Exploring the Aesthetics and Functionality of Casual Game Character Development

Submitted By

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This report presented in partial fulfillment of the requirement for the degree of bachelor of science in Multimedia and Creative Technology

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Approval

This Project titled **"Exploring the Aesthetics and Functionality of Casual Game Character Development"** submitted by **Md. Sohel Rana (193-40-639)** 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 **19/08/2023**.

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Declaration

Mr. Kazi Jahid Hasan, Lecturer in the Department of Multimedia & Creative Technology (MCT) at Daffodil International University, supervised the completion of this study. I also affirm that neither this project nor any portion of this project has been submitted elsewhere to earn a degree or certificate.

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Thank you sincerely for being an integral part of this academic endeavor.

Abstract

Low-poly game characters are essential for mobile casual strategy games. They outshine high-poly models, delivering improved performance, smooth gameplay, and budget efficiency. Their quick creation process enables developers to save time and resources. These models also offer versatile aesthetics, allowing designers to create unique and visually appealing games. In the mobile casual strategy genre, low-poly 3D game characters create visually stunning and functional games.

This report explored the characters creation, emphasizing the balance between visual appeal and performance. It features case studies of popular mobile casual strategy games utilizing low-poly 3D graphics. Effective teamwork, task allocation, timelines, and quality standards are crucial for successful collaborative projects involving low-poly game characters. These characters seamlessly blend captivating visuals with exceptional functionality, shaping the landscape of mobile casual strategy games.

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CHAPTER 1

1.1 Introduction

In the mobile gaming company operations, low-poly game characters are essential because gamers seek aesthetically pleasing experiences. By 2027, the market value of these characters is expected to reach $80 billion. They provide improved performance, faster creative processes, and adaptable aesthetics, which are crucial for developing immersive and captivating gaming worlds. Developers can negotiate the cutthroat mobile gaming market and provide experiences that appeal to a broad player base by utilizing low-poly game characters. Low-poly game characters improve gameplay and create visually stunning experiences that propel the sector to new heights of creativity, accessibility, and profitability.

1.2 Motivation

I. Improved mobile game functionality
II. Increased efficiency in time, resources, and expenses
III. Creative freedom for captivating aesthetics
IV. Responding to the demand for visually appealing mobile games
V. Creating immersive landscapes and characters
VI. Streamlined production and resource management
VII. Optimized resource use for smoother gameplay
VIII. Increased marketability and player involvement

The integration of low-poly 3D game characters in mobile casual strategy games is driven by enhanced mobile performance, cost-effectiveness, adaptable aesthetics, and the demand for visually pleasing games. These assets optimize resource use, expedite production, and create visually unique game elements. By harmonizing aesthetics and performance, developers enhance market appeal and player engagement while minimizing expenses.

1.3 Research Objective

This study aims to dive into the field of creating and deploying low-poly 3D game characters in mobile casual strategic games. The study is motivated by the following objectives:

I. Investigate the many approaches and processes used to create low-poly 3D gaming characters, including polygon optimization, texture mapping, and animation methods.
II. Examine the impact of low-poly aesthetics on game performance, including crucial characteristics such as frame rates, loading times, and overall gameplay seamlessness.
III. Examine the delicate balance between aesthetic delicacy and performance efficiency while creating low-poly characters, exploring the many ways that influence both visual attractiveness and gameplay immersion.
IV. Conduct an in-depth examination of successful examples of mobile casual strategy games that have expertly merged low-poly 3D visuals, identifying the tactical design decisions that drive their success.
V. Provide game developers and designers with practical advice and best practices for leveraging the benefits of low-poly aesthetics to ensure peak game performance and the creation of aesthetically appealing mobile casual strategy games.

In addressing these research aims, this study hopes to improve our understanding of the creation, integration, and consequences of low-poly 3D game characters in mobile gaming. The findings are expected to provide creators with actionable insights and strategic advice, allowing them to make more educated decisions to improve the quality and overall performance of their games.

1.4 Research Questions

I. Approaches to Character Creation: How can game developers create low-poly 3D game characters for mobile casual strategy games, and what are the primary approaches and tactics used?
II. Performance Tradeoff: Is there a noticeable compromise between frame rates, loading times, and general gameplay smoothness while using low-poly aesthetics?
III. Balance of Aesthetics and Playability: What is the best balance of aesthetic refinement and gameplay usability for low-poly components in mobile casual strategy games?
IV. Design Decisions for Success: What particular design decisions and practices drive the most celebrated low-poly 3D mobile casual strategy games' achievements?
V. Enhancement of Collaborative techniques: How may collaborative techniques and project management strategies be efficiently used to create high-quality, low-poly 3D game characters?
VI. Aesthetics: How can game designers and developers use low-poly aesthetics to produce aesthetically appealing mobile casual strategy games while assuring optimal performance?
VII. Texture Optimization Guidelines: When dealing with low-poly objects, what are the ideal approaches for UV mapping and texture baking?
VIII. Optimal Polygon Reduction: How can the optimal degree of polygon reduction for a low-poly model be determined?
IX. Smooth UV Mapping for Simplicity: How can smooth and precise UV mapping be achieved despite the simpler geometry of low-poly assets?

By addressing these research topics, this study aims to provide light on the complexities of creating, deploying, and assessing low-poly 3D game characters in mobile casual strategy games. The insights gained through this investigation will provide vital knowledge to game designers and developers, resulting in improved game quality and performance.

1.5 Expected Outcome

Some of the predicted outcomes of this research endeavor are as follows:

I. In-Depth Understanding of Low-Poly Character Creation: Gaining in-depth knowledge of strategies and procedures for creating low-poly 3D game characters for mobile casual strategy games. This includes reducing polygon counts, improving UV mapping, texture application, and low-poly animation approaches.

II. Low-Poly Character Performance Evaluation: Investigating the influence of low-poly character graphics on gaming dynamics. The research will look at the relationships between low-poly character design and key performance measures including frame rates, loading times, and overall gameplay smoothness.

III. Finding Effective ways for Balancing Visual Appeal and Performance Efficiency: Finding effective ways for striking a healthy balance between visual appeal and performance optimization in low-poly character design.

IV. Critical Character Analysis: An in-depth assessment of successful low-poly 3D character implementations in mobile casual strategy games. This research seeks to provide helpful insights for developers seeking comparable results by analyzing design choices and implementation methodologies.

V. Effective Team Collaboration and Project Management: Recognizing the importance of teamwork and skilled project management in the creation of high-quality low-poly 3D game characters. For successful outcomes, effective communication, task distribution, deadline adherence, and quality assurance must be established.

VI. Optimization Strategies for Low-Poly Character Graphics: Providing game creators with realistic advice for increasing user immersion and engagement. This includes improving character performance while also creating aesthetically appealing mobile casual strategy games.

The ultimate goal of this research is to improve the quality and performance of low-cost mobile casual strategy games by developing, integrating, and employing high-quality low-poly 3D game characters.

CHAPTER 2

Background Study

2.1 Introduction

It intends to go into many aspects of generating and employing these characters in the context of game production. This research seeks to provide game developers and designers with significant insights into creating captivating and aesthetically appealing gaming experiences by analyzing historical, theoretical, and practical aspects. The next sections will expand on this foundation by digging into approaches, tools, and best practices for the effective design and execution of low-poly game characters.

2.2 Key features for creating casual games

A casual game is simple and easy to play, with mechanics, short play periods, and visually attractive elements that appeal to a large audience. It delivers quick entertainment, encourages social interaction, and is accessible in a variety of genres, providing simple experiences for both casual and non-traditional gamers.

Here is a list of important factors to consider while developing a casual strategy game using 3D game assets:

I. Visual Appeal: Create a pleasant and aesthetically attractive art style that will appeal to casual players.
II. Low-Poly Models: For optimum efficiency and short loading times, use low-poly 3D models.
III. Color Palette: Choose a lively and unified color palette that complements the tone of the game.
IV. Character Design: Create character designs that are charming, relatable, and unique so that gamers can connect with them.
V. Environment Variety: To keep gamers interested, provide different and intriguing surroundings.

Below I mention the names of several popular games which are casual strategy games. The data given here is taken from several websites. Which we have crosschecked and listed in various ways.

No.	Game name	Company	Country	Release Date
1	Clash of Clans	Supercell	Finland	2012-08-02
2	Boom Beach	Supercell	Finland	2014-03-26
3	Castle Clash	IGG.COM	China	2013-10-22
4	The Battle of Polytopia	Midjiwan AB	Sweden	2016-02-04
5	Bloons TD 6	Ninja Kiwi	New Zealand	2018-06-14
6	Domi Nations	Big Huge Games	United States	2015-04-01
7	Hexonia	TOGGLEGEAR	Korea	2019-01-27
8	Mushroom Wars 2	Zillion Whales	Russia	2016-10-13
9	Age of Strategy	Zero Touch	Hungary	2013-10-26
10	Rusted Warfare - RTS	Corroding Games	Australia	2017-07-15

Table 2.2.1- Casual strategy games list

2.3 Literature Review

The use of low-poly 3D game characters in the mobile gaming company has lately gained popularity. This literature review delves into the arena of research and academic debates around the production and use of low-poly characters in mobile games, notably in the context of the strategy game genre.

Low-poly 3D game characters provide significant benefits in mobile game creation by improving performance and ensuring flawless gameplay on devices with restricted processing capabilities. Smith's research (2021) highlights the reduced computing needs of low-poly models, resulting in increased frame rates and faster loading times, hence increasing player happiness.

Furthermore, low-poly figures' particular aesthetic appeal adds to increased player involvement and immersion. Low-poly games' stylized visuals build a distinct identity, effectively attracting and maintaining players in a competitive gaming industry (Brown, 2022).

Nonetheless, issues remain in attaining visual complexity while preserving a low polygon count. In order to create aesthetically appealing low-poly models, effective character generation techniques such as polygon reduction, texture optimization, and shaders must be used.

Time and cost considerations are equally important. Character production, both high-poly and low-poly, can require significant resources, demanding good project management and seamless teamwork.

In response, best practices for addressing these difficulties have evolved. Prioritizing stylized graphics and capitalizing on the qualities of low-poly characters is critical. Working with a broad team of professionals, such as 3D modelers and animators, guarantees the creation of high-quality character assets. The use of procedural methodologies and asset reuse simplifies workflow, effectively lowering both time and costs.

Finally, the incorporation of low-poly 3D game characters into the mobile gaming industry, particularly in casual strategy games, provides a chance for performance optimization as well as different visual aesthetics. To achieve visual intricacy while managing time and expenses, however, effective character production and skilled project management are required. Developers may create aesthetically appealing and performance-optimized mobile games by using the specific characteristics of low-poly characters and following to best practices.

2.4 Scope of The Problem

Understanding the spectrum of obstacles associated with low-poly 3D game characters is critical for newbies since it aids in identifying specific concerns and considerations during character design. This understanding enables game creators to use suitable tactics, tools, and best practices to create aesthetically beautiful, optimized, and entertaining characters.

Within the scope of this task, key dimensions include:

I. Visual Aesthetics: Low-poly 3D game characters have fewer polygons than their high-poly counterparts. This constraint may limit the degree of complication and aesthetic appeal that may be achieved, thus providing issues in creating visually appealing and lifelike characters for gamers.

II. Performance Improvement: While low-poly characters perform better than high-poly models, getting optimal performance might still be difficult. It is critical to strike a balance between visual quality and performance efficiency in order to maintain smooth gameplay and avoid difficulties such as frame rate variations or long loading times.

III. Texturing and Detailing: Texturing low-poly characters must be done with care to provide textures that improve visual quality and realism. A possible problem is achieving acceptable textures and surface details while preserving optimization.

IV. Artistic Coherence: Working with low-poly 3D characters can make it difficult to maintain a consistent and visually attractive artistic style. It is critical for a coherent and immersive gaming experience to ensure uniformity among varied characters while maintaining the intended visual direction.

V. Character Creation Workflow: Modeling, UV unwrapping, texturing, and optimization techniques all contribute to an efficient workflow for creating low-poly 3D gaming characters. To achieve project deadlines and provide high-quality character assets, the character creation process must be streamlined.

2.5 Research Area and Construction’s

The research and construction realm is a dynamic and captivating exploration, fueled by curiosity to uncover new insights, unravel complexities, and construct novel solutions. This journey takes place through virtual and tangible canvas, navigating theories, methodologies, and hands-on construction. The journey embodies the spirit of pioneers, architects, and artisans, who dared to dream and construct, bridging the gap between thought and action.

2.5.1 Aesthetic Appeal of Low-Poly Art

The Simplicity Advantage in Strategic Immersion: The distinctive low-poly art style holds a unique allure in the realm of casual strategy games. This section explores how the simplicity of low-poly graphics aligns seamlessly with the strategic gameplay dynamics. The geometric forms and minimalist design not only create an approachable visual experience but also provide players with a clear understanding of the game environment. By reducing visual clutter, the low-poly aesthetic fosters a focused gameplay experience, allowing players to immerse themselves more deeply in their strategic decision-making.

Fostering Nostalgia and Strategic Reflection: In casual strategy games, the simple low-poly graphics bring back memories of older games, making players feel nostalgic. The basic designs make players think about their strategic decisions. Since there aren't many details, players use their imagination to picture different outcomes and strategies. This matches the thoughtful style of strategic gameplay.

Innovations within Low-Poly Aesthetics: In casual strategy games, there's space for creative changes in the low-poly look. This part talks about adding new elements without losing the main style. Things like moving shadows or simple animations can be added to make the game feel better. These improvements can make the game more interesting while still keeping its unique strategy style.

Balancing Aesthetics and Gameplay Clarity: Casual strategy games, it's important to balance the simple low-poly look with clear gameplay. This part talks about how to keep the game looking nice while also making sure players understand what's happening. Methods like using different colors, making important things stand out, and using animations can help show important information without making the game look too busy. In our casual strategy game, the low-poly style really grabs players' attention and helps them focus on strategy. We also learned how to keep the game looking good and research findings and observations regarding the unique impact of the low-poly aesthetic on player engagement, strategic immersion, and gameplay clarity within the context of your casual strategy mobile game.

2.5.2 Anatomy Fusion: Humans and Animals in Low-Poly Gaming

Character anatomy becomes an aesthetic bridge in this endeavor, connecting human-animal hybrids like goblins and enormous pigs with the fabled presence of dragons. These one-of-a-kind anatomical compositions breathe life into the game's universe, providing players with a gripping visual story.

I. Human-Animal Hybrids: Characters like goblins and giant pigs result from the combination of human and animal features. By fusing familiar and fantastical elements, these hybrids not only pique the player's interest but also fit well with the game's strategic core.
II. Dragon Anatomy: Within the low-poly structure, dragons, everlasting icons of amazement, are lovingly sculpted. Proportions, wings, tails, and scales are all meticulously constructed to create formidable antagonists that blend effortlessly into the narrative.

This investigation balances anatomy and aesthetics within the limits of low-poly design, yielding characters that increase player immersion. The combination of complex anatomy and a distinct low-poly aesthetic enhances the player experience in the casual strategy mobile game.

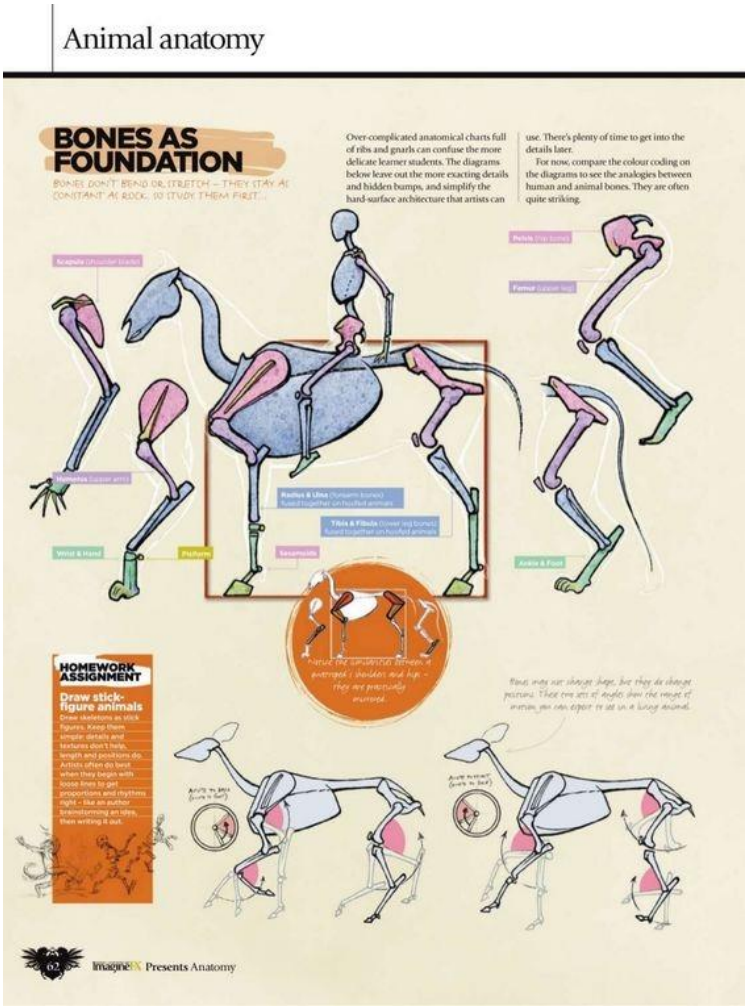


Figure 2.5.2.1- Anatomy Fusion (*http://slideshare.net/*)

2.5.3 Organic Modelling

Organic modeling in low poly is a 3D technique for representing natural shapes with limited polygons, enhancing performance and visual appeal in video games, animations, and real-time applications.

