Colorize-HD

(Texture Color Modifier)

Contents

Introduction to Colorize-HD Documentation

Welcome to the Colorize-HD documentation. Colorize-HD is an advanced add-on designed to complement and extend the capabilities of Colorize-Pro. Our decision to integrate Colorize-HD within the familiar interface of Colorize-Pro stems from our commitment to provide a seamless and intuitive user experience, ensuring that you, the user, can dive into high-definition texture editing with the tools and workflows you've already mastered.

Colorize-HD builds upon the robust foundation of Colorize-Pro, unlocking a new realm of possibilities in high-resolution, non-palette-based texture editing. This allows for unprecedented detail and quality, empowering artists and developers to push the boundaries of visual fidelity in their projects.

This documentation will specifically focus on the features and workflows unique to Colorize-HD. While the powerful pattern editing mode and other versatile tools from Colorize-Pro are at your disposal within Colorize-HD, they will not be covered in detail here. For comprehensive guidance on the full suite of Colorize-Pro tools and their operation, please refer to the Colorize-Pro Documentation.

As you embark on exploring the expansive feature set of Colorize-HD, remember that the knowledge you've gained from Colorize-Pro is directly applicable, enabling you to leverage advanced HD texture editing with confidence and creativity.

Installing Colorize-HD

Download and Import

Installing Colorize-HD is designed to be a straightforward and hassle-free process. To ensure a smooth setup, please follow the steps below:

Prerequisites:

- Ensure that you have the latest version of Colorize-Pro installed. Colorize-HD is built as an add-on to Colorize-Pro and relies on its core functionalities.

Installation Steps:

1. **Download Colorize-HD:**
    - Navigate to the package manager.
    - Locate Colorize-HD and initiate the download process.
2. **Import Colorize-HD:**
    - Upon completion of the download, select the option to 'Import' Colorize-HD into your project.
    - Colorize-HD will automatically integrate with Colorize-Pro, and there are no additional steps required for activation.

Post-Installation:

- Once imported, Colorize-HD features will be immediately available for use. You can begin enhancing your project with high-definition textures right away.

Important Note:

- If Colorize-Pro is not already installed, importing Colorize-HD will result in errors. This is due to the dependency of Colorize-HD on the Colorize-Pro framework.

Troubleshooting:

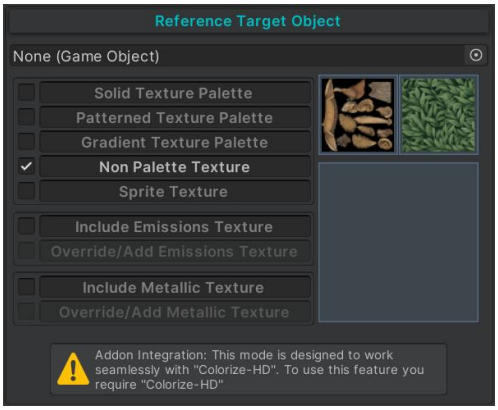
- **Missing Dependency Errors:** If you encounter errors after importing Colorize-HD, please confirm that Colorize-Pro is installed. If it is not, please download and import Colorize-Pro first, then re-import Colorize-HD.
- **Other Issues:** For any other installation issues, please consult the Colorize-Pro Documentation or contact us on Discord for support.

Verifying the Activation of Colorize-HD

To confirm that the Colorize-HD add-on is active in your project, you can check the availability of the "Non-Palette Texture" workflow. This feature is exclusive to Colorize-HD and provides a clear indication of the add-on's status.

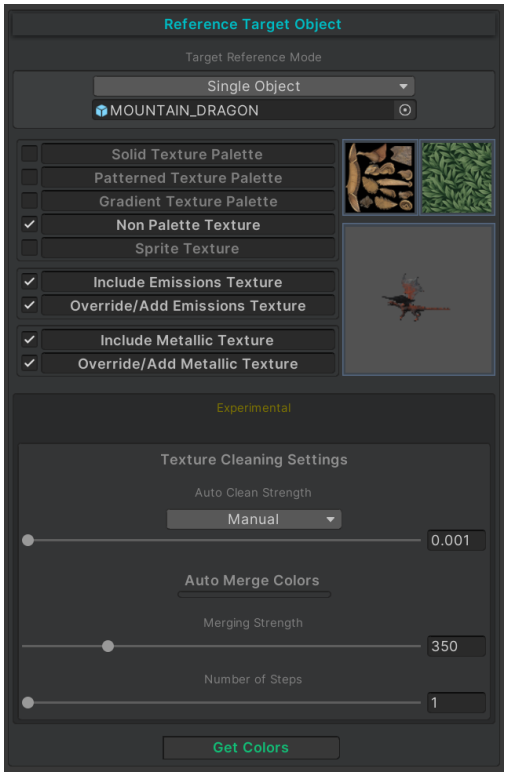
Without Colorize-HD Installed:

