BEAUTIFY

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Contents

Introduction

Thanks for purchasing!

Beautify is a full-screen image processing effect that improves the image quality in real time producing incredibly crisp and vivid scenes.

Beautify **uses several algorithms in a single-pass resulting in a very fast image effect**:

- Analyses local pixel contrast, enhancing visual features and producing sharp images.
- Reduces or completely removes banding in gradients, usually seen in sky boxes due to color quantization.
- Adjusts pixel saturation, boosting pixel color without over saturating the image.
- Factory presets or global effect slider, which takes care of all effect details in one step.

In addition to this unique image enhancement technology, Beautify provides state of the art filmic ACES tonemap operator and high quality extra effects which you can combine just enabling them in the inspector. These are high quality effects which are combined in the same render passes providing superior performance.

Beautify is very easy to use, just add the image effect to your camera, choose a preset and that's all.

It works with forward and deferred rendering paths as well as linear and gamma color spaces.

3 shader variants are included: a High-Quality version that should be the preferred choice, a Best Performance version which sacrifices some fidelity in favour of performance and a Basic version which just comes with basic effects (sharpen, color adjustment, dithering).

Demo Scenes

A few demo scenes are included to quickly play with the different presets. Just open and play with them to learn about Beautify possibilities.

Quick Start

1. Add the Beautify script to your main camera in your scene.

2. Choose one of the preset and that's all!

You can of course customize any of its parameters to match your game mood and requirements.

Beautify parameters

General Settings

- **Quality**: chooses the shader variant. The "Best performance" variant uses less texture fetches and includes some extra optimizations which results in a faster performance with less accuracy making it suitable for mobile devices (real performance depends on device GPU power and the number of enabled effects).

- **Super Sampling / Downsampling**: this slider shows up depending on the quality mode. In Best Quality mode, super sampling forces camera to render to a bigger target and then, downscales it before applying Beautify effects. This results in a better quality image (you can also combine this to anti alias – either MSAA or the integrated anti alias that can be found in Shader Options section). In Best Performace mode, the downsampling slider reduces the target size before applying Beautify effects (useful on slower devices).

- **Preset**: quickly choose a factory combination of values for the parameters below.

- **Profile**: assign or create a Beautify profile. A profile is a custom file that stores current configuration. You can have multiple profile and assign them either in Editor or at runtime. Jump to "Using Profiles" for more details.

- **Compare Mode**: shows a side by side comparison of Beautify effect.

Image Enhancements Options

- **Sharpen**: sharpen intensity. A higher value will produce a dramatic result but can show some undesired artifacts with thin objects or whitish backgrounds. Use the following extra settings to control those artifacts:

  - **Min/Max depth**: allows you to choose the depth range where sharpen will be applied. Decrease max depth to remain skybox untouched. Increase min depth to cause an effect similar to depth of field.

- o **Max Depth**: will compute depth difference around pixels to detect edges. When the depth delta is greater than this value, sharpen will not occur. This will protect thin objects like standalone wires or lines.
- o **Luminance Relaxation**: sharpen is subtler on high contrasted areas. This parameter tunes this relaxation. Reduce this value to preserve thin edges or bright areas.
- o **Clamp**: irrespective of sharpen intensity or above params, clamp controls the maximum effect applied over a single pixel.
- o **Motion Sensibility**: reduces sharpen effect while camera moves/rotates. This option can reduce flickering and produce a cheap motion blur effect. Set this value to 0 to disable this option.

- **Dither**: dither function shifts pixel RGB values according to a pseudo-random pattern to reduce banding.
  - o Min Depth: by default, dither is applied to entire image. Use this parameter to make dithering only occur beyond given depth (set this value near 0.99 to make it only affect sky).

Color Grading Options

- **Tonemapping**: default is Linear which means no tonemap operator is applied. Choose ACES (Academy Color Encoding System) to map HDR colors into LDR space. Use only with HDR enabled on your camera.

- **LUT (Look-up Texture) Transform**: switches colors according to the provided lookup texture. A sample LUT Sepia texture can be found inside Beautify/Resources/Textures folder.

- **Vibrance**: controls the intensity of adaptative saturation. This algorithm considers current saturation of each pixel, so low saturated pixels receive more importance than high saturated pixels.

- **Tint**: multiplies scene pixels by a given color. Alpha controls the transparency of the tint effect.