Key characteristics of organic modeling in low poly:

I. Natural Shapes: Organic modeling captures complex, irregular shapes in nature, including animals, humans, trees, and rocks.

II. Minimal Polygon Count: Models use limited polygons for optimal real-time performance.

III. Subtle Detailing: Organic low-poly models use texturing and shading techniques to convey complexity without intricate high-poly models.

IV. Artistic Stylization: Organic low-poly models use artistic stylization for visual interest and minimal polygonal detail.

V. Rigging and Animation: These models are often rigged and animated to bring them to life in interactive environments or animations.

Benefits of organic modeling in low poly:

I. Efficient Performance: Reduced polygon count enhances real-time performance, making it ideal for video games and simulations.

II. Quick Rendering: Organic low-poly models render faster, saving processing time with fewer polygons.

III. Versatility: Low-poly models enhance visual quality without compromising functionality.

IV. Mobile-Friendly: Organic low-poly models are lightweight, ideal for mobile devices with limited processing power.

Figure 2.5.3.1- This character from the 3D-Ace Studio

Overall, Organic low poly modeling balances performance and aesthetics, making it popular for creating visually appealing 3D assets in interactive and entertainment media.

2.5.4 Shape Language

Shape Language is a concept used in art and 3D game character design to communicate meaning based on shapes we are familiar with. When used in character design, shapes can tell a story, show emotional responses or personality traits, impacting user experience and perception of low-poly 3D game character.

David Colman said:

Body language and overall posture of the character has more weight of emotion compared to facial expressions (eyes, eyebrows, lips and so on)

Importance of shape Language in the project:

I. Emotional Impact: Shape Language enables designers to strategically use shapes to evoke emotions, improving player engagement and immersion.

II. Aesthetic Appeal: Shape language gives characters unique aesthetic identities that help players recognize them in the game's universe.

III. Visual Cohesion: Consistent shape language maintains visual harmony across characters and environments.

IV. Market Attraction: The game stands out thanks to its distinctive shapes, drawing players looking for new experiences.

V. Artistic Expression: Shape usage allows designers to creatively express character essence.

VI. Storytelling: Shapes can be employed to convey information, symbolism, or thematic elements, enriching the storytelling aspects of the game and creating a more immersive experience for players.

VII. Overall Success: Shape language connects artistic expression and gameplay, improving the attraction of the game and player interaction.

By incorporating shape psychology into the design and creation of low-poly 3D game character, the project can achieve a harmonious balance between aesthetics, emotions, and user engagement, ultimately enhancing the overall quality and impact of the game.

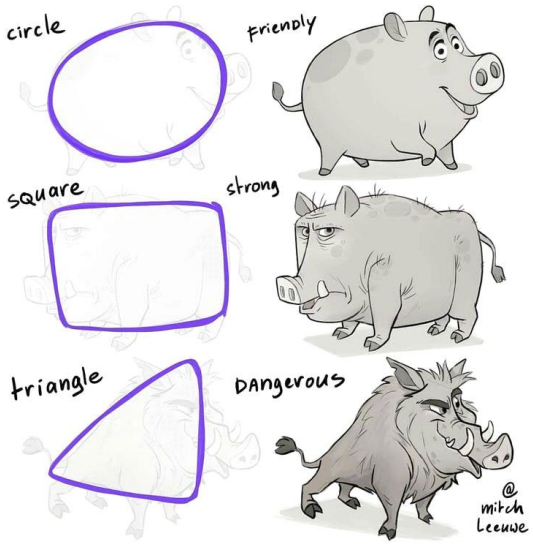


Figure 2.5.4.1- The Artist Mitch Leeuwe (Artprof 2019)

2.5.5 Visual breathing space

Visual breathing space, also known as negative space or open area, refers to the empty areas surrounding design features that add balance and clarity to visual compositions.

Significance of visual breathing space in the character development:

I. Focus and Clarity: Visual breathing space inside low-poly game characters improves clarity, creating an uncluttered framework that encourages player involvement and comprehension.
II. Aesthetics: The effective use of negative space enhances the visual attractiveness of gaming characters, making them fascinating and immersive.
III. User Experience: Incorporating visual breathing space enriches user experience by reducing noise and disturbances, enabling players to concentrate on essential character attributes.
IV. Readability: Incorporating visual breathing space improves user experience by decreasing noise and disruptions, allowing players to focus on important character qualities.
V. Emphasis on Core Traits: Visual breathing space serves as a guide, bringing players through character design, emphasizing essential attributes and focus points, and emphasizing notable aspects.
VI. Sense of Equilibrium: Negative space introduces equilibrium and harmony to character design, enhancing overall aesthetic cohesiveness and sophistication.

Figure 2.5.5.1- Camera distance (Visual breathing space)

In summary, Visual breathing space is critical when creating low-poly 3D gaming characters. It improves the aesthetics, readability, and user engagement of the character's visual design, contributing to its engaging and immersive nature.

Figure 2.5.5.2- LOD (Level of details)

CHARACTER LOD COMPARISON TABLE

APPLICATIONS	HIGH RES FILM	AAA GAME	MOBILE/AR/AEC	CROWD	
Character Level	Subdivision Export	CC Avatar(CC3+)	ActorBUILD	LOD 1	LOD 2
Character Type	CC Avatar		actorBUILD	Humanoid	
Bone Number	CC Standard (101)			54	22
Polycount *Including cloth and hair	240k up	60k up	20k	7k	0.8k
Mesh Reduction Type	-	-	Convert Base	Remesh	
Facial & Lipsync	O			X	
Shader	Digital Human		PBR	PBR	PBR
Texture Size	4096 multi-channels for 4 body materials		4096	1024	512
Material Number	Multi-Material		One	One	One
Camera Distance	0M	2.8M	10M	20.8M	42M

Figure 2.5.5.3- Character LOD comparison table

2.6 Player Engagement and Interaction

The Player Engagement and Interaction chapter explores the dynamic relationship between players and virtual worlds, revealing the artistry of interaction design and the psychology behind engagement. It explores the pathways, decisions, and stories that transform players into adventurers, strategists, and heroes. The chapter celebrates the magic of human curiosity and digital creativity, revealing the alchemy of immersion and the science of connection.

2.6.1 Player-Character Connection in Low-Poly Realms

The low-poly aesthetic makes it easier for gamers to relate with the characters. Because of the simplistic design, players may construct their own sentiments and ideas for the characters, making it feel like they're a part of a tale. The way characters move, appear, and do things may be enhanced to strengthen this connection, making players feel immersed in the game's environment and plot. We want gamers to be able to appreciate the strategy without being confused by complex visuals. This encourages more people to enjoy the game. The strategic components are simple to see and comprehend, allowing everyone to play and have fun.

2.6.2 Balancing Aesthetics and Functionality

Character creation in our casual strategy mobile game with low-poly design is a bit difficult. The basic design is appealing, but it might make it difficult to display critical game information. We made decisions such that personalities and locations appear attractive while still allowing gamers to notice what's vital. We sometimes made things stand out more or kept them basic to ensure that the game is both entertaining to play and visually appealing.

CHAPTER 3

Research Method and Workflow

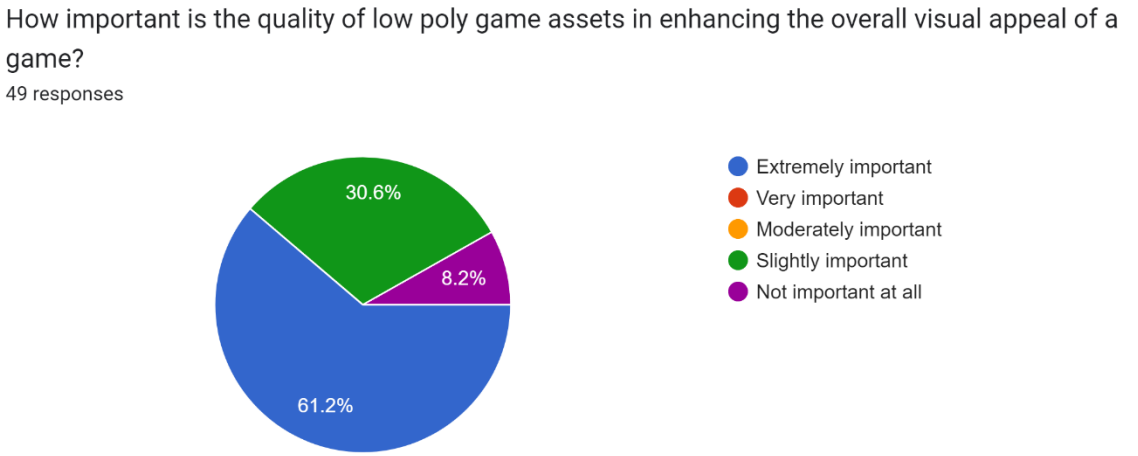
3.1 Introduction

The approach section is critical in sculpting low-poly 3D game characters for mobile casual strategic games. It lays out a step-by-step plan for creating aesthetically appealing and functional characters. This chapter walks you through the essential phases, techniques, and best practices of character design, highlighting the confluence of aesthetic refinement and technological accuracy to create fascinating game characters that enhance the immersive realm of mobile casual strategy games.

3.2 Survey

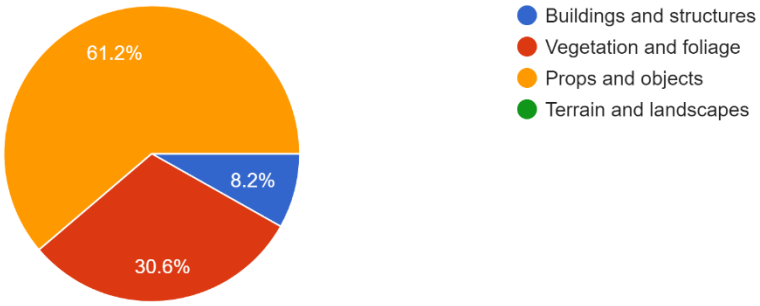
We conducted various surveys in support of our efforts. This survey was very significant in our work, and we base all of our research and initiatives on it. Employees from many gaming firms that create these casual strategy games took part in our study. In addition, some 3D artists that are directly or indirectly associated with casual strategy games contribute. Everyone here participated anonymously. Nobody consented to provide their personal information or identify. However, in the reference chapter, we will offer as many virtual profile links to such firms and 3D artists as feasible. We examine various research papers and web portals and generate certain project-related questions, providing several alternatives accordingly. Here those who participated chose from that option and gave their opinion.

Below we will present the data of this survey through a pie chart.



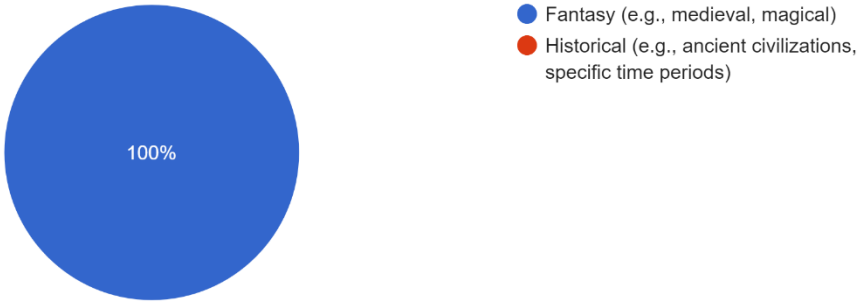
Which type of low poly game assets do you find most essential for creating an immersive game environment?

49 responses



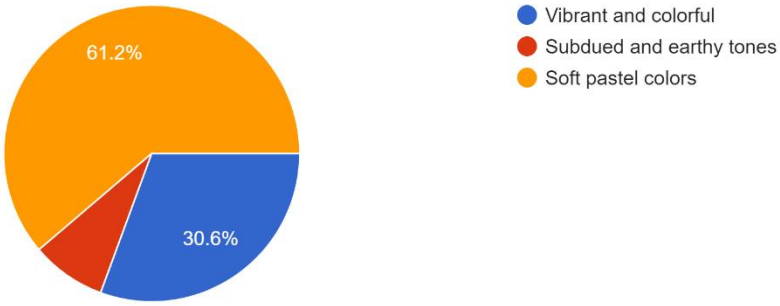
Which setting or theme would you prefer for the low poly game assets?

49 responses



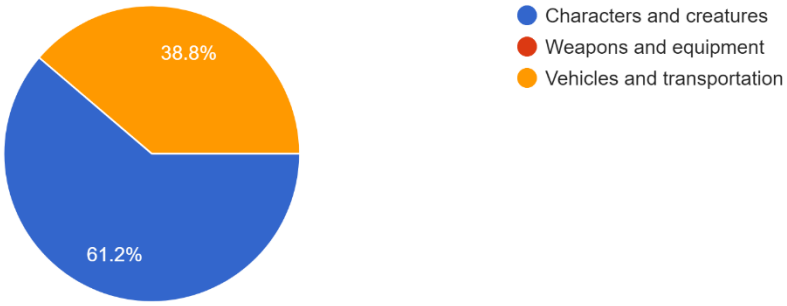
Which color palette would you prefer for the low poly game assets?

49 responses



Among the following low poly game asset categories, which do you believe requires the most attention to detail?

49 responses

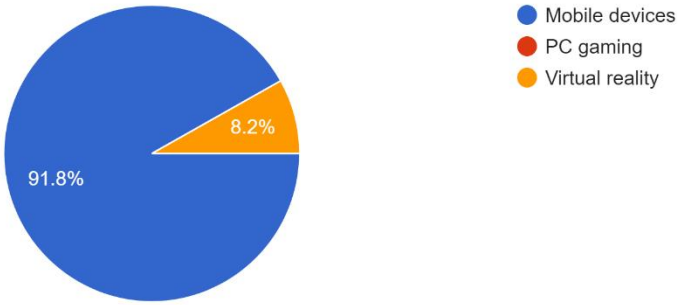


In your opinion, what are the advantages of using low poly graphics in games?

49 responses

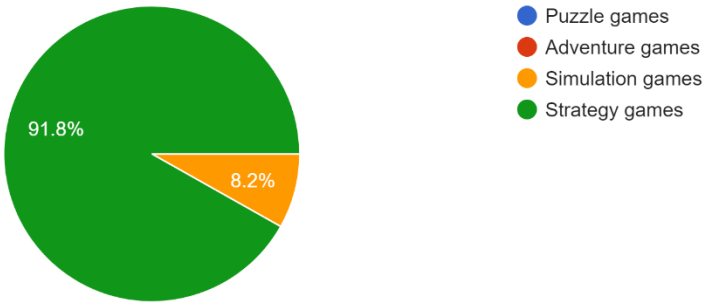
Which platforms do you believe benefit the most from low poly games?

49 responses



Which low poly game genres do you believe have gained the most popularity in recent years?

49 responses



How important is it for low poly game developers to incorporate storytelling and narrative elements in their games?

49 responses

What future trends do you anticipate in the low poly game industry?

49 responses

3.3 Gantt chart

In our low-poly game character endeavor, the Gantt chart is a dynamic instrument for project oversight, resource optimization, and hurdle detection.

I. Strategic Blueprint: A Gantt chart lays out a systematic pathway, streamlining planning and organization for the character creation journey.
II. Collaborative Synergy: Task visualization within the Gantt chart fosters seamless teamwork and alignment among creators.
III. Precise Time Navigation: Progress tracking and delay identification, as facilitated by the Gantt chart, ensure timely completion of character development milestones.
IV. Optimal Resource Utilization: The Gantt chart's ability to allocate resources efficiently ensures a harmonious distribution of creative efforts.

Ultimately, the Gantt chart emerges as an indispensable companion in steering the course of our low-poly game character project.

