Al-rubaye Omar

# STYLIZED 3D SCENE USING BLENDER

Bachelor's degree in business information technology

2023

KAMK • University of Applied Sciences

KAMK • University of Applied Sciences

# Abstract

**Author:** Al-rubaye Omar

**Title of the publication:** Stylized 3D scene using Blender.

**Degree Title:** Bachelor's degree in business information technology.

**Keywords:** 3D modeling, Blender, Texturing, train, station, Ghibli.

The purpose of this thesis is to examine the process of creating a Studio Ghibli inspired art style scene in a 3D space using 3D models from concept stages to complete scene. The models are not designed for any type of game engine and will not be used as an in-game assets, the modeling Process was studied by learning about the different types of colors used in Studio Ghibli movies and study the type of art created to make the scene look the way it looks and to make more accurate models, the full modeling and texturing Process is done using only Blender 3.2.0.

The theoretical part focuses on learning: the different types of modeling techniques, learning from online tutorials and how to mix and match and apply the learned techniques into the 3D models.

The practical part consists of modeling: creating the models, using modifiers, and texturing the final model by using material nodes then presenting the finished render using the techniques and information learned during the theoretical part.

The modeling Process was done using Blender 3.2.0, Blender was chosen for ease of use and the free cost.

# CONTENT

# PICTURES

# LIST OF ABBREVIATONS

| | |
|---|---|
| Blender | 3D modeling program. |
| Polygon | face in a 3D space, made from edges. |
| Subdivision | the action of smoothing the mesh. |
| Texturing | the action of adding colors or images to a mesh. |
| Evee | render engine inside of Blender. |
| Stylized | artistic freedom when representing an object. |
| 3D Blockout | rough 3D models without any details. |
| Node | visual scripting system. |
| Modifiers | system that changes the geometry of an object. |

# 1 Introduction

This thesis is centered around the creation of 3D models designed for a stylized scene, versatile enough to serve as background elements in different 3D scenes or animations.
The prosses starts with the selection of reference artwork, proceeds to the development of blockout, and ends with modeling and texturing the scene. While the primary goal is to craft models for the thesis, it's important to emphasize that these models hold standalone utility beyond this research context and can be used within Blender software in the future.

The theoretical part will explore the process of learning Studio Ghibli art style with the aim of mastering the art style and establishing a pipeline for the creation of 3D models that capture the shape and color fidelity seen in Studio Ghibli's iconic movies.
This pipeline involves an initial phase of construction a 3D blockout, which is refined through the application of particle systems, modifiers, and nodes in the node editor.

Practical part will focus on the modeling Process and go over all the models that are used to create the scene, using techniques learned during the theoretical part and other techniques learned during the modeling process, firstly creating basic shapes then transform the shape by using modifiers and nodes then texturing the final model.

The modeling Process was done by using Blender 3.2.0, other programs were considered such as photoshop and substance painter but there were some difficulties getting access to such programs.

# 2 STUDIO GHIBLI

Studio Ghibli, Inc. is a Japanese animation Studio based in Tokyo Japan in a small city located in the west portion of Tokyo called Koganei, the Studio was founded in 1985 by Miyazaki Hayao, Takahata Isao, and Suzuki Toshio after acquiring Topcraft Co. Ltd assets after Topcraft went bankrupt.

Studio Ghibli is known for its strong presence in the animation industry and its well-received and easily recognized art style, with one of the most famous mascot characters in industry the character is named Totoro that's inspired by the 1988 film called my neighbor Totoro which resembles a spirit of a giant racoon dog and cats. (Encyclopedia, n.d.)

With a legacy of over 37 years spent creating some of the most iconic animated films and memorable characters and character designs of all time Studio Ghibli managed to stay on highest grossing anime feature films made in Japan, Spirited Away, Howl's Moving Castel and Ponyo are still in the top ten highest-grossing anime feature films made in Japan. (Encyclopedia, n.d.)

Some of the Studio's films are.

Spirited Away 2001, Howl's Moving Castle 2004. Ponyo 2008. My Neighbor Totoro 1988, Castle in the sky 1986, Grave of the Fireflies 1988, when Marnie Was There 2014. (Encyclopedia, n.d.)

## 2.1 **STUDIO GHIBLI ART STYLE**

Studio Ghibli is known for its visually stunning and imaginative art style that is characterized by its attention to detail, vibrant colors, and fluid animation.

The art of Studio Ghibli is deeply inspired by culture and nature, many of the Studio's films feature stunning depiction of the natural world, including lush forests, hills, and sparkling waterfalls. The art often features a combination of traditional hand-drawn animation, 3D animation, and computer-generated imagery to create unique and memorable visual style. One of the defining features of the art style is the use of vivid and expressive colors, Ghibli films are known for their bold

and striking use of color and the attention to detail in every aspect of the animation. From the intricately designed clothing and accessories worn by the characters to the painstakingly crafted backgrounds, every element of a Ghibli film is carefully considered and executed with precision and care. This is particularly evident in films like “My Neighbor Totoro” “Spirited Away” and “Po-nyo” which feature vibrant and playful color palettes that perfectly capture the sense of childlike wonder and imagination that is at the heart of these stories. (BBC, 2020.)

Perhaps the most distinctive feature of the Ghibli art style is the way it captures the full range of human emotion. Ghibli films are known for their ability to evoke deep feelings of joy, wonder, sadness, and nostalgia, often all within the same story. This is accomplished through the nuanced and empathetic portrayal of characters, as well as using visual motifs and symbolism that speak universal themes and experiences. (BBC, 2020.)

## 2.2 **MAKING STUDIO GHIBLI ART**

Creating art like Studio Ghibli requires a combination of technical skill and artistic creativity. While there is no single approach to drawing in this style, there are certain techniques and principles that can be used to improve the work and create art that captures the spirit of Studio Ghibli’s iconic films.

One of the first steps in learning anything new in art is to study the work of the artists who create the art of films, the learning process can be anything related to the Process from the artis way of thinking to how the artist start drawing or modeling the object, learning can also be done by watching their work such as films or animation and pay attention to the details in the character designs, backgrounds, and animation, taking notes on the color palettes, character proportions, and the other elements that make the art style unique. (Gvaat, n.d.)

# 3 Pre-production

Pre-production is the initial stage of the creation Process where the groundwork is laid out for the project. It is the planning phase that takes place before actual production begins, and it is a crucial step in ensuring that the final product meets the desired outcome. During the pre-production stage, 3D artists work closely with the client or team to establish the project's goals and objectives. They also create rough sketches, concept art, and storyboards to help visualize the final product. The artists may also create 3D models of the characters, objects, and environments to get an idea of how the final product will look. (Matt, 2023)

In addition to planning the visuals of the project, pre-production also involves determining the technical specifications and requirements for the project. This includes deciding the software to use, setting up the workflow and pipeline, and establishing timelines and budgets. (Matt, 2023)

## 3.1 Gathering references

Gathering references is an essential step in the creative process for artists, especially in the realm of 3D modeling and visual effects. This phase lays the foundation for a successful project by enabling the artist to envision the results with precision.

The hunt for references spans a wide range, encompassing not only visual elements but also informative resources that enhance the depth and authenticity of the work. artists search for references by looking at books, information on the internet, pictures and videos that align with their project's core concept.

When crafting a 3D model, reference becomes the artist's guiding star. Reference provides valuable information and insights into the object's proportions, the interplay of light and shadow, and the minute details that lend an object its unique character, these could be character designs, creature concepts, or even the ambiance of a specific environment. This intricate understanding fuels the artist's creative process, enabling them to breathe life into their virtual creations.

Reference serves as the backbone for ensuring accuracy, a key aspect in the world of 3D modeling. By having the artist examining reference images, the artist can meticulously recreate the textures, materials, and intricate features that make, and object stand out. This level of detail is what elevates the final product, making it visually appealing and captivates the audience.

## 3.2 Blockout

Blockout is a fundamental stage in the realm of 3D modeling and plays a big role in shaping a successful project. It involves the creation of basic, rough shapes that outline the structure and layout of the final model or scene. This step provides a strong foundation for more intricate details to be built on.

At its core, blockout is sculpting the skeleton of a model, it's not about refining the model, texture or adding details, instead it's about defining the overall composition, proportions, and spatial relationships between different elements. (Mussu, 2019.)

The blockout phase is the blueprint to the project. It allows 3D artists to visualize the flow, arrangement, and positioning of the components within the scene. By laying down the structural framework early, artists can identify and spot design issues early in the development process. (Mussu, 2019.)

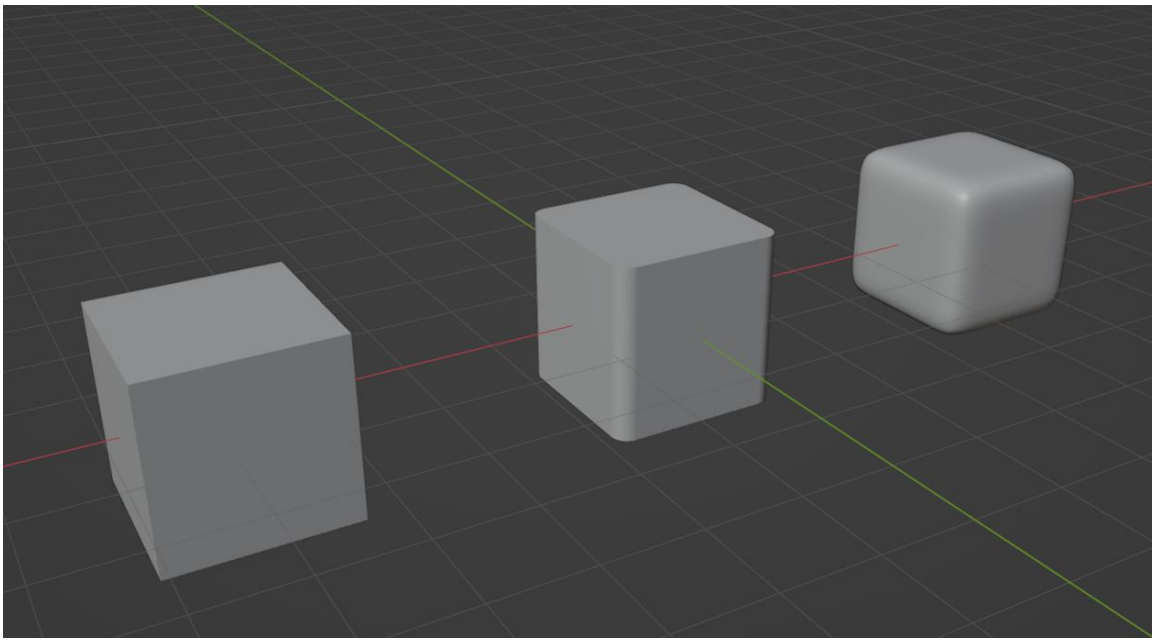
Blockout can also serve as a visual communication tool within a collaborative environment. When working on a team, a well-executed blockout can effectively convey the intended design direction to the other team members. This shared reference point ensures everyone on the same page focused on creating more harmonious final result. (Mussu, 2019.)

