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The following pages includes some random thoughts and tips on lighting in trueSpace (several aspects apply universally) and more updates (possibly with images to illustrate points) will come in the future. Current topics covered include: light color, setting up a light system, lighting and texture mapping, raytracing vs. shadow mapping, infinite/local/spotlights and negative lights.

Lighting is an important artistic aspect of 3D graphics, one that is not easily mastered. The purpose of lighting is not entirely limited to achieving realism. Rather, lighting can reflect the mood and story of your scene.

Infinite Lights

Infinite lights are more suited for outside scenes due to their even fill light and directional capabilities. Ideal for simulating the sun...

If you're trying to set a very moody atmosphere, particularly for an indoor environment, infinite lights 'wash away' the rest of your lighting system and generally should be avoided, particularly if you're aiming for stark lighting and shadows.

Once your main light(s) are set, infinite lights can work well, usually better than local lights as fill lights.

Using infinite lights as fill lights, a common practice, you'll find it useful to occasionally have them set so they don't cast shadows.

Spotlights

Spotlights are probably the best lights to use in trueSpace 1 through 3. Their defined scope and focused results make it easier to control these lights and gain exact results to your liking. A multitude of spotlights can create realistic looking light without the distinctive 'spotlight'.

An arch or line of spotlights with diminishing intensity falloff from the center spotlight can be highly effective when creating light flooding through a doorway or window, or recreating the sun, etc. This type of effect is also possible with local lights, but spotlights are easier to use when attempting to gain this result and there is a less likely chance of flaws occurring in the render.

In animation, spotlights are also the most ideal if you have a "moody" setting or have lit an object in a certain fashion which you wish to retain throughout the animation, since the spotlights will have little impact on the rest of the scene.

Control over the spotlight aperture is a great bonus, allowing you to have softer shadows around the edges.

The downfall with spotlights is that you may find tweaking frequently necessary and the use of several spotlights to detract from the "defined spotlight" look, which increases rendering time. Maintaining a low level intensity for the spotlights in this situation is beneficial.

Spotlights are great for use in 3D lamp objects as is

often seen in 3D rendered images. However in reality, light often spills out around the side, not just straight down as exhibited with spotlights in trueSpace. To simulate this effect, pair the spotlight with a local light and adjust each as need be. Scaling the spotlight can also help to a certain extent.

Local Lights

Local lights replicate light in 3D perhaps more as we recognize lights in reality, more so than the other two lights in trueSpace, and are highly useful.

Beware though, in large numbers in a complex scene where local lights are spread apart, they can be particularly difficult to accurately control and fine tune, especially if used primarily and in these cases rendering errors (usually strange shadow streaks) are more prone to appear.

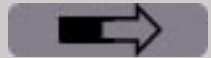
Carefully positioned local lights (with a few bunched together in groups) within a scene, behind certain objects, can create a great myriad of distinct and subtle shadows.

Because of a local lights area of influence, the surrounding environment, even what isn't visible in the rendered image can be more important than with other lights. With a carefully designed surrounding environment not apparent to the viewer you can shape the effect a local light has through the rest of the scene to a great degree.

Shadows produced by local lights are often better using

high quality shadow maps over raytraced shadows, as long as the shadow map integrity holds.

In reality, light bounces off objects and illuminates other objects, something which is simulated with radiosity, not raytracing. You can to some degree simulate this with local lights by using asquared falloff and minimal light intensity. Unfortunately the lack of precision with the RPlus rendering engine complicates matters, since you really need to be able to specifically control the falloff numerically and local lights give of too distinct highlight when close to other objects with no option to disable light specularity which you don't want when trying to simulate radiosity.



Light Color

Light color is a vital aspect for depicting the type of environment, time (time of day, month, year or even the period), and mood for a scene. The color of lights you use can do more than just simulate reality. Rather help create a more dramatic mood that reveals or reflects the subject matter of your scene more closely. For example, lighting with a clear blue hue can be perceived as mysterious and perhaps even give the viewer a sense of danger, as seen on television shows such as the X-Files. A mixture of yellow/orange/red light colors can give a great sense of warmth and highlight a safe place. A more red hue can represent danger as we see in everyday life.

White is the most often used of light colors in 3D graphics, but a subtle shade of another color, a slight yellow light color works well for an outdoor scene on a cloudy day, where as a subtle light blue hue can be ideal for night.

Do not however discount using white light. White light can often highlight the artificiality of urban environment and give a cold feeling as seen on television series such as EZ Streets from a couple of seasons back or even some shots from episodes of the first season of Millenium.

In addition, white light can produce a great stark look, provide a great contrast between 'warmer' lighting and this contrast of light colors should always be considered.

