

Using LightWave's Motion Blur to Achieve a Hand Drawn Line Effect:



Cellshader, Unreal, and the use of gradients along with other plugins have given us some great cell painted cartoon and comic book effects, but there isn't anything for LightWave that gives us a hand drawn look simply and easily. This mini-tutorial explores using motion blur (specifically the PLD form used in 8.2) to achieve a more natural medium look. It should be noted that much can be done with this technique but that this tutorial is aimed mainly at getting you started.

Understanding Motion Blur:

If you already understand how LightWave's motion blur works then please skip ahead to the next part of the tutorial (**Adding Moving, Oscillating Displacement:**).

To use this sketch line technique it is first important that you understand some of the basics of how LightWave's motion blur works. Three main factors will determine the look of the motion blurred object- the speed of the object, the level of AA used, and the blur length.

Look at the first two images with the red box. Each one uses the exact same level of PLD, or AA passes, the only difference is in the blur length (5% and 100% respectively).

The AA level or PLD controls the number of samples (renders of the moving object), and Blur Length Controls the distance of the sample spacing between frames (the streak length).



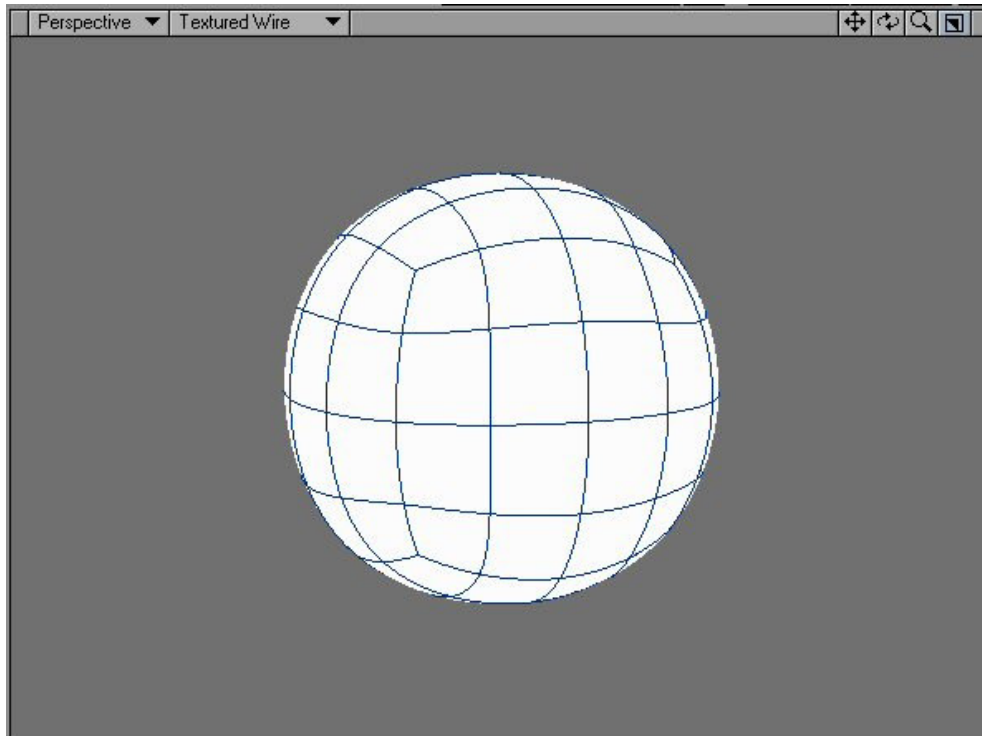
The first image has a much smoother blur than the second due to the fact that the blur length is small, which makes the overlap of samples closer. The second is spread way out and the samples are spaced greatly.



Now look at the third image with the red box. You'll notice that there is a much smoother streak now. That's because we upped the samples to "fill in the holes."

Why is this important? Well, the sketch line technique uses these factors to a great degree as moving displacement combined with gradients and/or LightWave's Object edges are what enable us to use motion blur to create a more natural look. A mid-sized, thin line, being created by a little displacement will normally need fewer levels of PLD to look smooth/smear while a larger line that is greatly displaced will need more samples to look correct. Keep in mind that these are general rules, and that you might need to depart from it to get the "right" look you are going for. Still this is where we start!

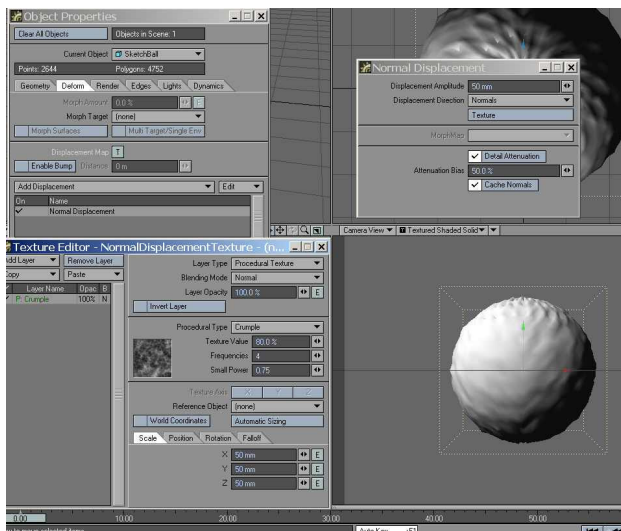
Step One: The Object



Just so we're all on the same page let's start with making an exciting model in modeler- a sub patched sphere!