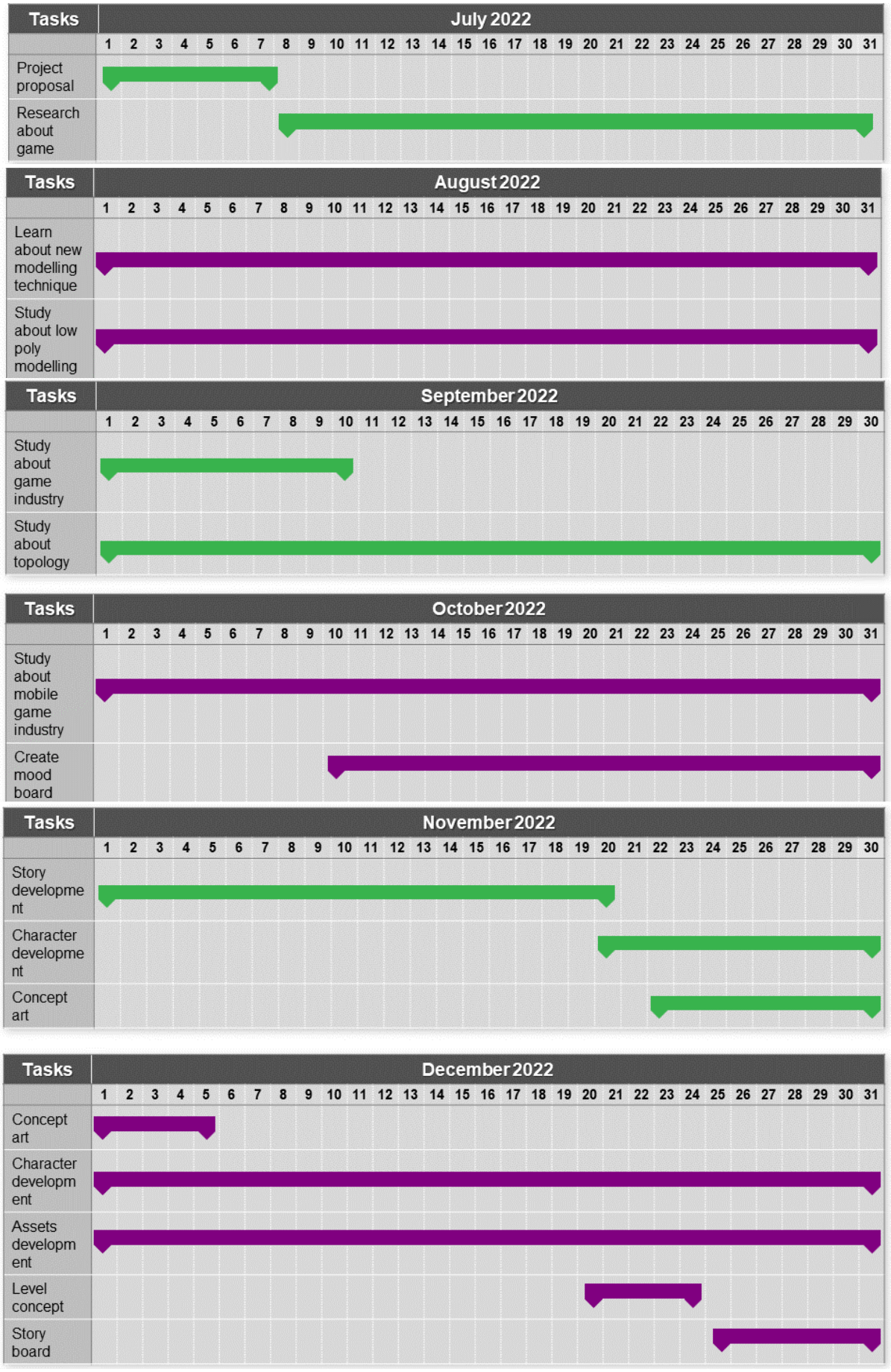


Table 3.3.1- Gantt chart

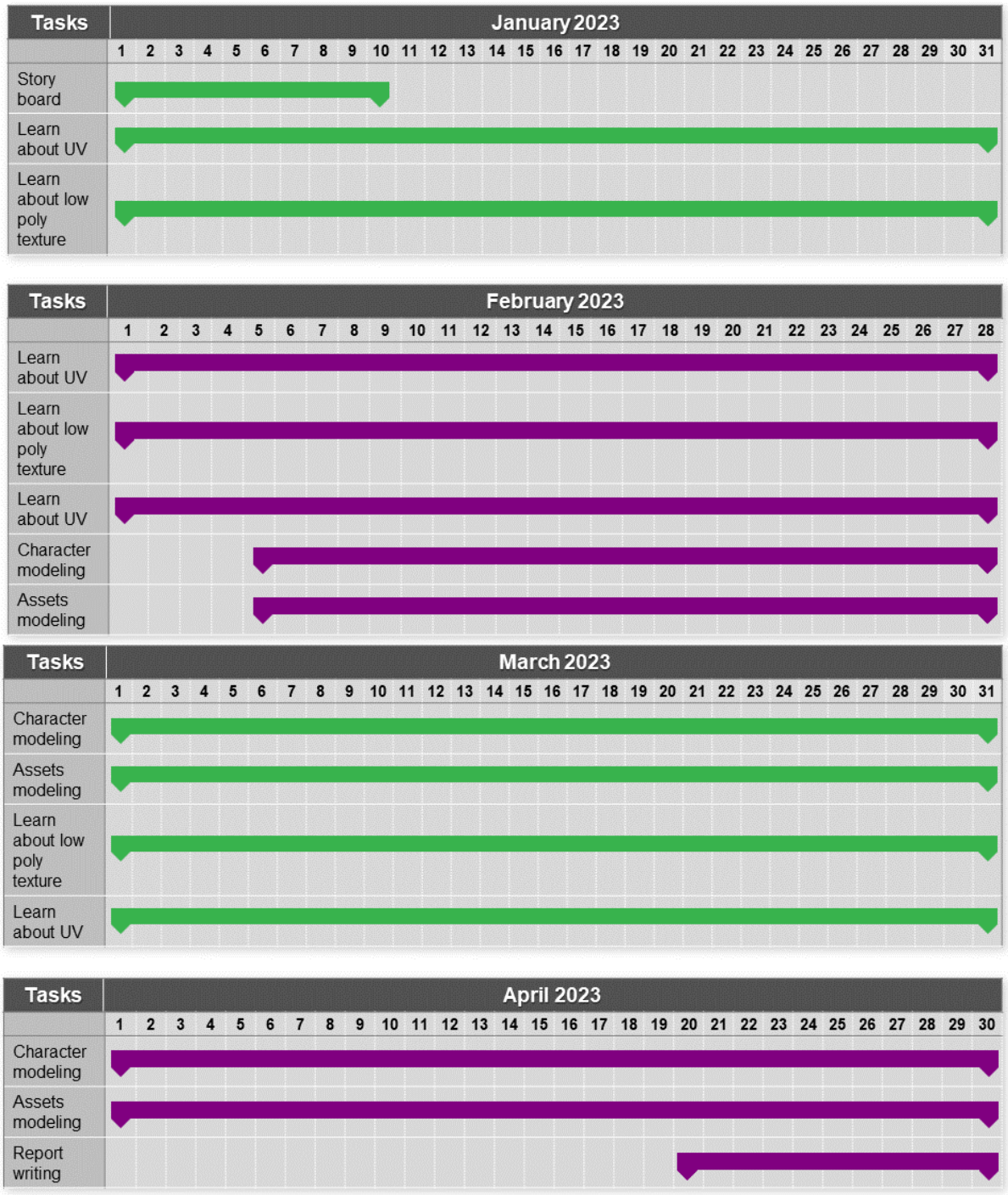


Table 3.3.2- Gantt chart

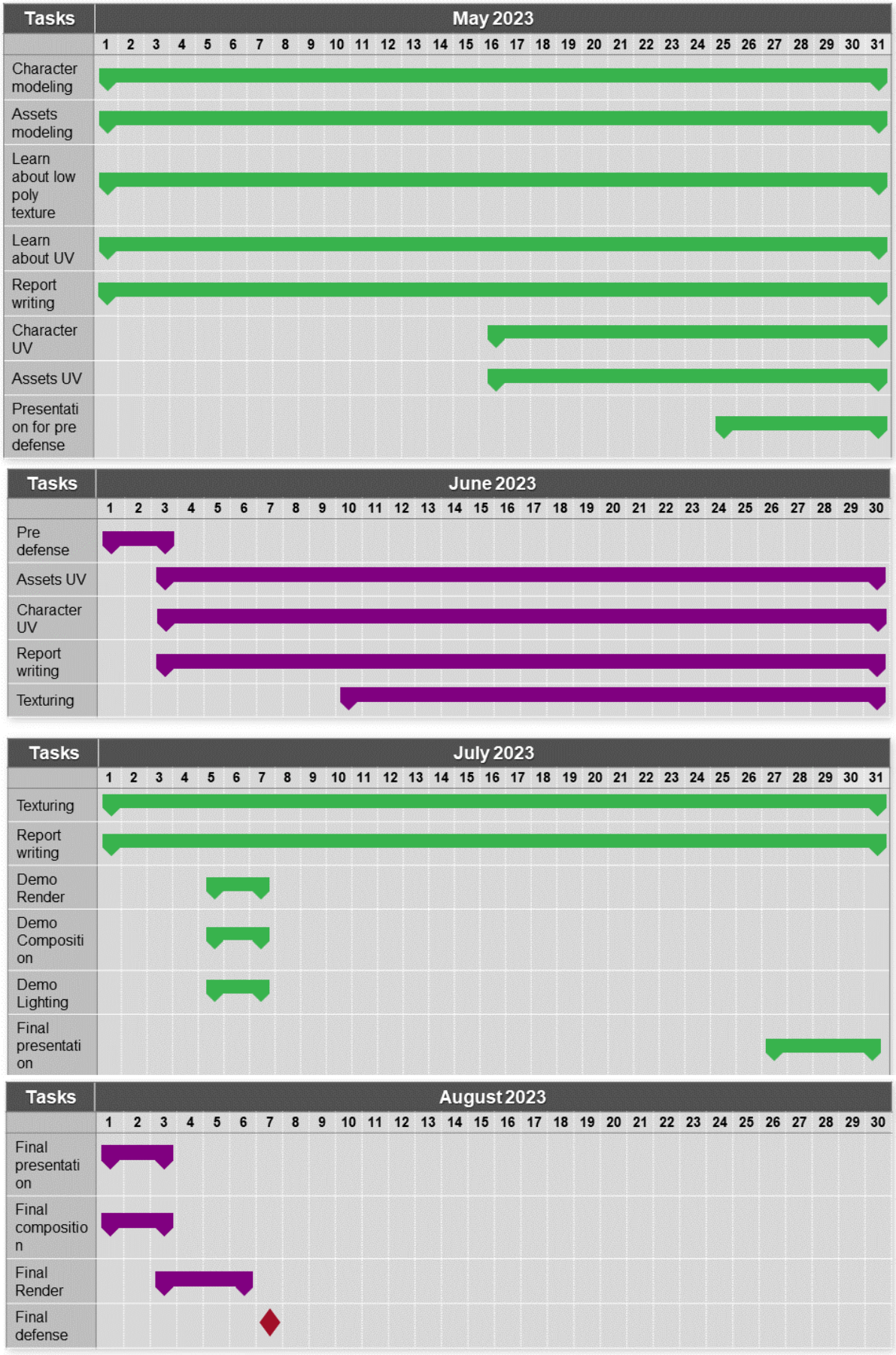


Table 3.3.3- Gantt chart

3.4 Main story in a brief

Once there was a hero who guarded a precious gem. He and his team built a settlement around the jewel to protect it from those who wished to steal it. One day, while the hero was away, a group of enemies attacked the village hoping to claim the gem. The enemies captured the entire village and killed everyone. When the hero returned, he made it his mission to retrieve the precious jewel and free the village from the enemy's hold. And so, our game begins...

Figure 3.4.1- Game Icon

3.5 Story Board

Storyboarding is a critical tool in our low-poly gaming character endeavor, detailing the character's journey and interactions and providing the following significant benefits:

I. Visualizing the Persona: Storyboarding brings the character's narrative, look, and behaviors to life while enhancing their design.
II. Idea Sharing: Storyboarding facilitates effective team communication, which provides a standard knowledge of the character's essence, objectives, and creative direction.
III. Engagement Strategy: Storyboarding maps out the route and interactions of the characters, delivering an immersive and exciting user experience.
IV. Identifying Early Insights: Potential design difficulties and narrative gaps are highlighted and addressed proactively by visually sketching the character's arc.

Overall, storyboarding emerges as a guiding light in our goal of creating engaging and meaningful low-poly game characters, promoting cooperation, and increasing creative potential.

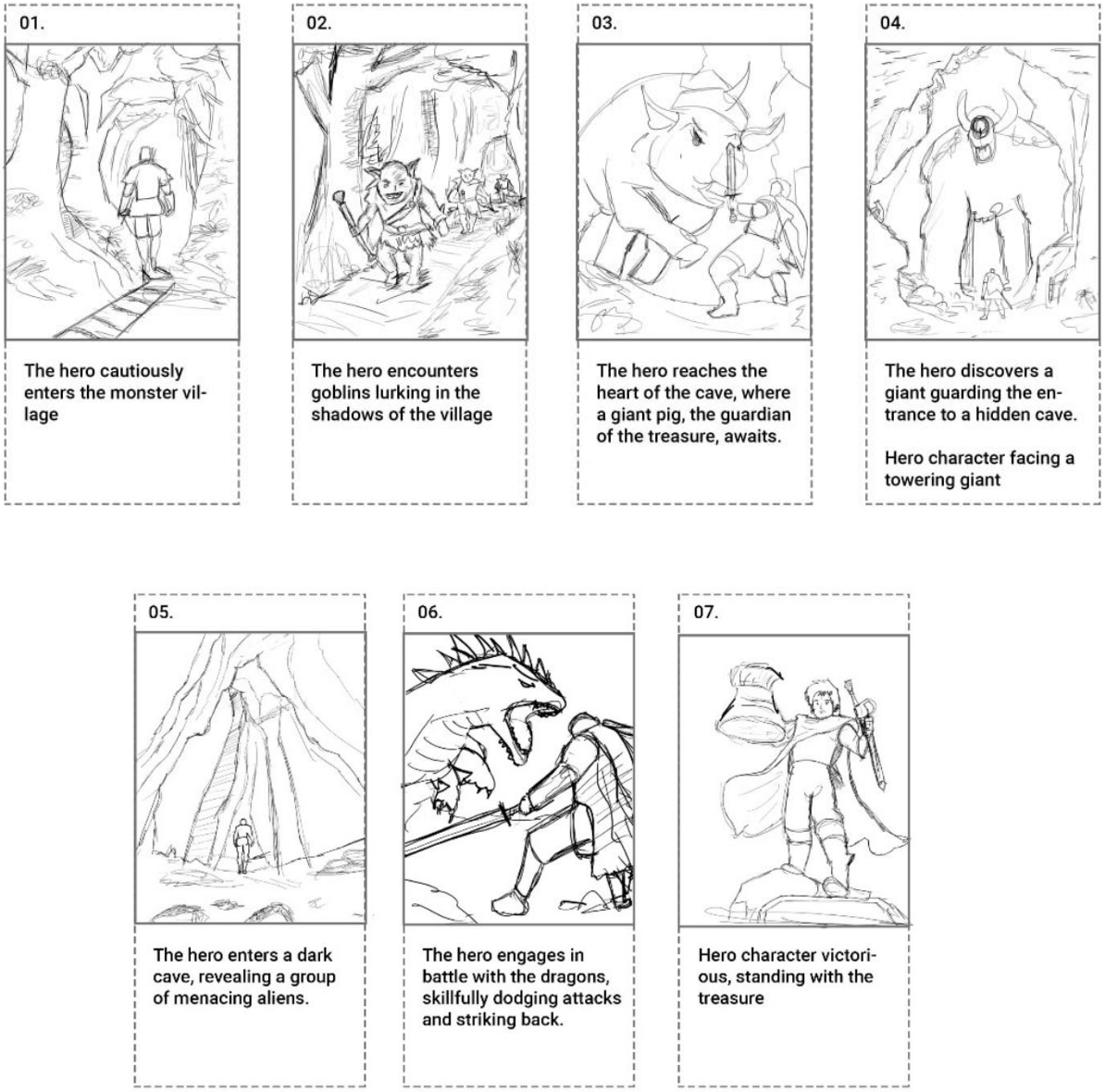


Figure 3.5.1- Story Board

3.6 The software we used

I. Autodesk Maya 2023
II. Adobe Substance 3D Painter
III. Marmoset Toolbag
IV. Adobe Photoshop

Autodesk Maya 2023 using for low poly modelling and UV mapping. Then Adobe substance 3D painter for texturing and baking map. Then Marmoset Toolbag using for final output render. Adobe photoshop used for post-production of render image.

Figure 3.6.1- Used software for this project

3.7 Software Description

The Software Description part delves into the complex world of software, emphasizing its role in bringing ideas to life. It exemplifies the marriage of human intellect with computer capability, enabling us to sculpt, shape, and mound our ideas. The chapter highlights the marriage of creativity and technology, which enables us to explore, experiment, and create in novel ways.

3.7.1.1 Autodesk Maya 2023

Autodesk Maya proved a strong ally in our quest to create low-poly game characters. This powerful 3D computer graphics program, which is well-known in the cinema, broadcast, gaming, and architectural fields, enables us to create lifelike 3D personalities through modeling, animation, and rendering. Maya's fluidity, versatility, and user-friendly interface make it an indispensable tool for 3D artists working in a variety of fields.

Our research used Autodesk Maya's low-poly character modeling capabilities to create quick, aesthetically appealing characters with low polygon counts. The software's expert UV mapping skills provided seamless texture blending, adding realism to the characters. Maya's agility aided our 3D asset production even more, playing a critical part in our project's successful completion. Its extensive toolbox and user-friendly design sped up our production, allowing us to create professional-grade characters that took our project to new heights.

