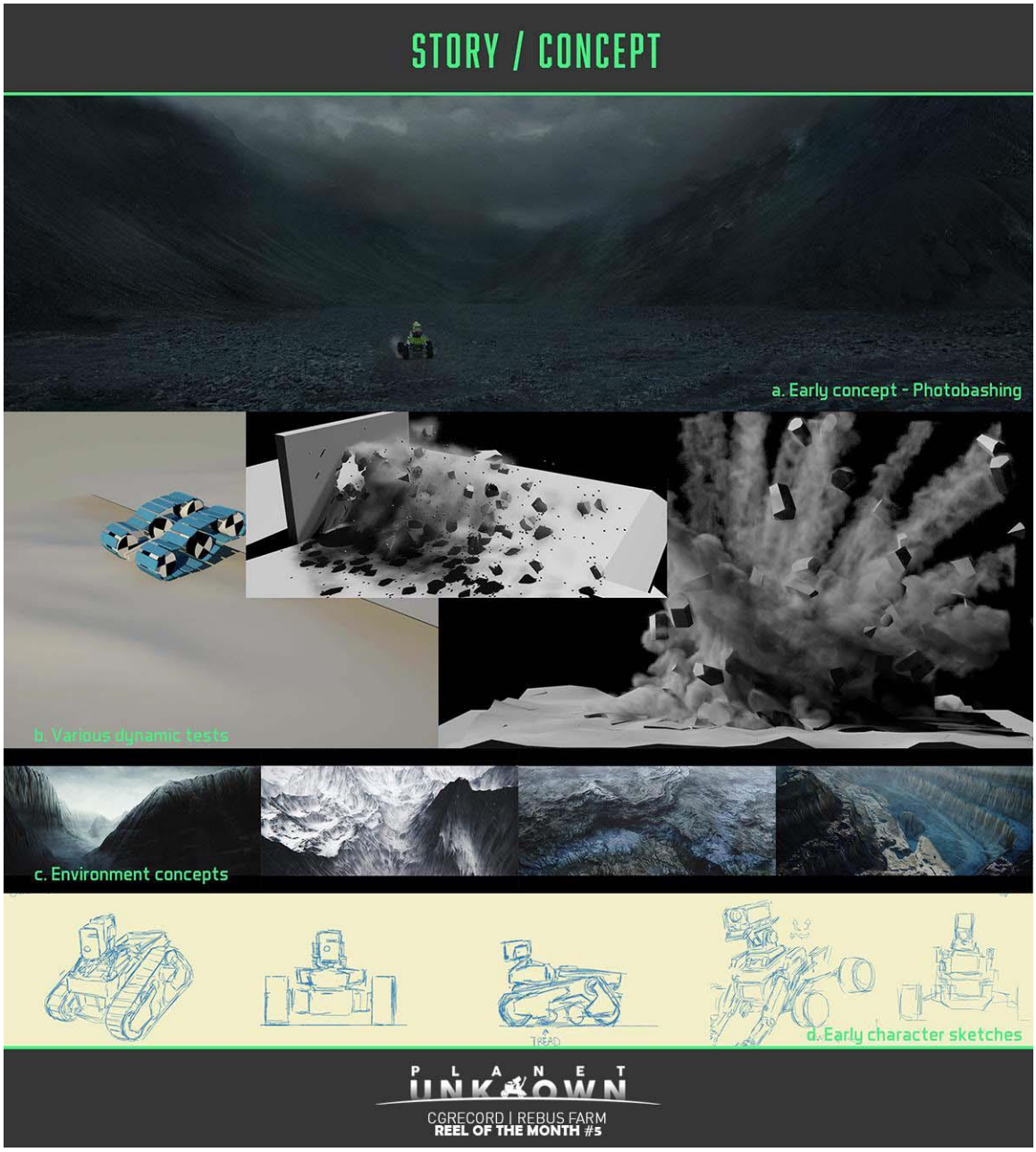

Figure 5.6: Planet Unknown story concept

সাল 2068।
পলাশটা মঙ্গলগ্রহের মিশনের। মিশন MM2.
পৃথিবী থেকে অনেক দূরে মঙ্গলে এক রোবটের অভিযানের কথা।
রোবটটি তখন পৃথিবী থেকে সকল প্রকার যোগাযোগ বিচ্ছিন্ন কিন্তু
রোবটটি কৃত্রিম বুদ্ধিমত্তায় আজও নিজে উদ্যমে চলছে মঙ্গলের
মাধ্যমে।
Soil test, air test সহ বিভিন্ন test করছে নিজ বুদ্ধিমত্তায়।
রোবটের নিজস্ব কিছু নেই কিন্তু কৃত্রিম বুদ্ধিমত্তা তাকে যেন এক
অকৃত্রিম সত্ত্বায় পরিণত করেছে এখানে।
সময় অতিবাহিত হওয়ার সাথে সাথে রোবটটি আরও নতুনভাবে
মঙ্গলকে চিনতে শেখে।
একদিন soil test এর সময় মঙ্গলের মাটিতে খোঁজ পায় মাটি চাপা
পড়ে থাকা নতুন এক রোবটের যা কিনা বেশ পুরোনো। পুরোনো
রোবটকে দেখে এবার তাকে Active করার পেছনে লেগে পড়ে রোবটটি।
বেশ কিছু চেষ্টার পর সচল হয় inactive রোবটটি।
নিজ মিশনের কাজের জন্য রোবট-১ যথারীতি আগের test করায়
ব্যস্ত হলে রোবট-২ ও রোবট-১ কে follow করতে থাকে। আর এভাবেই
তাদের মাঝে তৈরি হয় ওঠে এক সুসম্পর্ক।
এভাবেই এক নতুন সম্পর্ক মঙ্গলের গ্রহে হাঁটতে থাকে। সময়ের পরিক্রমায়
একদিন হাজির হয় দারুণ এক পরীক্ষা। রোবট-১ সম্মুখীন হয়
মঙ্গলের নতুন এক প্রতিকূল পরিবেশ। রোবট-২ ও তার পেছনে
অবস্থান করে। হঠাৎ রোবট-২ এর চার্জ প্রায় শেষের দিকে থাকাতে
তাকে টেনে রোবট-১ হাঁটতে থাকে। কিন্তু নতুন পরিবেশের চোরাবালির
জন্য রোবট-১, রোবট-২ কে ছেড়ে দেয়।

পুনশ্চ: সবশেষে দেখানো হবে রোবট-১ আসলে পৃথিবী থেকে
নিয়ন্ত্রিত হচ্ছিল।

Figure 5.7: First version of the story

Finally, I composed a story, but it contained some difficulties, so my teammate and I decided to alter the story slightly.

5.1.3 Sound Design

Sound design is important to understand the story with the appropriate concept. Before starting the storyboard, I tried to ensure the sound design so that it would help improve the animatic and editing sections of the film production. There is a concept that is called "See With The Ears". This concept is the main reason for doing sound design. "See With The Ears" means a person who can understand the situation thru sound because of the sound quality. We all know that video is the main part of any kind of film, but the main puppet master is the audio of that video.