- **Daltonize**: similar to vibrance but mostly accentuate primary red, green and blue colors to compensate protanomaly (red deficiency), deuteranomaly (green deficiency) and tritanomaly (blue deficiency). This effect does not shift color hue hence it won't help completely red, green, or blue color blindness. The effect

will vary depending on each subject so this effect should be enabled on user demand.

- **Contrast** & **Brightness**: these two parameters add a final contrast + brightness adjustment to the image.

Lens & Lighting Effects

- **Bloom**: produces fringes of light extending from the borders of bright areas, contributing to the illusion of an extremely bright light overwhelming the camera or eye capturing the scene. Use intensity and threshold (light sensibility) to adjust bloom effect. Layer mask option allows you to specify which objects are subject to bloom.

- **Anamorphic Flares**: also known as JJ Abrams flares, they add a sci-fi look to the scene. This effect is only available for Best Quality settings. It's like bloom but also can be assigned a tint color (use alpha to blend between original and tint color) and an orientation (horizontal or vertical).

- **Sun Flares**: beautiful, fast, and procedural lens flares produced by the bright light of the Sun. There're lot of options to customize from sun disk size and intensity, corona rays, ray diffraction and ghosts.

- **Lens Dirt**: adds dust and dirt effect to your camera when looking to a light source. You can control the intensity and the brightness threshold (brightness sensibility). If you want to use different dirt textures, just assign your own texture into the Dirt Texture slot (several textures are provided in this asset inside the Textures folder).

- **Chromatic Aberration**: simulates lens chromatic aberration by applying a color fringe effect to the scene around screen edges with custom intensity and optional smoothing (blur quality). The effect implements a variation of color dispersion based on their hues.

- **Depth of Field with Bokeh**: depth of field is the distance between the nearest and the furthest objects giving a focused image. Enable this option to produce a photography effect where the target object remains focused while the background and foreground looks blurred.

- **Autofocus / Focus target / Focus distance:** allows you to specify where the focus plane is. For autofocus it's recommended to reduce the focus speed as it will produce a more pleasant effect between changes.
- **Focus speed**: the speed between current focus and a focus change. For example, if the target focus is moving a focus speed of 1 will update the focus instantly whereas a lower value will make the focus more progressive.
- **Focal Length and Aperture:** these two parameters are used to simulate the virtual camera. Focal Length is the distance between the lens and the image sensor. Aperture is referred to the effective aperture or diameter of the pupil through which the outside light enters.
- **Foreground Blur:** enable to allow foreground objects to be blurred. Use offset to adjust the foreground blur distance.
- **Bokeh Composition**: the integrated option is faster while the separated option produces stronger bokeh effects.
- **Downsampling**: reduces the screen buffer size to improve performance. Can produce some artifacts.
- **Sample count**: referes to the maximum samples that will be gathered. The algorithm is optimized to produce adequate results with a value of 4. A lower value will be faster, but the results will look incorrect. A greater value will increase the quality of the blur, which can be appreciated when using a higher focal length value.
- **Transparency Support**: enabling this option will render a depth pass over transparent objects and consider their depth into the Circle of Confusion computation. Use only if you really need this.
- **Exclusion Layer**: this option enables you to exclude certain objects on the scene from the Depth of Field effect. Useful to focus attention on specific areas or objects.
- **Exclusion Layer Bias**: this is an offset value used in the exclusion layer computation. Modify it if the excluded objects show DoF effect applied over some areas.

- **Eye Adaptation**: simulates eye reaction to quick luminance changes in the scene. You can customize the eye adaptation to light or to dark, either min/max exposure changes or adaptation speeds.

- **Purkinje**: this effect simulates the achromatic vision in the dark plus a spectrum shift to blue tones. You can customize the shift amount and the effect luminance threshold.

- **Vignetting**: darkens or tints with a custom color the border of the scene. The alpha component controls the effect intensity. This effect can be combined with Night Vision or others to add great depth and special feeling to your scene. Optionally assign a mask texture whose alpha component will be overlaid over the image. You can find a sample "grungeBorder" texture inside Resources/Textures folder.

  Frame: adds a white or colored border to the screen. The alpha component controls the size of the border. Optionally assign a frame texture. You can find a sample "grungeBorder" texture inside Resources/Textures folder.

- **Outline**: adds a white or colored border around objects in the scene. The alpha component controls the edge detection threshold.

- **Night Vision**: the night vision effect will allow you to see in complete dark. You can customize the color (greenish by default) and the luminance using the alpha component of the color picker. This effect is completed by noise and scan line effect. Works great with vignetting enabled (set a black vignette with an alpha of 32).