- Navigate to the "Non-Palette Texture" workflow within the Colorize-Pro interface.
- If Colorize-HD is not installed, you will encounter a warning message stating: “Addon Integration: This mode is designed to work seamlessly with ‘Colorize-HD’. To use this feature, you require ‘Colorize-HD’.”
- Additionally, the interface will lack a "Get Colors" button, as illustrated in the following image:



With Colorize-HD Installed:

- After ensuring that Colorize-Pro is installed, import Colorize-HD via the package manager.
- Upon selecting the "Non-Palette Texture" workflow now, you will see the workflow's full suite of options.
- The "Get Colors" button will be visible and functional, indicating successful integration, as shown in the following image:



Auto Cleaning (Experimental)

Auto Cleaning is an integral feature in Colorize-HD, necessitated by the complexity of "Non-Palette Textures". These textures often contain a larger spectrum of unique colors than is manageable within the Colorize-Pro environment, necessitating an automated process to prevent system overloads and potential crashes.

High-definition textures in Colorize-HD typically include a broad range of unique colors that exceed the limits of both Dirty-Palettes and Gradient Palettes. Auto Cleaning is a mandatory step to prepare these textures for use without compromising the editor's stability.

Auto Clean Strength

- The Auto Clean Strength setting in Colorize-HD is a delicate balance between maintaining the highest possible detail and ensuring the texture's complexity remains within operable limits.
- For most high-definition models, setting the Auto Clean Strength to the minimum value of 0.01 is recommended to retain the utmost detail.
- In cases where the texture exhibits characteristics of a low-poly palette with solid and distinguishable regions, a higher Auto Clean Strength may be appropriate. This setting prompts the algorithm to prioritize solid, clean colors as the primary palette.
- Recommended Settings, is the setting that will give you the best result for the majority of situations for texture with high level of details.

Customizing the Cleaning Process

- Users should adjust the Auto Clean Strength based on the specific needs of their textures. The goal is to reduce color complexity to a manageable level without losing essential details.
- The resulting number of color groups, their logical cohesion, and overall texture quality will vary according to the chosen Auto Clean Strength settings.

Merging Strength

Merging Strength is a pivotal feature in Colorize-HD, which automates the manual merging process. This feature is instrumental in consolidating color regions, effectively increasing the area each color region covers. It's crucial to distinguish between 'merging' and 'grouping' — merging results in a single, unified color region, while grouping merely clusters colors together without combining them.

Understanding Merging vs. Grouping

- Merging: Combines multiple color regions into one, reducing the total number of distinct colors.
- Grouping: Organizes color regions into batches without altering individual colors.

Irreversibility of Merging

Once colors are merged using this automated feature or manually, the action is irreversible within the current session. To undo a merge, you must revert to a previously saved version of your texture (load earlier saved instance) or reprocess the texture using the "Get Colors" function if the merge does not meet your expectations.

Range of Merging Strength

The Merging Strength can be set between 0.1 and 1700.

- At the maximum value of 1700, the texture will essentially become a monochromatic region. While such an extreme setting is unlikely to be useful in most cases, it is provided to facilitate experimental understanding through trial and error.
- At the minimum value of 0.1, the algorithm is so conservative that it is unlikely to merge any colors.

Balancing Control and Efficiency

- Higher Merging Strength means fewer distinct color regions, resulting in faster processing times but less control over individual color adjustments.
- Lower Merging Strength preserves more distinct color regions, offering more control for detailed re-coloring but at the cost of longer processing times.

Strategic Use of Merging Strength

To effectively utilize the Merging Strength feature, we recommend starting with a higher value within a reasonable range. This approach allows for rapid processing, enabling you to quickly gauge whether the resulting level of detail is too limited for your needs. If the initial merge results in an overly simplified texture, you can incrementally decrease the Merging Strength. This strategy is more time-efficient than starting at a low value, which could lead to extended processing times only to discover that the detail is excessive and unmanageable. By beginning with a higher setting and adjusting downward, you can swiftly find a balance between processing speed and the desired level of detail.

Number of Steps

The 'Number of Steps' setting determines how incrementally the merging process is applied, affecting the subtlety and precision of the merge. A single step applies the full Merging Strength immediately, while multiple steps divide the strength across several iterations, creating a more nuanced merge.

- With a Merging Strength of 300 and a step count of 2, for instance, the algorithm processes the texture first at a strength of 150 and then at 300. The result is a more refined merge compared to a single step at full strength.
- The range for the Number of Steps is from 1 to 10. Starting with a single step is advisable to assess the initial effect of merging before increasing the steps for a more detailed merge.
- Overall, higher value will actually reduce the level of control, as it does increase the overall “Merging Strength”, for majority of situation, the maximum value should be set to 1-3.