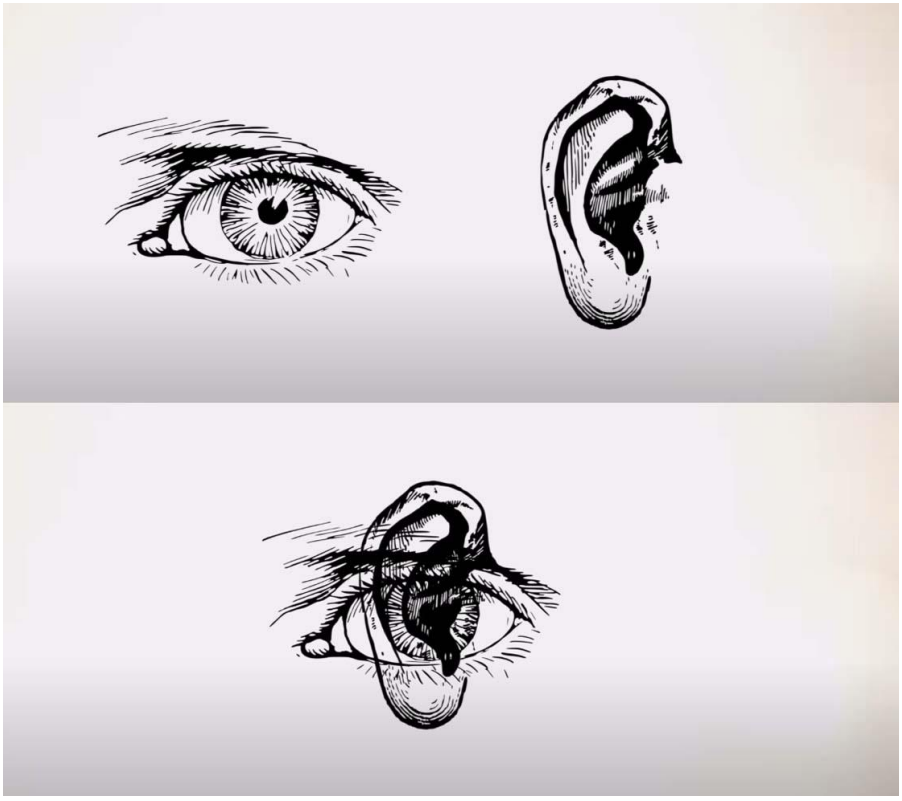

Figure 5.8: See With the ears concept

When a storyteller wishes to convey information, he or she considers the story; but, when a filmmaker wishes to convey information via video, he or she must consider composition, camera angle, and sound. Without an understanding of sound design, it is impossible to demonstrate to the audience the perfect outcome of the story. The strength of sound design is in its imperceptibility. There are two distinct sorts of sound in this project. One is for sound effects, and the other is for music.

There are numerous forms of sound effects, including crowd noises, war sounds, foley sounds, and train sounds, terrifying sounds, background sounds, door sounds, and sci-fi sound effects.

On the other hand, music comes in a variety of styles, including drama, romance, and action.

I spent a lot of work on the sound design in order to capture the scene's distinct feel.

To accomplish this, I needed to find an online marketplace for stock sound effects and music in order to complete the production quickly. I'd chosen the Epidemic Sound and acquired a music license.

5.1.4 Story Board

A storyboard is not just for the illustrations; it also includes the camera angle, perspectives, composition, and transitions.

Following the story's inception, I divided it into smaller sequences based on mood boards. I needed to make a working model of the two rovers before I could begin drawing.

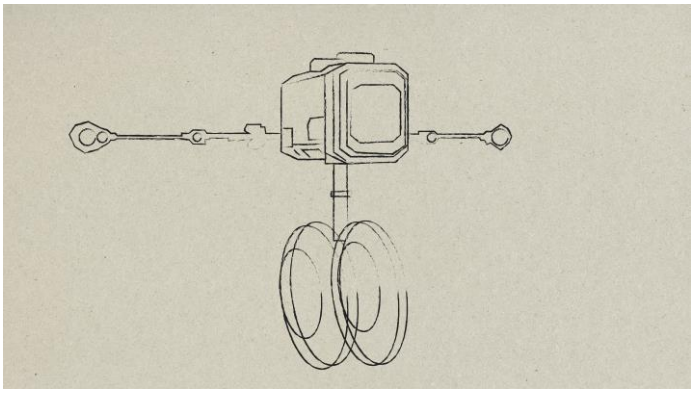

Figure 5.9: CK-32 Conceptual art

Following the conceptual arts, I drew the scenes from the narrative.

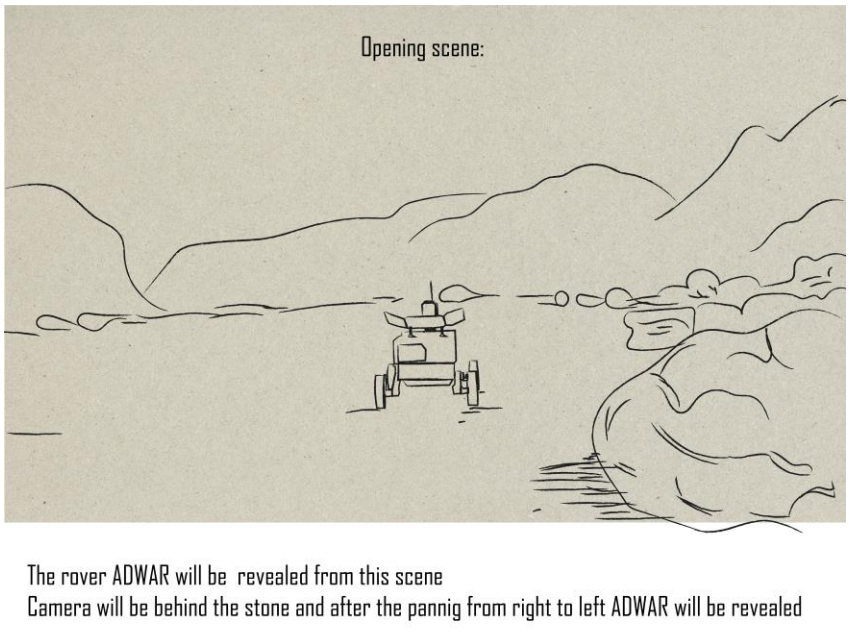

Figure 5.10: Story Board-Start scene

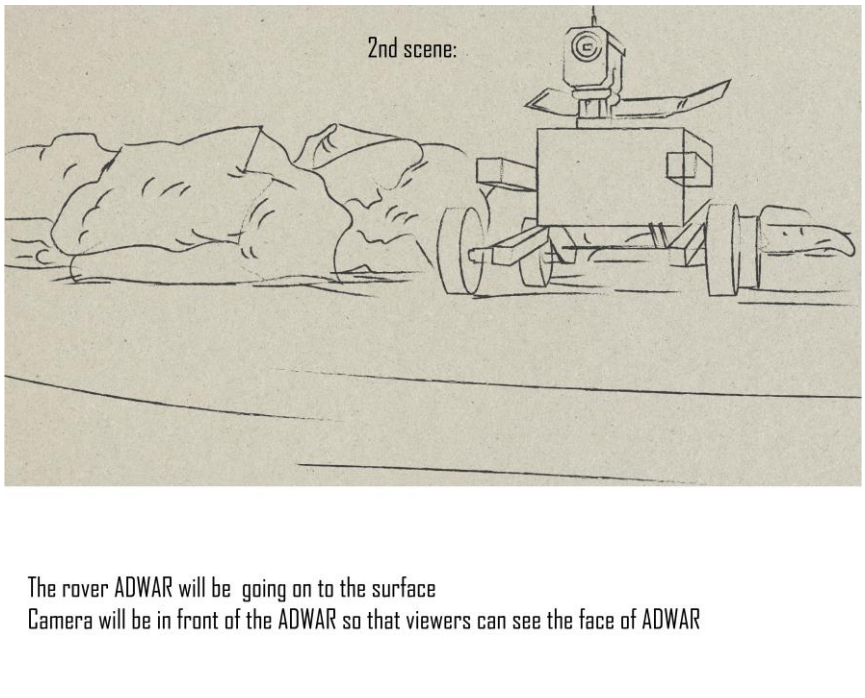

Figure 5.11: Story Board-2nd scene

5.1.5 Animatic

After completing the drawings and sound design, an After Effects animatic was made to provide pre-visualization for the next production level work.

