finalRender Stage1-sp1 : fR_image GI engine

■ How could we speak about finalRender Stage1 without speaking about Global Illumination ? Even if Stage1 is a complete renderer on each features, GI is a big one ! besides QMC engine, sure physically correct but so slow, and HyperGI engine which is dedicated to fast animation rendering, the well known fR_image Gi engine allow fast and detailed GI rendering.

I will try here to explain you how it works, and how to use its parameters to get faster result

Attention : this article implies that you **have sp1 installed**.



For those who know the previous Stage0 version, the fR_image engine is a new version of the Stage0 one, with a lot of improvement in terme of flexibility, quality, and speed, specially due to better samples distribution, allowing less rh to be shot for clean result. Setting is also a lot faster, and works in most of the cases.

This engine is dedicated to still images with a fine detailed GI solution, or for flythrough animations, like the Sponza one, rendered in 1min per frame without LOD !

Note : Be sure to turn your ambient light to pure black, as GI generate its own ambient light. Default one is set to 11,11,11 which isn't good, even for standard lighting.

The theory :

Mathematically, your parameters (in stage1 renderer UI) defines where will be placed the samples on the surfaces. These samples will then shot some RH rays (Random Hemisphere) in all directions, and collect informations on the light around (luminosity, color, distance). These informations will then give the samples their luminosity and color value. So, the more samples you have the cleaner the solution will be, the more rh you have, the more detailed solution will be. Let's place the samples where we need them, to keep as less samples as possible to keep fast rendertimes.

The settings :

■ **Bounces** : This parameter limit the number of bounce for the RH rays to limit rendertime. For exteriors, 2 is nice. You can increase it to 3 for interiors, or 4 for closed/unlighted aeras.

■ **RH rays** : RHrays (Random Hemispherique) are the rays shot by the surface samples to collect luminosity and color informations around the sample. You need a minimum of RH to get clean and detailed GI, but keep them as low as possible to speed rendering. SecRH option allow you to specify a lower number of RH rays after the first bounce of the rays. I use in most case 128/64, or 128 (secRH unchecked) for interiors. 64/32 can be good for some exteriors or object rendering.

Densities : These parameters will defines how much samples you will have per surface. You can set it as relative

- finalRender: Global Illumination j	
Sky Light Color 1.0 🖨	None Interview None None Transparency
Global-Illumination ✓ Enable Bounces: 2 ↓ ✓ Color Bleeding (%): 60.0 ↓ Saturation (%): 0.0 ↓ Contrast (%): 0.0 ↓ Contrast Range: 1.0 ↓ HDRI Cover Angle: 250.0 ↓ Engine: finalRender: Image	None Flags Disable Locals Render GI-Caustics Consider Atmospherics Consider Background Consider SSS Multiplier: 1.0 Sec.Multiplier:
Prepass Use PrePass Min: 3 Edge Detection Max: 1 Simulation Settings RH - Rays: 128 Sec. Rays: 64 \$	 Size Ratio: 1/2 Ambient Samples Show Samples in Viewport Show Samples Save Solution to Scene
 ✓ Absolute Resolution Min. Radius 10.0cm Max/Min Ratio: 7 ✓ Solution State 	Lock Solution Lock Solution Load Solution Save Solution
Num. Samples: 0 Location: Memory	
Advanced Simulation Setting Balance (%): 80.0 Curve Balance (%): 55.0 Adaptive Quality (%): 0.0 Color Samples:	Filter Size: 2.5
✓ On Amount: 5.0 🗢	Start: 150.0cm 🖨



or absolut. **Relative** defines the number of samples per surface, which cause hudge problems if you got very big surface and small ones in your scene. On other hand, **absolut** defines the space between samples, and isn't dependent of surface size. That's why I allways use absolut, with radius around 10cm and ratio 7. increase radius for low detailed scenes, and vice versa.

Balances : The two balance params act nearly the same, with plane surfaces and curve surfaces (Curve Balance). They defines the placement of the samples on the surfaces.

A high balance place more samples along intersecting edges (details), and small curvatures for Curve Bal. Personnally, I use mainly 80/55. Increase them when it's not enough.

Filter Size : Because you don't get samples on each pixel of the image (which would take forever to render), you need to blur the values collected by the samples. It is what this parameter do, at the end of the GI calcul process. A higher value will need less RH and be cleaner, but you will lose details. Usually between 2.0 and 3.5.

flythrough Animations : For animations, you can use nearly the same parameters, with secRH unchecked, and reuse checked. Reuse tell to the engine to reuse the samples calculated in previous frames, which speed the process a lot ! Use filter size around 2.0/2.5.

LOD GI: In large/deep scenes, where we have foreground and background separated by large distance, the calcul for samples and rh on the background take a lot of time, for a small total of pixel on the final image, and invisible details.

The LOD function (Level Of Detail) allow us to put less samples on these far surfaces. It act linearly accordingly to Z depth, from start value (distance from camera), and with LOD value strengh. Personnally, I got 3/4 times faster rendertimes with LOD between 4 and 8. On very large landscapes, increase start value and LOD value.

Rmq : The two color pickers, at bottom, defines the color of the samples (default white) and the reflected/refracted samples (default yellow). You see them when turning on prepass or show samples option.

Prepass : Activating the Prepass allow the renderer to do a first pass for geometri/intersections etc detection and place samples more accurately. You can set it from 1/1 to 1/8, which mean one ray per pixel, or 8pixels per ray. The prepass also allow you to see how much samples there are, and where they are placed, which is very helpfull. I allways use prepass, with 1/2 setting in most case, or 1/1 if I need more definition. 1/4 could be use for large landscape (or no prepass at all).

General settings

Whatever the engine you will use (QMC, HGI, fR_i), you have access to basic parameters to tune the GI solution.

■ **Color Bleeding :** This param defines the amount of color interactions between objects in the scene. A high value will produce high color interactions (typical example of the red sphere on white plane), a color bleeding to zero will produce black and white GI, only collecting luminosity values. I use usualy a color bleeding of 60, less in closed colored interiors.

Saturation : Plays on the saturation of the GI solution. I rarely touch this one ,-)

Contrast : Plays on the contrast of the GI solution. You can increase it to dark angles, or decrease it to fill dark aeras in interiors.

Sky Light	
🗸 Color 1.0 💠	None 🔽 🕨
Samples: 16 Quality:	0.0 🗧 🔲 Transparency
Global-Illumination	
💌 Enable Bounces: 2 📮 🗭	✓ None
Color Bleeding (%): 60.0 ↓ Saturation (%): 0.0 ↓ Contrast (%): 0.0 ↓ Contrast Range: 1.0 ↓ HDRI Cover Angle: 250.0 ↓	Flags Disable Locals Render GI-Caustics Consider Atmospherics Consider Background Consider SSS
Engine: finalRender: Image	Multiplier: 1.0 ≑ Sec Multiplier: 1.1 ÷

Contrast Range : This param increase the range of values took into account for contrast affect. Increase it if you got some light multipliers higher than 1.0, or hdr skylight and such "higher than 1.0" effect, and want to use them into contrast effect. I rarely touch this one ,-)

HDRI Cover Angle : It increase the range of values took into account for hdr skylight effect.

Here you are ! You now know near all I kow on fR_image engine and GI ,-) I sincerely hope that this article help you to understand how t works, and how to get faster and cleaner results. It's your turn !