- **Thermal Vision**: this effect is like night vision but just shift color hues to simulate thermal sensitivity. It also distorts the image to give the impression of temperature. This effect is also completed with noise and scan lines.

Advanced Settings

Some advanced options can be found inside the "Shader Options" section:
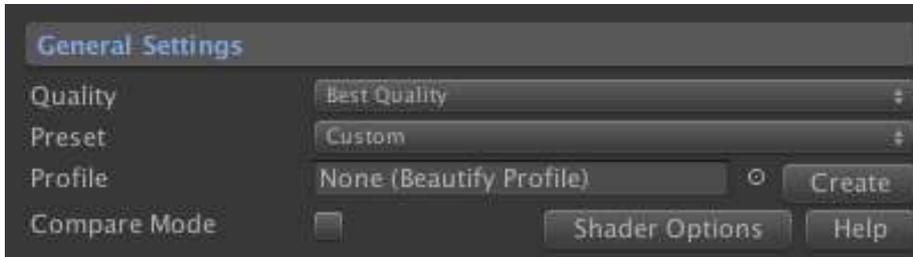
The first section "Shader Features" lists many of the shader options that can be enabled/disabled. Each feature uses a shader keyword to optimize the shader execution. Enabling or disabling an option will modify the shader source creating an optimized version of Beautify improving performance and saving build time and size.

The second section contains a few specific options. Each of these options also modify the shader source code:

- **Orthographic Mode**. Allows Beautify to work with orthographic camera.

- **Use Sharpen**. Enabled the sharpen algorithm. If disabled, the sharpen logic is removed from the shader.

- **Depth Based Effects**. Disable to cancel request for camera depth buffer creation which can contribute to faster rendering, especially on mobile.

- **Use Dithering**. Same but for dithering effect.

- **Dithering at the end**. Dithering can be applied to the source image or after all Beautify effects have been applied. You decide.

- **Color Tweaks**. Enables/disables color correction options.

- **Use Dynamic Range Eye Adaptation**. Uses an improved algorithm to compute retina adaptation when light intensity changes. Should be left enabled. This option is left for compatibility reasons in case your project uses the old /basic method.

- **Use Sun Depth-Based Occlusion**. By default Beautify uses RayCast to determine if the Sun is occluded or not. When the Sun is not visibile in front of the camera, the Sun Flares effect is diminished or removed. Enable this option to use a more precise way based on depth buffer instrad of Rayasting to determine if Sun is occluded.

- **Use Alternate ACES operator**. Switches to an alternate algorithm to compute ACES tonemapping.

- **Use Sobel Outline method**. Uses a color-based algorithm to detect edges instead of depth changes. Can be useful for 2D games or to detect edges in the textures themselves.

- **Use Procedural Sepia**. Uses a mathematical method to compute Sepia effect instead of using a LUT-based method.

- **Better Fast LUT**. Improves LUT quality when using the Best Performance mode of Beautify.

- **Anti-Aliasing**. Enables a basic edge anti-alias in Beautify. A new option "AntiAlias" is then shown in the "Image Enhancement" section. This AA method is a basic antialias edge-based algorithm that can improve your image quality slightly if MSAA cannot be used and you prefer a basic but faster method that other Post-Processing based AA methods.

- **Hard Light**. Enables the hard light effect. Once enabled, additional options are shown under Tonemapping & Color Grading section called hard light. This effect produces a more natural contrasted scene.
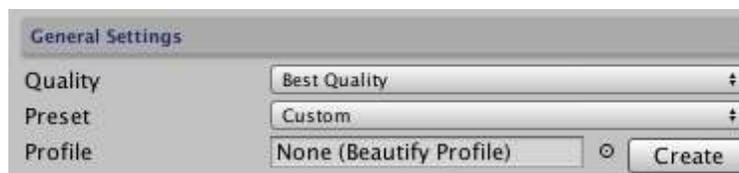
Using Profiles

A profile is a special file that stores all settings in Beautify inspector. You can have multiple profiles in your project and assign them in Editor or at runtime.

Profiles are useful to:

- Store and load multiple configurations with ease.
- Duplicate existing settings and create variations.
- Apply custom styles to different scenes (eg. main menu, custom levels, …)
- Along the global Quality setting, they can be used to provide different performance options by using or not specific effect parameters (eg. depth of field downsampling).