Figure 5.12: Animatic in Adobe After Effects

5.2 Production

5.2.1 Creating the model named CK-32

Although I developed a preliminary model of the CK-32 rover during the pre-production phase, I was required to examine the model's ratio and other features. Given that there is a primary rover named ADWAR who will serve as the primary focus and functional component, I need to create a model that is shorter than ADWAR and less functional in terms of activities but still easy to maneuver.

When I drew the preliminary model of CK-32 during the pre-production stage, the model was inspired by an artist in ArtStation.

I began modeling CK-32 in Autodesk Maya using my preliminary model and reference photographs.

Figure 5.13: Reference images

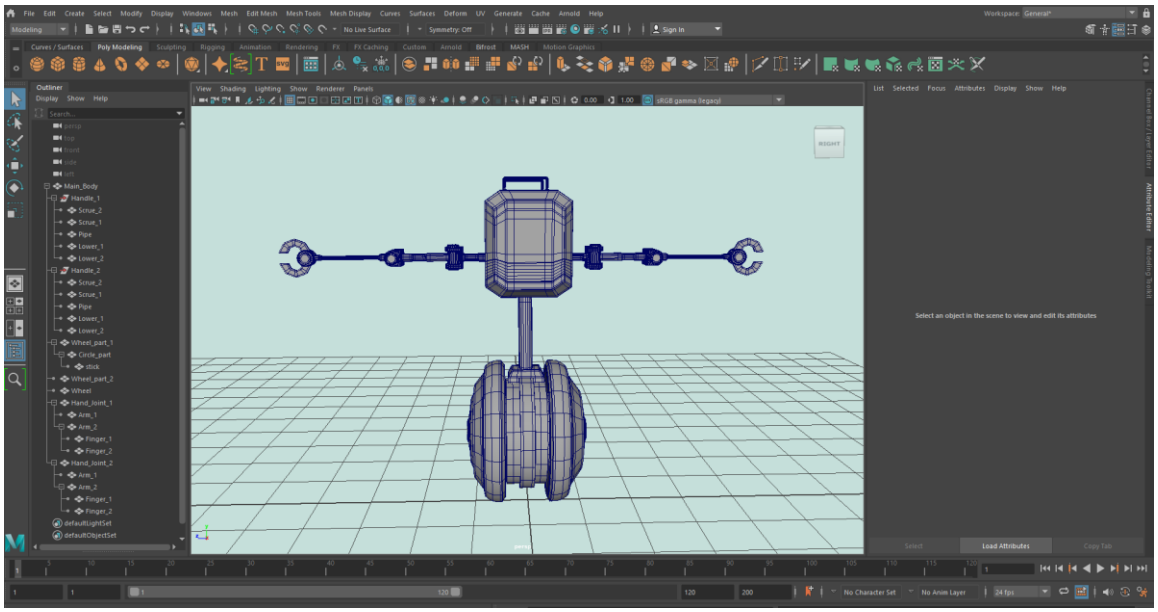

Figure 5.14: CK-32 model

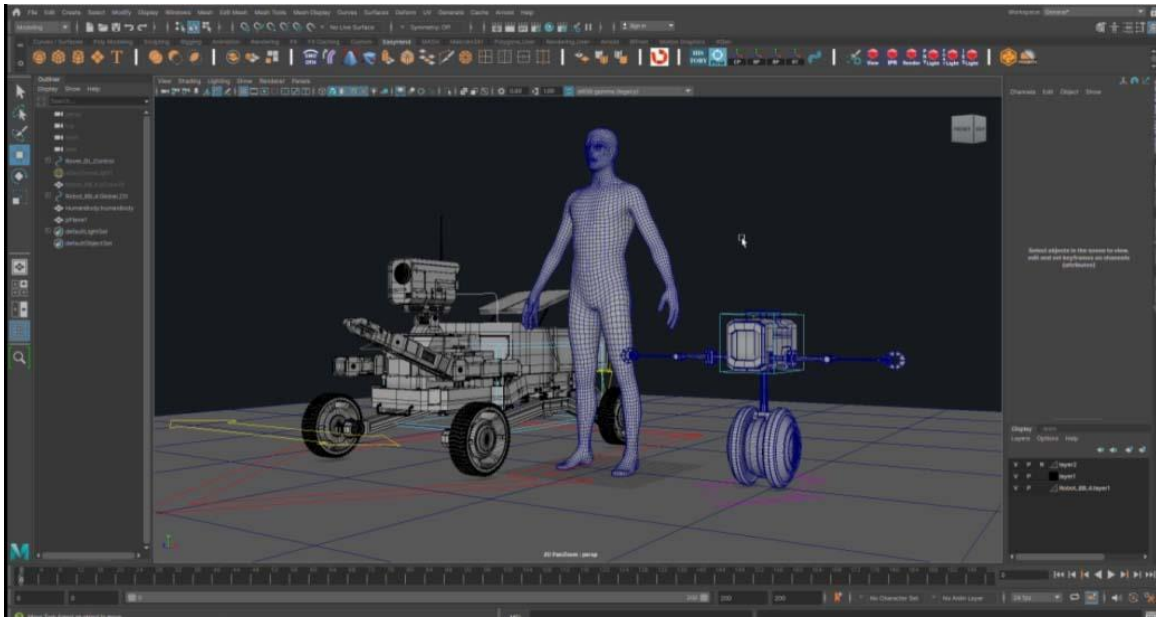

Figure 5.15: Comparison of Ratio

5.2.2 Rig testing

Tonmoy Baroi, one of my teammates, created the rig for the characters in our scenario. Rig testing is a phase in which rig defects are discovered, and it is critical to locate the exact rig issue; otherwise, it will be relegated to the hamper until the next time. There was a rigging issue with the rovers' wheels on this project.

We resolved the issue properly after identifying it.

5.2.3 Animation

Animation is a lengthy procedure. To preserve mechanical motion, I watched several movies of the rover in action. I also watched NASA's Mars rover simulation to gain a better understanding of the rover's movement.

Two distinct styles of animation are used in this project. There are two types of animation: character animation and camera animation.

5.2.4 Character animation

Character animation is a procedure in which a keyframe is used to animate a character. Any type of animation requires keyframe animation. To acquire the best results from the keyframe animation technique, one must be familiar with Maya's graph editor.

Controlling a graph from within the Maya software is not difficult. Additionally, Maya includes an animation layer from which the individual keyframes can be easily separated. To improve the time, one can use Maya's dope sheet.