Figure3.7.1.1.1- Autodesk Maya logo

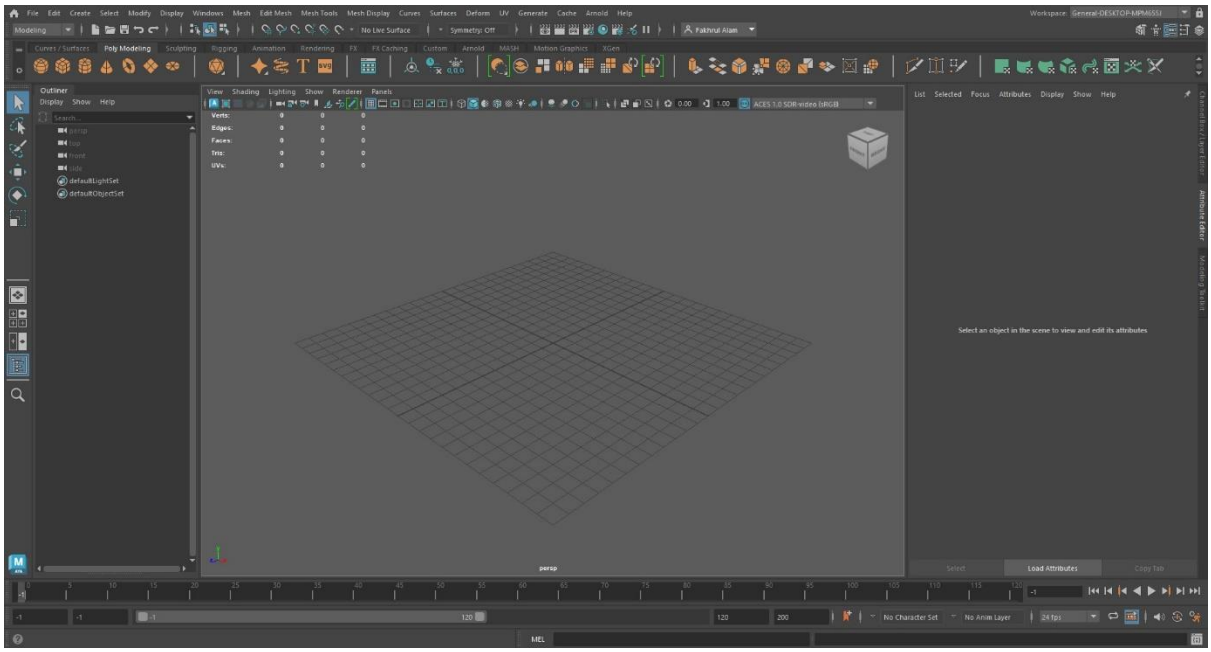


Figure3.7.1.1.2- software main interface

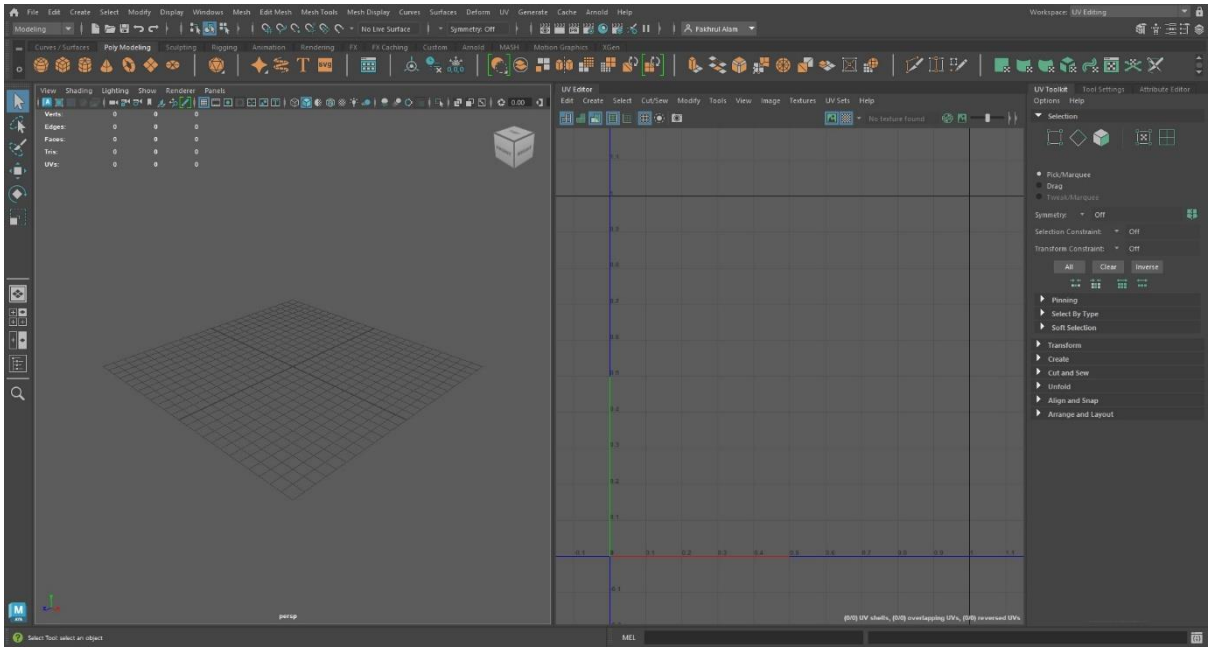


Figure 3.7.1.1.3- UV interface

3.7.1.2 The problem we faced

We experienced a few difficulties when navigating the world of Maya 2023 with our low-poly character:

I. Character Mishaps: Maya 2023 occasionally crashes while constructing, especially when dealing with large low-poly characteristics with UVs. These unexpected disruptions impair the creative flow and may result in data loss or time-consuming repairs.

II. Performance Potholes: When working with complicated low-poly characters, Maya 2023 periodically hits speed bumps, producing hiccups in our workflow's smooth ride.

III. Learning Loops: Unravelling Maya's dense tapestry, particularly low-poly character molding and UV weaving, proved to be a perilous introduction for newbies.

IV. Tool Tidbits: While Maya's toolset is extensive, its inherent UV tools occasionally left us wanting more, prompting us to seek out extra plugins or programs to fill the hole.

V. Export Expedition: When our low-poly marvels ventured beyond Maya's area, they encountered compatibility issues when exporting to various applications or game engines.

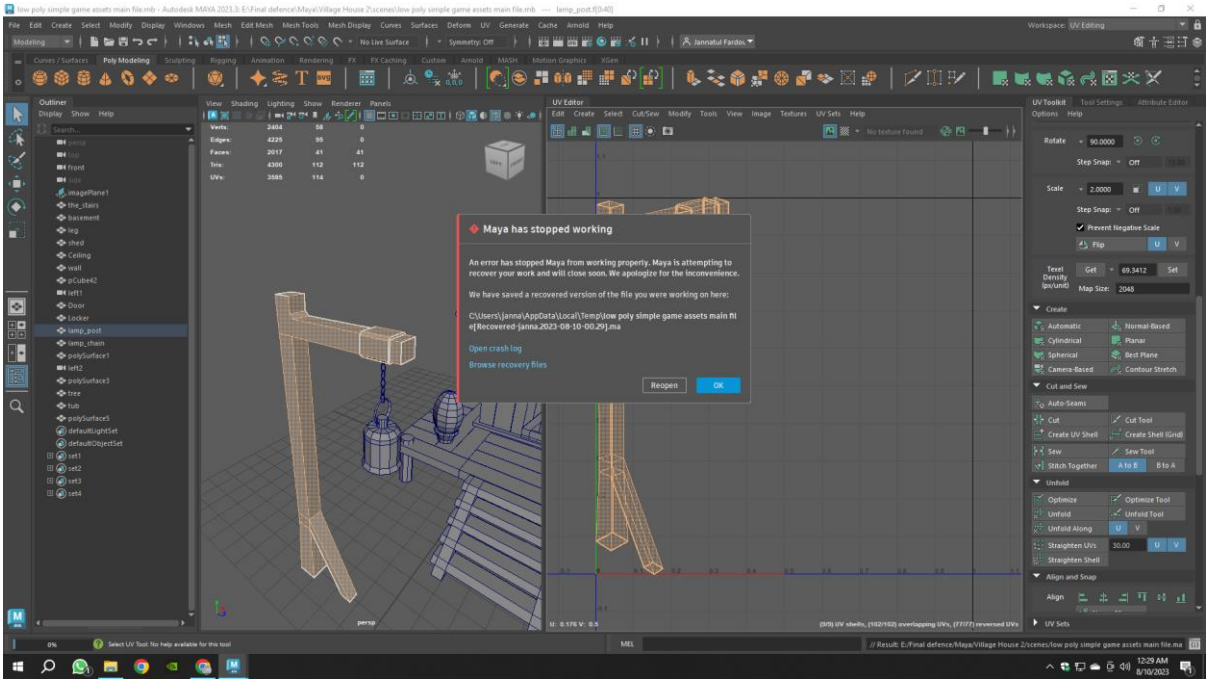


Figure 3.7.1.2.1- Software Crashes

3.7.2.1 Adobe Substance 3D Painter

We sought the help of Adobe Substance 3D Painter for our low-poly character creation:

Adobe Substance 3D Painter took on the role of an expert painter, bringing our characters' textures and environments to life. It is simple interface and real-time painting dance allowed us to create textures that changed as our characters' stories progressed. It quickly became the preferred wand for skilled artists looking for texture enchantment, thanks to its support for PBR magic and flawless integration.

Through Adobe Substance 3D Painter's magical touch, our low-poly characters blossomed with lifelike textures, a testament to its transformative prowess. Its painter-friendly interface and real-time painting symphony expedited our creative journey, while the Substance material sorcery wove threads of consistency and realism into our creations. In the grand tapestry of our project, Adobe Substance 3D Painter was the luminous gem that elevated our low-poly personas to an enchanting realm of visual allure.

Figure 3.7.2.1.1- Adobe Substance 3D printer logo

3.7.2.2 The problem we faced

I. GPU- This software needs a high config GPU. Without this is a horrible experience.
II. Resource Import- Sometimes we need extra material for texture. When we download a material from ‘adobe substance community assets’ then some materials are not imported.
III. Sometimes this software hangs and crashes.

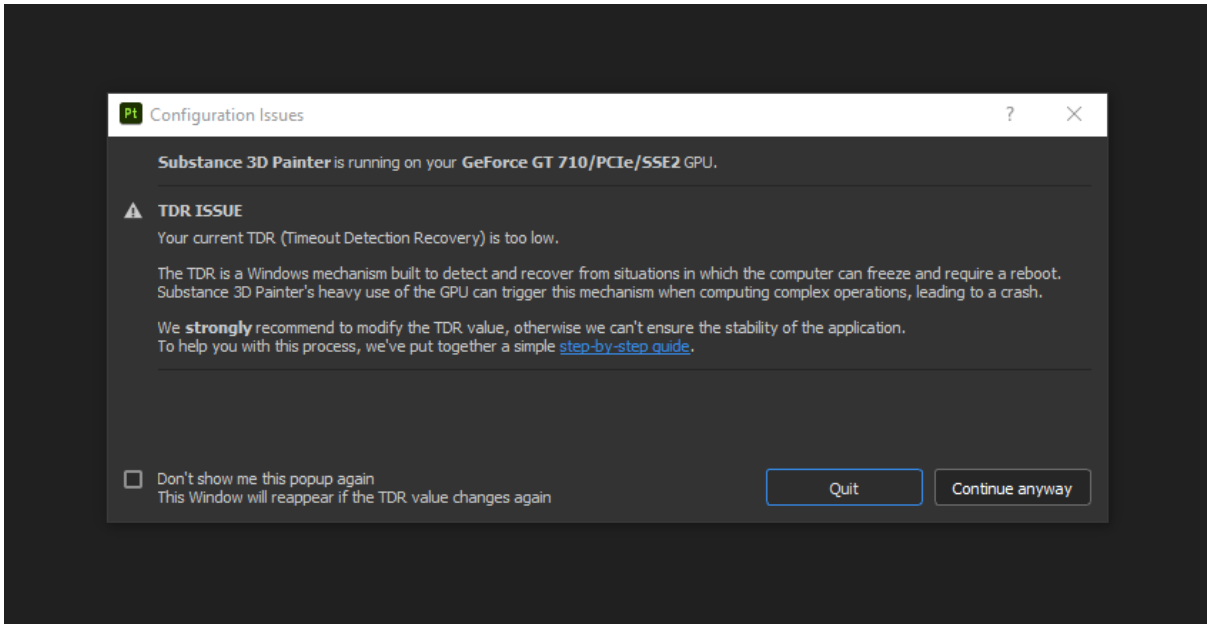


Figure 3.7.2.2.1- GPU Issue

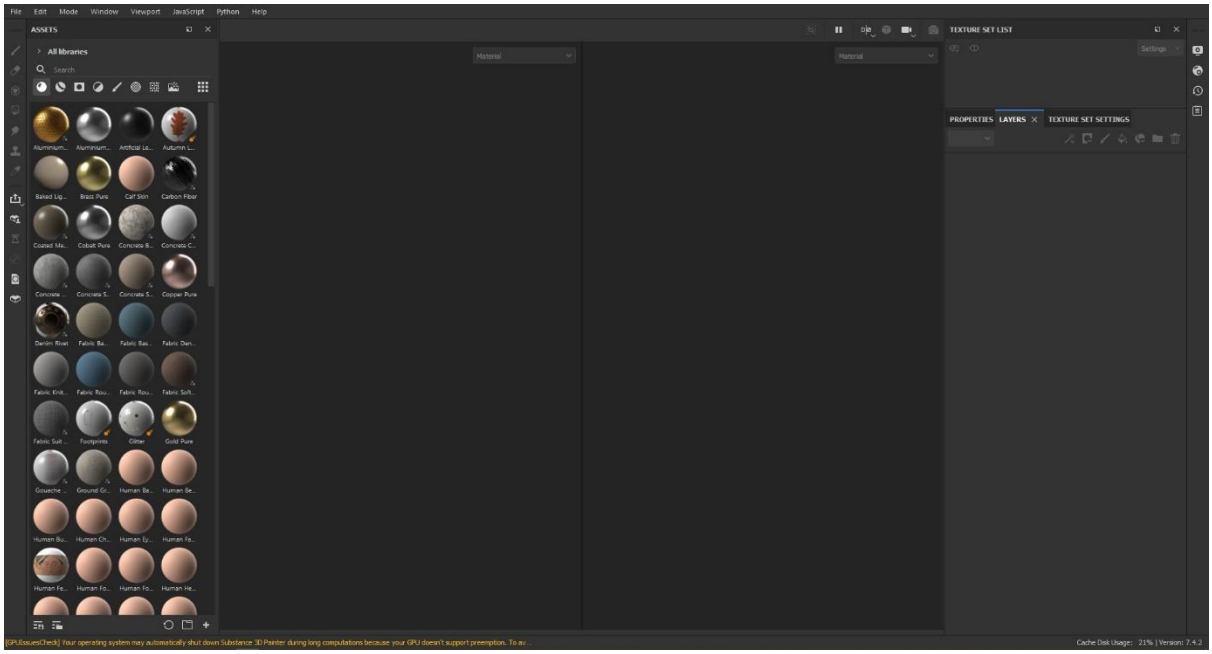


Figure 3.7.2.2.2- software main interface

Figure 3.7.2.2.3- software main interface

3.7.3.1 Marmoset Toolbag

Marmoset Toolbag, a master in real-time rendering and texture baking, played a pivotal role in our low-poly character craftsmanship. As a user-friendly sanctuary for 3D graphics and game development, it provides a sanctuary for orchestrating, rendering, and assessing our characters in real-time. With its swift rendering incantations, interactive illuminations, and post-processing effects, Marmoset Toolbag created mesmerizing visuals and photorealistic tapestries around our characters. It also provided us with the art of texture sorcery, creating high-quality textures that added depth to our characters' tales. Marmoset Toolbag's artistry captivated our characters, presenting them in all their three-dimensional glory.

Figure 3.7.3.1.1- Marmoset Toolbag logo

3.7.3.2 The problem we faced

I. Compatibility difficulties: Marmoset Toolbag may have compatibility difficulties with specific hardware setups, which may influence rendering and performance.
II. Animation Limitations: While Marmoset Toolbag has certain animation functions, it is primarily intended for static 3D models and lacks the depth of specialized animation software.
III. Resource Intensity: Rendering high-resolution textures or complex sceneries can tax system resources, potentially causing slowdowns or crashes on less capable PCs.
IV. Artistic Learning Curve: Mastering the interface and workflow of the Marmoset Toolbag may take time and practice, making it difficult for newbies.
V. Price Consideration: While the trial version is free, the full version is not, which may affect consumers on a tight budget looking for free alternatives.

3.7.4.1 Adobe Photoshop

Photoshop plays a crucial role in game art, aiding in concept art, texture creation, and asset design. While essential, other tools like Substance Painter and game engines are also significant. Stay updated with industry trends for optimal tool selection.

Figure 3.7.4.1.1- Adobe Photoshop logo

3.7.4.2 The problem we faced

I. large File Sizes: Creating high-resolution textures and complicated designs can result in big file sizes, which can stymie operations, particularly when sharing files or working on less capable technology.
II. Learning Curve: For newbies, Photoshop's numerous functionalities can be intimidating, taking time and effort to understand, thus delaying work for designers who are still learning.
III. Hardware Demands: Working with huge files and sophisticated designs may necessitate more powerful gear, which may be too expensive for certain designers or studios.
IV. Detail Work may Be Time demanding: Creating complex details and realistic textures in Photoshop may be time demanding, especially when working on objects that require high levels of precision.
V. Limited Collaboration Tools: While Photoshop supports collaboration, it may not be as efficient for team work as specialized collaboration tools.

3.8 Our work method

I. Low poly game characters: In mobile gaming, we carefully curated an array of low poly game characters spanning various genres.

II. Hybrid Charm: Our journey embraced the finesse of hybrid modeling, a technique that streamlined our efforts, rendering our characters optimized and vibrant.

III. Organic Form: Organic modeling breathed life into our characters, capturing nature's intricate irregularities – the grace of animals or the majesty of trees – all crafted with the economy in polygons.

IV. Topology's Influence: The symphony of topology conducted our characters' design, harmonizing efficiency, aesthetics, and animation. A well-orchestrated topology is our cornerstone for both visual allure and practical prowess.