To create a new profile: click "Create" next to Profile field in Beautify's inspector. A new file wil be created in the root of your project. This file contains a copy of all settings of Beautify. Rename this file and move it to any folder you wish. The new profile will automatically be assigned so any change you do to the profile will also affect Beautify.

To assign a profile: just drag & drop the profil file to the "Profile" field shown above. It can also be assigned using script:

Beautify.instance.profile = Resources.Load<BeautifyProfile>("path-to-profile").

To unassign a profile: click on the profile field and hit "DELETE" key. To completely remove the profile file, your delete the file from the project.

Once a profile is assigned: if you change any parameter on Beautify's inspector, it won't change the profile! To apply your changes (to update the profile), click "**Apply**". Or click "**Revert**" to load the profile settings again and replace any change you did:

Scripting support (C#)

All properties of Beautify are exposed through Beautify component. A convenient way to access Beautify's properties attached to the main camera is using:

`BeautifyEffect.Beautify.instance.`**`xxx`** `= new value;`

(BeautifyEffect is the namespace, while Beautify is the main class)

Where **xxx** is the name of the property. For example, Beautify.instance.sharpen = 6f will change the power of sharpening to 6.

You can also trigger a blink effect calling: `Beautify.instance.Blink` method.

Improving performance on mobile

Mobile devices vary in GPU power a lot. Old devices simply don't have enough power to maintain a decent frame rate while using image effects. Even a simple image effect can reduce FPS a lot on older devices. Medium and high-end devices should be able to run most of the effects fine – the result depends also on the number of effects and options enabled. Follow these tips to get the best performance:

Depth of Field is one of the most complex effects and here's a video showing it running at near 60 FPS along with bloom, sharpen and other core effects on iPhone 7+:
https://www.youtube.com/watch?v=53i1jXwiKQQ

Consider the following configuration tips to provide a nice quality/performance balance to your users:

1. Always provide a set of minimum options in your game menu so your users can enable or disable visual effects according to their preferences. Some users with powerful devices will want to enable all of the effects, while others will want to reduce them or even disable them completely so the game can have a minimum FPS.
2. Use "Best Performance" mode. This mode uses less texture fetches and render passes.
3. Disable "Depth Based Effects" in Shader Options section (button on top of Beautify inspector). Disabling this option will avoid creating the _CameraDepthTexture by Beautify which can improve performance significantly.
4. Try "Pixelate" + downscale option. A pixilation/downscaling of factor 2 can improve performance a lot on mobile. This option can be found at the bottom of Beautify inspector (it's an effect). Since mobile screens have a very high density resolution, a pixelation of 2 might not be noticeable but it will half the processing power required to execute all effects.
5. Consider reducing some options under specific effects, like "bloom blur" or "depth of field sample count".
6. Bloom & Anamorphic Flares Layer Mask options can be expensive. Consider disabling these options on mobile, or use just one mask for very specific objects, either on bloom or anamorphic.
7. Click "Shader Options" on top of Beautify inspector and disable some features.

8. The "Basic" mode provides a very basic set of options (sharpen, brightness, contrast, vibrance) and does not use depth. This mode can be used as a fallback for even better performance in some cases.
9. You game menu should contain the following quality options related to Beautify: "No Effects", "Basic" (the basic mode), "Normal", "Great", … each one can include one or more effects according to your design/preferences.

FAQ (Frequent Asked Questions)

Can Beautify work with other image effects?

Yes – however you need to experiment with image effects order. Beautify works better after Antialias as it can remove the extra blur it can add (especially FXAA).

Skybox banding is not completely removed. What can I do?

Enable HDR in your camera to improve dithering effect and banding removal.

What differences exist between the Best Performance and Quality settings?

Beautify includes two main shader variants – one for desktop with all the goodies and best algorithms and one for mobile.

The mobile version (Best Performance) has reduced quality across the shader. It's a little bit less accuarate with regards to the sharpen effect although unnoticieable. Bloom and anamorphic flares is simplified in this mode.

Depth of Field effect has its own performance options, since this is a very complex effect. Irrespective of desktop or mobile setting, ensure you set the appropiate downsampling and sample count.

When I launch a build, it takes lot of time to complete. What can I do?

Beautify makes use of several shader keywords (using multi_compile directive) to ensure only the useful code in shaders is executed. Multi_compile are directives that are included in the shader files that make the compiler create different variants for each shader, mixing different shader options in each variant. This way, when you enable one option or another (eg. outline, night vision, …) Unity will pick up the appropriate variant which has optimized code for that combination of features.

