Kerkythea Rendering System FAQ

Q. What are the system requirements for running Kerkythea?
For running Kerkythea smoothly, it is recommended to have at least 512Mb memory. Rendering complex scenes with high quality photon mapping, may require 1Gb to be quickly accomplished. A 3-button wheel mouse and minimum resolution 1024x768 (32bit color) are also recommended.

Q. What is photon mapping?
Photon mapping is a render method that solves the global illumination problem in two passes. In the first pass, photons are shot from the light sources and stored in the computer memory. Afterwards, in the ray tracing step, the rays shot from the camera "collect" the photons and estimate the perceived brightness.

Q. What is global illumination?
Global illumination refers to the inclusion of complex light interactions between camera, objects and light sources, as opposed to local illumination where the interaction between the objects in the scene is not taken into account. Global illumination includes phenomena like reflections, refractions and diffuse interreflection.

Q. Are there other ways to solving the global illumination problem besides photon mapping?
There are numerous techniques, each one having its pros and cons. Usually, these techniques are divided in two categories: biased and unbiased methods. Photon mapping is a biased method, meaning that the found solution differs from the real one. Unbiased methods, on the other hand, converge to the real solution.

Q. Can you say some examples of such techniques?
Examples of global illumination techniques are photon mapping and light cache falling in biased category, and path tracing, bi-directional path tracing and metropolis light transport falling in the unbiased category. In Kerkythea, all the above techniques are available.

Q. What are the pros and cons of the biased versus unbiased techniques?
Biased techniques are usually much faster, because the estimation happens sporadically and a large part of the image is usually interpolated between these key points. This might lead though to disturbing artifacts known as blotches. Unbiased techniques on the other hand take much longer but they are

guaranteed to solve accurately for all light interactions. The artifacts in their case appear in the form of noise that is decreased over running time.

Q. After I run the application, I don't know what to do next!
Kerkythea is not a completely independent application. It is actually a renderer with staging capabilities. For creating a scene, you will need a modeler (an application to sculpt your objects), from which you have to save a scene in 3ds or obj format, or export it directly to Kerkythea xml format using an appropriate exporter. The first thing to do in Kerkythea, is to open the file with the scene description.

Q. Are there any available exporters?
Yes, there are exporters, currently for SketchUp, Blender and 3dsMax/Gmax. Note that there exists a branched version of Blender with integrated support of Kerkythea renderer.

Q. After loading a file, what should I do next?
Go to Render and press Start. This will bring up a small dialog to select the camera and resolution to render the scene, and a list of preset render settings where you can choose which render technique to use. Pressing Ok will start rendering the scene (observe the progress in the title bar of the application).

Q. And where can I see the rendered image?
The image can be seen in the small preview window at bottom right. This is a preview image, subsampled at 200x200. For the full resolution image, go to Windows and press Rendered Image. There it is! Note though, that some render methods take some time to initialize until they start showing something on your view. After the rendering has finished, press Save to save the image.

Q. How can I scale an object in my scene?
From the View menu, go to Gizmo and check Scale. Now, whenever you click on an object, the scaling gizmo will appear. For uniform scaling, click and drag the origin of the appearing coordinate frame (you can also scale along the other axis from the corresponding axis block). Note that you can also switch between different gizmos by pressing 'G'.

Q. I click on an object but it can not be selected. What's wrong?
First, take a look if there is a rendering or some other process running (during rendering, a small lock appears on the top left of your view and you can not select or move any of your objects). It can also be the case that you are not in selection mode (the mouse cursor button is not checked on the toolbar and thus, the left mouse button performs some movement operation). In such a case, just press Esc to return to selection mode.

Q. I import my scene but some of my objects are not looking smooth. Is there anything I can do inside Kerkythea?

Yes and in fact there are two different smoothing operations that you can perform. The former operation corresponds to smooth shading and is related to having smooth normal vectors in your objects. To achieve that, a parameter that represents the maximum angle between two neighbour faces of your object is used to perform smooth lighting transition between these faces. In Kerkythea, after selecting your object to be smoothed, select and right click it on the models tree view, and Smooth with the appropriate angle (usually an angle of 45 degrees suffices).

Q. And you said something for another smoothing operation?

The latter smoothing operation corresponds to smooth geometry and is related to the density of the wireframe of your objects. In Kerkythea, you can perform a Loop Subdivision (can be found on the tree view, Modeling > Loop Subdivision on your selected objects) where each triangle of your mesh is subdivided in four new triangles (the process can be repeated for further smoothing). It is essential that your mesh objects are modeled properly – one thing you can do for greater safety is to perform a Vertex Welding (can be found on the tree view, Modeling > Vertex Welding on your selected objects) before subdivision. Note though, that there is a trade off between increasing the object density and rendering time – you should be conservative at how many times you perform subdivision on an object.

Q. I render a scene but all I get is a black image. What's wrong?

There may be a lot of different things causing a black image. You should check if there are any available active lights within the scene. Even then, perhaps the camera is in a place where no light can reach it. It also can happen that the light intensity may be too small to lighten the area. Finally take care of the mesh emitters where light may be emitted on the back surface where as, only the front is visible to the camera.