# 4 3D MODELING DISCOVERIES

## 4.1 3D modeling basics

3D modeling is the Process of creating digital representations of objects or environments in three dimensions. The basics for 3D modeling involve understanding the fundamental concepts and techniques used to create 3D models.

One of the most important concepts in 3D modeling is the use of geometry to represent the shapes and the forms of objects. This involves creating basic shapes, such as cubes or cylinders, and manipulating the shape to create more complex forms, using the tools for sculping, geometry node editing, extruding, and manipulating shapes are essential for this Process (Picture 1).



Picture 1 example of manipulating the shape of a cube.

Another key aspect of 3D modeling is the use of textures and materials to create realistic surfaces. This can involve applying images, color, and patterns to the surfaces of 3D models, as well as creating more complex materials properties like reflectivity or transparency. (FlippedNormals, 2019.)

Lighting is also an important consideration in 3D modeling, as it can dramatically affect the appearance of a 3D scene. Understanding how light interacts with surfaces and materials, and how to use lighting tools to create the desired effect, is a critical part of 3D modeling. (FlippedNormals, 2019.)

3D modeling involves a combination of technical skill, design principles, and artistic creativity. By mastering these skills, 3D modelers can create realistic, dynamic, and visually appealing models for a wide range of applications. (FlippedNormals, 2019.)

## 4.2 3D Modeling methods

in the world of 3D modeling, there are various methods and techniques that are used to create and manipulate digital objects in three-dimensional space. These methods range from simple and straightforward techniques, such as polygonal modeling and block-out modeling to more complex approaches such as NURBS modeling, subdivision surface modeling, sculpting and procedural modeling.

Polygonal modeling is perhaps the most widely used method in the field of 3D modeling. It involves creating a mesh pr polygons to define the shape of an object. This method is versatile and can be used to create a wide range of objects, from simple geometric shapes to complex organic forms. Block-out modeling is a simpler variation of this method that involves creating a basic, rough version of an object to establish its overall shape and proportions.

NURBS modeling is a mathematical approach that uses curves and surfaces to define the shape of an object. This method is particularly useful for creating precise, smooth shapes such as those found in automotive and product design. The curves and surfaces used in NURBS modeling are based on mathematical equations and are infinitely scalable, making it easier to adjust the object ass needed.

Subdivision surface modeling involves creating a basic mesh and then subdividing it multiple times to create a more detailed mesh with smoother surface. This method is commonly used for creating organic shapes such as characters and creatures. This technique is often used in combination with polygonal and sculping.

Sculpting is a digital version of traditional scalping and involves manipulating a digital “clay” material to create organic shapes such as characters, creatures, and landscapes, this method is particularly useful for creating highly detailed and realistic organic shapes. Sculpting often involves the use of specialized software and input devices such as pressure-sensitive tablets or stylus pens, to provide greater control over the sculpting Process.

Procedural modeling involves using mathematical algorithms to create complex shapes and patterns. This method is particularly useful for creating repetitive elements such as patterns and textures. With procedural modeling, an object can be created and modified using mathematical functions, rather than through manual manipulations of polygons or curves.

The choice of method depends on the specific needs of the projects, as each method has its own strengths and weaknesses. For example, polygonal modeling is a good choice for creating hard-edged, geometric objects, free-form shapes. NURBS modeling is well-suited for creating objects with precise, smooth surfaces, while subdivision surface modeling is ideal for creating objects with high level of detail. (Selin, n.d.)

In addition to the modeling methods themselves, 3D modeling software often provides additional tools and features that can be used to further enhance the modeling Process. For example, most software packages include a range of modifiers that can be used to modify the shape and appearance of an object. These modifiers can be used to create effects such as bending, twisting, and wrapping of objects, as well as to add texture and other visual effects. (Selin, n.d.)

## 4.3 Modifiers

Blender modifiers are tools that allow the user to modify and manipulate the geometry of a mesh without permanently changing its underlying structure and make a quick and precise changes to a mesh, refine its details, and create more complex shapes and structures with less effort. Using these modifiers effectively requires a lot of experience and knowledge with a lot of testing on how all the different modifiers interact with each other.

Modifiers can be used for a variety of tasks that affect geometry, such as Subdivision Surface Modifier: this modifier subdivides the faces of a mesh, creating a smoother and more detailed surface. It can be used to create high-quality models with smooth surfaces and rounded edges. (Blender, n.d)

Mirror Modifier: this modifier mirrors a mesh along a specific axis, allowing the creation of symmetrical models more quickly and easily. (Blender, n.d)

Solidify Modifier: this modifier gives thickness to a mesh by creating a second layer of geometry on the surface. The modifier can be used to create objects with volume. (Blender, n.d)

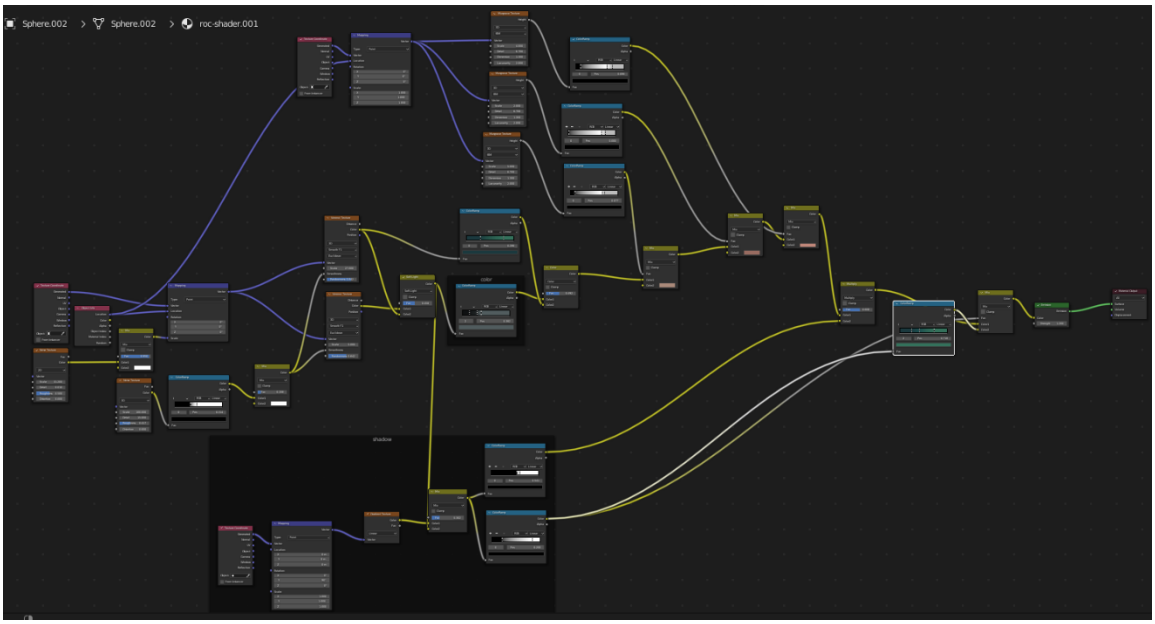
## 4.4 Nodes basics

Blender's nodes are a system of visual programming that are used to create and manipulate materials, texture, composites, and effects within Blender. The node system is based on visual interface that allows you to create a network of interconnected nodes that define how an object or scene will look. Each node performs a specific function, such as generating a texture, manipulating color, or adding visual effects. By combining nodes in different ways, the artist can create complex visual effects and materials that would be difficult or impossible to achieve using traditional methods. The node system offers an unparalleled level of control and precision in crafting the desired visual outcome. Artists can adjust parameters and tweak settings within each node to achieve the desired effect, giving them the freedom to experiment and iterate until they achieve their artistic vision. (Kaizen Tutorials, 2022.)

One of the key advantages of Blender's node-based system is its flexibility and customizability. Artists can create their own node setups, save them as node groups, and reuse them in different projects. This not only saves time but also encourages a collaborative workflow, as artists can share their node setups with others, fostering a community of knowledge and creativity (Picture 2). (Kaizen Tutorials, 2022.)

Blender's node system is not limited to standalone usage, it seamlessly integrates with other features of the software. Nodes can be used in combination with shaders, materials, and textures to create dynamic and interactive scenes. This integration allows artists to have full control over the

visual aspects of their project and enables them to create stunning visuals that are visually cohesive and harmonious. (Kaizen Tutorials, 2022.)




Picture 2. Example of nodes in Blender.

## 4.5 Texturing

There are various ways of texturing in 3D modeling, and each method has its advantages and disadvantages depending on the project's needs and requirements. Some of the most common ways of texturing in 3D modeling are Procedural texturing. This method involves creating textures through mathematical algorithms and functions that generate patterns and shapes. Procedural texturing can produce complex and detailed textures that can be easily edited and modified. This method is particularly useful for creating textures and natural objects like rocks terrain and vegetation.

Image-based texturing, this method involves applying pre-existing images onto the 3D model's surface. This image can be created using software like Photoshop or downloaded from various online resources. Image-based texturing is useful for creating textures that require high level of details or realism, such as textures for human skin or clothing.

Hand-painted texturing, this method involves creating textures by hand using software like Photoshop or other digital painting tools. Hand-painted texturing is a time-consuming process but can produce highly detailed and customized textures. This method is particularly useful for creating textures for characters or objects that require a unique look and feel.

Procedural + image-based texturing, this method involves combining procedural and image-based texturing techniques to create complex and realistic textures. This method is useful for creating textures that require both a high level of detail and customization.

Photogrammetry texturing, this method involves using real-world photographs to create 3D models and textures. Photogrammetry texturing is useful for creating highly realistic textures for objects that exist in the real world, such as buildings or sculptures. (Kaizen Tutorials, 2022.)

# 5 3D MODELING A STYLIZED SCENE

The work on this thesis project was started by studying how to create stylized art. The foundation of this learning journey was established through extensive online research, primarily relying on tutorial videos as the main source of education. By Following these tutorials, it was discovered that the real learning resided in post-tutorial modification and enhancements. This approach allowed for the identification of mistakes and the gradual refinement of skills over time, as more techniques were learned it unified the modeling process that laid the groundwork for this thesis.

## 5.1 References and establishing the design foundation.

The aim was to create a stylized art inspired by Studio Ghibli with no intention of using the art inside any game engine or animation. To achieve the desired stylized art, various searches were conducted, both online and offline, to collect relevant information on the stylized art. The study concluded that 3D art should have a base in the shape of a circle, upon which the rest of the model or models should be built. No specific objects were created, nor were any lists made during the research Process.

Once the stylized art style was understood, the focus shifted to the art style of Studio Ghibli. Several movies and online videos were watched to gather references and understand the animation and art style. This helped to identify the necessary models needed to achieve the desired output.

The modeling phase started with the creation of the first blockout model of the train and train station. However, the initial idea of making the station underground was later abandoned due to its deviation from the Studio Ghibli art style. Instead, the focus shifted to an above-ground station located in a grass field filled with trees and mushrooms. To achieve this new idea, various tutorial videos were watched to learn the Process of creating trees for the purpose of this thesis, making better models that are more readable and can resemble the look and feel of Studio Ghibli art.