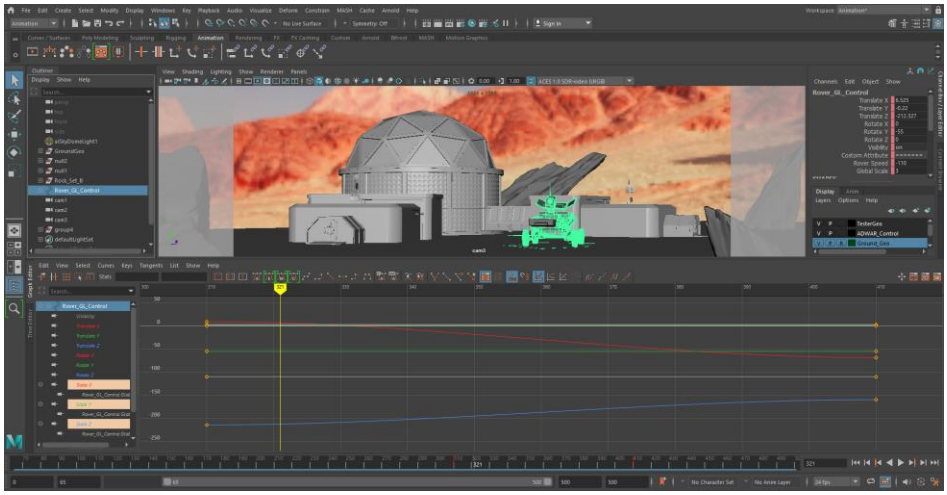

Figure 5.16: Graph Editor

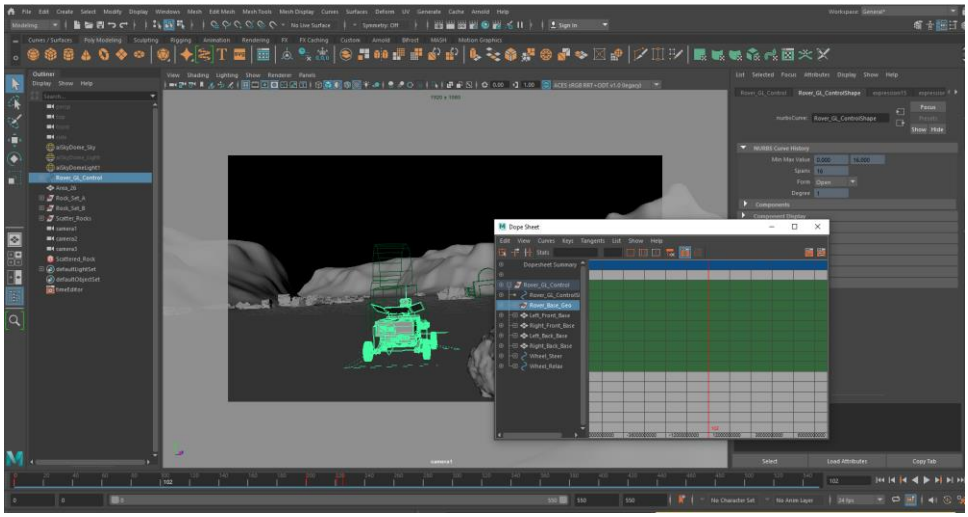

Figure 5.17: Dope sheet

5.2.5 Camera Animation

All camera animation is performed manually in this project by inserting keyframes into the timeline. Additionally, some of the images include the focal length, aperture, and lens squeeze ratio. This is also accomplished with keyframe animation.

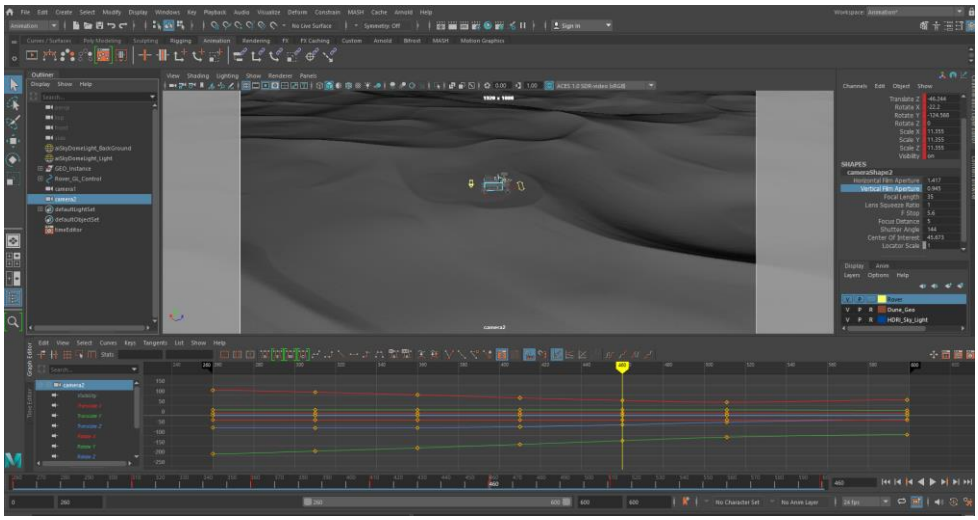

Figure 5.18: Key frames for the camera animation

5.2.6 Simulation testing

There was some tire dust simulation for a few key pictures. As a result, I attempted the dust simulation, but the plan changed and we omitted this section.

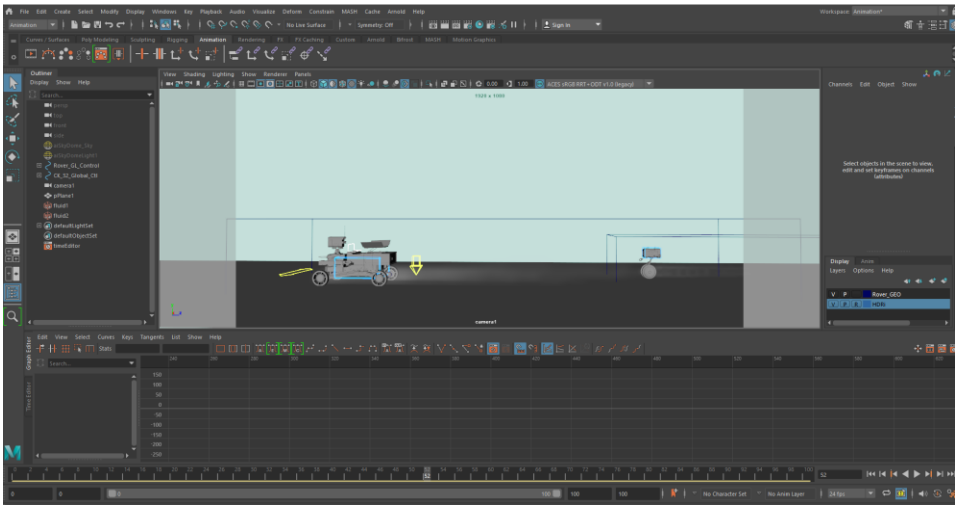

Figure 5.19: Test simulation

5.2.7 Rendering

I used the cloud rendering technique in accordance with our plan.

At the Windows command prompt, one must type a line that will complete the rendering process. Additionally, the project file must be copied to the command prompt during this step.