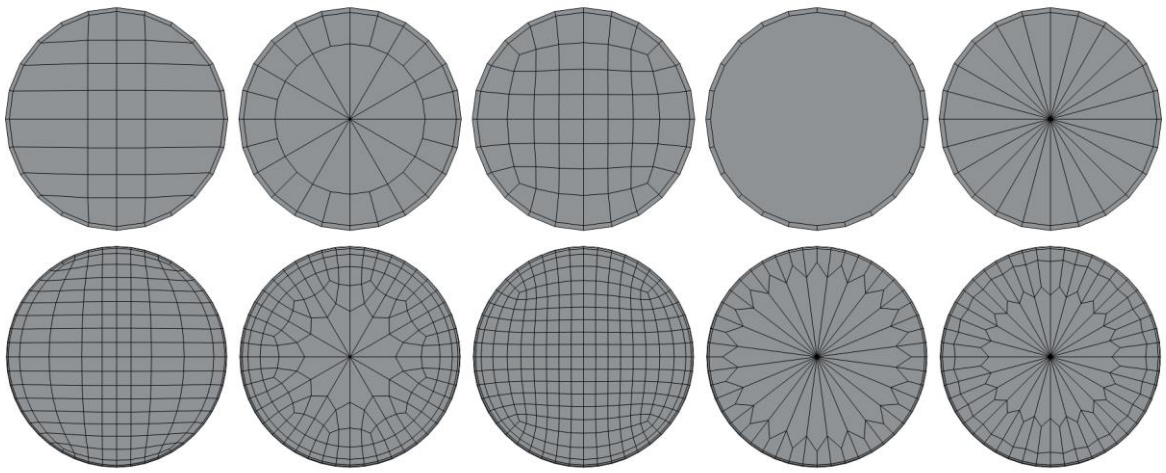


Figure 3.8.1- Visual representation for understanding topology

V. Shape Psychology: Shape psychology infused our characters with emotions. A circle for innocence and vitality, a square for stability and balance, and a triangle for vigor and assertiveness.

Figure 3.8.2- Visual geometry shape for understanding shape psychology

VI. Visual Respite: The rhythm of visual breathing space flowed through our characters, intertwining aesthetics and legibility, bestowing users with an oasis of experience, culminating in a tapestry of visual allure and immersion.

3.9 Maya workflow

I. First, we look at a reference according to our model.
II. As I have created the assets, I create a base of my model in low poly as a reference.
III. In this case I maintain the topology from the beginning
IV. After making the base model I create the UV map
V. While creating UV map, map size is 2048 (2k) and try to keep Texel density of all UV shells same.
VI. Then I rename each part of my base model separately so that it is easier to find it later and it is easier to place the material.
VII. After that select the entire model and assign a material id. So that I can texture the model as an object in Adobe Substance Painter.
VIII. The last thing I do is select the entire model and export it to FBX format for the next step.

Below I have added some pictures for ease of understanding.

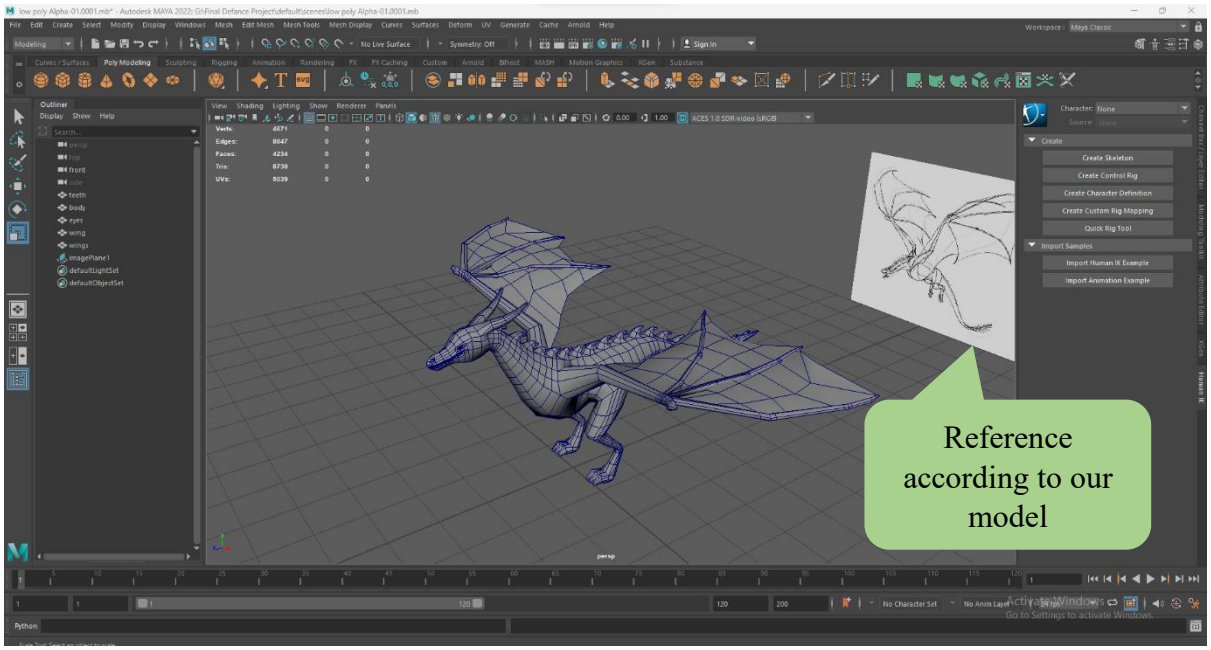


Figure 3.9.1- Screenshot 1

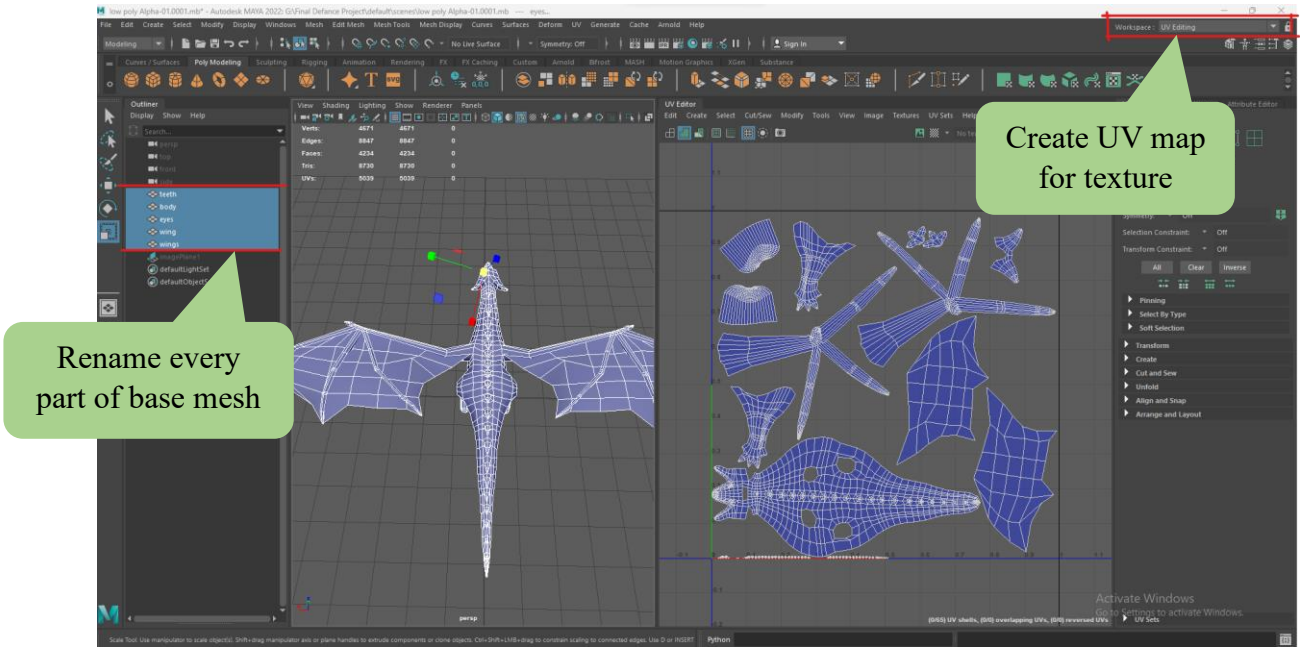


Figure 3.9.2- Screenshot 2

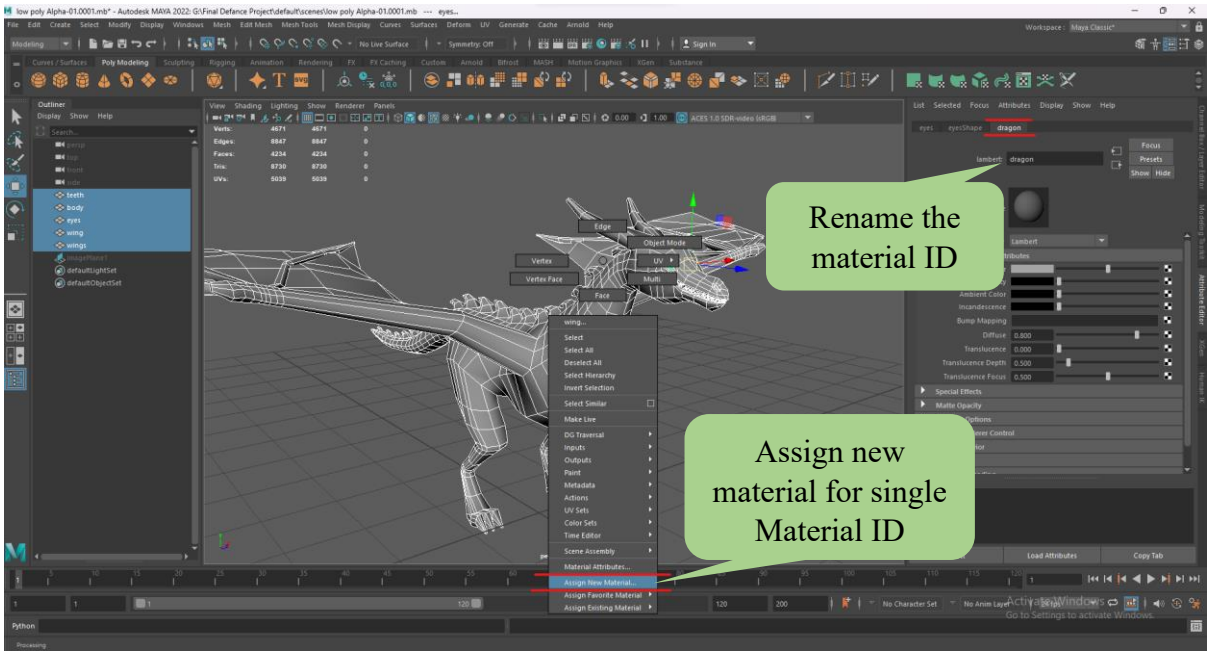


Figure 3.9.3- Screenshot 3

3.10 Adobe Substance 3D Painter workflow

I. Import Model: Import the 3D model into Substance Painter. Supported formats include FBX. This time I select Unreal Engine 4 (Starter Assets) as the template. Also select document resolution 2048 (2k).
II. UV Unwrapping: Ensure the model has UV mapping applied. Proper UV unwrapping allows the 3D model's surface to be accurately represented on a 2D texture map.
III. Baking Textures: At this stage I bake the model to generate other maps like Normal, Ambient Occlusion, or Curvature to transfer details to a low-poly model. I select 2048 (2k) while doing bake mash
IV. Texture Painting: Begin painting textures onto the model using a variety of brushes, masks, and tools. Substance Painter allows for both manual painting and smart materials application.
V. Real-Time Preview: Continuously preview the model in real-time to see how the textures affect the final appearance.
VI. Texture Output: At this stage I export the maps for the next step.

Below I have added some pictures for ease of understanding.