In modeler use Shift-x and then press "n" to bring up the numeric panel options for a Box. Make it have a Height, Width, and Depth of 1m. Close the numeric options panel and press the space bar to drop the tool. Now hit Shift-d and Subdivide the Polygons using metaform two times. Press "q" to bring up the Change Surface panel. Name the new surface Sketch Ball (how ingenious) and make it white with the Smoothing option checked. Now save your object as SketchBall and send it over to Layout.

Adding Moving, Oscillating Displacement:



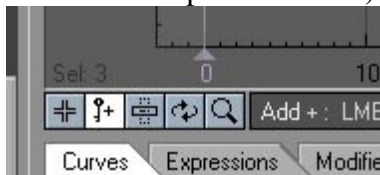
Now that we're in Layout lets start by adding some normal displacement to the object. Select the Object and press "p" to bring up the object properties panel. Select the Deform Tab and then using the Add Displacement dropdown select Normal Displacement. Double-click on Normal Displacement to display its properties panel and select the Texture button. Under the Layer Type dropdown select Procedural Textures.

By now your object has turned into a giant puffed cloud of polygonal mess. No worry. Go back to the Normal Displacement panel and lower the Displacement Amplitude to 80mm. Now go back into the Normal Displacement Texture Panel and change your Procedural Type to Crumple (different procedurals will give you different effects, but crumple and crust are the ones I use the most). Change the size to 50mm for X, Y and Z.

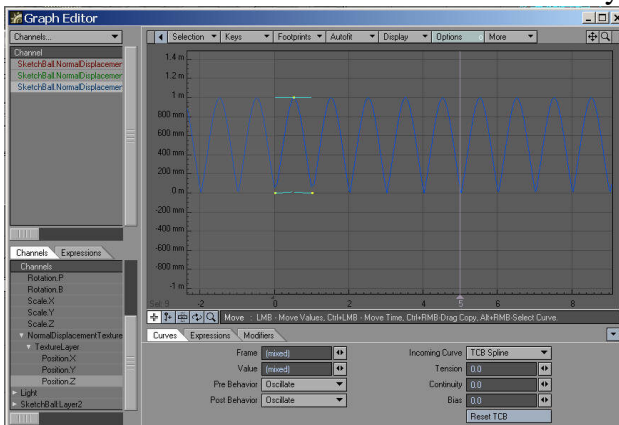
Let's animate the displacement so as to give us a blur, but to also make it so that only moving objects will be redrawn. Without this step we would have every frame redrawn differently, creating a crawling line.

To get started we first need to change our general options (press "o") to fractional frames so that we can key frames between 0 and 1. Next go back to the Position tab of the texture and press the "E" button to gain access to the graph editor envelopes for the X, Y, and Z position. Now the graph editor, home of all that is wicked and cool, pops up with the X, Y, and Z channels on the left and shows the envelope for the axis we clicked on in the main window. We want to select the X, Y and Z channels to save some time so select the X channel and then, holding shift, select the last channel which is Z. We now have them all at our attention.

Now to set some key frames. Click the add key frames button (it's located just above the Curves and Expressions tabs).



Now click somewhere on the line to create a key frame. Change the frame number to .5 and the value to 1m. Now create another frame the same way as before, but give it a frame number of 1 and a value of zero. *Save your work now!*



Here is what makes it all happen, or in terms of line crawl not happen. Select all of the key frames by dragging the right mouse button over them to form a selection window and then change the Pre and Post Behaviors to oscillate. Why did we do this? By creating an oscillation of the displacement that reaches the same spot at every whole frame we have nullified the crawl that would happen otherwise. Now as long as the object is not moving it will look the same on frame 1 as it does on 10000001, 5 or 403. Even if you move it from frame 0 to frame 20 it will then look the same from frame 20 to any other frame!

(On a side note: if you want to tweak things with your lines then look no further than messing with the values in the graph editor. The difference between a few points with a linear transition step and those with a smooth TCB curve can give subtle but noticeable changes in line quality as can the values which will affect the rate of change and thus the blur.)