Q. My image takes so long to render, even with low render settings, what am I doing wrong?

There are different factors that can make a render take long time. But one reason comes from using too many mesh lights in your scene. Even if the objects corresponding to mesh emitters are just a few, this can result in many small triangular lights where the contribution of each one of them has to be computed. Thus, if you want to use a mesh light, make sure that your light emitter has a low polygon count. To convert a mesh into an emitter, you do that in the Material Editor (Advanced Tab) where you assign a value greater than 0 to the self luminance color edit box. So, be careful and check if you have given any material

by accident a self luminance value greater then 0, because even a small value of 0.01 will give small light contribution which still has to be computed.

One way to quickly verify the number of light triangles in your scene is at the console log after render initialization where a sentence of the form "Refraction Enhanced DL Estimator: Optimizing area light computation. (cached ? area lights)" appears. You can also recognize the mesh emitters in your scene by the light icon appearing next to them under the Models list (on the left tree view). Note though, that the above argument does not apply to bi-directional path tracing and metropolis light transport render methods.

Q. I have strange shadows and/or light leaking in my image. What am I doing wrong?

If you have shadow problems or light leaking, it is probably due to a bad Photon map. Increase your photons shot to something like "Many – 100000" or "Very Many – 1000000". If you have a "bad quality" Photon map (not sufficient photons), it does not mater how much you increase your Final Gathering settings, it won't lead to a good render. It is always better to increase the Photon map quality (more Photon shooting) and have Final Gathering set to something like "Rays 900 – Very Many" and Accuracy to "Good/Very Good 0.15/1.0". If you want caustics in your image, then you have to use much more Photons like "A Lot –10000000 " or more, depending on your scene.

Another important thing is to use some rules of thumb in the modeling. For example, in modeling a room or building, make sure that your walls, ceiling and floor have some thickness – this effectively prevents light and shadow leaking.

Q. How do I know if my Photon map is good enough?

To see your Photon map you have to change your render method in the Global Illumination panel form "Photon Mapping + Final Gathering (SW)" to "Photon Mapping (Direct + Indirect)". Now, you will see that there are a lot of settings not available anymore because Final Gathering phase is omitted in this case – rendering will be also quicker. The result will not be of high quality, but it is good to find out the quality of your Photon map.

This is very much related to whether you can see "approximately good shadows" in your render (be aware that the image may appear quite irregular – this is because Kerkythea uses a variant of photon mapping where photons are stored on your objects' faces). When you have a good Photon map, return back and use the method "Photon Mapping + Final Gathering (SW)" for your final render.

Q. I have bright random spots in my image. How can I eliminate them?

It is probable that is caused by reflected caustics (produced by shiny surfaces like mirrors, water metal, etc.). To avoid them, you have to increase the caustic density count to something around 1000 photons (this depends on your scene

and may need a few trials until a sufficiently large number is set without over blurring the rendered image).

Q. I have clouds/blotches in my final image. How can I eliminate them?
If you have some kind of soft clouds or blotches, then increase the Rays in Final Gathering. Increasing the number of Rays ensures that the estimation at each gathering point is more accurate and thus, the blotchy "waving" is reduced.

Q. I have jagged edges, how can I get nice clean edges?
For that, you have to go to Render Setup and in the ray trace panel use "Production AA" as Antialiasing Method. In such case, an Antialiasing Threshold of 0.3 usually suffices to eliminate the jagged edges of your image.

Q. I see that with Render Setup, I can configure standard Ray Tracing and Photon Mapping. How do I switch to other methods?
The other methods are mainly unbiased and as such their parameterization is minimal and can be done via Advanced Settings. The easiest way to incorporate them though, is through the render dialog where after selecting the corresponding Render Settings you can press Apply to make the settings permanent (or of course just Ok to render next with them).

Q. When I start playing with Exposure and Gamma or other tone mapping after my render has finished I observe that antialiasing or/and smooth shading are not so good anymore.
The tone mapping settings are there for convenience in order to quickly find the proper lighting conditions. During rendering initialization, the antialiasing and irradiance interpolation are "calibrated" based on your initial tone mapping settings for best quality/speed performance. This means that changing for example the exposure or the gamma correction can only be taken into account in next render. Even more, best quality is achieved by changing the lights' power rather than the exposure (which if possible should be left to 1) because this is fully "integrated" in the rendering process.

Q. Which unbiased technique implemented in Kerkythea is the best?
Admittedly, there is no such thing (yet) as a unique unbiased technique that is optimal for all lighting situations. Each unbiased technique can prove to be the best under certain geometrical, material and light properties. As a rule of thumb though, path tracing is usually the fastest when rendering landscapes, bi-directional path tracing is usually faster in interiors comprising soft area lighting and metropolis light transport is usually faster in rendering difficult indirect/caustic lighting. Thus, depending on your geometry and lighting, you should choose the most appropriate method.

Q. Any other suggestion how to further avoid blotches in photon mapping or fireflies (white dots) appearing in unbiased renders?

We have observed that a big number of blotches/fireflies comes from the material reflectance description itself. If energy conservation is not kept in reflectance description, this results in an unrealistic material that reflects more light than it receives and it "sends" blotches/fireflies to your objects in the scene. Being more careful in materials description (in the simple non-textured case, the color weights of your various components like diffuse, specular, etc. should sum less than 1) will not only reduce/eliminate blotches but also result in a more realistic render.

Q. Finally, out of curiosity, what does the word "Kerkythea" mean?

Nothing! It is just an invention. Being unique word though has its advantages – you can not mistake its "meaning" for something else! ☺