The line I used in the Windows command prompt:

render -r arnold -cam cam# -s # -e # -ai:lve 2 -rd D:\renderout(Folder output name)

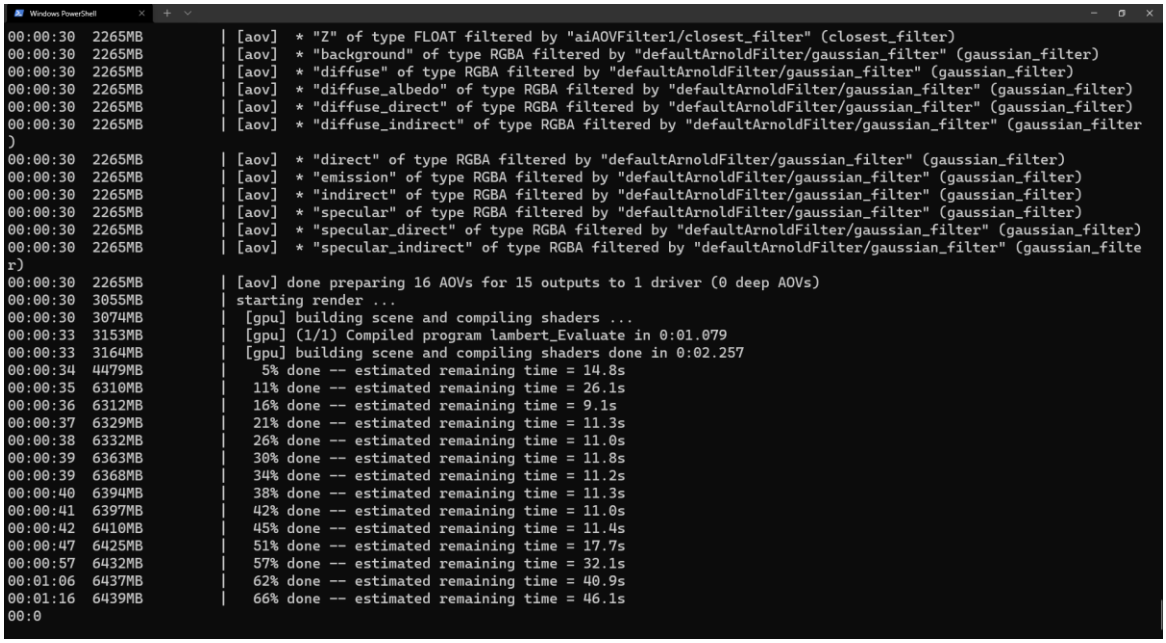

Figure 5.20: Rendering in command prompt

Hierarchy	Folder Name/File Name	Start	End	Frame	Status		Render Time (Frame)	Render Time (Total)	Render Stats	Backup	Extra AOV	Backup	File Name
Shot 01													
cam1:	Scene-AD01/SceneAD01	20	170	150	Optimized	LookDev	1.8m	4.30h	Done	Done	Done	Done	SceneUtil-AD01/SceneUtilAD01
cam2:	--	--	--	--	Skipped								
cam3:	Scene-AD02/SceneAD02	100	180	80	Optimized	LookDev	3.5m	4.34h	Done	Done	Done	Done	SceneUtil-AD02/SceneUtilAD02
Shot 02													
cam1:	Scene-AD03/SceneAD03	20	180	160	Optimized	LookDev	2.8m	7.10h	Done	Done	Done	Done	SceneUtil-AD03/SceneUtilAD03
cam2:	--	--	--	--	Skipped								
cam3:	--	--	--	--	Skipped								
cam4:	--	--	--	--	Skipped								
Shot 03													
cam1:	Scene-AD04/SceneAD04	1	150	150	Optimized	LookDev	2.6m	6.30h	Done	Done	Done	Done	SceneUtil-AD04/SceneUtilAD04
Shot 04													
cam1:	Scene-AD05/SceneAD05	1	250	250	Optimized	LookDev	1.94m	8.5h	Done	Done	Done	Done	SceneUtil-AD05/SceneUtilAD05
cam2:	Scene-AD06/SceneAD06	460	600	140	Optimized	LookDev	2.8m	6.2h	Done	Done	Done	Done	SceneUtil-AD06/SceneUtilAD06
Shot 05													
cam1:	Scene-AD07/SceneAD07	1	96	96	Optimized	LookDev	2.77m	4.26h	Done	Done	Done	Done	SceneUtil-AD07/SceneUtilAD07
cam1(sim):	Scene-AD08/SceneAD08	1	96	96	Optimized	Skipped			Discarded				
cam2:	Scene-AD09/SceneAD09	70		1	Optimized	LookDev	2m	2m	Done	Done	Done	Done	SceneUtil-AD09/SceneUtilAD09
cam3:	Scene-AD10/SceneAD10	1	100	100	Optimized	LookDev	2.15m	3.35h	Done	Done	Done	Done	SceneUtil-AD10/SceneUtilAD10

Figure 5.21: A portion of rendering details

5.3 Post production

5.3.1 Compositing

Each rendered image is in the EXR format. Multiple render passes are used to assemble all of the EXRs. I utilized several passes in the compositing process for this project.

For the compositing, I chose after-effects.

Adobe After Effects is a digital visual effects, motion graphics, and compositing application developed by Adobe Systems for use in the post-production of motion pictures, video games, and television projects.

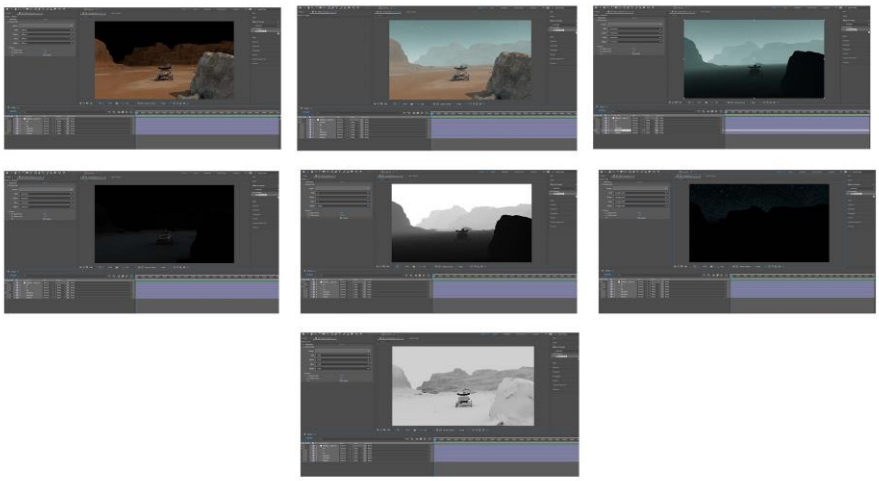

Figure 5.22: EXR Passes

5.3.2 Color management in after effects

In After Effects, I utilized the Open Color IO plugin to control the ACES color space.

OpenColorIO ("OCIO") is a free and open-source color management system for film production pipelines. It was primarily developed for Sony Pictures Imageworks' internal use before being made public in July 2010.

I followed a few steps to ensure that After Effects used the correct ACES color space.