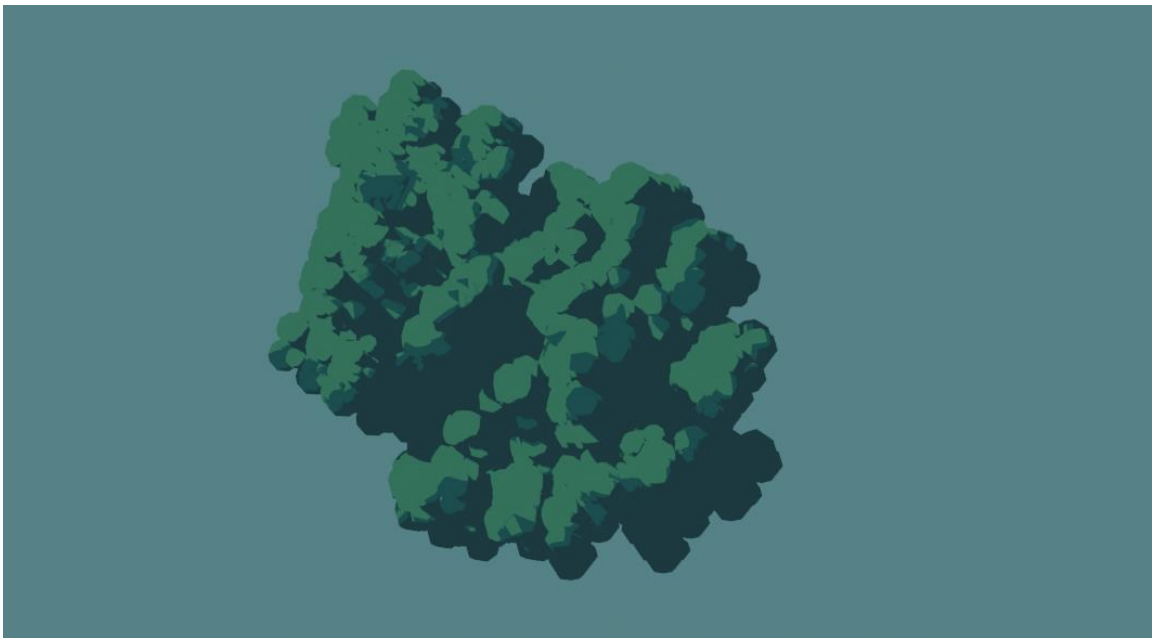
## 5.2 Modeling the trees

The creation of trees was the initial step in building the new scene. The trees were first created as a test object from a tutorial, with the original intention of using them as a placeholder and a reference for the rest of the models. Which was later deemed as one of the key objects of focus, and they quickly became a proving ground for the viability of the art style.

The idea of the trees was inspired by a reference image taken from the movie Spirited Away. After conducting research on how to create something similar to Studio Ghibli art, a channel called Lightning Boy Studio surfaced, which provided highly educational tutorials on creating the same trees from Spirited Away.

The tutorials began with shaping the default cube into a sphere by subdividing it, then went into the importance of non-destructive modeling using particles and modifiers to create the base object of the tree (Picture 3).

The tutorial covered the use of various modifiers and how to create the correct shading to achieve similar art style to Studio Ghibli. While not all steps of the tutorial were used, and the final model was not an exact replica, it served as a guide to understanding the process and creating a similar look and feel. Following the tutorial is recommended for creating similar trees.

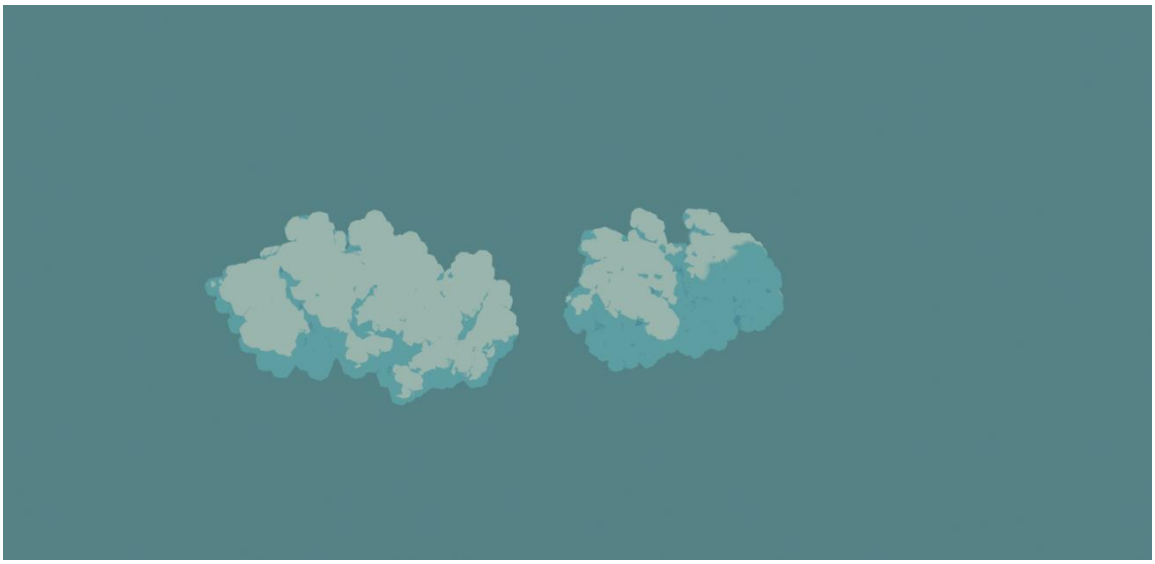


Picture 3. Result of the tree model.

## 5.3 Modeling the clouds

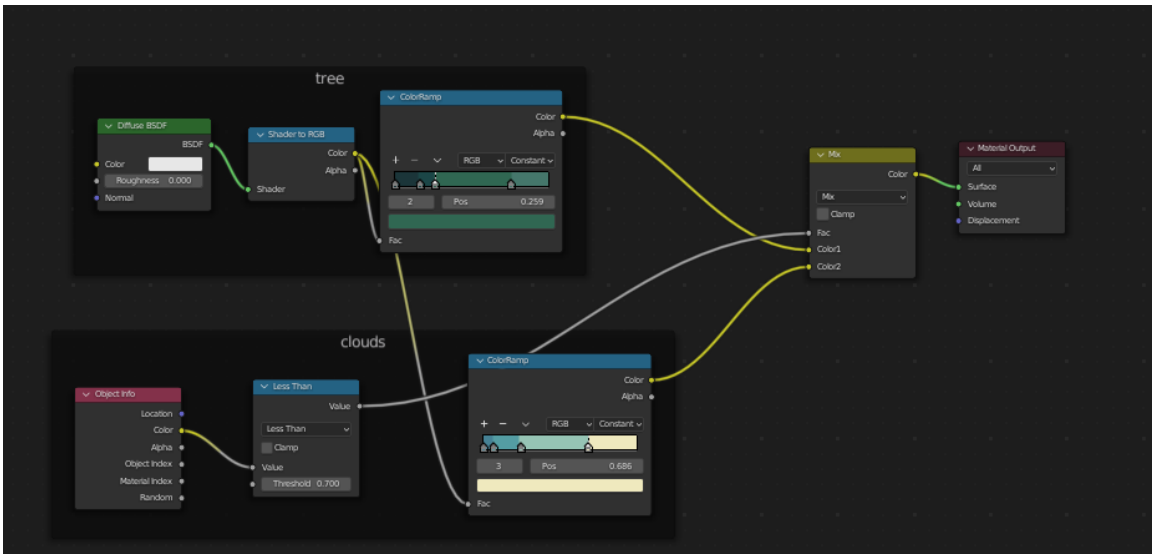
The clouds depicted in Studio Ghibli films are dynamic and expressive, with voluminous and three-dimensional shapes that are variously shaded in gray, white, blue, and sometimes yellow. However, these clouds are not just an aesthetic element, but they also serve a crucial role in setting the mood and conveying emotions and films, contributing to the emotional impact of the overall work. And thus, creating the clouds became an essential step in the scene's development, and one of the earliest models.

When it comes to learning modeling, the concept of reusable assets is a common and important one. In this scene, the clouds were created by using the same exact trees model with a different color ramp (Picture 4). In Blender, there is a viewport display feature that allows objects to be assigned to specific color for organizational purposes.



Picture 4. Result of the cloud models.

While the default setting for viewport shading is to display the object's material color, it can be changed to display the object's assigned color from the object properties for easier organization. To create the clouds, it was necessary to see the color change in the viewport. Instead, the focus was shifted to the tree material and an object info node was added, attached to a math node set to less-than, and then connected to the color ramp with the clouds color (Picture 5). By using a mix-shader mode to blend both colors, the trees can change color when the color in the object properties is changed. This allows the same object to be reused and has material changed inside the viewport.




Picture 5. Trees and Clouds texture nodes.

## 5.4 Modeling the train

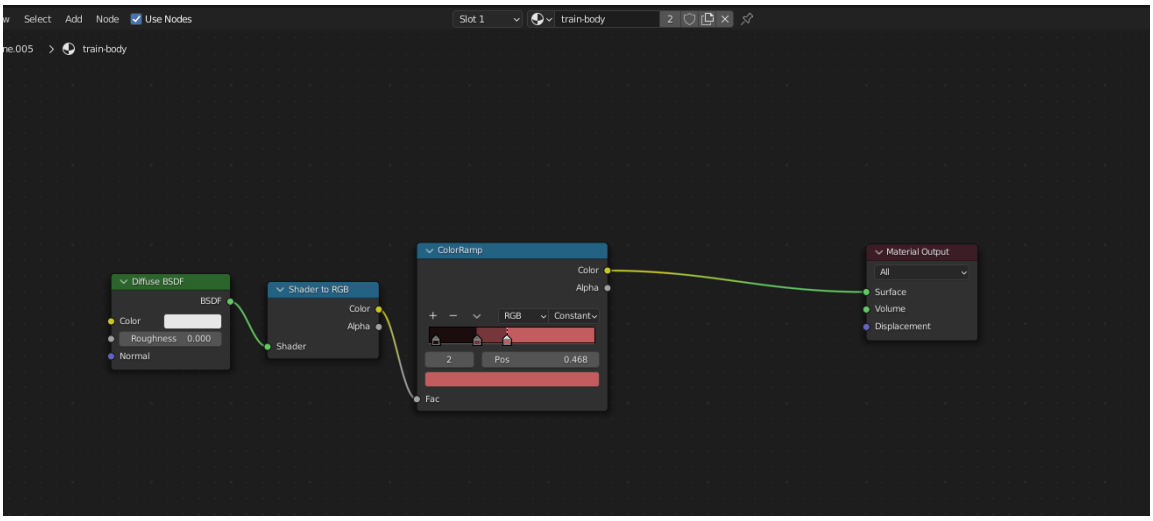
The train was originally intended to be the focus of the scene, but even after the decision was made to shift the focus away from it, the idea of having a train was still deemed important enough to include in the final product. To achieve a design that was both interesting and low detail, the train was made to look more like a spaceship than a traditional locomotive, with no metal wheels or tracks.

