Oso Toon Shader

By default the Oso Toon Shader has most of the same elements of standard Iray Uber Shader, that it is based on.
However, there are some additional functions that allow OTS to do some dramatic new things.

But why do these multiple steps?

In a conventional art filter, the program has no way of understanding that a dark stripe on the figure is different from the dark shadow behind the figure. Any attempt to generate outlines and sketches hits this problem, and you end up with lines following contours that make no sense to the viewer, that look very unnatural.
The approach here is to separate out a few important characteristics of a render, and then allow you to easily tweak and recombine them. The result are outlines that actually follow figures, lines that make sense, and colors that don't muddle into weird artifacts.

A 3-step process is laid out to create artistic renders, but there are many other possibilities. For a simple line render, for example, you can skip step 1. In other cases you might want a regular render and then use a flat color pass to provide a simple and quick form of ambient lighting.

The step instructions are also listed in the Oso Toon shader presets; mouse over for instructions on each step.

Step 1: Flat Color

When creating sketch-like images, it's useful to separate the base color from shading, so shading can be altered directly.
The flat color pass results in an image that has no lighting, just pure color.

- Set Render Settings/Optimization/Max Path Length to 1
- Select all objects (in Scene pane, right-click, Expand> Expand All, ctrl-A to select all)
- Select all surfaces (in Surfaces pane, ctrl-A to select all)
- Apply Oso Toon Shader (if you haven't already)
- Emission Type? to Base Color
- Switch off all lighting
- Render

This render should process pretty quickly; once the image shows up, it only needs a few iterations to be good enough.

Note that for solid objects, you are better off with Two-Sided Light being Off, to save rendering time. But for flat transmapped surfaces, such as leaves, you will want Two-Sided Light On.

Step 2: MaterialID

This step uses materialID in much the same way as Flat Color. This image can then be taken into Photoshop, GIMP, or another image editor and used to create outlines, or as a masking template to work on specific parts of the image.

- Set Render Settings/Optimization/Max Path Length to 1
- Select all objects (in Scene pane, right-click, Expand> Expand All, ctrl-A to select all)
- Select all surfaces (in Surfaces pane, ctrl-A to select all)
- Emission Type? to MaterialID
- Switch off all lighting
- Render

This render is fast. The output can be processed into an outline. Consider rendering at double or quadruple target size, or expanding the image before filtering to get edge lines. This will help make thin, precise lines.
In Photoshop, apply the Filter/Stylize/Find Edges. Then convert to black and white.
In GIMP, apply Filters/Edge-Detect/Sobel. Then convert to black and white.

MaterialID can be a bit annoying to set by hand on a large scene, so three scripts have been provided to help assign them (with thanks to djigneo, who coded the original forms; check out LineRender9000, it's a very powerful way to do artistic renders and was a big inspiration for this)

Random MatID: Any object/surface selected will all be assigned one random material ID color.

MatID to Each Object: Each object selected will be assigned a different random material ID color.

**MatID to Each Surface:** Every surface selected will be assigned a different random material ID color.

There isn't a simple way to lay out materialIDs, just guidelines; wherever colors are different, an outline filter will draw a line. So for a human figure, you want all the skin to be one materialID, while nails, sclera, and other details might be better off with different colors,

assuming you want outlines around them.

  With a complex building or machinery, setting every surface a different color might be best, but you need to notice when two surfaces should be part of a contiguous shape. Road surfaces, for example, might have divisions between sections.
  In some cases it may be easiest to go to a specific surface, copy the MaterialID and then paste it to other surfaces.