Setting up the Surface, Edge lines, Backdrop and Camera settings:

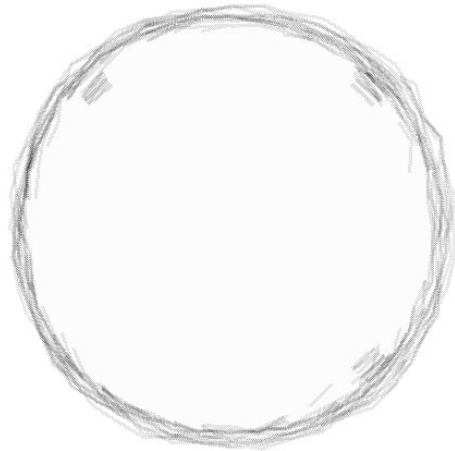
Close all of the open panels and press “F5” to open up the surface panel. Change the Sketch Ball surface’s luminosity up to 100 and the diffuse to 0. We do this so that we’ll only be looking and dealing with the lines and not the surface blur during motion blur. It’s also a fast way to get a pencil on paper look.

Select your object and press “p” to open the Object Properties panel again and select the Edges tab. Click on Silhouette Edges and give it a value of 2. (If we had more surfaces on our sphere etc. we might select more edges, but for our Sketch Ball this will do.)
Save your work!

Now hit ctrl-F5 to bring up the Backdrop panel. Here change the background color to white.

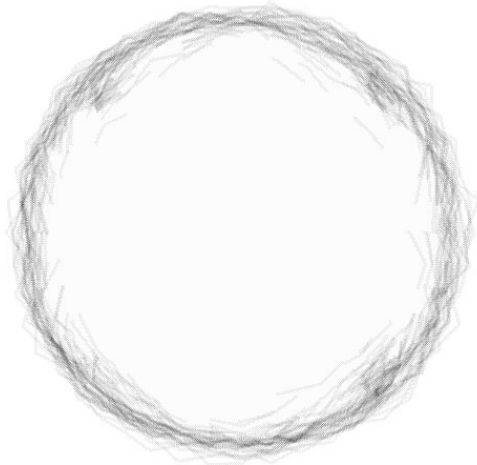
Exit the Backdrop panel, select your camera and hit “p” (BTW- you can use Shift-c to select Cameras and Shift-o to select objects etc. and then the arrow keys to cycle through them). Under AA select PLD 5, and change your Reconstruction filter to Mitchell (soft). Change your motion blur to Dithered and leave the blur length at 50%. *Save your work!*

Hit F9.



As you can see we have the beginnings of a sketchy line drawn sphere. Let's experiment with getting a slightly more sketchy line by upping the Normal Displacement Value to 100mm and changing our PLD to 7.

Hit F9.



Now that's looking a little more sketchy.

Things To Try Out:

Try adding a very small crumple bump map to the surface to simulate the texture of paper. A good way to start is by simply copying the texture you used as a Normal Displacement and putting it in the bump channel of your surface. Play with the bump channel level to get different paper effects or a more grainy line or so smoother shade. This is a great way to get a shaded drawing effect. Don't forget about bump maps and enabling bump displacement under the Deformation tab either.

You might also try and add a light angle controlled gradient to control something like color and/or illumination. Using Super Cel Shader can give nice values and more control over the look of your paper and your lines.

Experiment with thicker lines and higher displacement for looks like Sumi ink or charcoal. What does changing the blur length and/or the PLD level do to this? How about a little DOF?

Try changing the size of the displacement procedural to see what the effects are on your line. Higher values done right will give a more wobbly smeared line while smaller values with higher displacement can get very sketchy and start looking like someone who hasn't taken their medication was drawing. To control the jitter level of the displacement better with objects that have different mesh density try using weight maps and gradients to control multiple sized procedurals. Try changing the objects Subdivision Order to last.

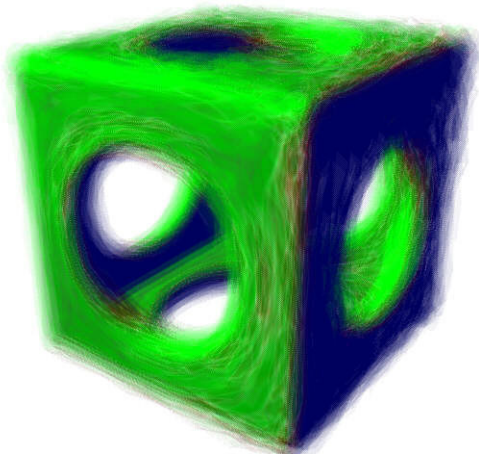
For a more controlled shade and a more messy line try making two copies of the same object. Make the one that will have the lines a little larger, transparent, and give it the displacement. Make the other one have the shading. What happens if you flip the normals line object version and turn it's transparency off?

Try using a color gradient controlled by a bump map...

Try rotating the displacement instead of moving its position.

For a more controlled crawling line try making your oscillation occur out of phase by shifting your position key frames on the displacement procedurals position from 1 to 1.01 or some other fractional frame that is slightly greater/lesser than one.

The Next Step:



The next tutorial will cover the fuzzier ground of painterly and non-graphite medium based effects (colored pencil, oil pastels, oils etc.). Thanks for reading my tutorial and please share your findings with us on the Lightwave3d.com discussion board as this technique evolves and changes.

Thanks,

Gideon (aka wacom)

(For future updates visit <http://www.geocities.com/gbreazeal/3rdeyemonkey.html>)