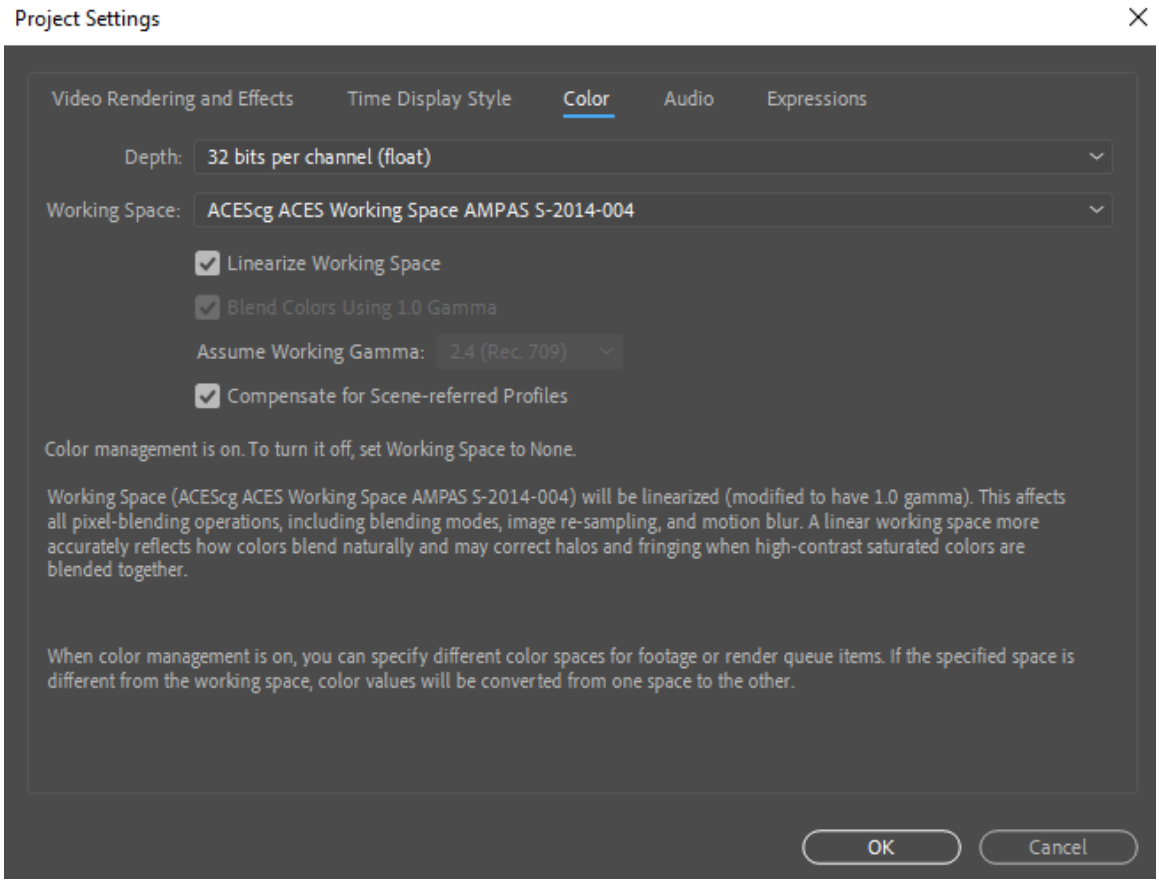

Figure 5.23: Project settings changing for ACES in After Effects

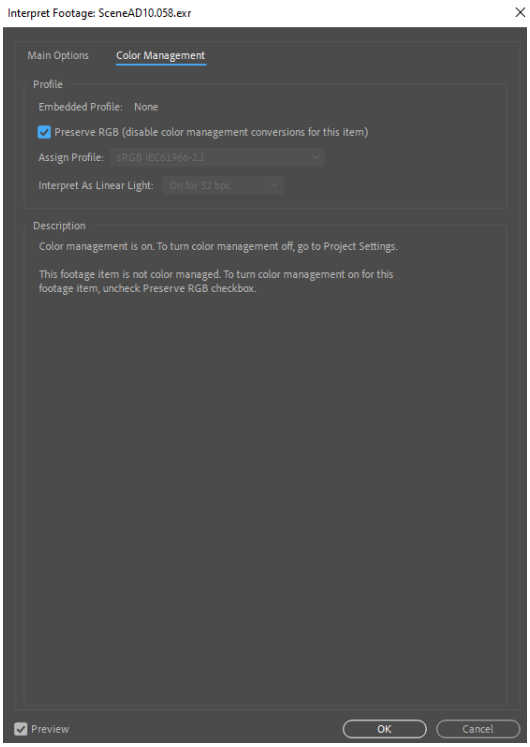

Figure 5.24: Changing Color Management by doing interpret footage

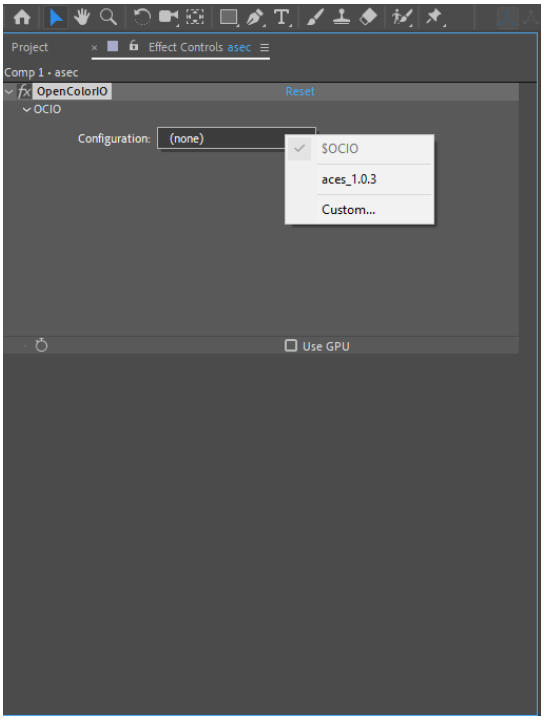

Figure 5.25: Applying OpenColorIo on the adjustment layer

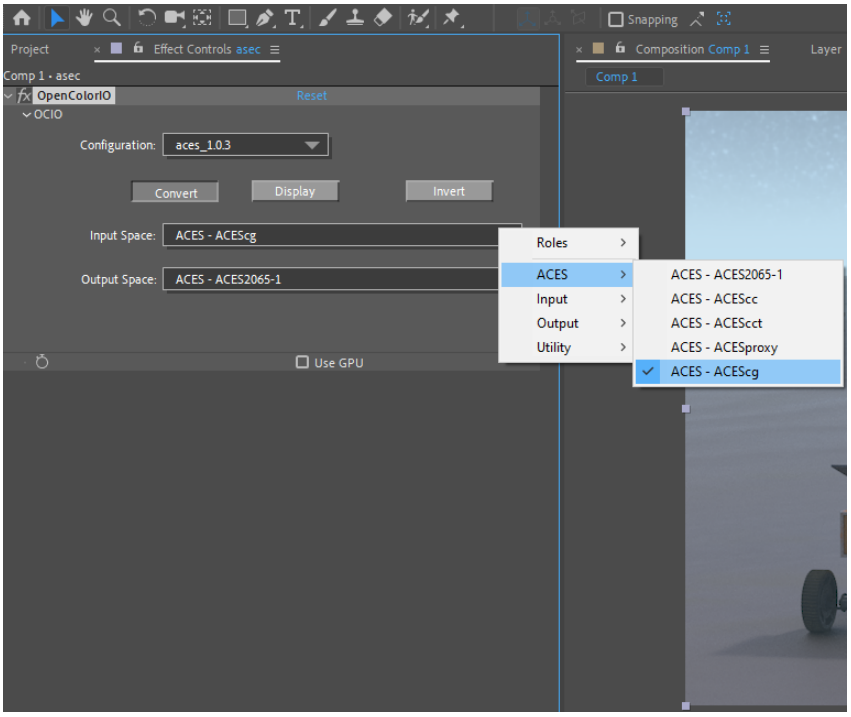

Figure 5.26: Changing input space from ACES to ACEScg

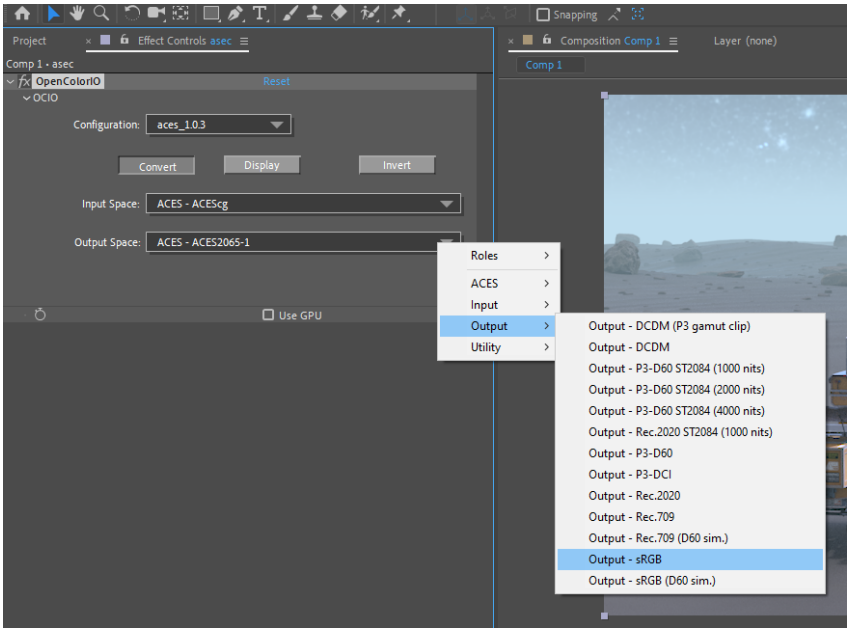

Figure 5.27: Changing output space from output to sRGB

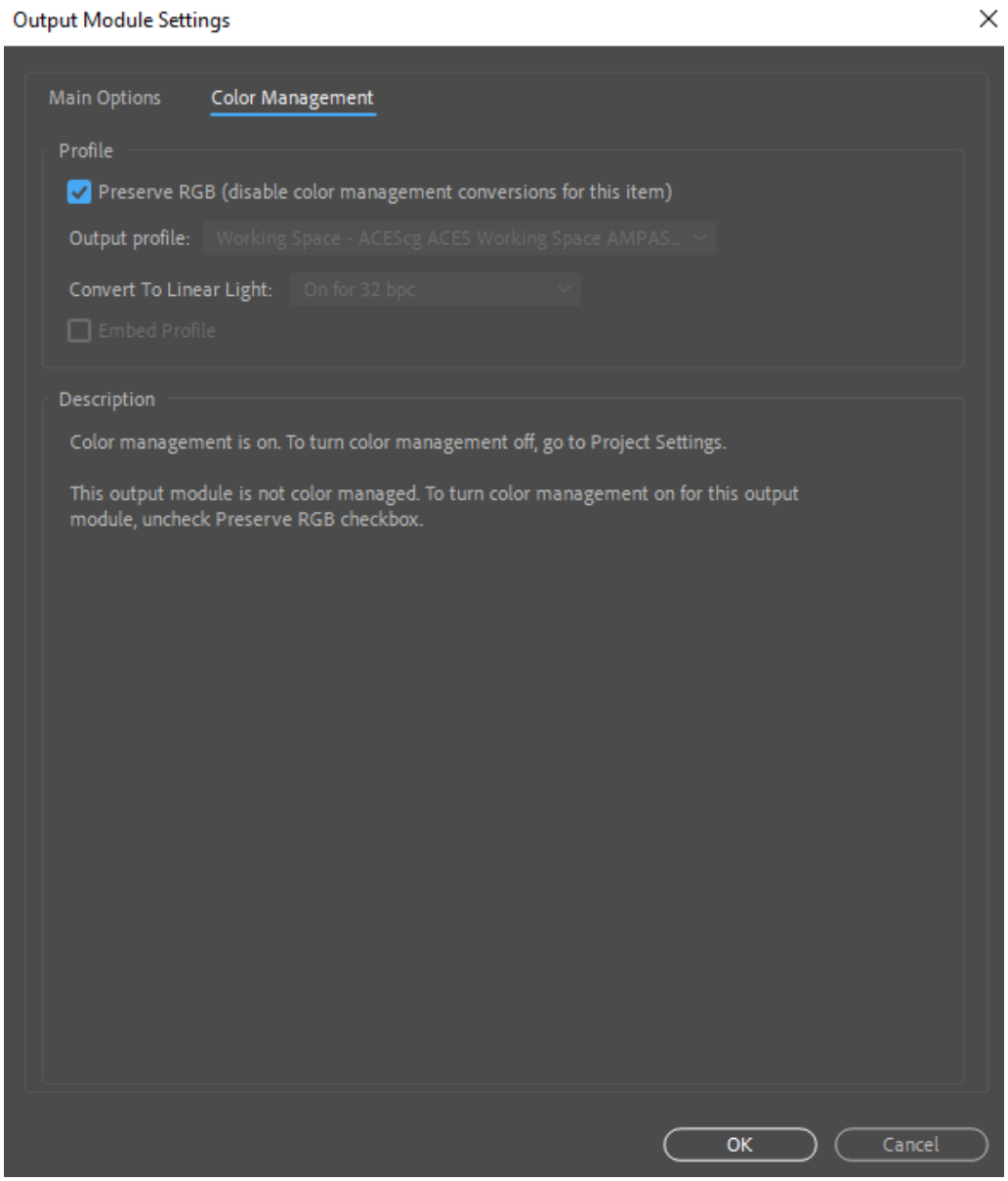

Figure 5.28: Changing Color Management in the render section

5.3.3 Color Grading

For color grading, I used DaVinci Resolve.

Our color palette is visually attractive, complementary, and linked. We created a mood board utilizing every image we could find on the internet, including NASA imagery and gorgeous artwork created by other aspiring artists on the Art Station.