The colors of objects in the scene in contrast to the light color you choose can also play an important role. For example, a great deal of distinct black or even white object colors highlighted with white lights (a specular bloom effect could be good here, check the misc. tips page on how to do this) with some strong interspersed yellow/orange lights (try not to conflict the two light colors too much) can provide an unsettling effect or possibly a dreamlike feel...

Raytracing vs. Shadow Mapping

Raytracing provides highly defined shadows which can often look fake, though the quality of the shadows are good and usually a little better than lights with generated shadow maps. While raytracing a scene you can also set lights to cast shadow maps instead and mix lights with raytraced and shadow map generated shadows, which can often be useful.

The highly defined shadows produced by raytracing can be partially alleviated by using an old 3D graphic trick, light arrays or light spokes where a considerable bunch of the same light types are packed together and create softer shadows. The Light fX plug-in in CoolPowers 2 for trueSpace 3 allows you to do this automatically.

Shadow maps for casting shadows often creates softer more realistic shadows. The downfall is that even high quality shadow maps can become pixelized and look awful, sometimes the right texture can hide this somewhat. A slight change in the position of the light as well as the camera's position can help to fix this

problem. If there's no reflection & refraction in your scene, a scanline rendering with shadow mapped lights can be a lot faster and the result just as good, if not better with softer shadows, and without taking even more speed hit for a raytraced light array. (As an example, the image Drowned in Sorrow in the gallery is a scanline render with shadow mapped lights.)

Decide early on if you'll be raytracing or scanline rendering your scene since if you change during the rendering, you'll need to overhaul your lighting systems with the differences raytracing and shadow mapped lights can have...

Setting up a Light System

If you're aiming for a moody and/or high contrast scene I suggest deleting all lights in the scene before you start setting up your lighting system, particularly if you're using one of the default trueSpace light systems which include infinite lights.

If your scene has obvious light sources or areas where light could be present (eg, the sun is visible in the side, you're representing daytime and a window without curtains is present, etc) this is a great place to start. You may even want to setup your scene with obvious light sources positioned in a way that is beneficial to setting the mood of the scene. This is even considered in the design of some places in reality such as some bars.

A quick way to get a lighting system started is to place three or four of the same type of lights in a triangular

or quad formation respectively around the scene and then adjust as you go along later.

While lighting always consider the traditional three point basic Hollywood system. A light(s) act as the key lights which highlight the center piece object of the scene or whatever is important and where lights should realistically be. After this is set add in a fill light(s) which basically controls the contrast of the scene and the starkness of shadows. Finally add a backlight(s) to separate the important subject of the scene from the background. This is a great method for highlighting the subject of your scene, specifically if the subject is a character, creature, animal, etc. Add any other lights which should be present such as those in lamps, etc. A base light for bright internal scenes or large external scenes can be thrown in and basically acts as a fill light for the scene instead of the scene's subject. There are several specific systems involving this method for light placement, intensity and falloff settings according to the time of day, mood your aiming for and how you want to highlight the subject of your scene. Pick up a good book on cinematography to learn more about this lighting system used for film and television.

Beginning with a few lights and then expanding with this light system can be good, as I especially recommend it when focused characters or creatures are in the scene. Furthermore once you know how various scene or character moods, time of day, etc. can be implemented with specific types of this light system, giving great results fairly fast. Othertimes, for various reasons, you may just prefer to 'wing' it, putting lights into the obvious positions and then expanding to improve the look and mood you want accordingly.

However it's always good to consider the three point light system and how it relates to what you have. You might just come up with a way to improve what you have.

Negative Lights

Local lights are usually the most useful as negative lights (setting the intensity numerically with a negative sign before the numerical value) and can really cast areas of a scene in darkness if other lights are effecting that part of the scene. To darken a specific area such as a corner of a room with a spotlight, without effecting other areas you don't want too, can be more difficult and most likely more time consuming to get the desired effect. By scaling the spotlight and moving it around (helpful to use view from object for this) and since it emanates light from one direction, you may prefer the better control in some cases. Negative lights in tS can really help to bring out shadows, particularly important if the shot is for print, where the often need for added brightness can diminish the effect of shadows to some extent.

Lighting and Texture Mapping

Materials, texture maps and lighting influence each other alot. A brightly colored texture in a dark environment will stick out like a sore thumb unless it appears to match the lighting within the scene. This often means matching the material and texture to the lighting by manipulating the material's shininess, ambience and roughness or even experimenting with the brightness/contrast of the texture map.

Lighting is also important in bringing out the detail of a texture or hiding some of its details when necessary. Due to this, lighting and texturing your scene at the same time is beneficial.

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