One of the primary design considerations was to incorporate air intakes and a power source at the back, with the front of the train designed to direct air to these intakes. Despite this, the train retained some key characteristics of old, blocky trains, such as having a flat face (Picture 6).

The train carts themselves were relatively simple, designed as a large box with levitating devices like wheels and windows to maintain the appearance of traditional train carts (Picture 6). The design of the levitating wheels was inspired by those found on the cars of the 2016 game called Overwatch, with the wheels being tilted to the side. All the train carts had to be connected, just like a typical train.

Picture 6. Final result of the train model.

The train was textured using three different but simple textures for the train-body, train-windows, and orange-yellow light for the power source (Picture 7).



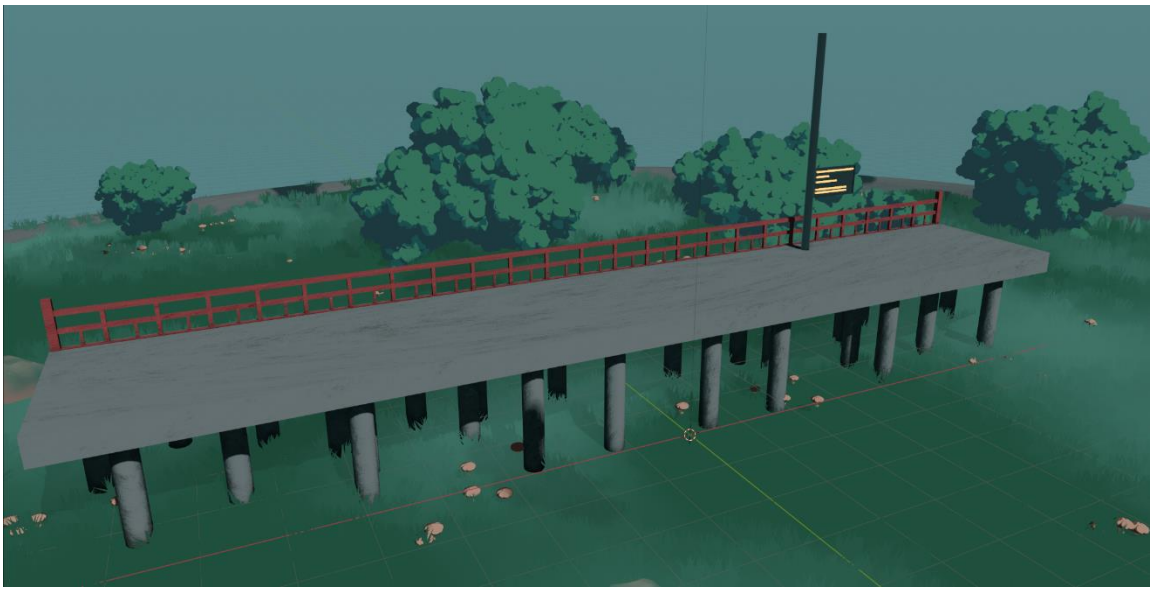

Picture 7. Train texture nodes.

## 5.5 Modeling the platform

Creating a station for the train was an important aspect of the scene, as it helped to give the train a sense of purpose and destination. The initial concept for the station was more of an underground design, but as the scene evolved, the decision was made to create a more open and natural setting for the station. The final design ended up being a simple platform in a grassy field, with a red wooden railing at the back for people to lean on and a pole with a sign at the top to indicate a station's name and train time.

The modeling Process for the station kept intentionally simple, as the focus was on creating a functional and believable structure without too much detail that would distract from the overall scene. The platform itself is a basic plane shape with some round supporting pillars at the bottom, while the railing is made up of simple rectangular shapes (Picture 8).

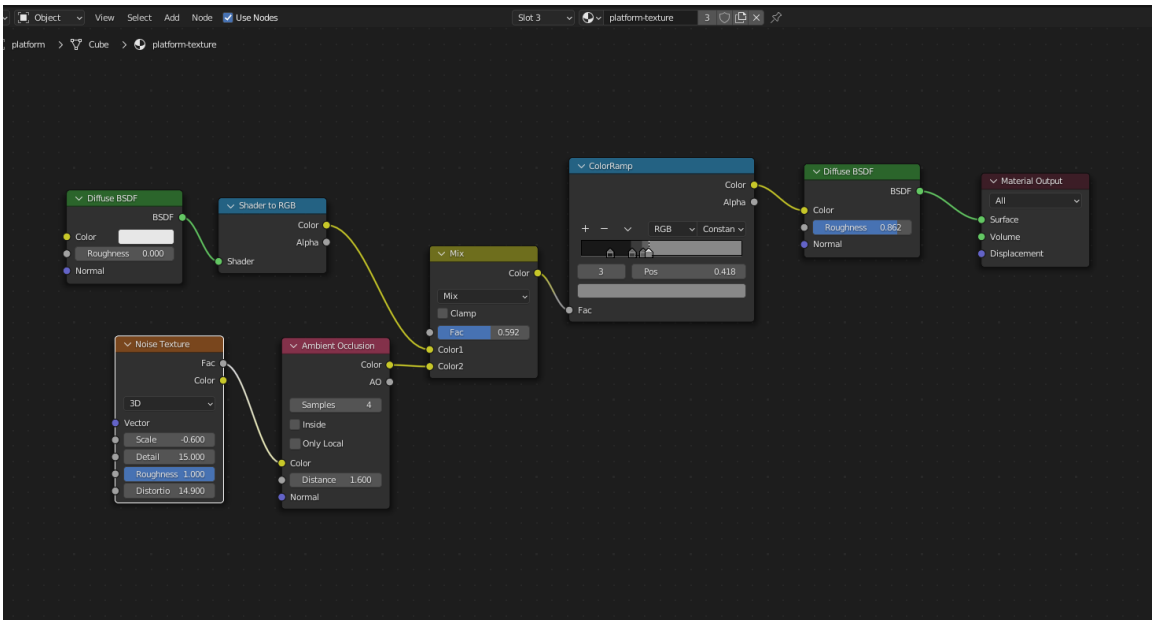
The station may not be the most complex or detailed part of the scene, but it serves an important purpose in helping to bring the train and the larger world around it to life.



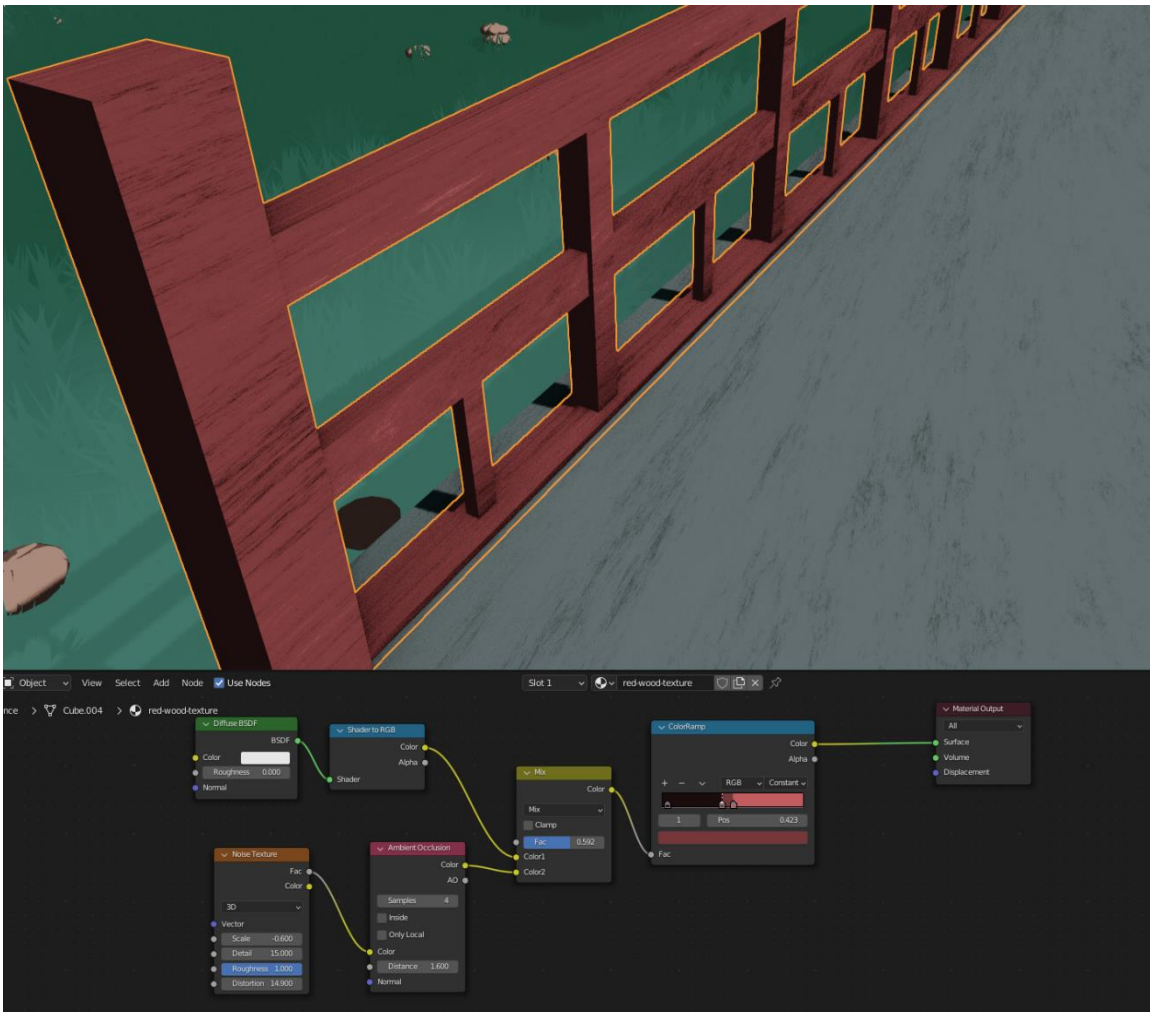
Picture 8. Train station platform.

### 5.5.1 Platform textures

The texturing process for the platform was straightforward and followed the same approach as the other models, such as the trees and clouds. However, since the station lacked details, an additional noise texture was added to the materials to give some surface variation and make the model more visually interesting (Picture 9) (Picture 10). This helped to create better-looking shadows and make the platform blend in better with the surrounding environment.




Picture 9. Train station platform texture nodes.