Strategic Use of Merging Strength & Steps

When optimizing your workflow with Colorize-HD's Merging Strength and Number of Steps, consider this approach for efficiency and detail control:

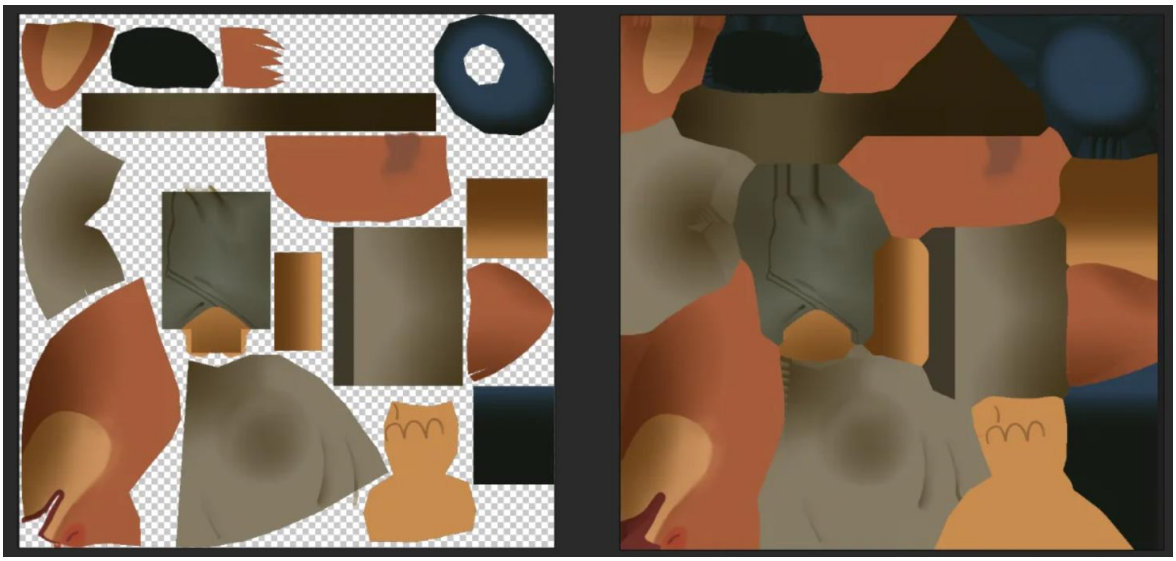
1. **Begin with High Merging Strength**: Start with a higher Merging Strength to quickly process and evaluate the initial merge. This step helps you quickly determine if the texture detail is overly reduced.
2. **Assess and Adjust Merging Strength**: If the texture is too simplified, reduce the Merging Strength incrementally. This strategy allows you to enhance the detail level without enduring long processing times right from the start.
3. **Apply Steps Judiciously**: After setting an appropriate Merging Strength, adjust the Number of Steps. Begin with a lower step count to establish a baseline. If the merge is too abrupt, increase the steps to distribute the merging process over several, more gradual phases.
4. **Fine-Tune the Balance**: Aim to find a balance where the texture maintains essential details with a manageable number of color regions, ensuring the processing time remains reasonable.

Starting with a higher Merging Strength and incrementally decreasing it allows for quick initial assessments. Adjusting the Number of Steps upwards can then refine the merging quality, leading to a well-balanced texture detail.

Compatibility

Dilation

No-Dilation | With-Dilation



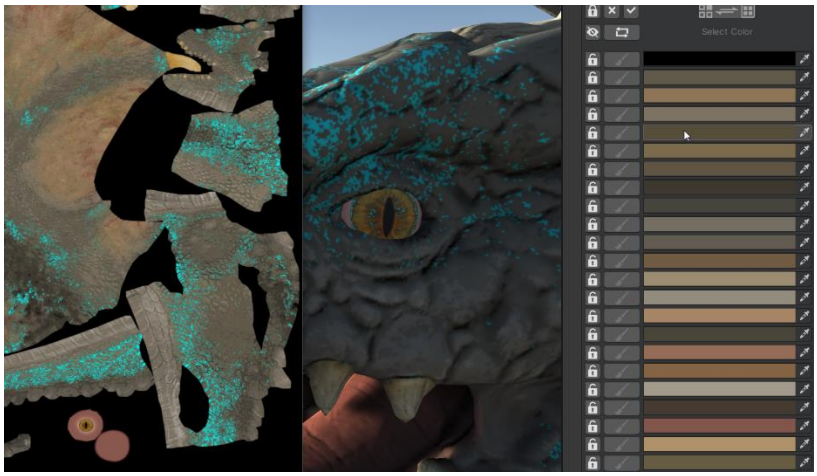
Colorize-HD is designed to handle textures with varying characteristics, including those with and without dilation. Dilation extends the pixels at the edges of UV islands into surrounding space, a technique used to prevent texture bleeding during in-game movement. Colorize-HD effectively works with both approaches.

That said, our “Segmentation and Consolidation” technologies work best on textures without the use of **Dilation**.