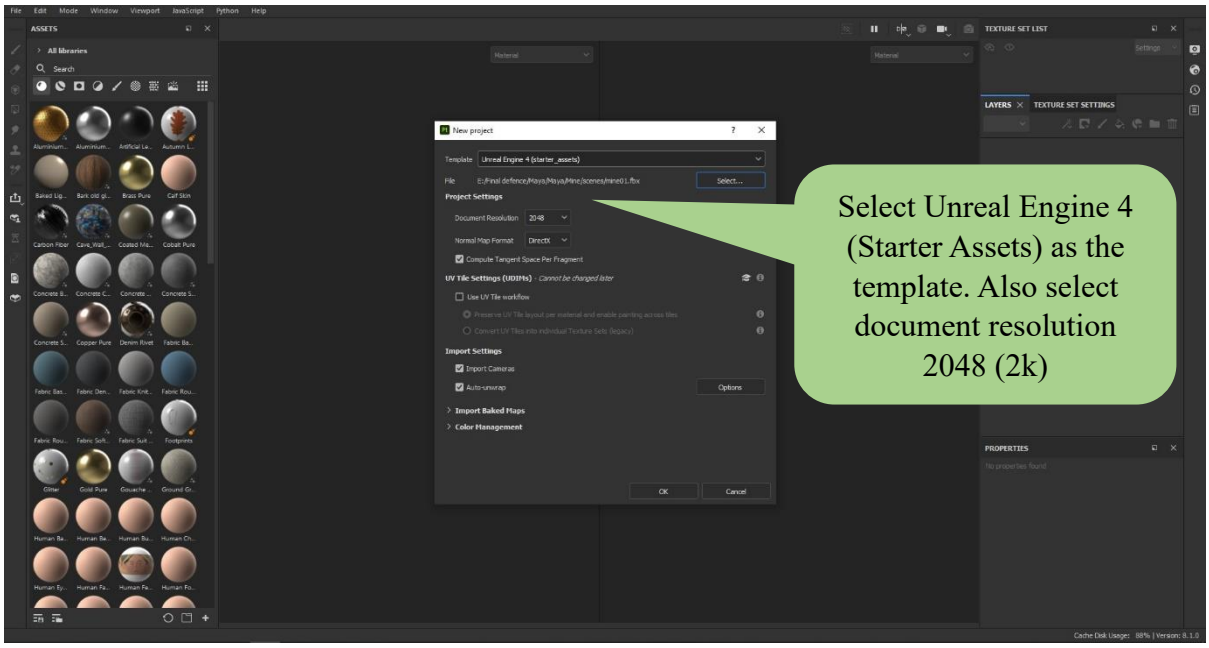


Figure 3.10.1- Screenshot 1

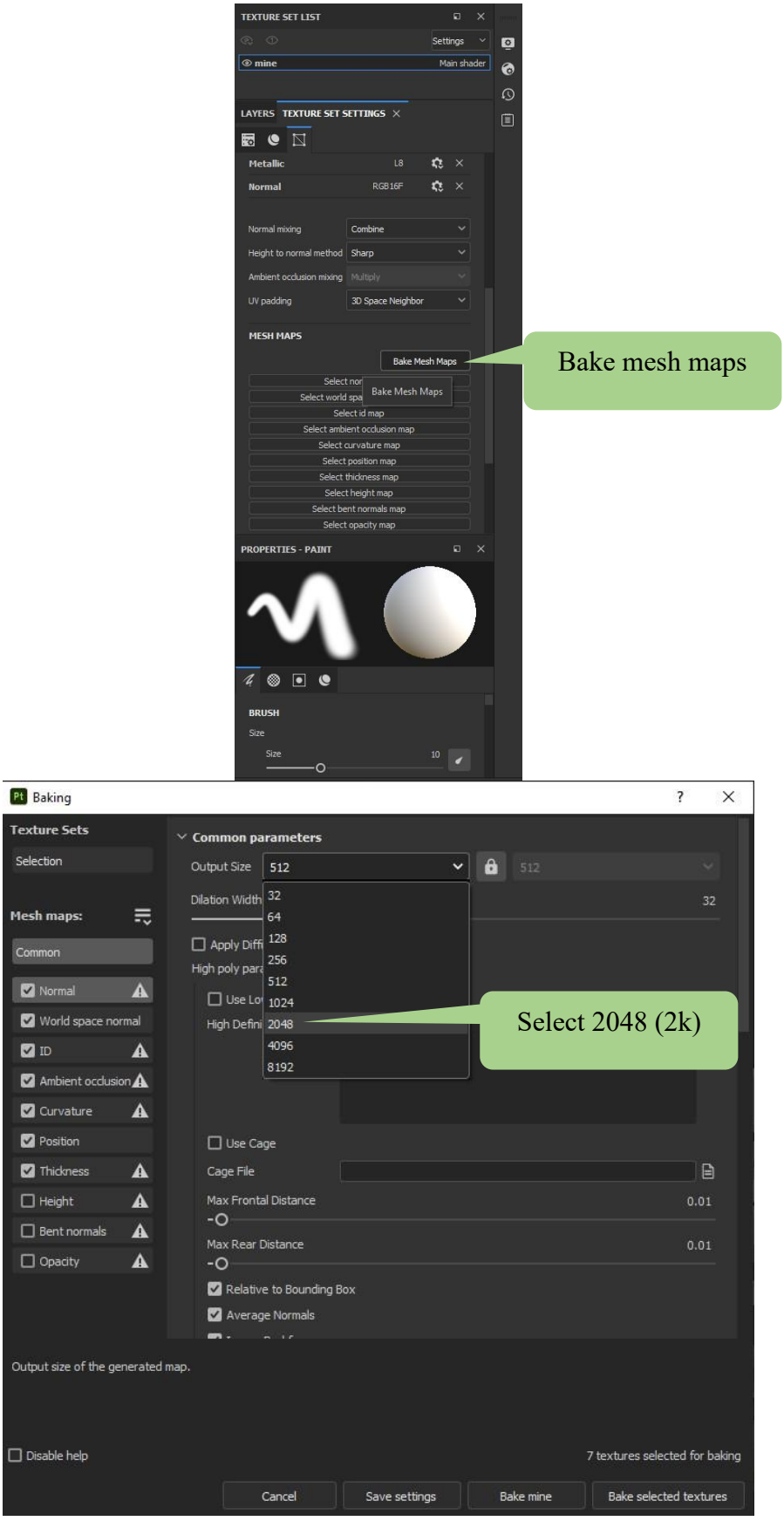


Figure 3.10.2- Screenshot 2

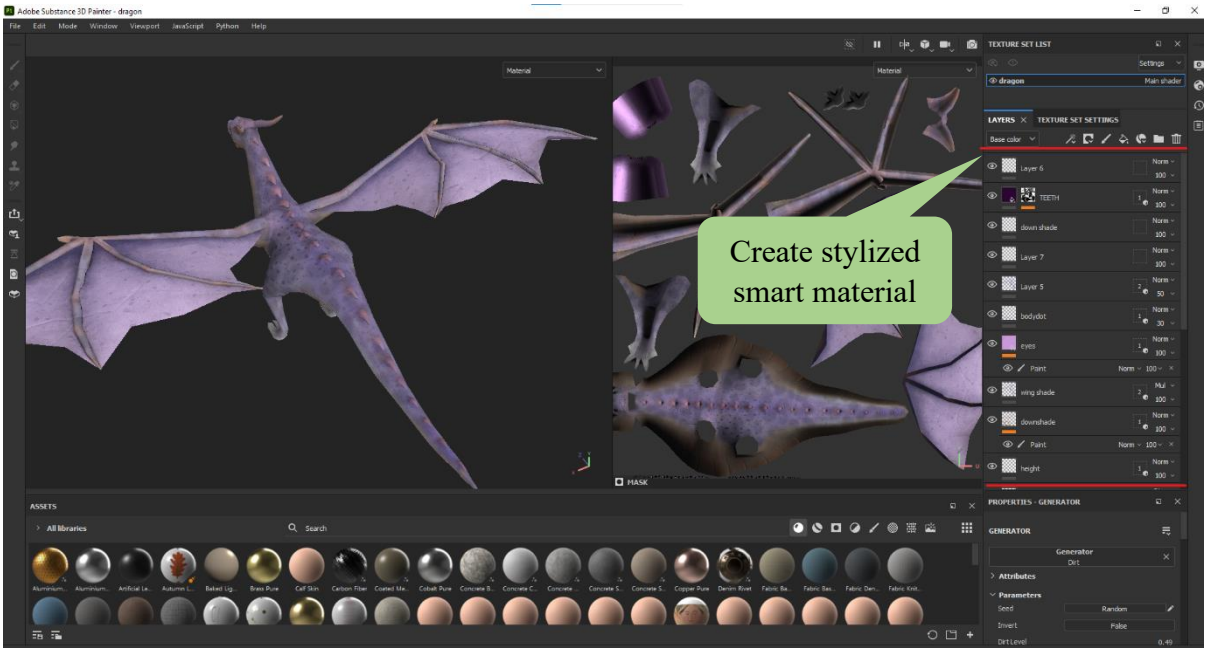


Figure 3.10.3- Screenshot 3

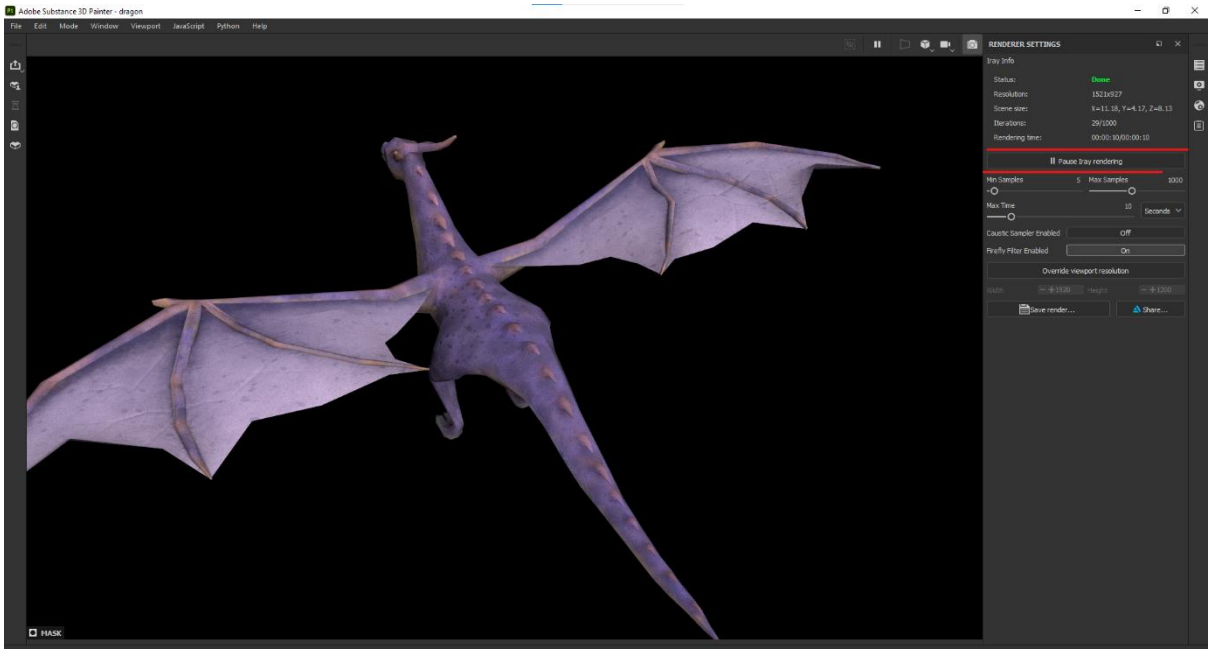


Figure 3.10.4- Screenshot 4 (Realtime render view)

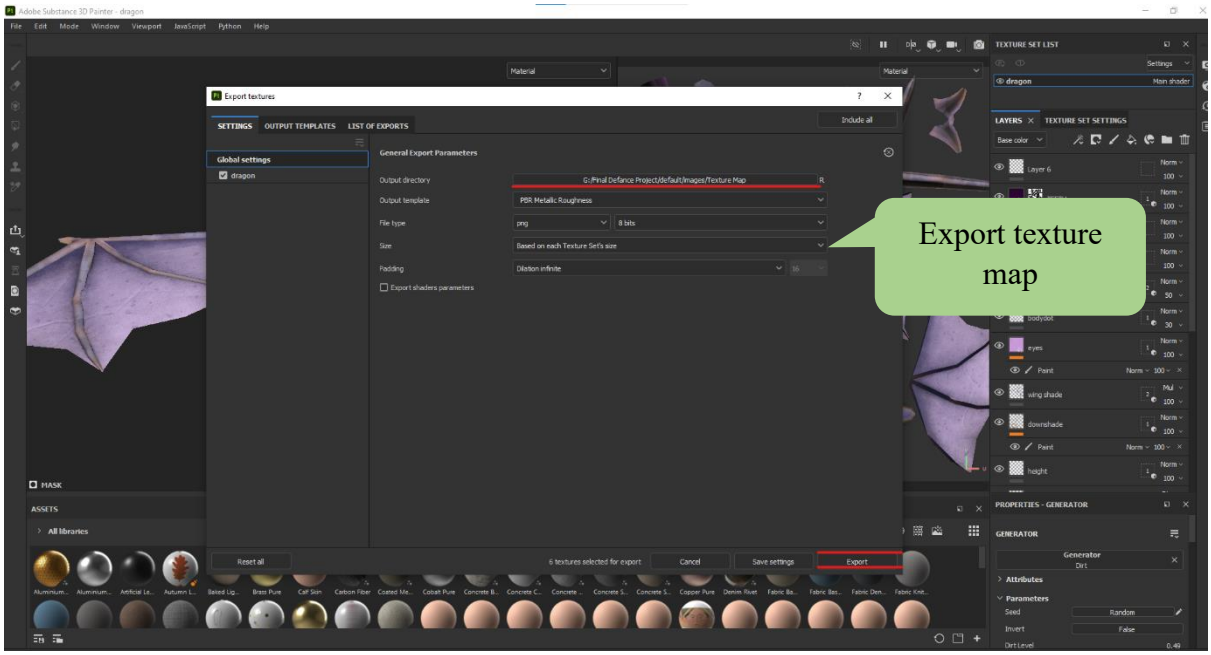


Figure 3.10.5- Screenshot 5

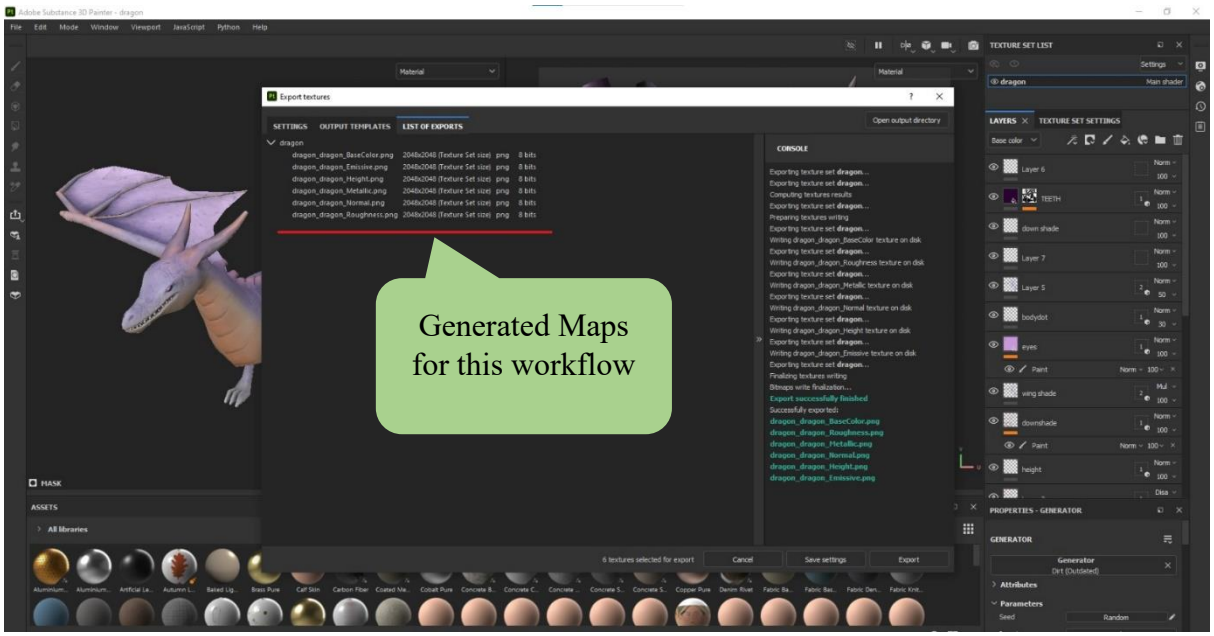


Figure 3.10.6- Screenshot 6

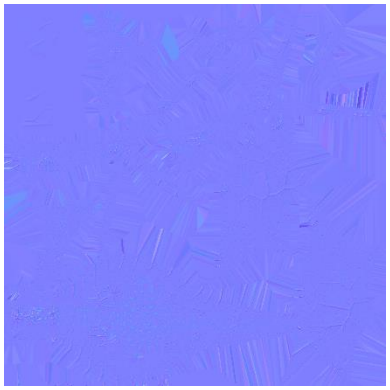


Figure 3.10.7- Normal Map

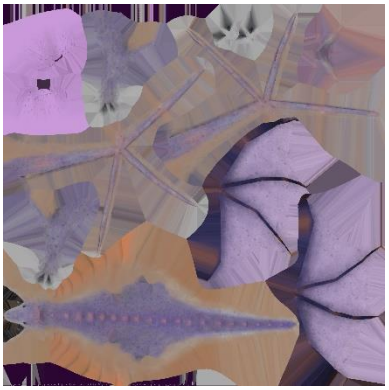


Figure 3.10.8- Base color map

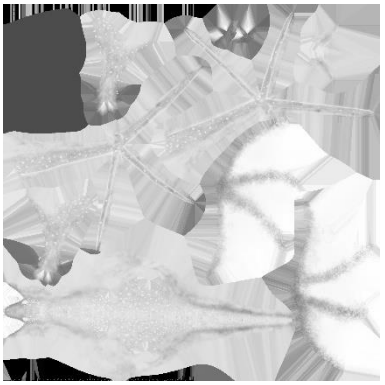


Figure 3.10.9- Roughness

Figure 3.10.10- Hight Map

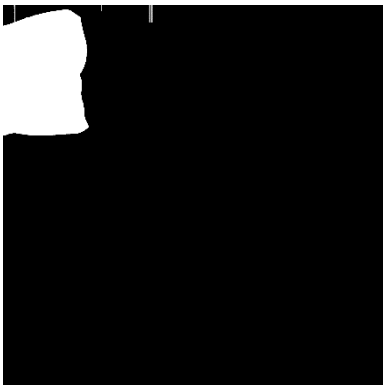


Figure 3.10.11- Metallic

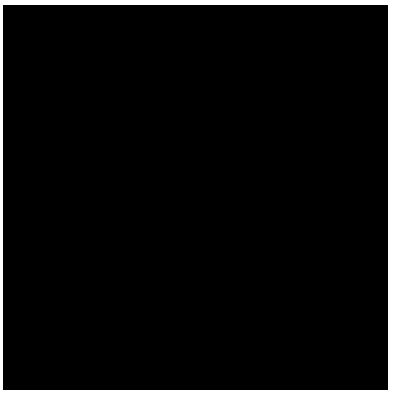


Figure 3.10.12- Emissive

3.11 Marmoset Toolbag workflow

I. First open the marmoset toolbag and take the shadow catcher to understand the shadow of the model.
II. Next, we imported our model. in FBX format.
III. Then I go to the material option to import the material. After selecting there, a popup menu appears below. Import the previously exported map for my model there.
IV. Next, I import the lights for my model. After selecting the type of light according to the need, I fix the parameters of the light from the menu bar below.
V. Then I fix the various parameters of the main camera as required in the same way.
VI. Finally, click the Render button to render. From there, after fixing the various parameters, after selecting the resolution according to my requirement, I click on the render image and complete the work.

Below I have added some pictures for ease of understanding.