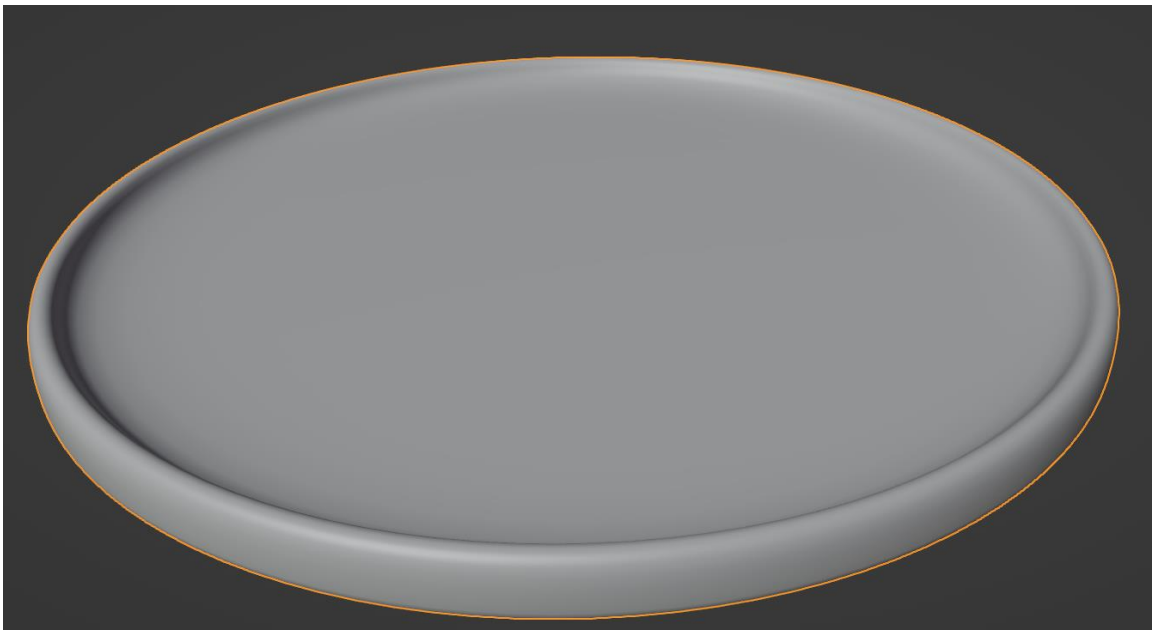



Picture 10. Wood railing and its texture nodes.

## 5.6 Modeling the ground

The ground is a crucial part of the scene and serves as the foundation for all the other models in the scene. As this scene follows a stylized art style, a circular ground was chosen to create a sense of whimsy and playfulness. The circular shape also allows for easy placement and arrangement of other models on top of it. The edge of the circle was created with a simple mesh extrusion, adding a small lip to act as a boundary and prevent any models from accidentally falling off.

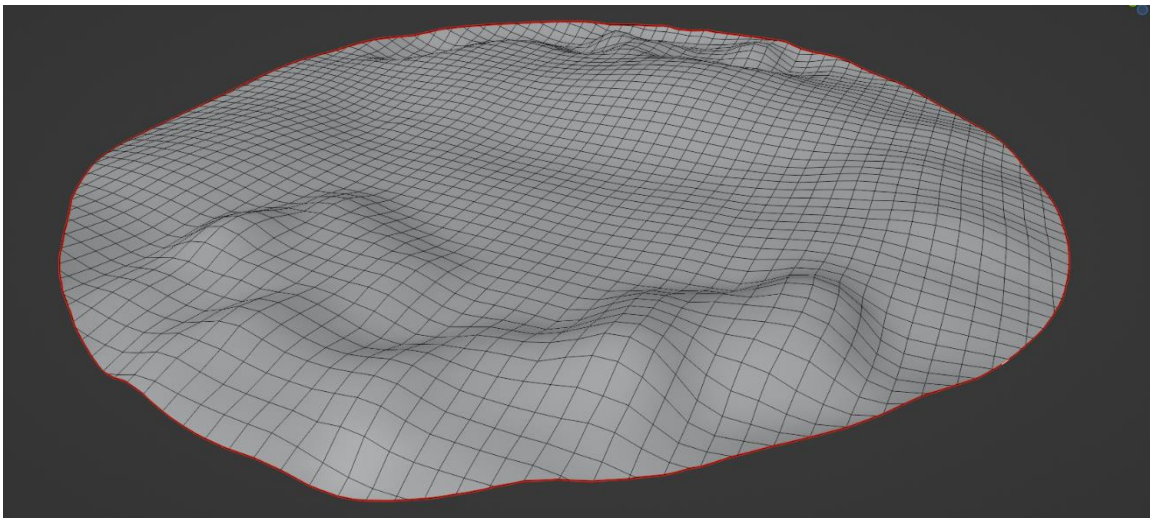
A two-step subdivision modifier was added to give the model a smoother shape (Picture 11). The subdivision modifier is a tool in Blender that smooths out the mesh of a 3D model by dividing each face of the mesh into smaller faces, resulting in a more complex but smoother shape. The amount of subdivision can be adjusted to achieve the desired level of smoothness.



Picture 11. Ground model.

To create some variation in the terrain, a second layer of ground was added by duplicating and slightly raising the first layer. This second layer would be used for small hills and dips in the ground.

To prepare this layer for particle systems and other effect, the two-step subdivision modifier was applied to make it easier to sculpt and manipulate the surface (Picture 12).



Picture 12. ground Terrain model.

### 5.6.1 Grass particle system

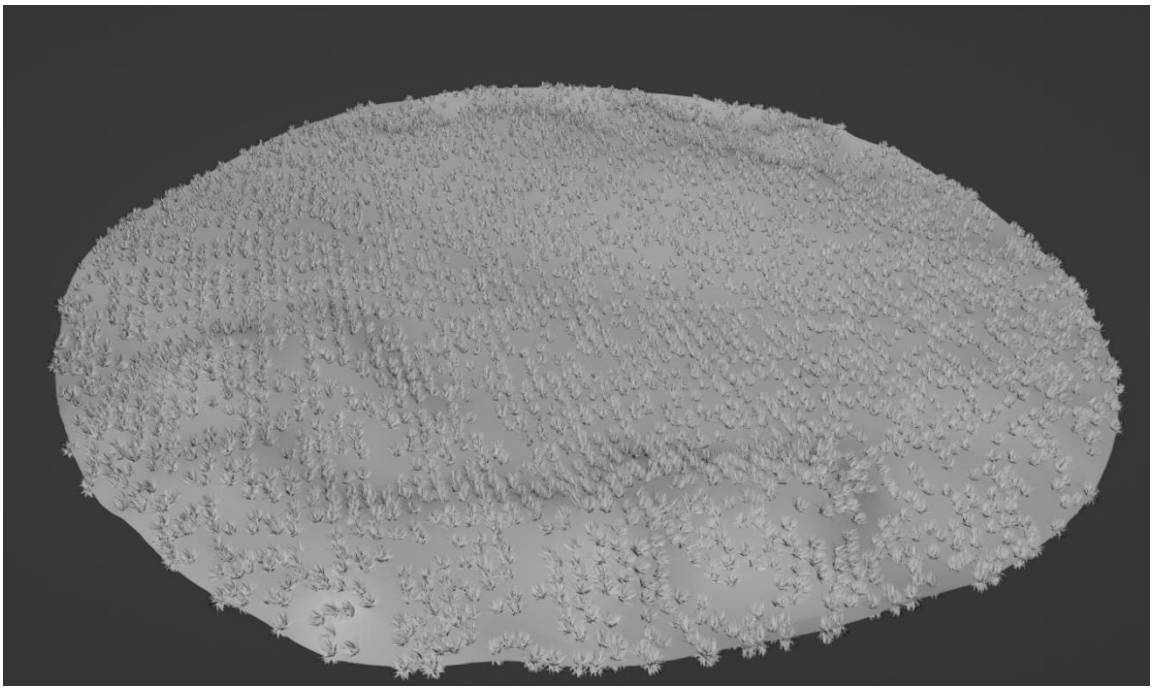
To create the grass, a particle system was added and named “grass”. In the render properties tab, the curve setting was changed to strip to give the hair the appearance of grass.

In the particle properties tab, the hair type was selected with 5000 particles, a length of 0 meters, and 5 segments.

Simple was chosen in the children tab with the display and render amounts set to 30, a length of 0.502, a threshold of 0.202, and a radius of 0.18 meters.

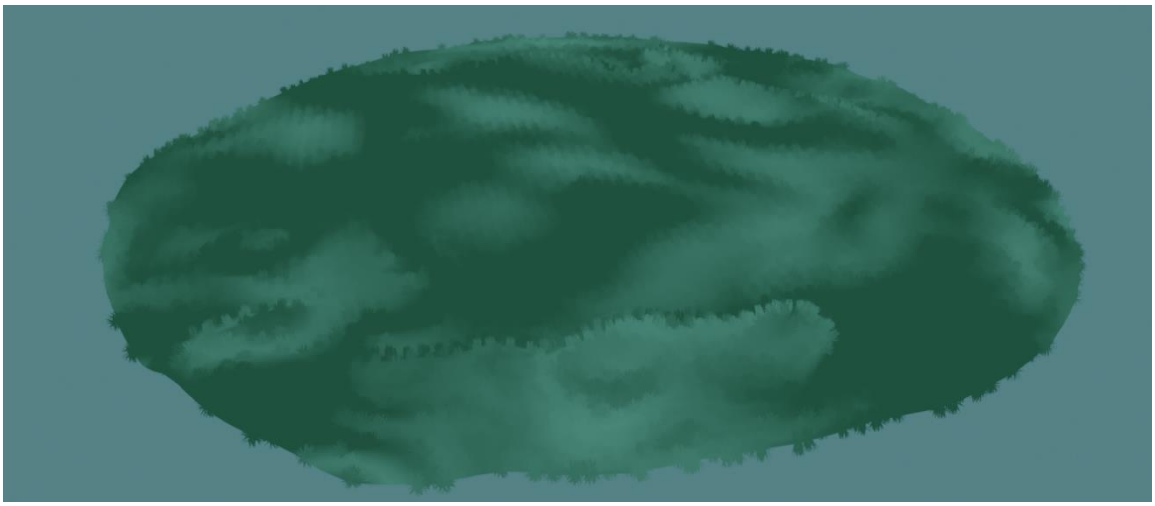
In the clumping options, the clump was set to -0.573, the shape to 0.999, and the twist to 0.315.

This caused the grass to clump together and create some empty spots (Picture 13), but this was intentional as it would be hidden once the texture was applied.