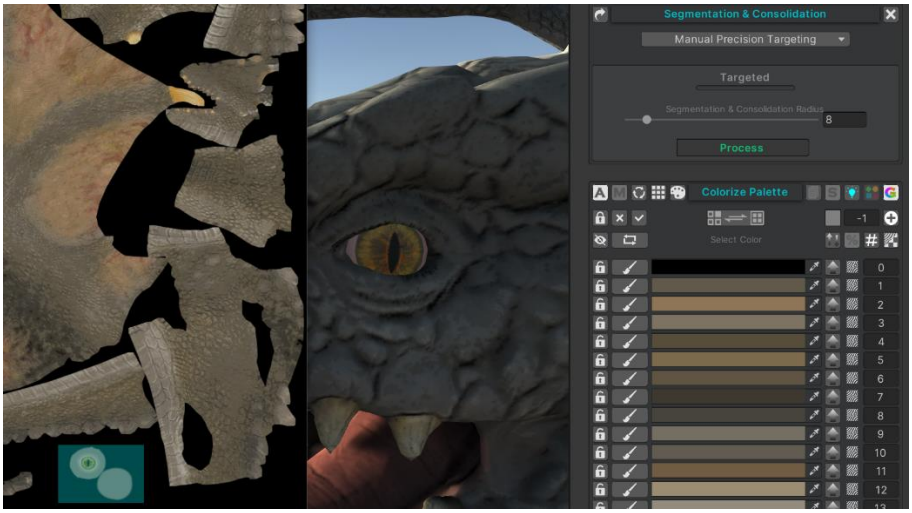
Segmentation and Consolidation

For the basics on segmentation and consolidation, please refer to Colorize-Pro documentation.

Targeted Segmentation Example



As you can see from the highlighted (Cyan-Color) that the eye is sharing colors with other parts of the body, however we can use segmentation to isolate the eyes completely, and the fact this texture does not use dilation, it makes this process even easier and more precise.



All we have to is highlight the eye and segment, the lower the “segmentation radius” the more segments will be produced which will give you more control over the level of detail, but it’s not necessarily a good thing, more control makes it more work and less cohesions between the details when it comes to randomization algorithm. With too much detail, we recommend using diffusion painting mode instead.

As you can see, we have segmented the eye completely, the process groups all new segments in their own group and in this example, 320 different segments (color regions) where produced.

As you can see from the results, we can apply colors and emissions directly to the segmented region without effecting other regions that the segments originally belonged to and where cleaved from.

Detail Retention versus Artistic Style

The software comes equipped with features like Diffusion painting to help maintain detail in delicate textures. While this aims to preserve subtleties, some loss of detail can still be noticeable, particularly in high-definition areas. In contrast, for textures where precise color placement is less critical, like on a dragon's scales, Colorize-HD's processing can actually enhance the visual complexity and contribute to an improved aesthetic.

Impact on Artistic Style

The use of Colorize-HD influences the overall look of a texture. Textures that contain smooth gradients may adopt a more distinct, stylized appearance after processing. Users should anticipate that the tool can alter the model's style, potentially introducing a new creative angle to the original design.