Figure 3.11.1- Screenshot 1

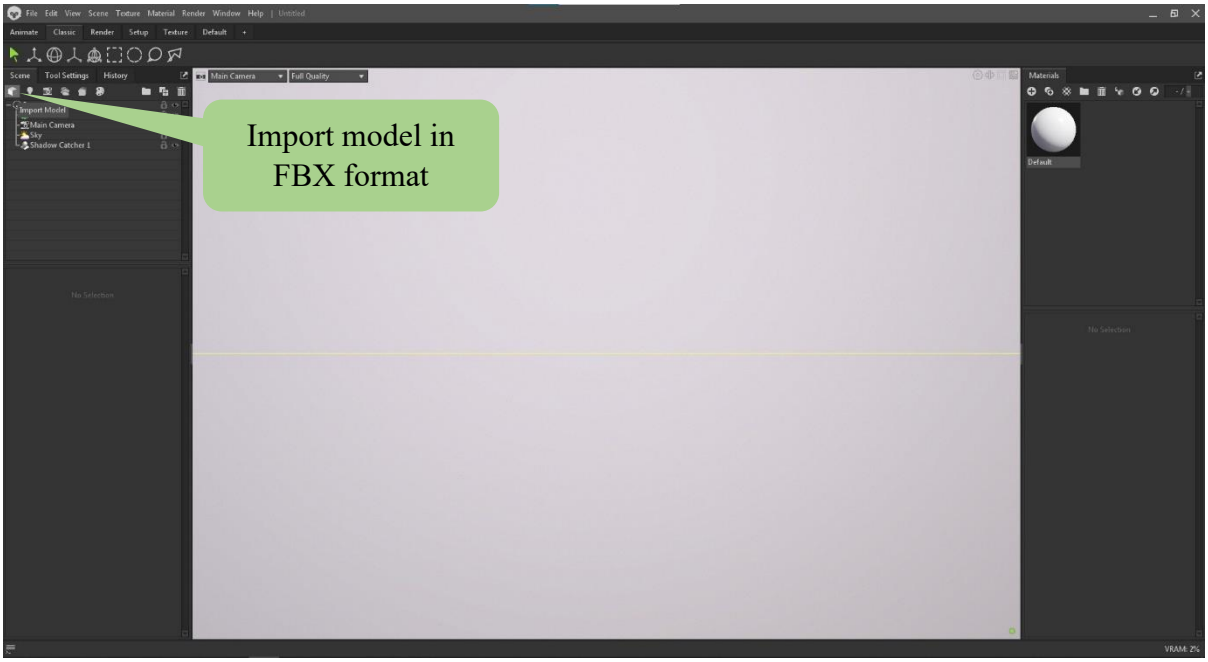


Figure 3.11.2- Screenshot 2

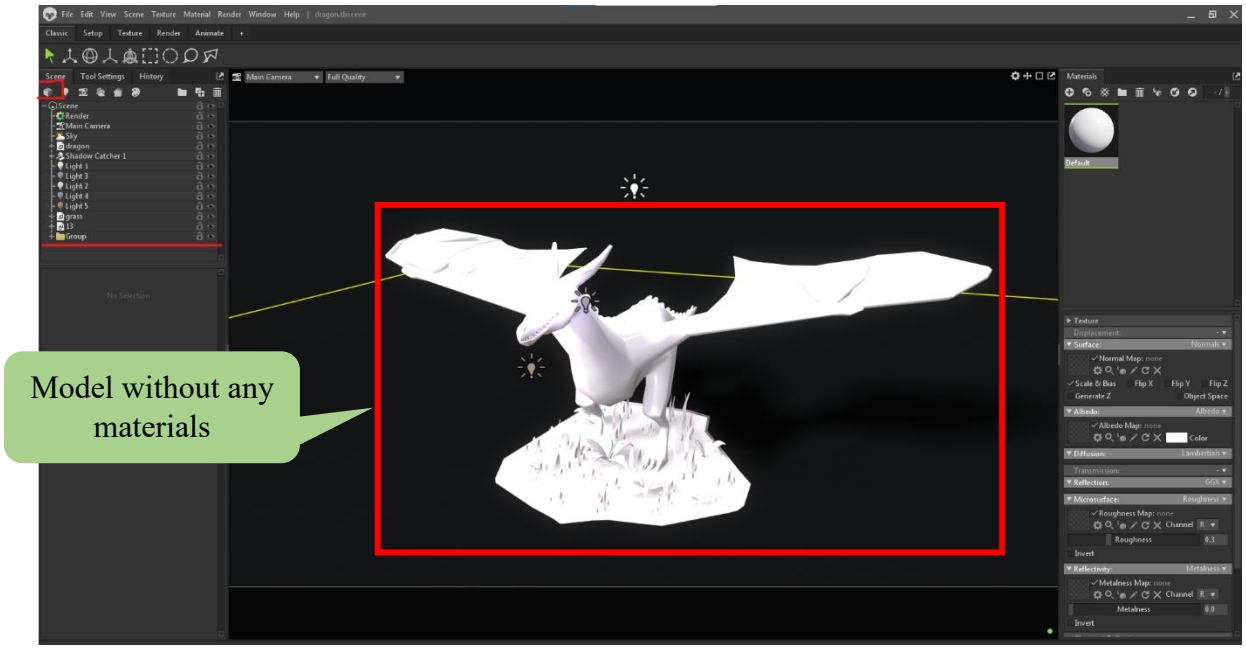


Figure 3.11.3- Screenshot 3

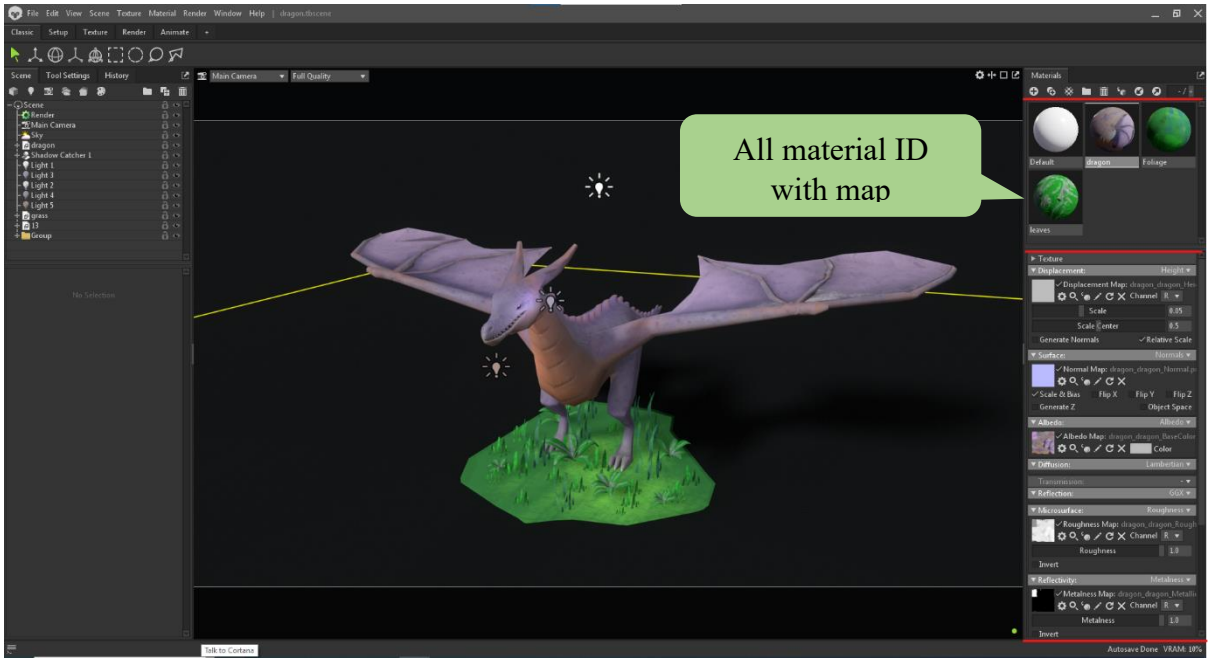


Figure 3.11.4- Screenshot 4 (All model materials are imported in the base mesh)

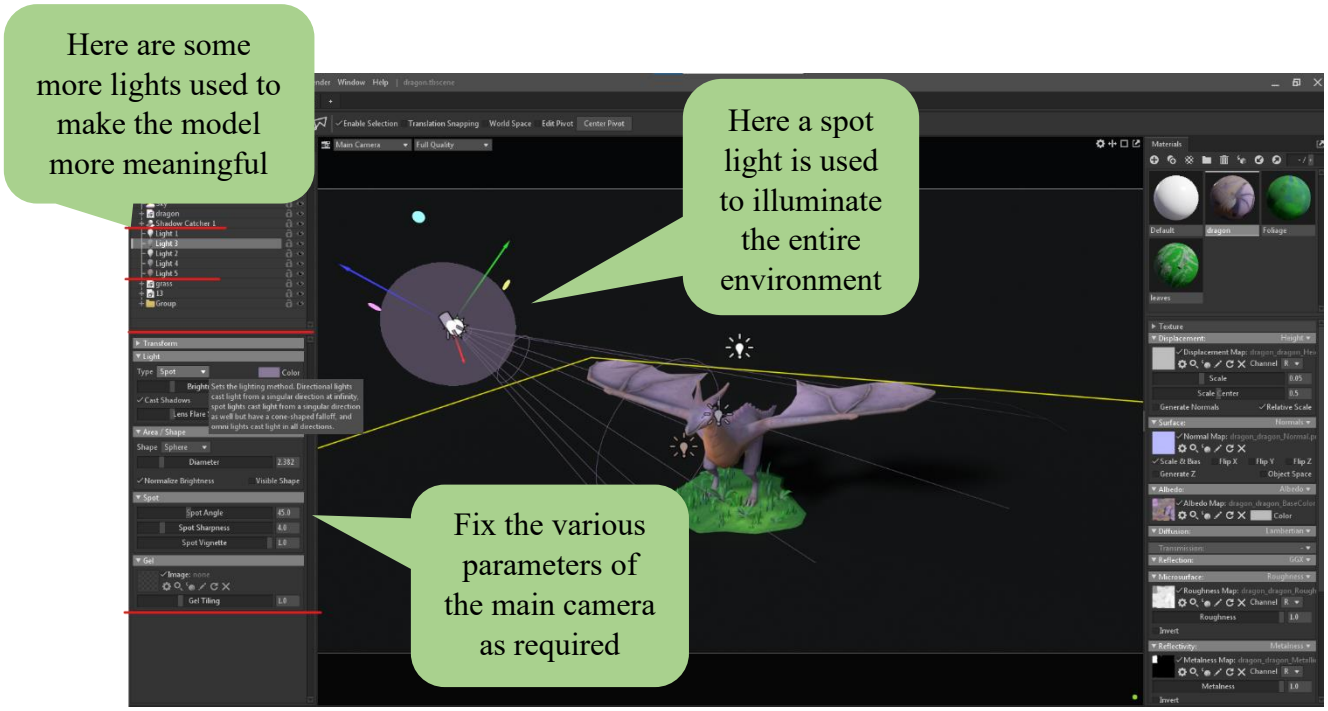


Figure 3.11.5- Screenshot 5

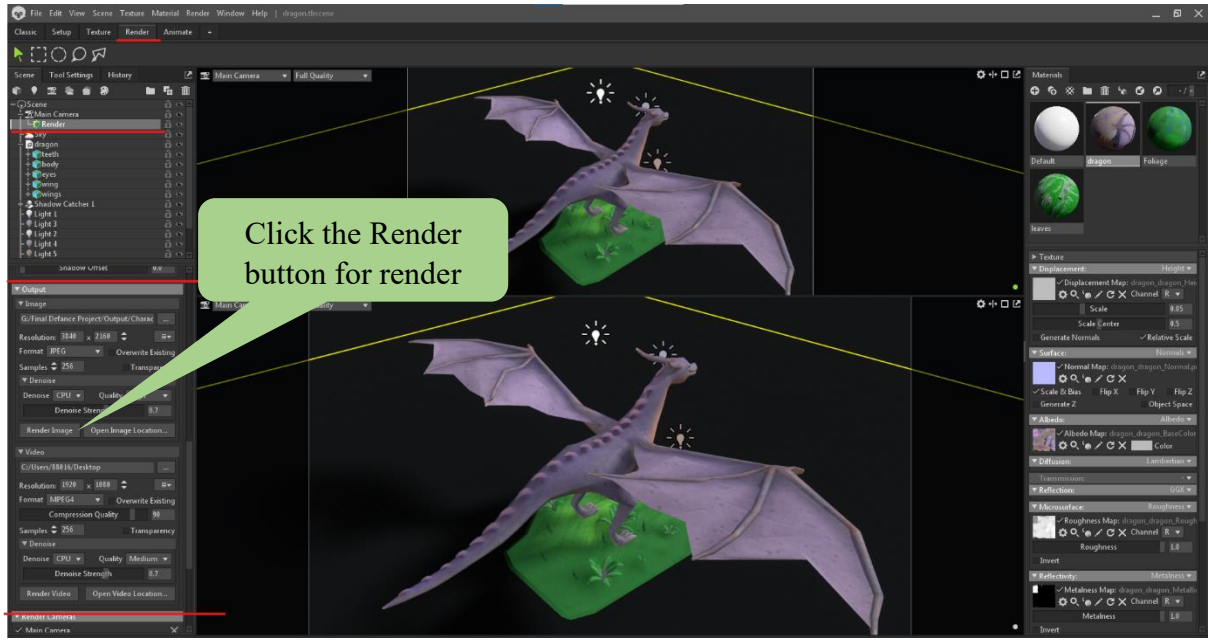


Figure 3.11.6- Screenshot 6

CHAPTER 4

Experimental Results

4.1 Introduction

Crafting low-poly game characters is a thrilling journey of analysis and discovery, where data serves as the compass and insights are the stars. This process illuminates challenges and uncovers hidden gems that lead to victory. Every revelation is a brushstroke, painting life onto the canvas of our aspirations. As we decode the intricacies of pixels and polygons, the essence of character creation undergoes a metamorphosis, transforming raw data into characters that breathe and stride across digital landscapes, leaving behind authentic footprints.

In this grand theater of artistry, the curtain rises not just on characters but on a symphony of achievements. Each insight and challenge we overcome contributes to a tapestry that weaves together our dedication, innovation, and the magic of creation. As the final act approaches, our characters step into the limelight with an aura of eminence, transformed into vessels of storytelling wonder.

Creators, let us venture forth with our compass of data, navigating through challenges like skilled navigators of creativity. Breathe life into code and substance into polygons, as every stroke of insight is a stroke of genius. As our characters take their bow, they represent art and stand tall as monuments to the allure of the digital age.

4.2 Character Personality Trait Tables

Character personalities are important in defining player experiences in the game design landscape. Character Personality Trait Tables offer an organized way of defining and portraying characteristics, behaviors, and subtleties. These tables are critical tools for game creators, allowing them to meticulously build characters and immerse players in fascinating tales. This introduction delves into the relevance of Character Personality Trait Tables in current game design, emphasizing their significance in creating realistic and intriguing virtual identities.

4.2.1 Positive Personality Traits

Name	Trait	Strength	Weakness
The Hero	Adventurous	Eager to take hard jobs. Watchful for possible danger	Fire

Table 4.2.1- Positive Personality Traits

4.2.2 Negative Personality Traits

Name	Trait	Strength	Weakness
Alien	Enigmatic	Mastery of advanced technology for strategic advantage. Quick to jump into things	Susceptibility to Earth's environmental conditions and immune systems.
The Giant Tree	Aggressive	protecting or defending	Sunshine
Pig Monster	Good at getting Info	Hit & run	Leg
Fire Goblin	Fire coil	Fire	Water
Thief Goblin	Treasure theft	Fast run	Ground bomb
Magician Goblin	Misguided	Magic spell	Hand
Dragon	Ferocious	flight, fire-breathing, heightened senses, and extraordinary physical prowess.	Smoke

Table 4.2.1- Negative Personality Traits

4.3 Base mesh, Wireframe, UV Render & Final Output

The Hero

Trait- Adventurous

Strength- Eager to take hard jobs. Watchful for possible danger

Weakness- Fire

Figure 4.3.1- The Hero

The Alien

Trait- Enigmatic

Strength- Mastery of advanced technology for strategic advantage. Quick to jump into things**.**

Weakness- Susceptibility to Earth's environmental conditions and immune systems.

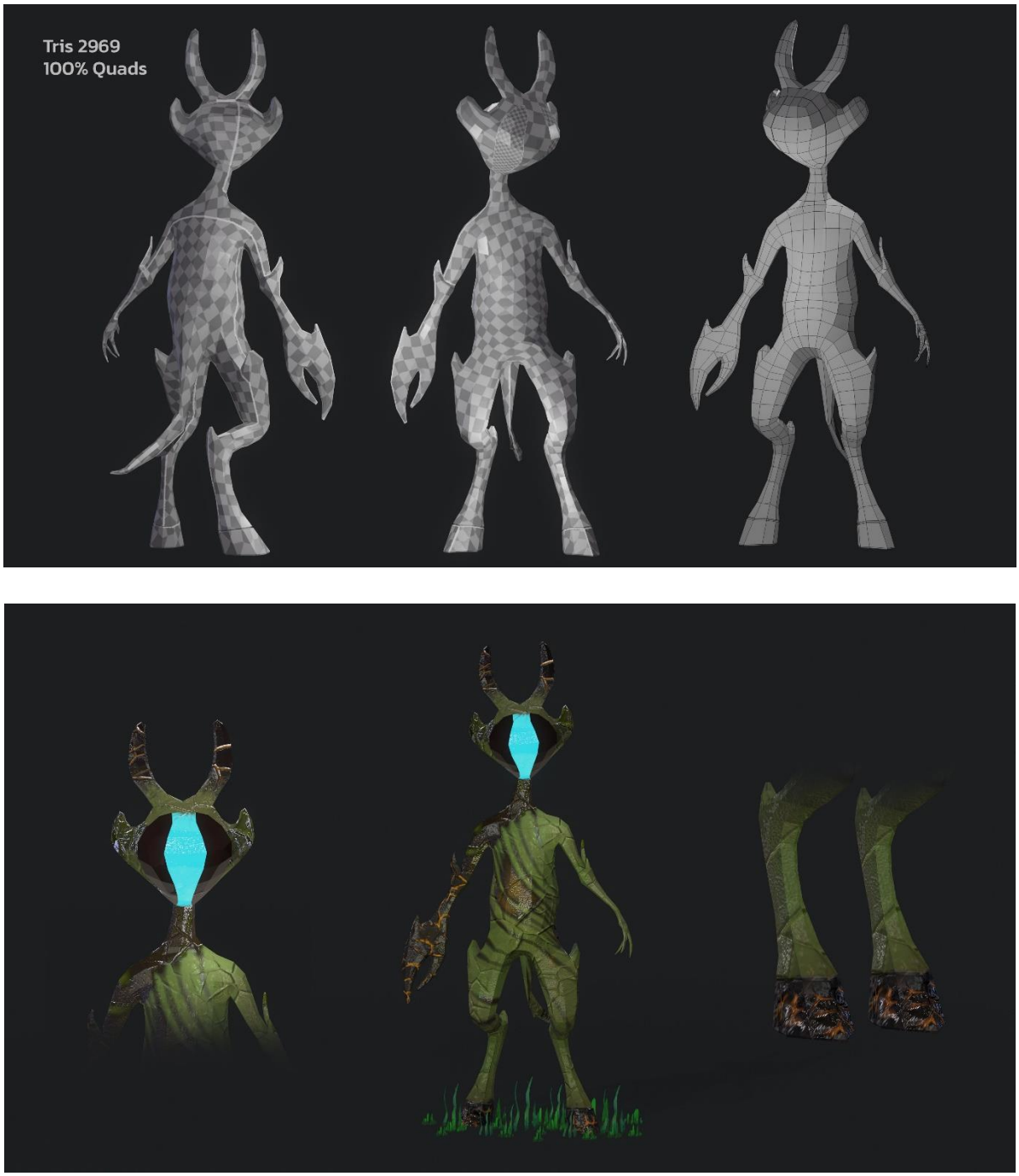


Figure 4.3.2- The Alien

The Giant Tree

Trait- Aggressive

Strength- protecting or defending.

Weakness- Sunshine

Figure 4.3.3- The Giant Tree

Pig Monster

Trait- Good at getting Info

Strength- Hit & run.