  The line intensity depends on the difference of colors, which is extremely difficult to control. Instead, use Levels or Threshold to adjust the lines to the same rough intensity, then soften with some form of blur. Again, rendering large works nicely to give you 'room' to manipulate the image.
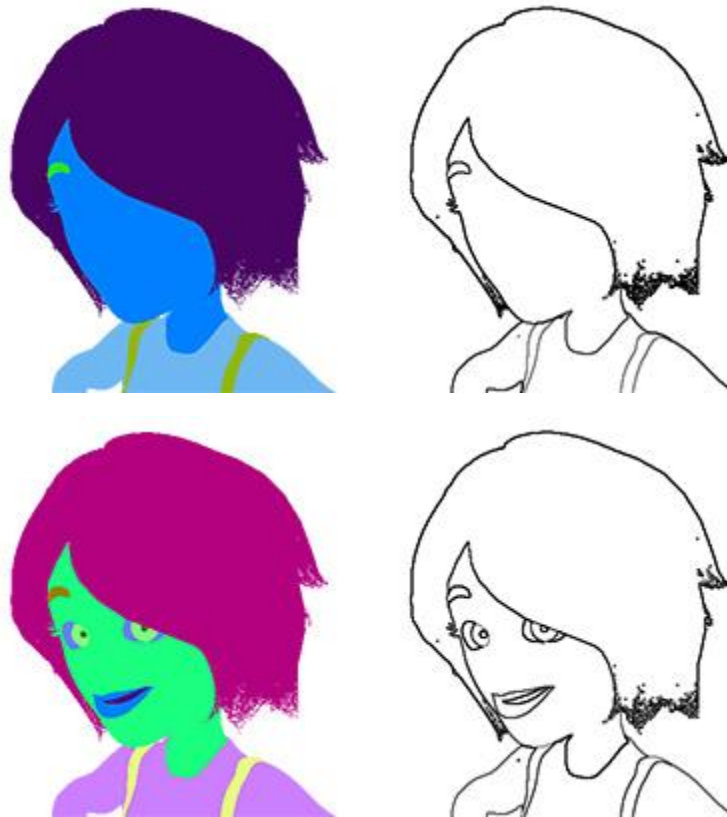
Step 3: Shading

One of the simplest renders, just lighting and white surfaces, the shading pass provides a critical element to creating artistic renders.

By manipulating a shading pass into simple shading, artistic filters, and similar, and then combining with the other passes, you can create effects ranging from sketches, anime, ink diagrams, and more.

Both Photoshop and GIMP have art filters included which can create cool shading effects. FilterForge and FotoSketcher are other good options.

Note that if parts of the render look strangely dark/black, particularly around eyes or hair, it's a sign that Max Path Length is too low. If you aren't happy with the result, bump up Max Path Length and check again.

- Set Render Settings/Optimization/Max Path Length to 2 (possibly higher)
- Select all objects (in Scene pane, right-click, Expand> Expand All, ctrl-A to select all)
- Select all surfaces (in Surfaces pane, ctrl-A to select all)
- For most rounded, organic figures, set Base Color Type? to Alternate Base Color
  - Set line balance to ~.5 (may want to play with this)
  - For a very strong line effect, set backscatter weight and roughness to 1
- For rigid, flat shapes (tables, cubes), set Base Color Type? to Edge Lines
  - Set Edge Line Width to .06 (adjust to taste)
  - Edge Line Bleed Across Materials to On
  - If lines too blurry, increase Edge Line Sharp
  - Curves will look off with edge lines; higher subd might help
  - Smooth values may also help or hinder, toggle it to see if there's improvement
- Emission Type? to Emission Color
- Use desired lighting
- Render

Note that the two line effects can be skipped for a simple shaded look. Otherwise they can help create interior sketchy lines, particularly combined with an art filter.

Shading converted to 2 tone, FilterForge Crayon Master v2, FilterForge Crosshatch Drawing

Combining Passes

The real power of Oso Toon is in combining the results to create an artistic effect.

The core of most good artistic renders is how the Shading pass is filtered. There are many different options, and it's worth taking a shading render and playing around to find something that looks right.

For fun line or pencil style art, combine shading with outlines. Outlines help strengthen edges that can blur or disappear with the results of a filter. A default outline is probably too dark and pixelated to work well with a shading pass, so a little blur (Gaussian blur of .5 to 1) and lower Opacity will help it blend in nicely with the next layer.

A **two tone** shading effect helps create a style similar to anime, particularly if you are careful to light scenes from the side.

Take a shading pass, use Threshold and find a good black/white look that highlights features nicely. Using Levels, adjust output up to 128 (IE: create gray and white image).

Then place this over a flat color pass with Multiply or Soft Light.