Work Flows

By random painting

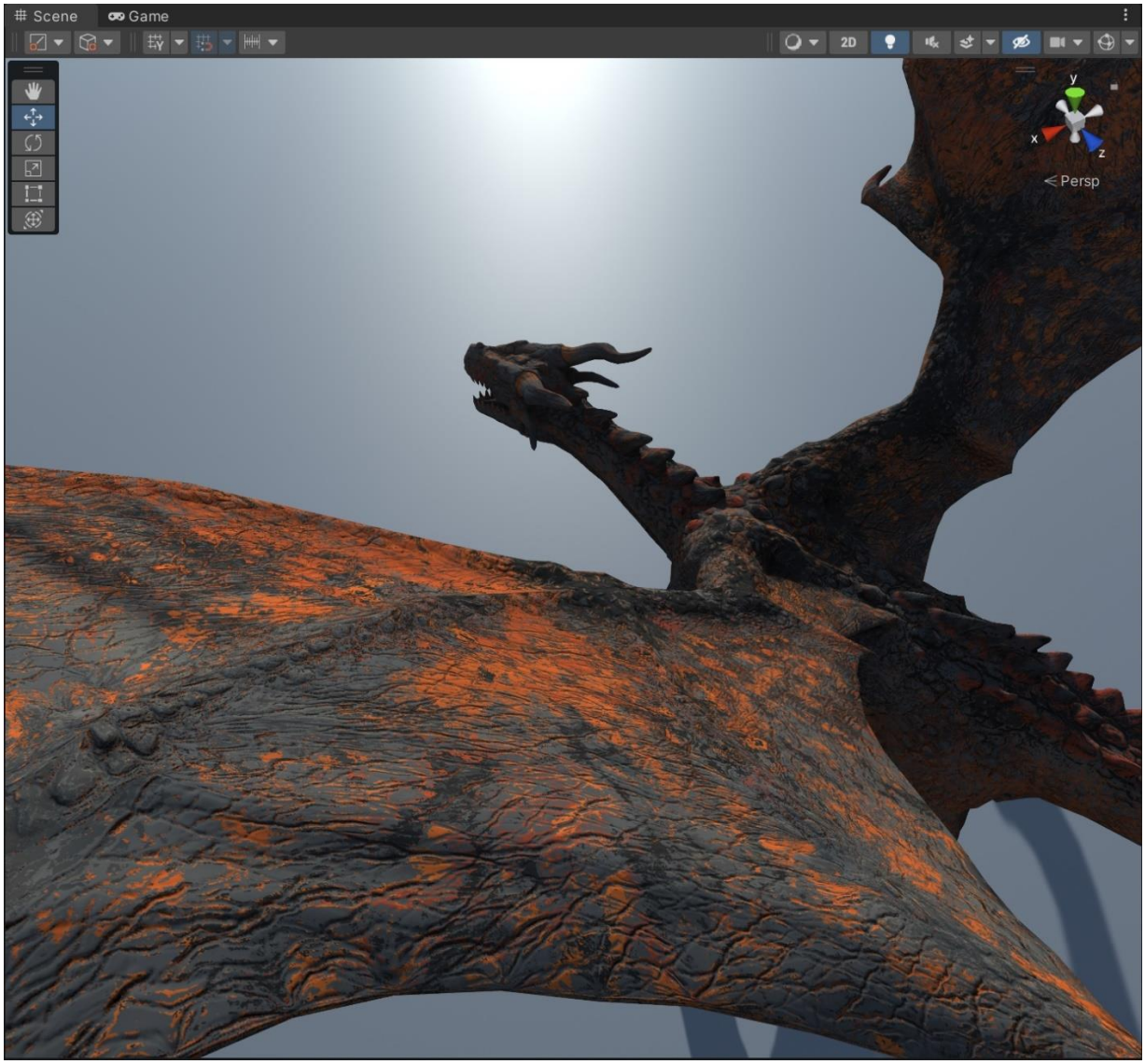
Though this can give a unique look to the model, it may lose the original spirit of the color relationship intended by the artist and the original texture. In some cases it may look too stylized, Grainy, or even pixilated. But, it can indeed provide a look that is desirable.

By Diffusion painting

Using the Diffusion technology (See Colorize-Pro Documentation), you retain the color relations ship between different regions of the texture, this is to keep the spirit of the original texture intact. However, no matter what technology you use, Colorize-HD will reduce the level of detail of the resulting texture relative to the original. This is due to the grouping process of the colors which is necessary to make the coloring process necessary, as it would be unreasonable to color each unique color pixel individual especially when these HD models can over 500,000 unique color regions.

High control (Low Merging Strength)

Random Painting:

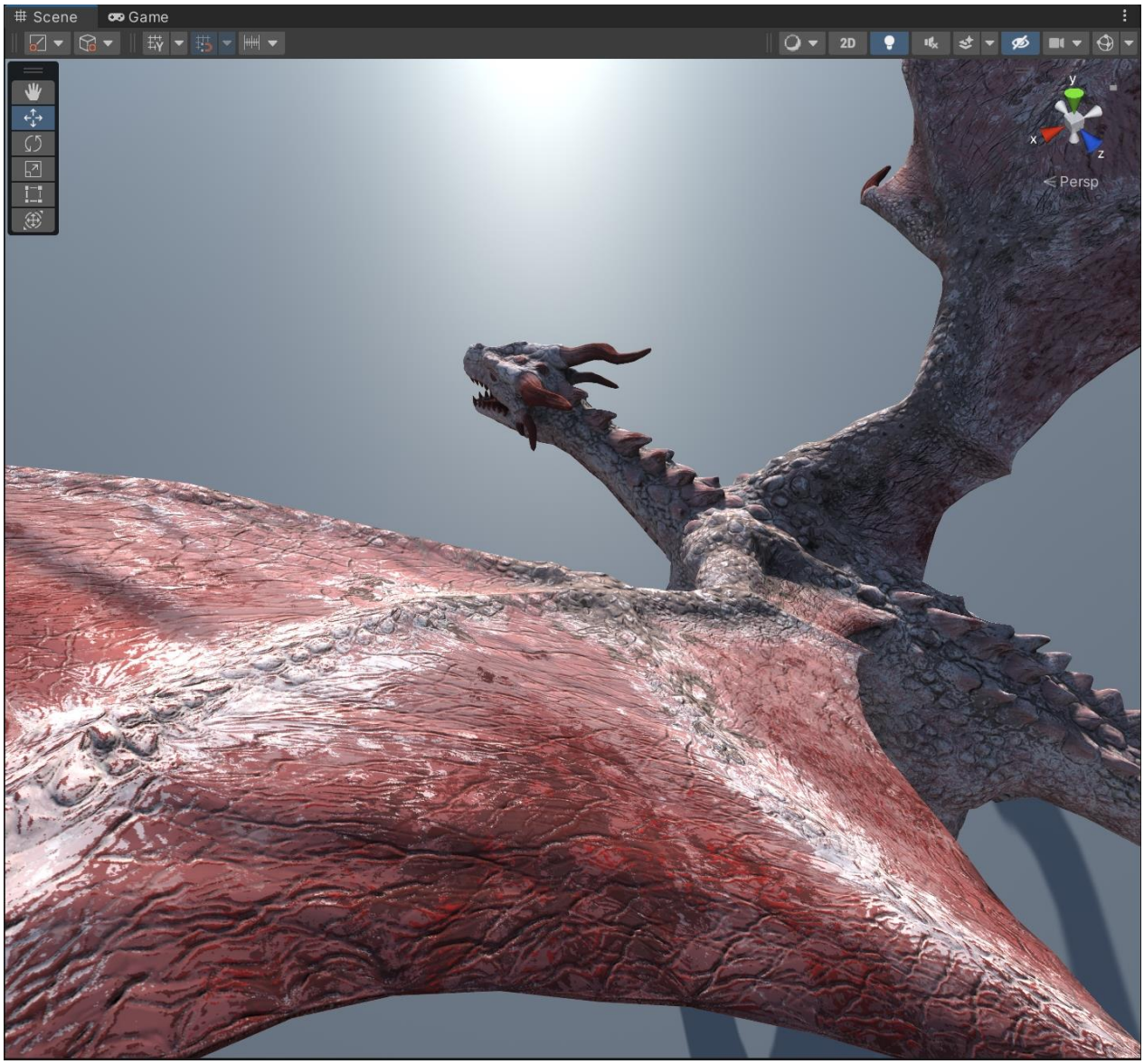


As you can see, High control with randomization doesn't always give the best results, the randomization is evident, and there is no real sense of natural pattern formations. It looks a lot closer to random rusting effect rather than biological color pattern.

Merging Strength = 80
Number of Steps = 2
Regions Produced = 87

(Note: this dragon model is not included in the asset and can be purchased from the unity asset store, provided by Protofactor Inc)

Diffusion Painting:



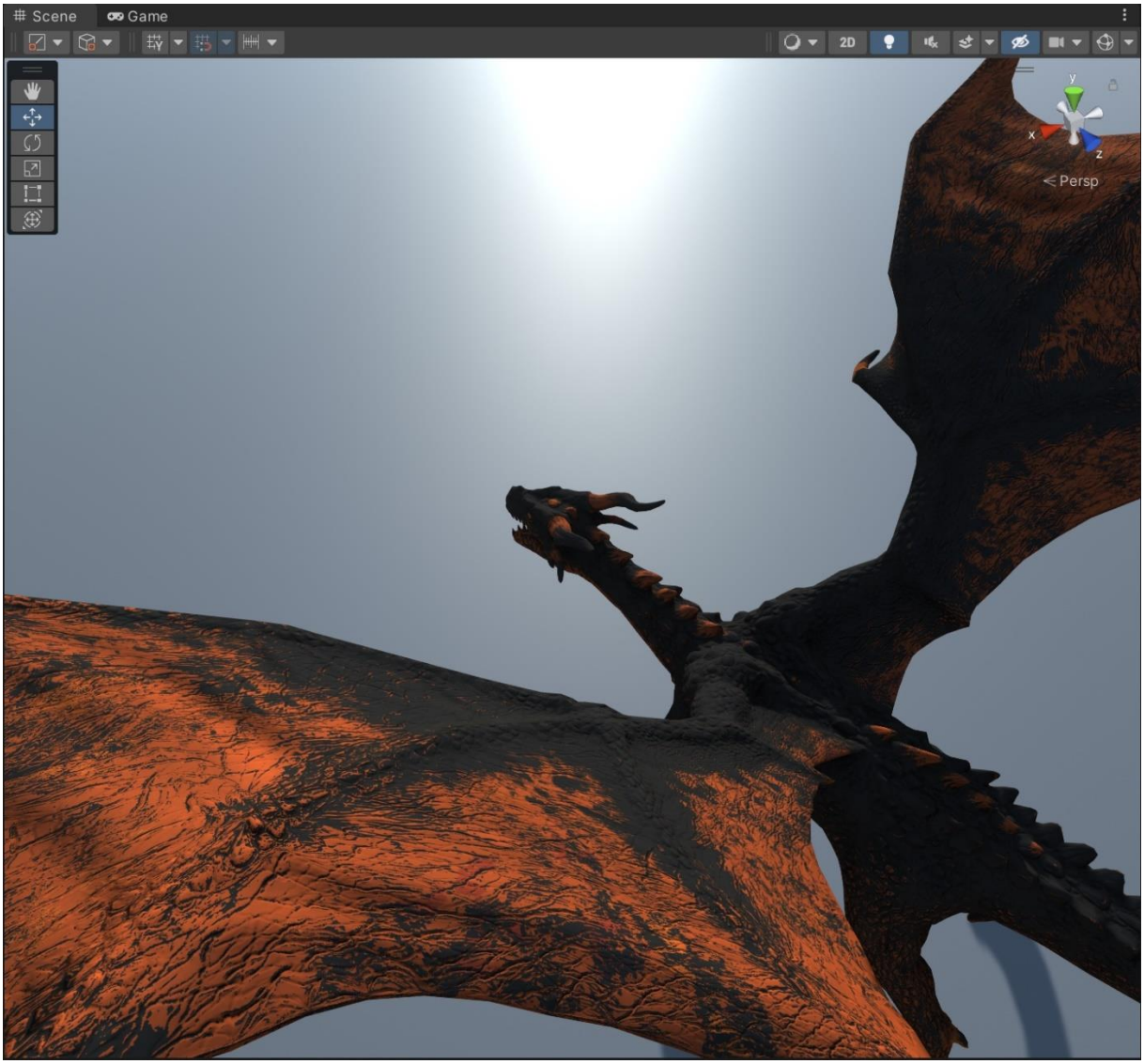
With the exact same level of detail, we managed to make an image that makes a lot more sense in terms of biological pattern generation, when using diffusion painting compared to random color painting.