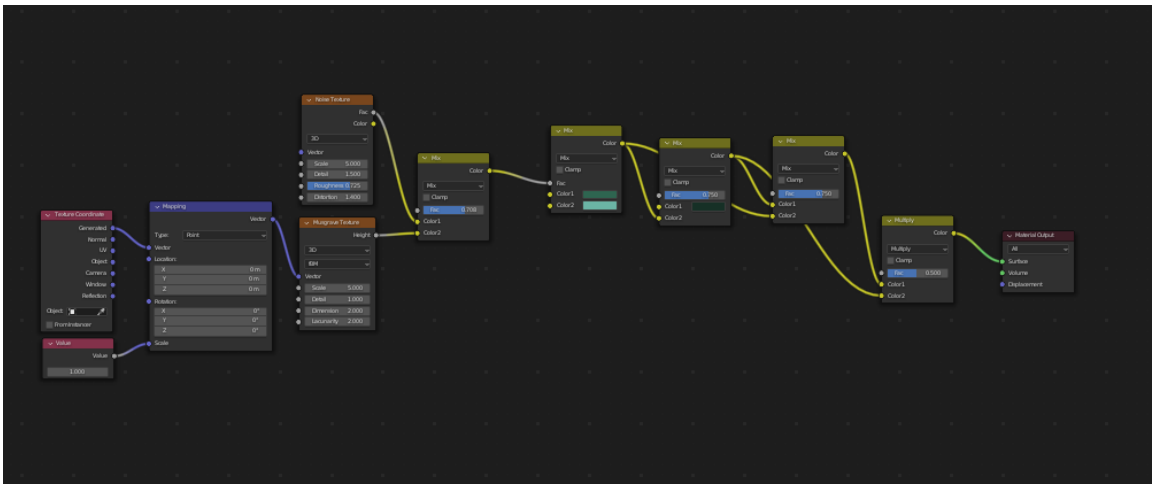
Picture 13. Grass particle system.

To create a convincing grass texture, several factors need to be considered, such as ensuring that the grass didn't cast shadows by changing the shadow mode in the material settings to None. Additionally, the grass needed to blend in with the rest of the scene and create the illusion of shadows by having some part of the grass appear darker depending on the shape of the ground below (Picture 14).



Picture 14. Grass particle system textured.

To achieve this effect, a mix of Musgrave textures and a mapping node were used in combination with a noise texture. The resulting texture was then mixed with the same colours used for the trees to create a natural and cohesive look (Picture 15).



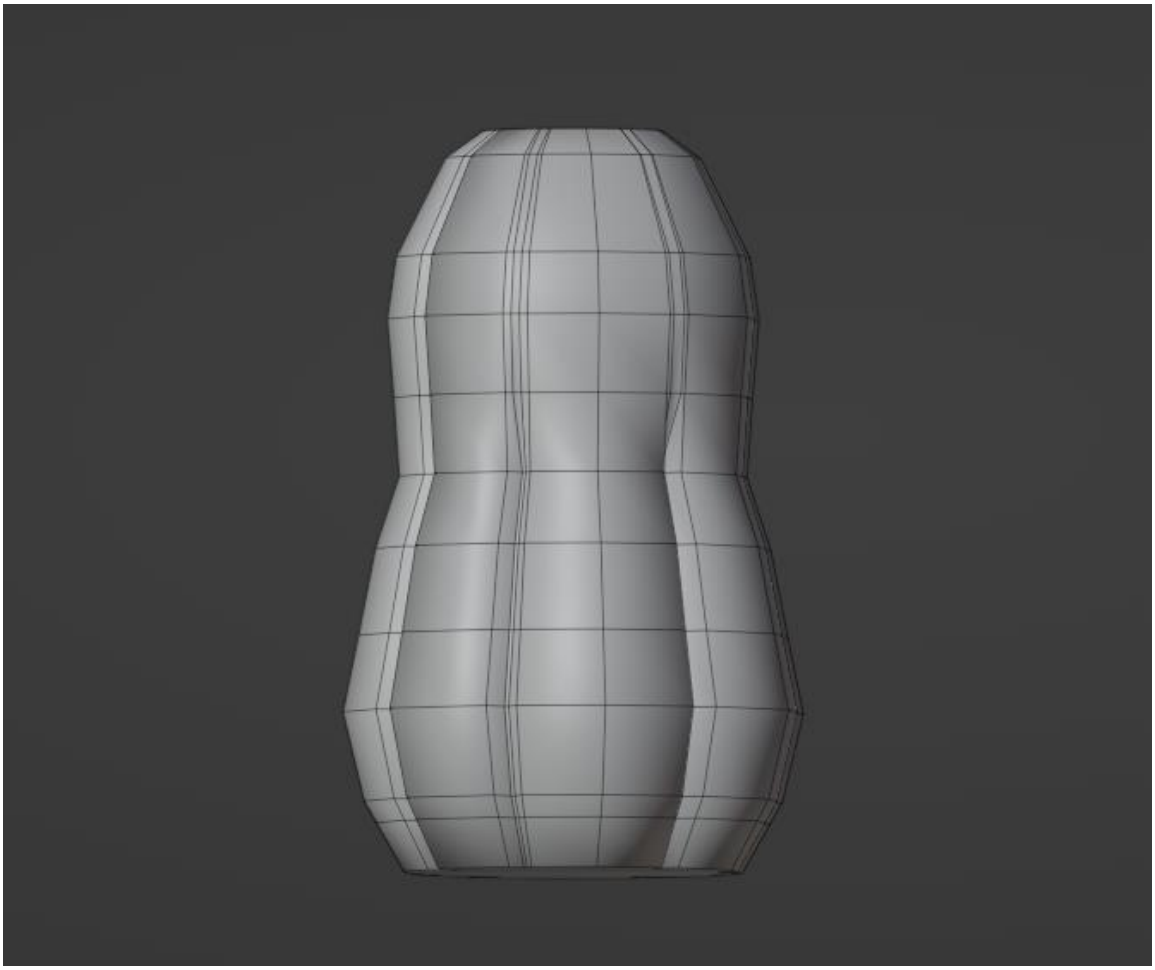
Picture 15. Grass particle system texture nodes.

### 5.6.2 Mushroom particle system

After the grass particle system was done, it became evident that the ground felt empty and lacked details, resulting in the grass appearing as a repetitive pattern. To address this, a second particle

system was implemented, and after careful consideration, it was decided to use mushroom as the chosen object.

Modelling the mushrooms was relatively straightforward Process. It began with a cylinder shape, which was then modified to resemble a mushroom stem. The stem was designed to be wider at the bottom and slightly thinner towards the top (Picture 16).



Picture 16. Mushroom stem.

For the cap, a copy of the stem's top face was taken and resized to cover a wider area. It was then extruded downward to create a cap with flat gills, as the gills would not be visible (Picture 17).

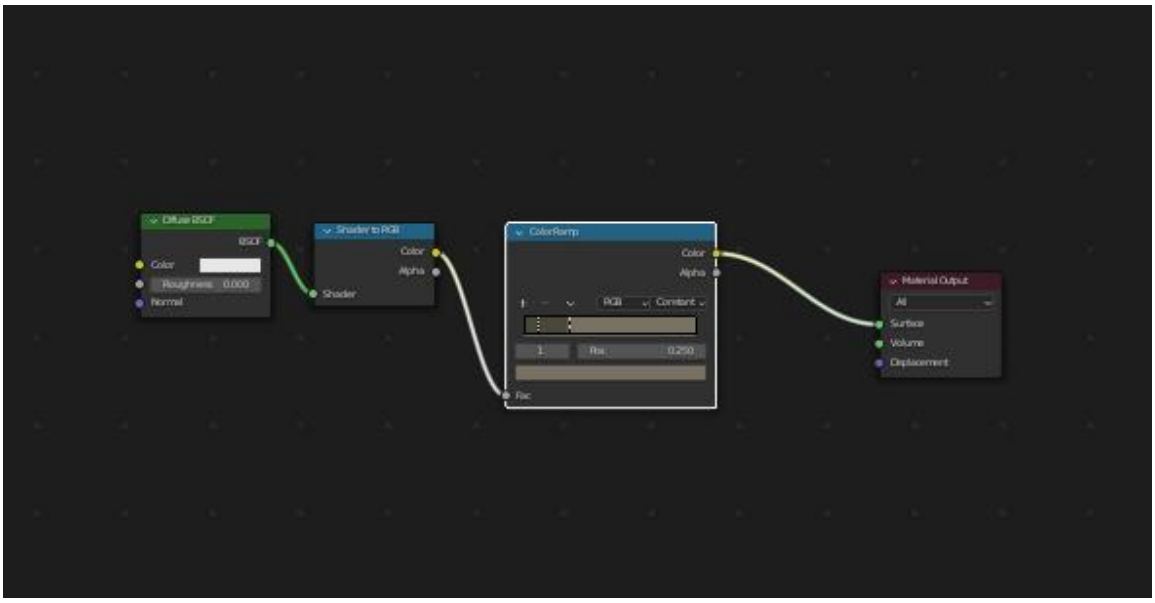
To refine the model, a subdivision modifier with two levels of subdivision and shade smooth was applied. This allowed for easier adjustments and further detailing. In edit mode, additional edge loops were added between the faces of the stem by selecting the edges and using the G key to

move them inward, a more realistic shape was achieved. The same process was repeated for the cap.

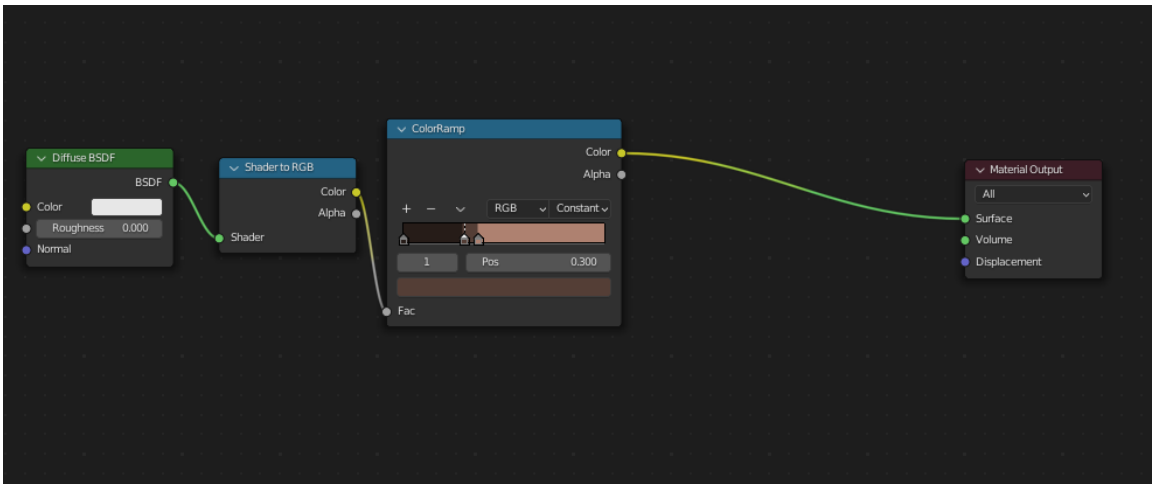
Picture 17. Mushroom stem and cap combined.

To introduce more variety, additional mushrooms were created by duplicating the finished model, and adjusting the size of the stem and cap accordingly. The mushrooms were then added to a new collection named Mushroom so that they could be easily utilized in the particle system. By organizing the mushrooms into a dedicated collection, it became simpler to manage and manipulate them as a group.

The same approach used for the train, clouds, and trees was employed to maintain consistency with the overall theme of the scene. The textures were carefully chosen and applied to achieve the desired visual appearance. The stem texture was mapped onto the stem geometry (Picture 18), while the cap texture was applied to the cap geometry (Picture 19). This helped to differentiate the two parts of the mushroom and enhance their realistic representation within the scene.