Figure 5.29: Color grading in Resolve

5.3.4 Editing

Adobe Premier Pro was used to add sound effects, music, title animation, and other necessary editing components.

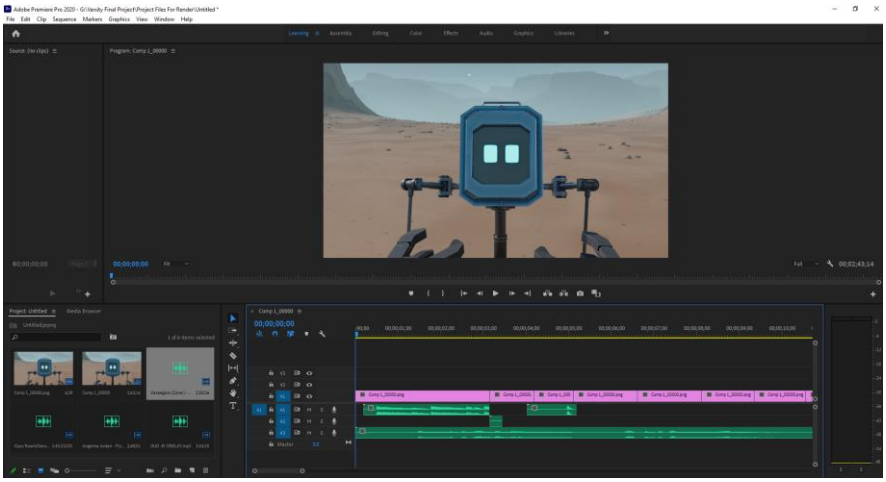

Figure 5.30: Editing in Adobe Premier Pro

5.4 Project Management

While the project's length is short, its scope is tremendous. As a result, controlling the entire project proved to be difficult. While the storage capacity of Google Drive, which our university provides, is relatively substantial, file sharing requires a high band width. As a result, I used Rclone to retrieve and upload the relevant files. Rclone is free and open source multi-threaded command line software for managing and migrating content on cloud and other high-latency storage systems. It supports sync, transfer, encryption, caching, union, compression, and mounting.