Merging Strength = 80
Number of Steps = 2
Regions Produced = 87

Note: the number of regions can be increase by segmenting areas of the texture such as when isolating specific regions (eyes, teeth, horns etc…)

Less control (High Merging Strength)

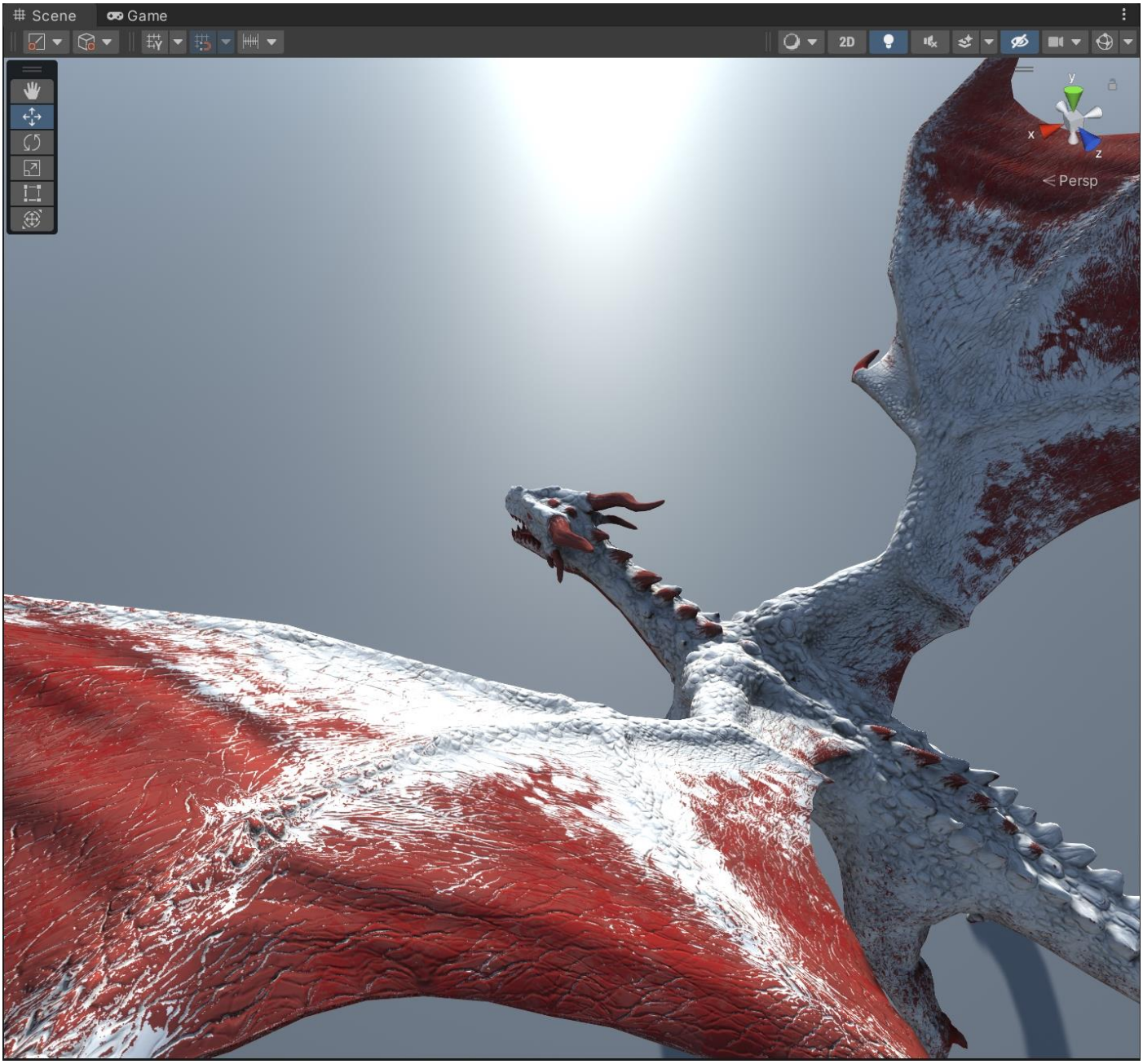
Random Painting:



As you can see, low control with randomization works much better than with high control. It looks a lot closer to the biological pattern the dragon should have rather than random looking erosion with noise. But it does come at the cost of detail, as high merging strength reduces the level of detail.

Merging Strength = 144
Number of Steps = 1
Regions Produced = 20

Diffusion Painting:



Diffusion painting, maintains the biological patterns a lot better regardless of whether or not you have High or Low color control caused by variation in merging strength and number of steps used for processing the texture.

Merging Strength = 144
Number of Steps = 1
Regions Produced = 20

Note: in all circumstances, the level of detail of the texture is reduced and this is a lot more apparent with higher merging strengths, finding the balance requires experience and trial and error and a level of understand of the underlying logic, it is precisely for this reason that this asset is aimed at professionals.

Limitations

Many of these are temporary limitations and we are working to increase compatibility and reduce the limitations of this plugins

- Does not work well with realistic model/textures such as human faces.
- Will never be able to maintain the original level of detail, for example, the dragon we used in our examples has over 100,000 unique colors, Colorize groups and merges these colors to a manageable amount (generally <200), though this might be hard to notice sometimes, it can affect the style of the original model.
- Does not support Custom Shaders (you can always switch shaders back and forth)
- Only works on URP and BuiltIn-RP (For now)
- Only works on UniversalRenderPipline/Lit Shader and the Standard Shader
- Only works with Palettes Unless you have Colorize-HD or Colorize-2D add-on
- Texture has to be POT such as 32x32, 64x64 etc... (POT = Power of Twos).
- Texture has to be a perfect square (can't have 32x64)
- We are working on overcoming these limitation where possible
- Does not currently work with Occlusion textures (You have to apply and transfer existing ones manually)
- Does not currently work with Height-Map textures (You have to apply and transfer existing ones manually)
- Does not currently work with Normal-Map textures (You have to apply and transfer existing ones manually)

Hardware Compatibility

We continually aim to ensure compatibility across various platforms including:

- **Windows**
- **Mac**
- **Linux**

However, guaranteeing compatibility at all times can be challenging, particularly when issues arise from the Unity editor itself. Our effort extends to ensuring smooth operation across diverse hardware configurations. There have been instances of challenges encountered with Mac M1 and M2 chips. Although these issues largely stem from Unity's compatibility nuances, we have devised workarounds to address them. Should you experience any difficulties with M1-M2 chips, refer to the Colorize Settings for preferences that might alleviate the problems.

Minimum hardware specification

Colorize, Colorize-Pro, Colorize-HD, and Colorize-2D were all developed and tested on the following hardware configuration:

- **Processor:** Intel(R) Core(TM) i7-6850K CPU @ 3.60GHz (12 CPUs), ~3.6GHz
- **Memory:** 32GB RAM
- **Graphics Card:** NVIDIA GeForce GTX 1080

This configuration enables us to work with 4K textures, although it can result in extended processing times depending on the complexity of the operations being performed.

We have received feedback from users who have successfully operated Colorize on less powerful hardware setups. If your work primarily involves textures with resolutions lower than 4K or 2K, the above hardware specifications should provide a more than adequate performance level for most tasks within Colorize and its variants.

Colorize-Pro, particularly when utilizing Colorize-HD or Colorize-2D features, is significantly more processing intensive. Certain functionalities within these tools leverage compute shaders, which offload processing tasks to the GPU, potentially enhancing performance.

For an optimized experience, especially when working with high-resolution textures or complex operations, a robust graphics card and sufficient memory are highly recommended.

Support

Video guides:
Colorize HD Texture Processing Guide
Colorize HD Segmentation Guide
Colorize HD Diffusion Painting Guide

Please contact us on Discord for support!

Bug Report

This asset is still under active development, we expect there to be bugs that we have not encountered during production. Please report these bugs as we may not be aware of them otherwise.

Please contact us on Discord for to report any bugs or lack of performance, and we will do everything we can to provide an update with a fix as soon as possible!

Thank you in advance!

Licensing

Colorize Products License Agreement

For licensing, please refer to the online colorize-Pro documentation. The licensing applies to Colorize-Pro and it's Plugins (Colorize-HD, Colorize-2D, etc…)

Special thanks

External Consultants

Steve Smith (Code Master)

Justin (Art Master)