To reduce the build time, just open the Build Options section and disable the effects that you are not interested to include in your build. Disabled effects in this section won't be available in the shader (the shader itself is modified automatically by Beautify) so Unity does not have to generate those variants hence reducing build time and resulting binary size.
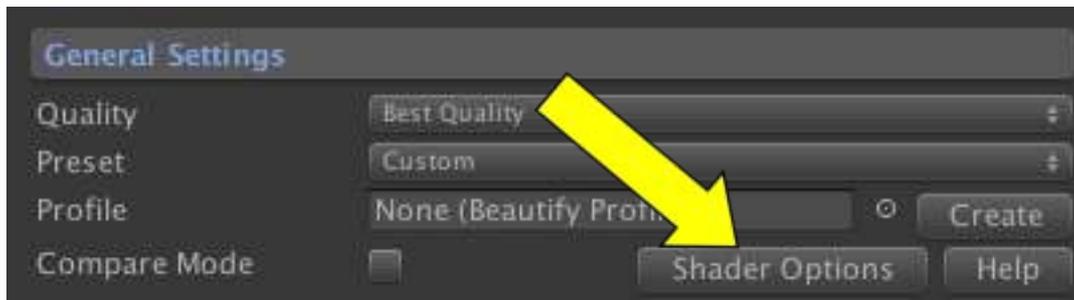
(Check out our Shader Control asset to manage other shader keywords in your project)

Can I exclude my UI from Beautify?

Yes, you need to edit Beautify.cs script and add [ImageEffectOpaque] just before the method OnRenderImage, so it reads:

```
[ImageEffectOpaque]
void OnRenderImage(…)
```

I get shader error on Playstation 4!

Use the High-Quality setting mode and remove BeautifyMobile.shader from Beautify/Resources/Shaders folder.

I get shader error on Xbox One!

This error occurs because the shader compiler provided with XBox DevKit only accepts Windows file encodings. To solve this issue, create a new text file per each file found in Beautify/Resources/Shaders folder and copy/past the contents, replacing the old files with the new ones.

Can I make bloom affect only emissive materials?

Unity does not render emission separately from lighting when HDR is enabled so this is not possible. But as emissive materials are also affected by lighting, the resulting brightness value will always be higher that other non-emissive materials, so a workaround is setting the threshold high enough, so only emissive materials are affected. You can also use the Layer Mask option to restrict bloom to emissive objects

How to enable Orthographic Camera support?

To enable support for orthographic camera, locate and edit the file "BeautifyAdvancedParams.cginc" located inside the folder "Beautify/Resources/Shaders".

You will see a self-explanatory configuration file with a global shader define which is commented out by default:

// Uncomment this one to support Orthographic Camera

//#define BEAUTIFY_ORTHO

Is it possible to disable core effects like vibrance, dithering or sharpen?

Yes, they are heavily optimized at the core but you can disable them if you just want to use any other effect (for optimization purposes for example).

To disable the core effects, locate and edit the file "BeautifyAdvancedParams.cginc" located inside the folder "Beautify/Resources/Shaders".

// Comment out this one to disable sharpen, dithering, brightness, contrast and vibrance effects

#define BEAUTIFY_ENABLE_CORE_EFFECTS

Bloom burns/saturates the lights, can I spread it or make it softer?

Yes, in addition to adjusting threshold and intensity, you can try the "Customize" option (in Best Quality mode). This option will allow you to adjust the weight for each one of the 6 HDR bloom layers. Reduce the weight for the first 3 layers. Also try the "Boost" sliders for layers 5 and 6.

Can I provide custom focus distance to Depth Of Field effect?

Yes, use the OnBeforeFocus event of Beautify script to provide your own distance to the camera value for the focal point.

My LUT texture doesn't look good. What LUT formats are supported by Beautify?

Beautify supports LUT textures of 1024x32 or 256x16 where dark colors start on bottom/left area of each subarea:

If your texture doesn't look correct, try flipping it vertically in a graphic editing application like Photoshop or GIMP.

I get compile errors if I disable the VR/XR modules in Unity. How can I solve this?

Edit Beautify.cs and comment the line:
#define VR_MODULE_PRESENT

Support

Please visit kronnect.com for questions, support and more info.

Feedback & Review!

We take a lot of effort to optimize and maintain Beautify. If you like it, please rate or review it on the Asset Store, or send us an email telling your story/project/issues. We'll help asap!