fryrender

physically-based render engine

Scene Optimization Guide

WIP **beta 0.1a.**

1. Get Optimized.

Scene optimization can often be of vital importance for unbiased rendering, where careful callibration of geometry, material settings, cameras and emitters can often be balanced to achieve optimal results with a minimum of sacrifice. The FRY scene optimization guide is an evolving set of points, suggestions and tips which, depending on the scene, may or may not be applicable individually or in their entirety. As FRY is in continual development, some of these points may soon become obsolete, others more relevant; most likely is that the majority will remain as a fixed methodology. As the FRY community continues to grow hopefully this document will grow with it. Any participation, comments and/or suggestions as always are more than welcome for consequent updates.

2. Guidelines.

1). Avoid intersecting geometry emitters at all costs. Obtaining 'physically real' results requires a 'physically real' approach to scene illumination. Avoid intersecting geometry for emitter objects as they will create additional noise and undesired results. Avoid self intersection and coplanar intersection with adjacent objects. Keep it simple, keep it real.

2). Avoid covering emitters (even partially) as much as possible. Covered lights sources (covered luminaires, window blinds etc) create havoc with light paths, so try to keep emitters as 'open' as possible. Doing so can create dramatic increases in scene efficiency and noise reduction.

3). Reduce emitter geometry as much as possible. As a general rule, the fewer the polys on any emitter the better. While it is essential to mimic real world light sources as much as possible, drastic reduction of emitter polys, especially for complex scenes (above all scenes with many reflective and/or glossy materials) can often be essential in keeping render times down.

4). When possible, keep as much distance as possible between emitters and the objects they illuminate. Give emitters space to breath. When too close to the objects they illuminate, they may generate escessive noise, especially when in proximity to reflective surfaces. If you have a neon light fixed to a wall and a rectangular emitter (or cylindrical) for the neon light geometry, remove all emitter faces facing to the wall - significant reductions in noise can be gained.

5). Never let the sum of all material layers for any given material exceed 100. As a default, FRY does not automatically constrain layer weight sums to 100; the total sum can be exceeded. Don't do it (unless you are really sure of the final outcome). Layer efficiency and overall scene efficiency go hand in hand, so, when it doubt, do it simple.

6). Use lambertian materials as much as possible. Excessive reflections can lead to excessive noise, so in order to keep noise factors as low as possible, try to keep roughness values as high as possible. For walls ceilings concrete etc its a good idea to start with a roughness value of 100, and works backwards, keeping an eye on how lowering roughness values affects overall scene noise and rendertimes.

2. Guidelines. - continued

7). Avoid unnecessary high reflectance material settings. Once again, cut down on reflectance values unless you really need them. Metal, plastic and highly reflective details, if not of primary visual importance, should have higher roughness values in order to speed things up. Reflective geometry layers not visible to the camera can in most cases be assigned a material with roughness 100 in order to reduce noise, if they do not contribute signifigantly to the scene in terms of light distribution, caustics, etc...

8). Avoid excessively high bump values. Very high bump values can contribute unwanted noise to a scene. If possible, choose a range of acceptable tollerances (15-65 for example) and try to keep the majority of bump materials within that range, exceeding it only in rare cases when very high bump values are a must.

9). Choose ghost over dielectrics as much as possible. We are all awaiting the day when using massive amounts of dielectrics will be second nature, but in the meantime, due to current unbiased limitations concerning dielectric materials, use ghost dielectrics as much as possible, as they will greatly reduce the amount of noise in your scene. Above all, avoid at all costs covering emitters with dialectric materials (such as glass), as it will vastly increase noise levels, due to the fact that all light passing through the dielectric medium is considered as a caustic.

10). Limit glossy material usage (roughness 20-50). As with bump values, try and find a range of acceptable tollerances with glossy materials (mid range roughness values). Exceed this range only in cases of primary visual importance to the scene.

11). Limit material layers to as few as possible. Creating and using complex layer structured materials often leads to interesting & innovative materials, but for complex scenes keep them simple unless absolutely necessary. Try to keep materials compact , with as few material layers as possible.