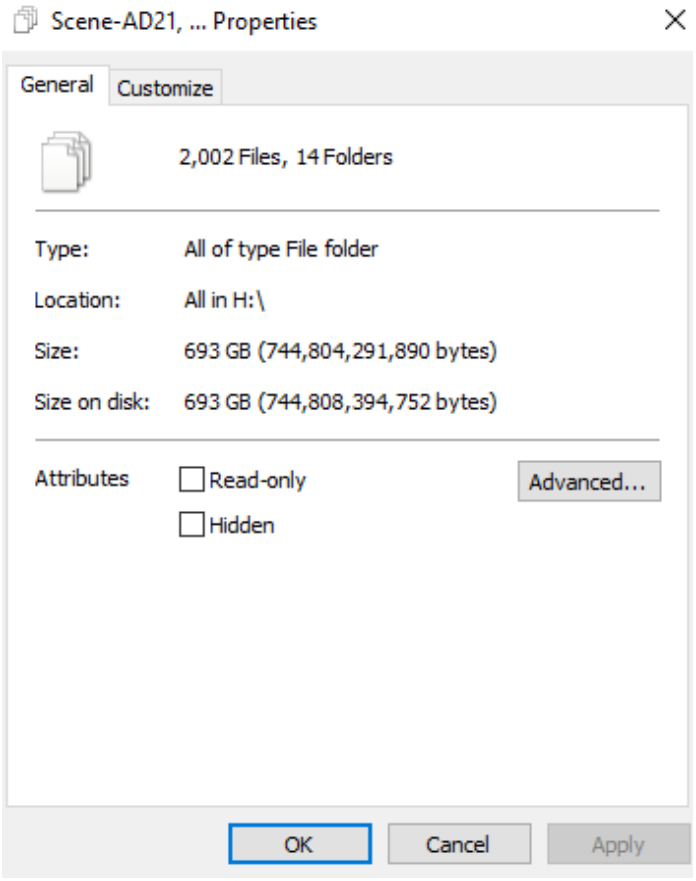

Figure 5.31: EXR file size

CHAPTER 6

CHALLENGE

Each difficulty reveals a fresh solution or presents us with new opportunity.

ADWAR has reached the finish line after approximately four months of hard effort. While there are some problems in the project, there are also some crucial learning opportunities for the developing team.

The difficulties we encountered-

-Mechanical Character Rig and Animation

-Character Facial Expression

-Large Scale Simulation and Rendering

-Quality control in LookDev and Rendering

-Sound Design and Compositing

-Project Management

We were able to reach our targeted result after facing and tackling the situation.

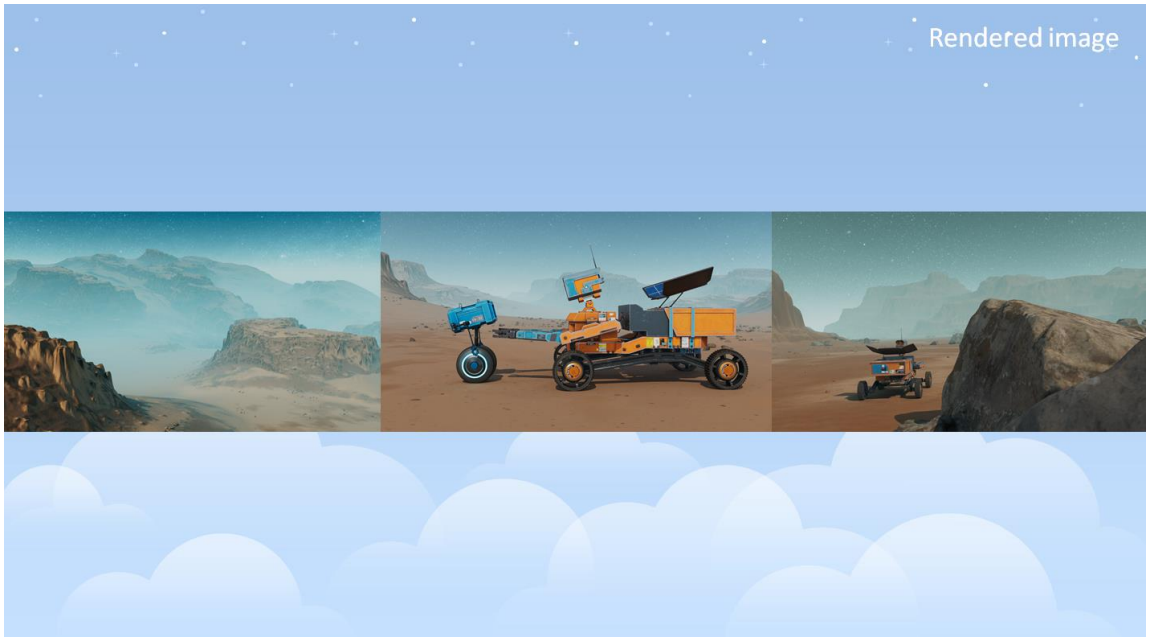

Figure 6.1: Rendered images

CHAPTER 7

DISCUSSIONS

On the basis of the rover's model, ADWAR and Planet Unknown's short video share a little resemblance. Additionally, the environment is strikingly similar to that of Planet Unknown. Each short film features a unique calamity.

There are no further parallels between ADWAR and Planet Unknown apart from those already mentioned.

Planet Unknown is a short film about two rovers who are doing their missions until they are unexpectedly confronted with a calamity. Eventually, they complete their task. There was a lonely rover in the ADWAR short film. It eventually discovers another rover. They grew acquainted. However, a calamity occurs, and they are separated. ADWAR expresses regret and then goes on. Finally, he witnesses a miracle. ADWAR is a short film that functions as a metaphor for a specific human feeling. The Unknown Planet, on the other hand, is a short film about the finding of life on another planet. As a result, we can see that ADWAR and the Planet Unknown short film have a significant difference.

CHAPTER 8

FUTURE WORK OPPORTUNITIES

According to the industry standard methodology, the entire pipeline took around four months to complete. This project has been made possible by a lot of hard effort and perseverance, which contributes to its success. We put up our best effort to complete the task. However, there are several faults in the project as a whole.

Every piece of high-quality work necessitates the expenditure of dollars in order to progress correctly. The budget for this project was straightforward. We subscribed to the audio source, which we paid for out of pocket.

In addition to inspiring the next generation of our department, we believe that this effort will also inspire some artists in Bangladesh.

As a result, the project has a great deal of potential. If we are given a budget to develop some projects, we can assure that we will be able to produce some high-quality work that is superior to that produced by ADWAR.

When it comes to making a contribution to this industry, films like ADWAR are a fantastic way to go. On the other hand, there aren't many animated films produced in Bangladesh, which is surprising. Thus, it is imperative that some actions be taken in order to create some animations and compete in the global market.

We also have a plan to make a sequel to this film in the future, as this is only the beginning of our endeavors. At the conclusion of the film, the main character, ADWAR, discovers something new, which serves as a prelude to the film's next sequel. The fact that the development team attempted to pull off such a surprise must have been obvious to those in attendance.

CHAPTER 9

CONCLUSION

ADWAR is more than just a short story; it is also a video that will have an impact on the audience and get them to pause and think about what they have just seen. In order to achieve its primary goal, the film must persuade spectators to consider and conquer their loneliness. The creation of the short film –ADWAR is a humble gesture as well as a test for the future of Bangladesh's animation industry. Our team used industry-standard tools, methods, and processes to ensure that the greatest level of quality was maintained. It goes without saying that in order to produce something, one must be inspired by high-quality work, and thus there may be some comparisons, but retaining high-quality work is a sensible plan.

Despite the fact that animated films are becoming increasingly popular and have a significant market internationally, we are still trailing behind in this field. Our industry's success will be dependent on an increase in qualified workers, the expansion of educational institutions, and the government's willingness to be accommodating and understanding.

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