Picture 18. Mushroom stem texture nodes.

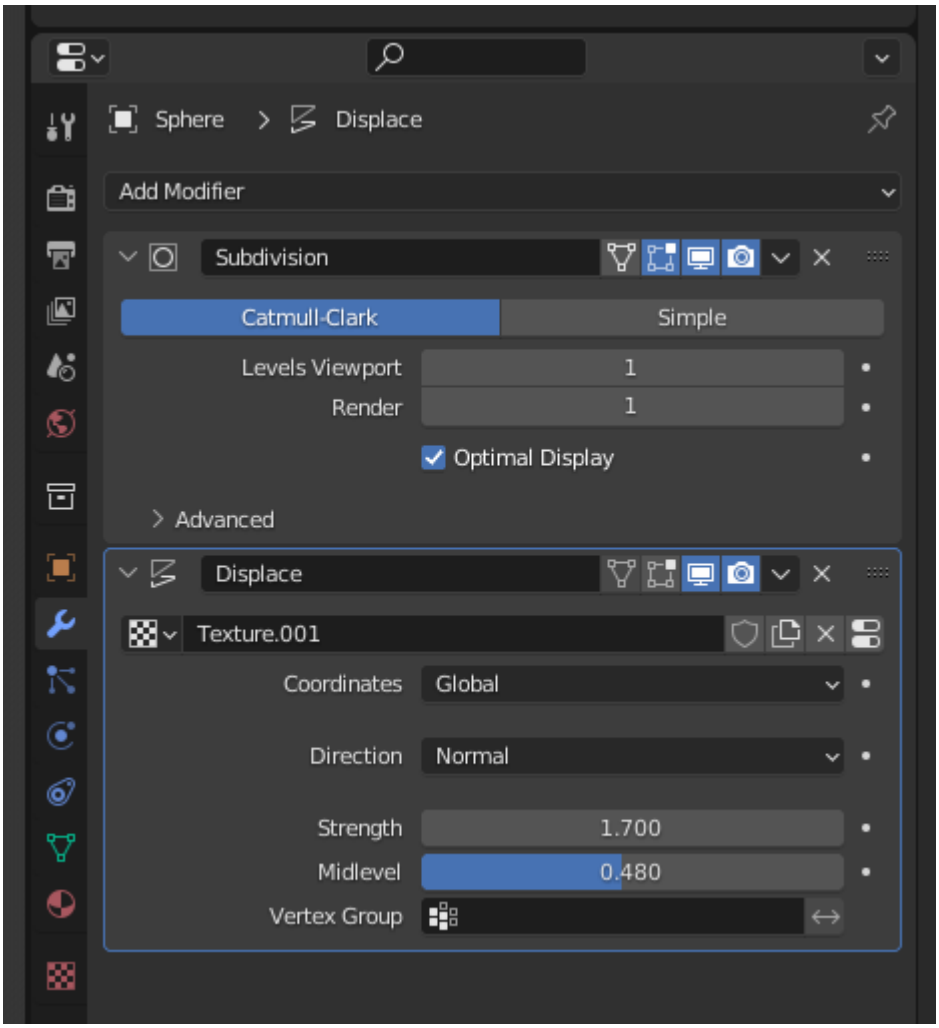



Picture 19. Mushroom cap texture nodes.

### 5.6.3 Modelling a rock

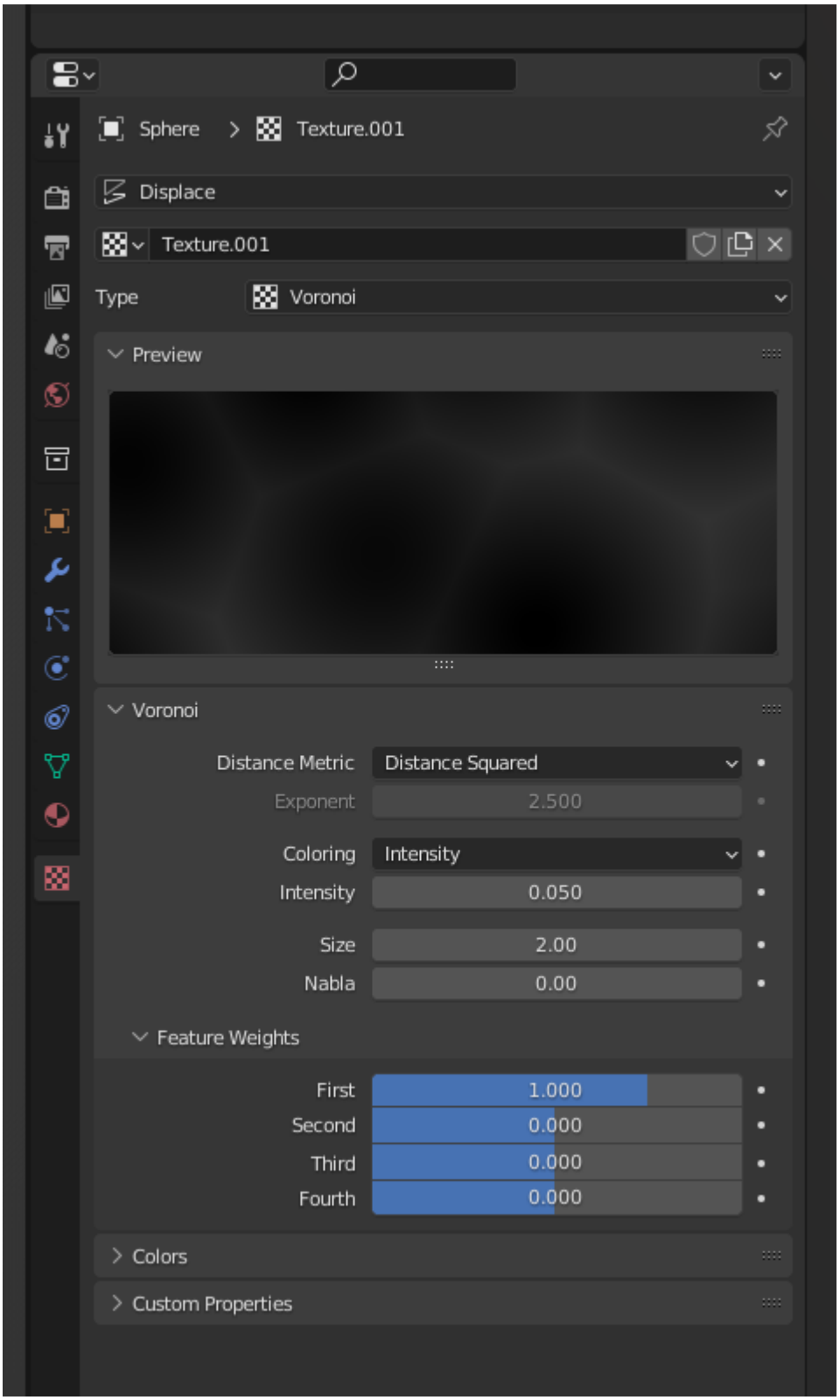
To introduce rocks into the scene, a simple model of a rock was initially considered but deemed too basic. Alternative approaches were explored, and one of them involved utilizing the displace modifier.

The Process began by creating a sphere and applying a subdivision modifier to achieve a smoother rock shape later. The displace modifier was then added (Picture 20), and the coordinates were set to Global to ensure consistent displacement across the entire scene. The strength and mid-level settings were adjusted to the desired effect.




Picture 20. Rock displacement modifier settings.

A texture was added to the displace modifier by selecting the texture box in the displace modifier tab and choosing the Voronoi type (Picture 21). The texture settings were adjusted to create a rough edges and square-like appearance, resembling the texture of a rock.



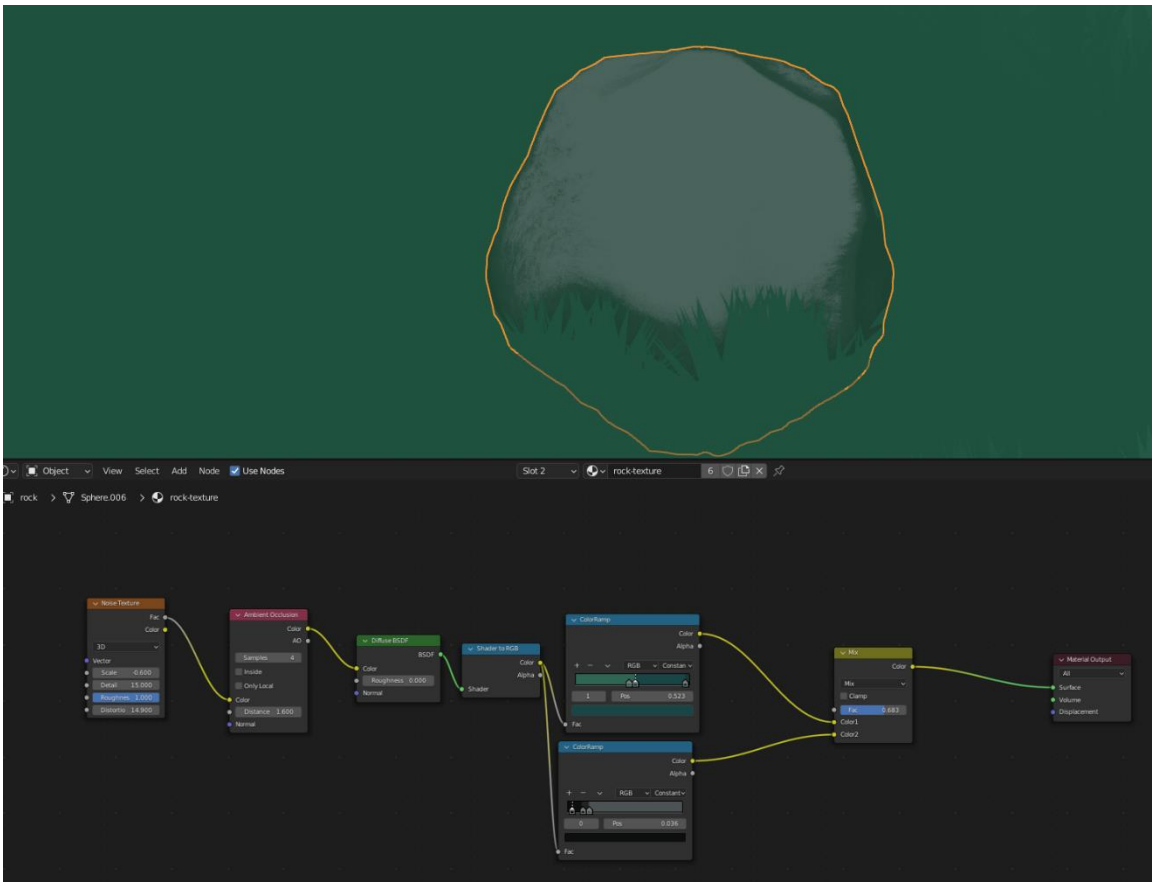

Picture 21. Rock displacement texture settings.