Weakness- Leg

Figure 4.3.4- Pig Monster

Fire Goblin

Trait- Fire coil

Strength- Fire

Weakness- Water

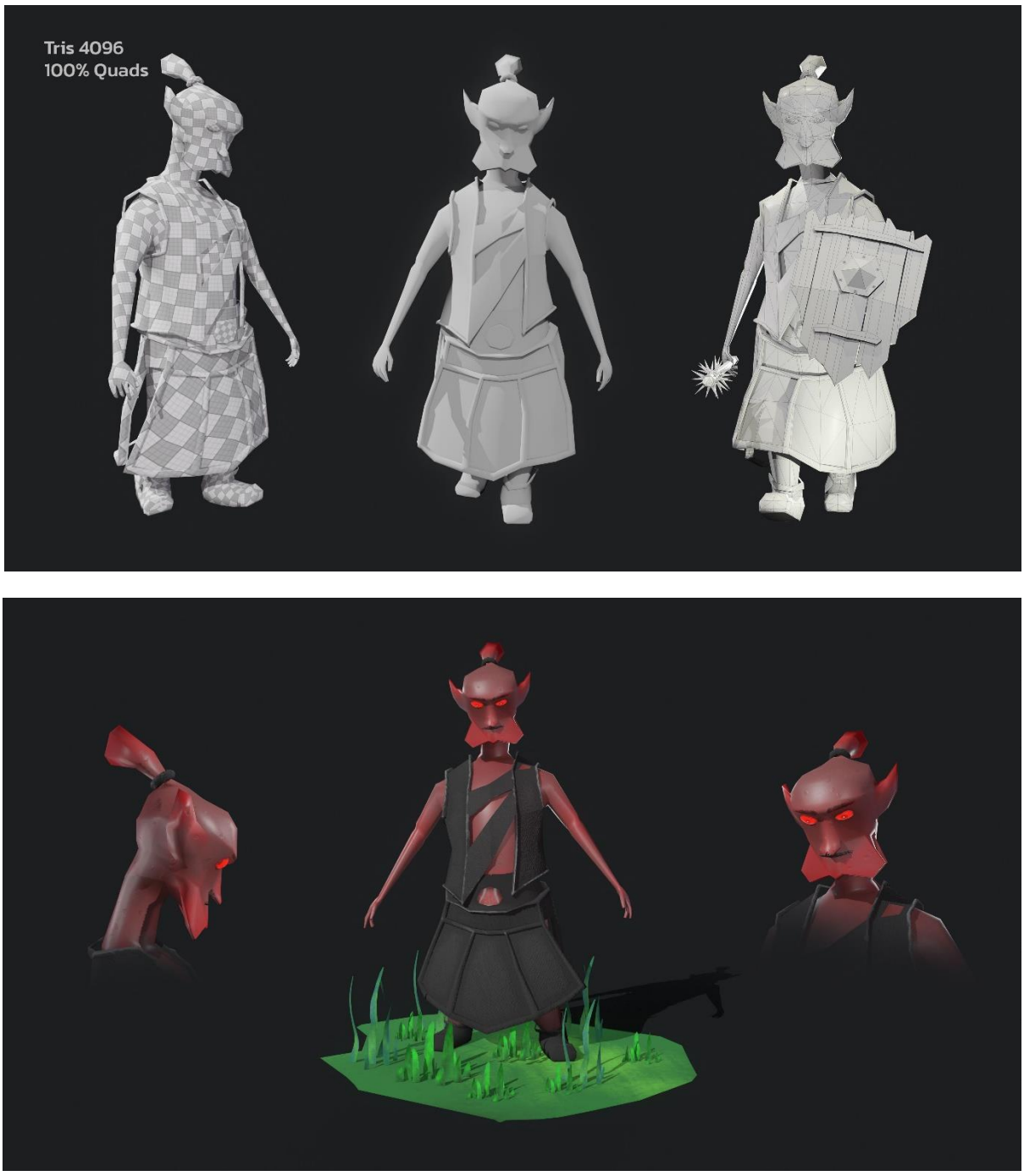


Figure 4.3.5- Fire Goblin

Thief Goblin

Trait- Treasure theft

Strength- Fast run

Weakness- Ground bomb

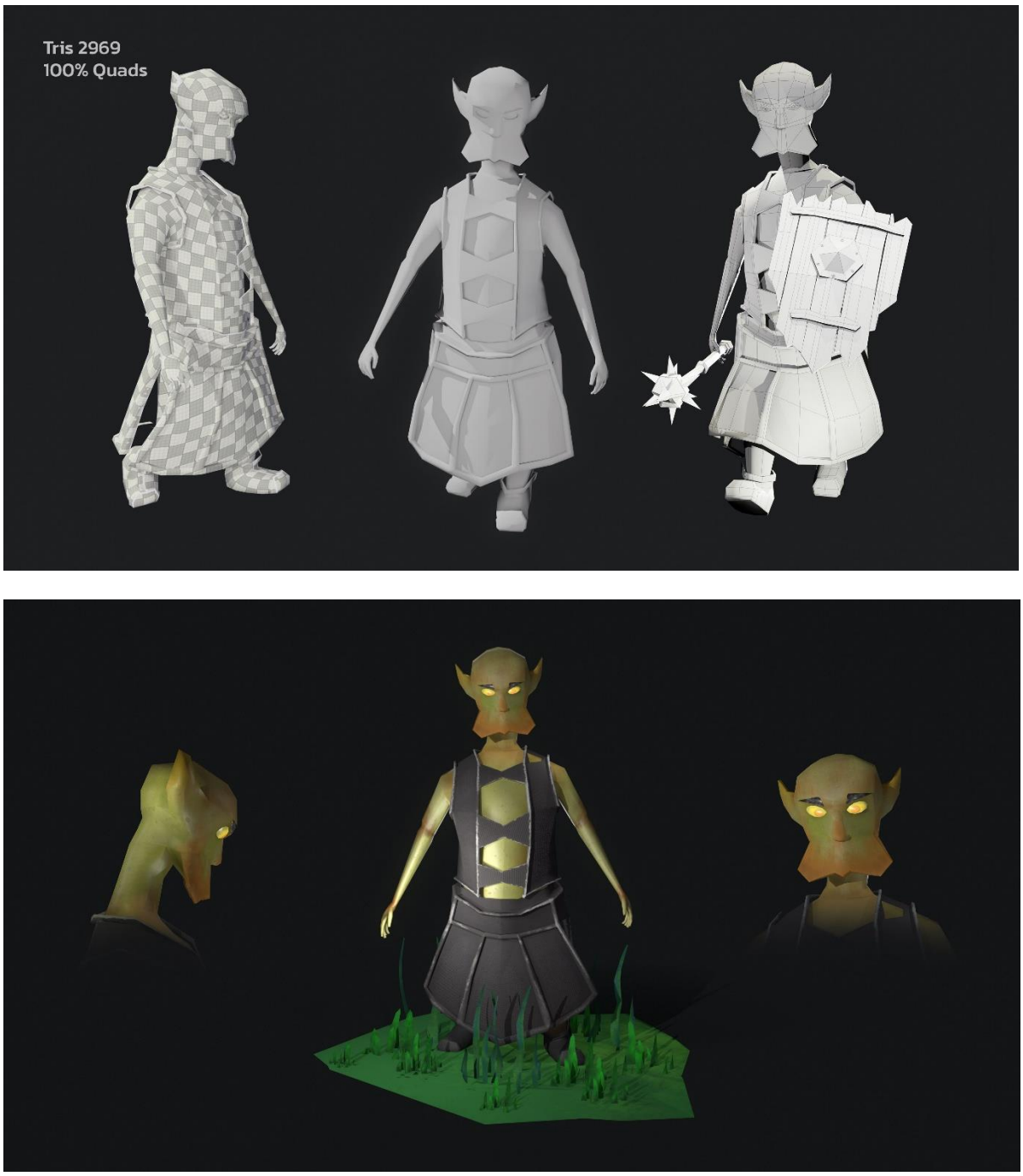


Figure 4.3.6- Thief Goblin

Magician Goblin

Trait- Misguided

Strength- Magic spell

Weakness- Hand

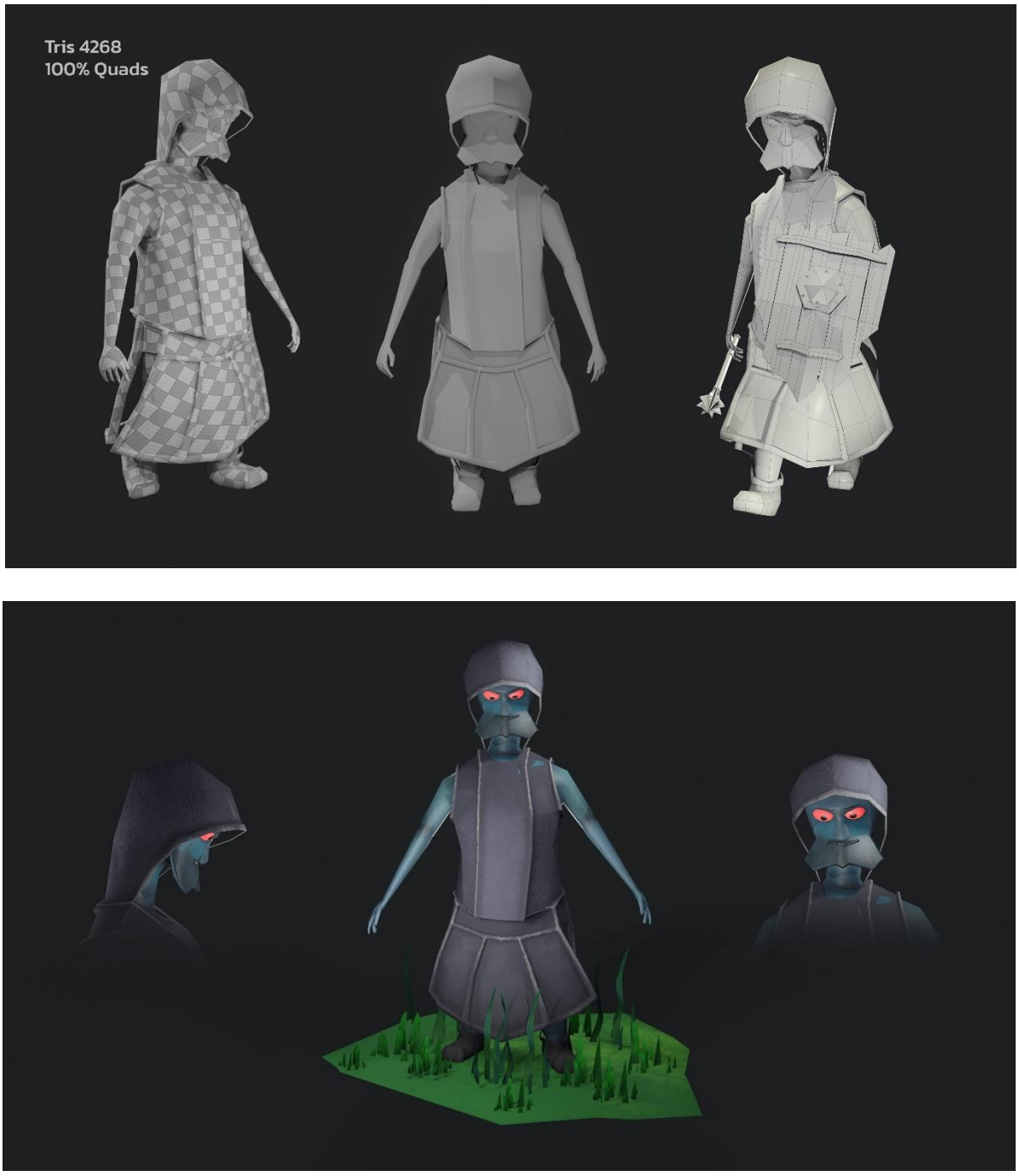


Figure 4.3.7- Magician Goblin

Dragon

Trait- Ferocious

Strength- Flight, fire-breathing, heightened senses, and extraordinary physical prowess.

Weakness- Smoke

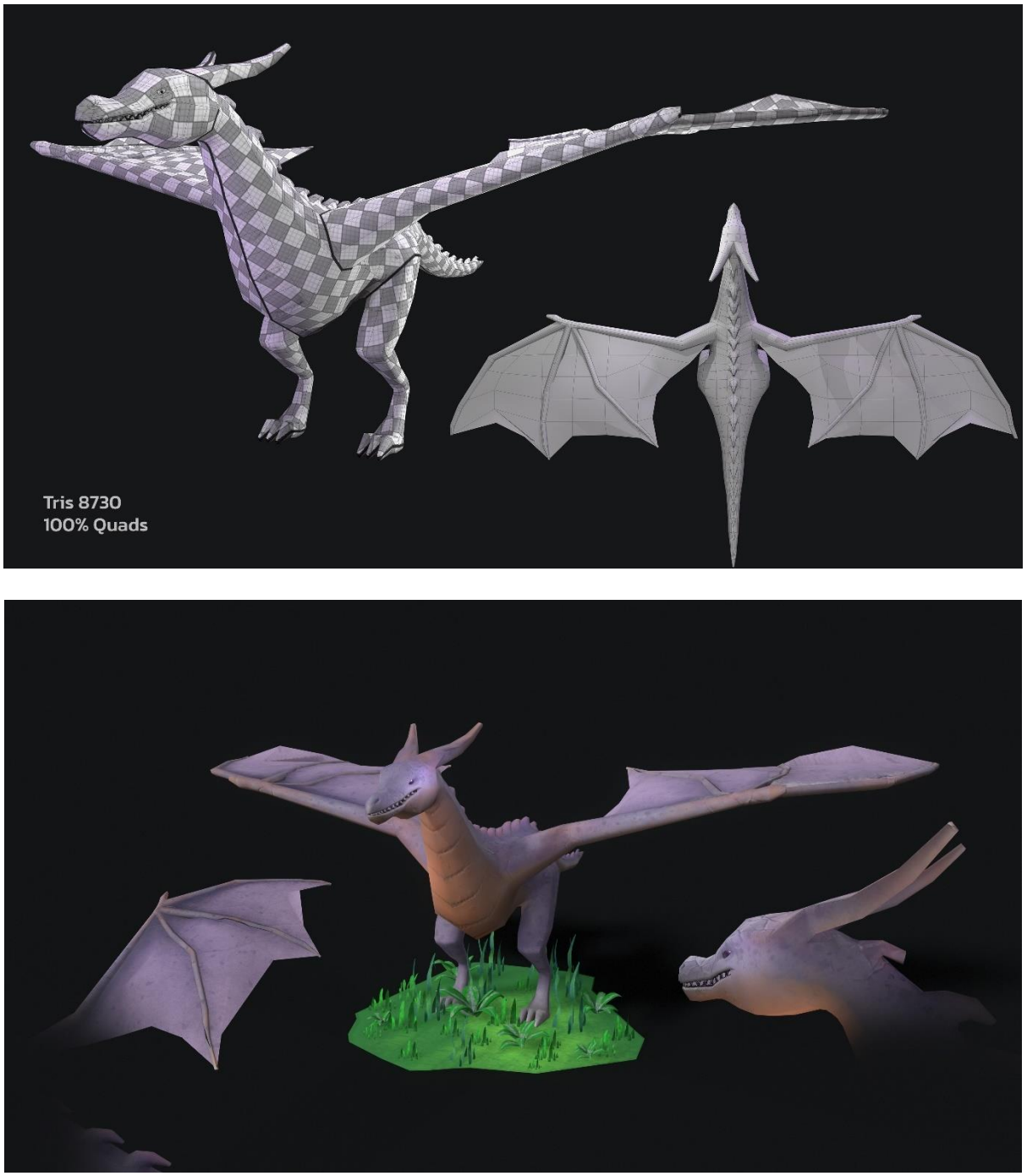


Figure 4.3.8- Dragon

CHAPTER 5

5.1 Conclusions

Exploring low-poly game characters in mobile strategy games has revealed a tapestry of creativity, problems, and opportunities. These characters are crucial in the growing complexity and value of the mobile gaming arena, serving as a link between performance enhancement and visual attraction. Their ability to improve performance, promote cost-effective expansion, and spark creative inventiveness demonstrates their worth. The guiding star in mobile strategy games has been the careful balance of visual beauty and frictionless gameplay.

Using programs like Autodesk Maya and Adobe Substance Painter, the team has mastered low-poly sculpting, UV mapping, and texture making, transforming primary forms into living organisms. However, the journey has faced challenges such as software complexities, difficulties, and UV unwrapping. The team has learned that low-poly game characters are more than just technical components; they also consider game design concepts, form psychology, and visual breathing space.

Integrating narrative and characters brings the virtual tapestry to life, enticing gamers into immersive realms. However, the journey highlights the critical need for cohesive participation in collaborative endeavors, effective communication, work distribution, and timetable adherence. Mastery in both areas is required to create captivating, high-performance experiences. The team is ready to build their way on this thrilling journey, armed with greater understanding and talents.

5.2 Future Scope of Work

As the final defense project on low poly 3D character design for the casual strategy mobile game concludes, several exciting avenues for future exploration and development emerge. The project has laid a strong foundation in creating captivating characters within the constraints of the low poly aesthetic, catering to the game's immersive narrative. Building upon this accomplishment, the following areas offer promising avenues for further work.

I. Expanded Character Roster: Adding more characters to the roster might provide variety to the game and increase player engagement. More anti-characters with distinct skills and qualities might add complexity and depth to the strategic components of the game. Integrating powerful AI algorithms might result in more dynamic and complex encounters between the hero and anti-characters. Furthermore, by using adaptive gaming principles, the difficulty level might be tailored based on the player's abilities and progress.
II. Multiplayer Features: Introducing multiplayer functionality, such as cooperative or competitive modes, could foster social engagement and expand the game's appeal to a wider audience.
III. Multiplayer Modes: Adding multiplayer features, such as cooperative or competitive modes, might increase social interaction and broaden the game's appeal. Branching storylines or multiple routes based on player decisions might increase replay value and engage gamers in a more personalized storytelling experience.
IV. Augmented Reality (AR) Integration: Investigating the incorporation of AR technology might bring the characters and games into the actual world, providing gamers with a fresh and participatory experience.
V. Cross-Platform Compatibility: Adapting the game for platforms other than mobile, such as PC or console, has the potential to broaden its reach and effect.
VI. Exploration of New Genres: While the project is primarily focused on a casual strategy game, studying how the low poly character design may be applied to other genres, such as puzzles or role-playing games, offers up new creative frontiers.

This low poly 3D character design project's success sets the door for an exciting future of additional innovation, creativity, and increased player experiences. By branching out in these new ways, the project's influence may be broadened, enthralling gamers and improving the realm of casual mobile gaming.

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