Sometimes you can get a good look by multiple instances of a shading layer. For example, a combination of Shading Multiply 50% Opacity and Shading Soft Light 100% can add some good light and shadow along with bringing out good colors.

When **combining flat color with shading pass**, it may require brightening a bit. But be careful, brightening can wash out or change colors; a mix of vibrance and brightness should be juggled carefully to maintain strong colors.

Another way of doing two tone is two tone multiplied over color, and then another two tone on top with less white set to Linear Dodge (add) set to about 40% Opacity; this creates a brighter highlight.

Flat Color can be used as a form of ambient lighting. Simply place it as a layer over a regular render, then set opacity to a low value and adjust until you get the look you want.

Max Path Length

One critical part to all the steps is Max Path Length. This parameter controls how many bounces light sources are calculated making, in a render. By default, it is set to -1, which means 'unlimited' (although there is a much larger internal limit).

Max Path Length can be set in Render Settings tab (usually in the left side pane toward the bottom), under Optimization.

Setting Max Path Length to a small value, like 3 or 4, will result in a faster render. If it is set too low, you will note that refractive and transparent surfaces may turn black; the light has hit its bounce limit and just fails to pass through.

For step 1 and 2, Max Path Length is set to 1. In these modes, the surfaces are set to emit light. A MPL of 1 ensures that the light is only registered when it comes to the camera, with no bounce/spill of light at all. This creates a simple, flat appearance with no lighting.

For step 3, some shading is needed and the info tips suggest a MPL of 2. This will work in most scenes, but a value of 3 or 4 may work better if you want a softer shading.

New Parameters

Base Color Type?

This changes what base color is used in rendering the surface. The options are Base Color (or normal appearance), Alternate Base Color (often white or some other simple color), or Edge Lines (an advanced effect that creates black lines along sharp angles in the geometry).

Emission Type?

Which color is used for emissive surfaces. Options are Emission Color (default, uses default luminance settings), Base Color (use base color as emission color, use Alternate Luminance), and MaterialID (use materialID as emission color, use Alternate Luminance).

Alternate Base Color

Simple alternate color, useful for a quick switch to do colorless shading passes.

Alternate Luminance

A different luminance value than normal. This is useful when switching from normal surface

behavior to Base Color/MaterialID emission renders. By default, it is set to 40000. This value works for the default Luminance Units of cd/m^2. If the unit is different (such as if the base surface emits light), the value may need to change.

   If Base Color/MaterialID passes are too dim or bright/washed out, consider adjusting the Alternate Luminance higher or lower to get the even look you want. Base Color can sometimes stand out as very dark or light, so some compensation to get even color might be a good idea.

Line Fill Color

   Useful in Shading passes, this is set to white and should generally be untouched. Changing it will add to the base color.

Line Edge Color

   Also for Shading passes, this creates a color effect along the glancing edges of an object. Should be left at default black.

Line Balance

   Determines how much line edge color bleeds from the edges. Values above 1 (10 is default) essentially eliminates the effect. A value of .5 or so adds darkening along the edges.

   For a very strong line effect, set Backscattering Weight and Roughness to 1. This works best for very even, diffuse lighting; strong lights can create distracting shimmer.

Edge Line Width

   When Base Color Type? is set to Edge Lines, Edge Line parameters come into play. Edge Line Width is simple: how big the edge line effect is. For most objects, a value of .06 is about right.

Edge Line Bleed Across Materials

   Whether the edge line effect uses neighboring surfaces in calculating lines. Leave On in most cases.

Edge Line Sharp

   'Tightens' the spread of edge lines.

Additional notes

   Setting Emission Type to MaterialID or Base Color will overwhelm any regular base color effect. Because of this, if you want to do a MaterialID or Flat Color pass after setting edge lines and other details for a shading pass, you don't have to touch the base color type; just set up the emission type, max path length to 1, and shut off lighting.

   Hair ends can sometimes look overly dark in outlining. One possible fix is to increase Cutout Opacity of hair so that the hair is essentially made black and white with no gray.

   The materialID scripts are good for a first pass, but once you apply them it's a good idea to set viewport to NVIDIA and start tweaking colors. While it's difficult to control how separated colors will be, moving colors that blend together too much to different hues or intensities help.