12). Don’t use Direct Mode if there are scene caustics and relevant reflections/refractions.
Direct Mode in certain cases can run faster than Full Integration in scenes were there are NO caustics and/or few materials requiring computations involving refrlections and refractions. Using it in a scene WITH caustics will lead to poor results as caustic calculations will not be optimized.

3. Recommended Usage.

Of course, in any given complex scene, it is highly unlikely that using all of the above points could be considered possible, however as a general framework it is a good idea to keep many of these points in mind. In many cases they can lead to substantial gains in calculation efficiency and reduction of noise in a given scene. In the following chapter we can see how the implementation of some of these optimizations can lead to overall scene efficiency and gains in render times.

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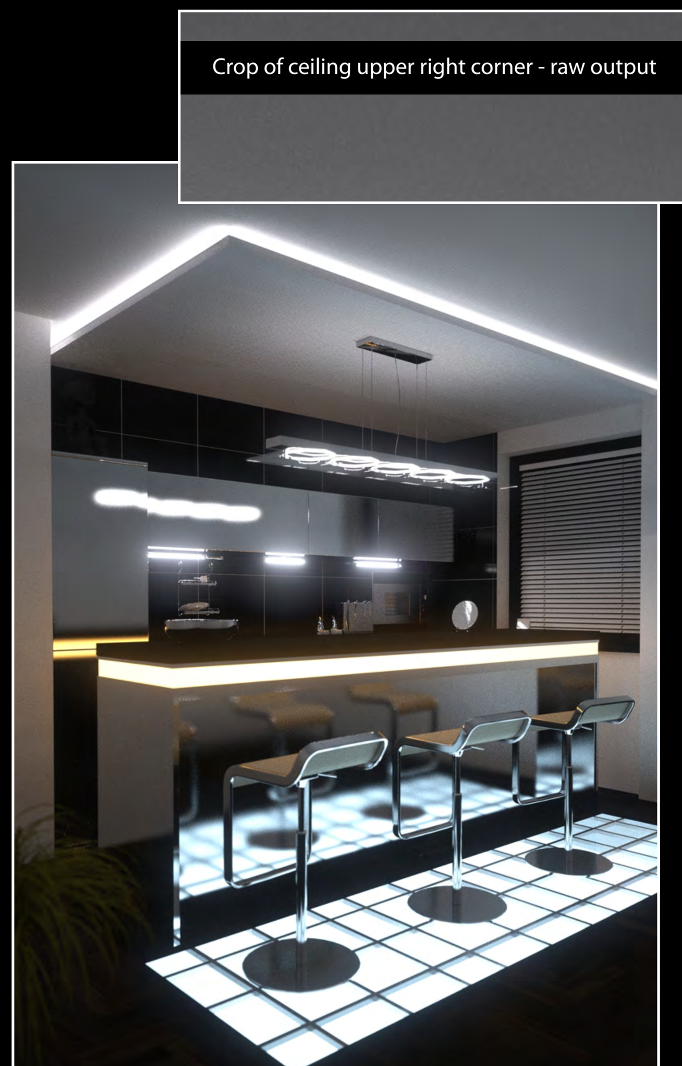
3. Case Study

Scene before optimization: 15 hrs. Dual xeon 2.33 Ghz



Optimised scene: 2 hrs. MacPro Dual Xeon 5160 Dual Core 2.66 GHz

In this case study we will attempt to show how a few scene optimizations can lead to significant speed increases with FRY render. The intent was not to do a 1:1 replica of the original scene nor any type of comparison. Its aim is solely to provide a generalized example of how some of the preceding points can create greater efficiency in certain FRY scenes.