Using this technique allowed the rock to change shape slightly each time it was moved away from the centre of the scene. To speed up filling the scene with rocks, copies of the original rock model were made, with each copy being placed in a new location. As the copies were moved, they would change shape, resulting in a more varied and natural-looking arrangement of rocks throughout the scene (Picture 22).

When it came to the rock texture, it was important to achieve a balance between blending in with the other textures in the scene and still resembling a realistic rock. Additionally, the texture needed to interact with light to generate shading when the rock was moved.

The approach taken for the rock texture followed a similar method to the other textures used in the scene. However, ad additional step was introduced using an Ambient Occlusion node. This node, along with a Noise Texture node connected to the colour input, enhanced the realism of the rock by determining how much the hemisphere above the shading point was occluded. This technique allowed for the creation of procedural texturing and the generation of weathering effect, particularly around the corners and areas with low light on the rock's surface.

In terms of colour, a mixture of shades of grey and green was utilized to provide the rock with character and depth, avoiding a flat and uniform appearance. This variation in colour helped to enhance the rock's overall visual appeal and contribute to its natural and organic aesthetic within the scene (Picture 22).




Picture 22. Rock and rock texture nodes.

## 5.7 Lighting the scene

When it comes to lighting the scene in Blender, there are multiple approaches that can be taken, especially with the Eevee rendering engine. One simple method is to adjust the world settings by changing the colour from grey to a sky colour, such as blue or orange, depending on the desired atmosphere of the scene. However, this method can make it challenging to render the scene with a grey background because it will affect everything surrounding the models, making it the same colour as the sky.

To address this, nodes can be used to achieve more control and flexibility. By isolating the models from the background, you can have the sky colour only affect the models while keeping the background separate, allowing the colours to be changed separately.

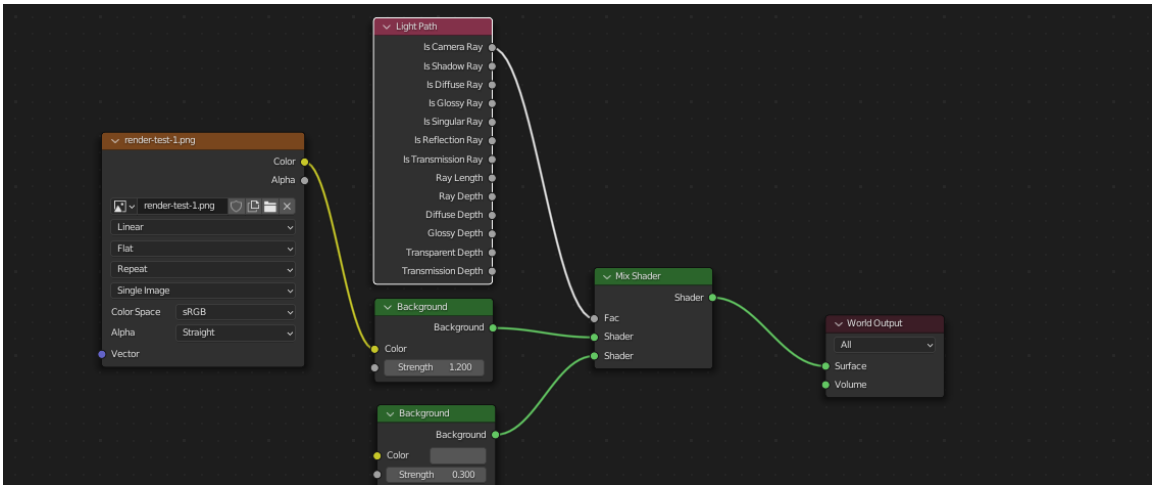
To implement this using nodes, two different node colours is needed, one for interacting with the models and another for the rest of the background. then added to a mix shader node and attached to the world.

For the background, a single node is all that's needed, the default background colour with the default grey and strength of 300 can be used.

For the models lighting, a mix of nodes is used, the background node is combined with an image texture node, which can use a reference image from a movie or a different scene. In this case, a rendered image of the grass from the same scene was used, utilizing the first method by having a blue colour and a default sun light then rendered to be used in this scene. By adding the render image to the image texture node then attached into the colour of the background node that then attached to a mix shader with the grey background node.

To ensure that the image texture only effects the interacts with the models, a light path node is used. The camera ray output of the light path node is connected to the factor input of the mix shader (Picture 23). This setup ensures that the image texture is applied only to the models.

By utilizing nodes and these methods, more control over the lighting of the scene can be achieved, allowing for different effects while separating the models from the background.




Picture 23 World texture nodes.

## 5.8 The final render

To prepare the final render of the scene in Blender, several adjustments were made. In the scene render settings, the sample count was increased for better anti-aliasing and noise reduction. This helps to produce smoother and more refined edges in the final image. Additionally, a bloom effect was applied to enhance the glow of lights, adding a touch of realism and visual appeal.

To ensure accurate and detailed shadows, the high bit depth was enabled in the shadows tab. This allows for more precise representation of shadow information, resulting in better overall lighting in the scene.

For the camera settings. The focal length was adjusted for 85mm to avoid any fisheye distortion and maintain accurate proportions of the scene. this helps to capture the models and their surroundings in a natural way.

To add depth and visual interest, a depth of field effect was applied to the camera. This creates a scene of depth by selectively focusing on a specific object or area within the scene while gradually blurring the foreground and background. In this scene the train was selected as the focus point

By Implementing these adjustments, the scene is ready for the final render, which will result in a high quality and visually captivating image that closely resembles the style of a Studio Ghibli movie (Picture 24).

Picture  24 Final render.

# 6 Conclusions

The objective of this thesis was to create stylized 3D artwork inspired by the distinctive style of Studio Ghibli. This project involved the process of modelling, texturing, and rendering within the Blender 3.2.0 software environment. The modelling phase was characterized by its efficiency and speed, most models were constructed using basic shapes and fundamental modelling techniques.

The utilization of node-based texturing represented a fresh approach, initially limited to basic node functionalities. However, through extensive research and practical experimentation, various advanced techniques and strategies were acquired, enhancing the overall texturing process.

Given the initial lack of clear requirements for the scene, the project's evolution primarily transpired during the modelling stage. Discussions and adjustments were frequently conducted to ensure alignment with the evolving vision for each model's integration within the scene.

The substantial amount of time invested in making this scene facilitated the exploration and implementation of diverse techniques, fostering the development of effective problem-solving skills. Such skills are expected to be advantageous for future modelling ventures, enabling the successful execution of new projects.

# 7 References


Alchemica. (2019, August 7). *Procedural Stylized Rocks Tutorial [Blender 2.8]*. Retrieved from youtube.com: https://youtu.be/8xjur7uoBUo

Bauer, P. (2019, September 13). *Studio Ghibli*. Retrieved from Britannica: https://www.britannica.com/topic/Studio-Ghibli

BBC. (2020, January 18). *Why Studio Ghibli films have that extra magic | Inside Cinema - BBC*. Retrieved from youtube.com: https://youtu.be/8HGjm0Sk8tk

Beef, A. (2021, August 5). *Ghibli Stylized Grass Tutorial (Overview & Step-by-step)*. Retrieved from youtube.com: https://youtu.be/HO9qdDPBuAo

birdienumnum17, a. L. (2017, March 20). *The Magic and Artistry of Studio Ghibli's Films*. Retrieved from the artifice: https://the-artifice.com/magic-artistry-studio-ghibli-films/#:~:text=Often%2C%20Studio%20Ghibli's%20films%20present,isolation%2C%20wonder%2C%20or%20anxiety

Blender. (n.d.). *Ambient Occlusion*. Retrieved from Blender: https://docs.blender.org/manual/en/latest/render/shader_nodes/input/ao.html

Blender. (n.d.). *Blender Manual*. Retrieved from Blender: https://docs.blender.org/manual/en/latest/modeling/modifiers/index.html

BNPR. (2020, August 31). *The BNPR Show #19: Ghibli Edition*. Retrieved from youtube.com: https://youtu.be/UZqKn29o590

Cafolla, A. (2016, November 29). *What makes Studio Ghibli so magically immersive?* Retrieved from DANZED: https://www.dazeddigital.com/artsandculture/article/33864/1/what-makes-studio-ghibli-so-magically-immersive

Crawford, T. (2021, January 17). *The Photography of Studio Ghibli.* Retrieved from youtube.com: https://youtu.be/6tXkjy7M594

Dedene, K. (2020, September 29). *Tutorial: Ghibli style procedural rocks in blender*. Retrieved from youtube.com: https://youtu.be/FHeBI5tAGP0

Dedene, K. (2020, August 20). *Tutorial: Ghibli/BoTW Anime Stylized Grass in Blender wth EEVEE*. Retrieved from youtube.com: https://youtu.be/6hyztL8btlY

encyclopedia, f. (n.d.). *Studio Ghibli*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Studio_Ghibli

FlippedNormals. (2019, October 24). *How to Model Anything in 3D - Modeling Fundamentals*. Retrieved from YouTube: https://youtu.be/tTfIo_bezqw

Gvaat, A. S. (n.d.). *How to Paint Ghibli Backgrounds, What I Learned So Far*. Retrieved from Gvaat's Workshop: https://gvaat.com/blog/how-to-paint-ghibli-backgrounds/

Matt. (2023). *What is Pre-production? Definition, Examples & Guide*. Retrieved from FILMMAKING LIFESTYLE: https://filmlifestyle.com/what-is-pre-production/

Mont, L. d. (2020, July 21). *Creating Fluffy Clouds in Blender*. Retrieved from youtube.com: https://youtu.be/5QxCa-bsbK0

Mussi, J. (2019, January 19). *Step By Step Guide to Create the Perfect 3D Blockout*. Retrieved from ArtStation: https://www.artstation.com/blogs/jlmussi/Nmbm/step-by-step-guide-to-create-the-perfect-3d-blockout

Selin, E. (n.d.). *10 Different types of 3D modeling techniques*. Retrieved from ARTISTIC RENDER: https://artisticrender.com/10-different-types-of-3d-modeling-techniques/

Studio, L. B. (2020, August 18). *How to Create Ghibli Trees in 3D - Blender Tutorial*. Retrieved from youtube.com: https://youtu.be/DEgzuMmJtu8

Tallerico, B. (2020, May 17). *Every Studio Ghibli Film, Ranked*. Retrieved from VULTURE: https://www.vulture.com/article/best-studio-ghibli-films-ranked.html#:~:text=1.,has%20become%20a%20modern%20classic

tuat555. (2022, August 6). *Grease pencil beginner tutorial | TOTORO | Blender 3.2*. Retrieved from youtube.com: https://youtu.be/SpFwrQOpQ0M

Tut, T. (2022, January 31). *Basic Blender Toon / Cel Shader Tutorial 2D Grease Pencil + 3D Modelling*. Retrieved from youtube.com: https://youtu.be/hBztmFHkNQo

Tutorials, K. (2022, October 22). *How to Create Professional Materials*. Retrieved from YouTube: https://youtu.be/-x-b2U-MSgc