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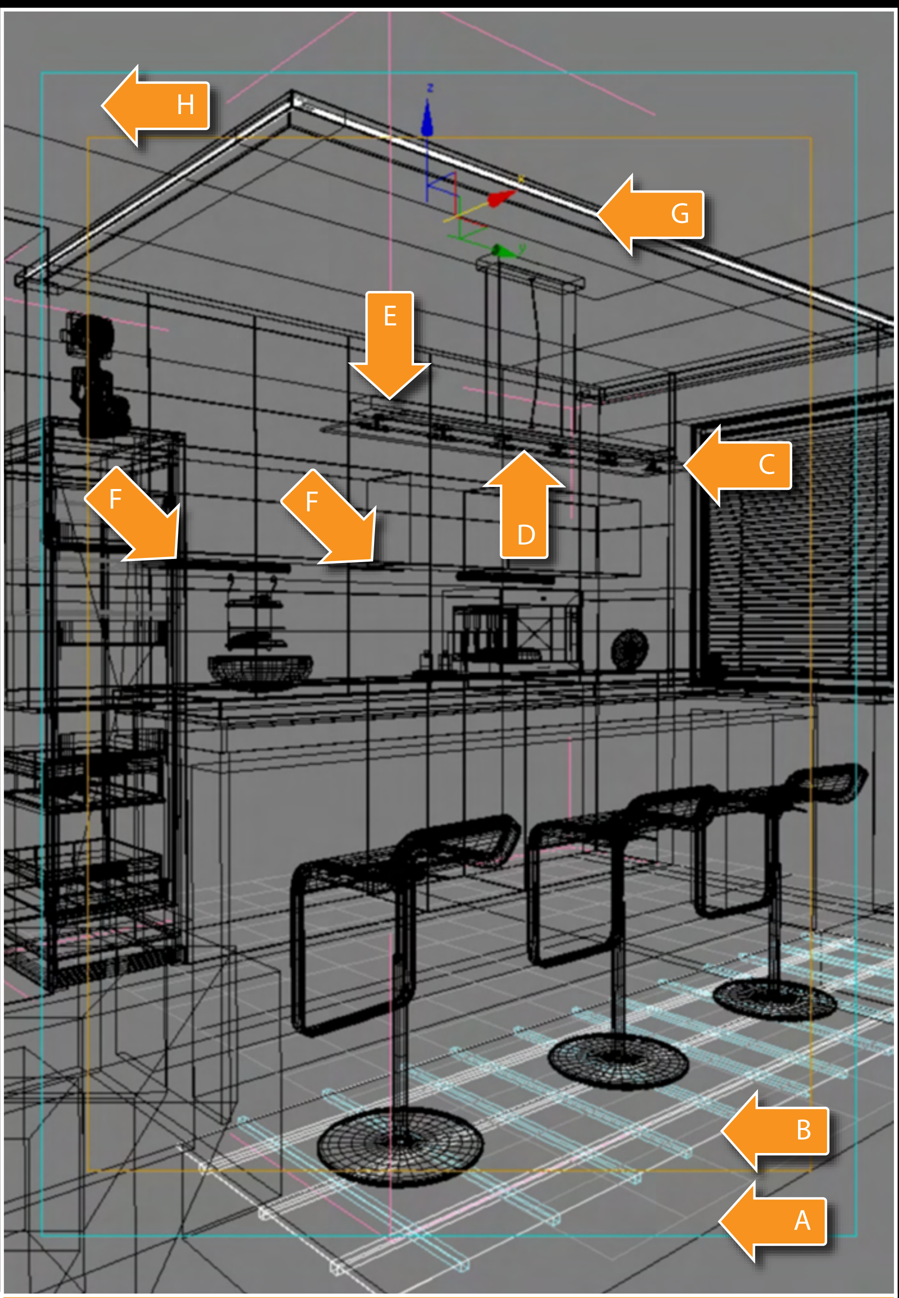
3. Case Study - Optimizations



Optimization List

Optimization List

- A — Reduction of bump value for flooring.
- B — Glass flooring over sunken emitters changed from dielectrics glass material to ghost glass material.
- C — Glass panel under light emitters changed from dielectrics glass to ghost glass material.
- D — Torus emitters redrawn with lower poly count (from 4,320 to 320).
- E — Objects blocking light emitters from above are excluded from GI via FRYRENDER object modifier.
- F — Neon lights fixed to to the wall (or slightly in front) are clipped of all back facing faces (in proximity to the wall)
- G — False ceiling emitter box is removed (as it contains intersecting faces) and is replaced with single poly neon emitter strips
- H — Wall and ceiling surfaces converted to lambertian surfaces with 100% roughness.

Additional optimizations:

adjustment of materials with total layer weight value over 100.

reduction of emitter geometry for all light sources

adjustment/refining of materials

3. Case Study - Optimized Render 2 hrs. MacPro Dual Xeon 5160 Dual Core 2.66 GHz

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3. Case Study - Blending Layers