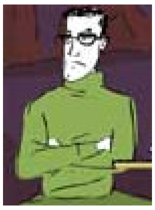
Modeling 2D characters using XSI

For the past couple of years now, my company has specialized in using 3D software to recreate the look of 2D animated characters. Even though there are a lot of toon shading type solutions out on the market, our approach has always been to create the character as flat animated characters and use the 2D medium to its fullest advantage. If you look at old Hanna Barbera cartoons, the 2D characters exist in such a way, that they could never be constructed in 3D without losing something in the conversion. It is impossible to stay on model with 3D representations of these characters, because the artists take many liberties when creating the variety of poses and angles the characters are viewed at. Many artistic cheats are employed to make the characters work from situation to situation. If you look at many of the limited animation type characters of 60's and 70's prime time fame, you notice that they tend to be shown from one or two angles. A ¾ left or right is usually chosen for composition purposes, as is a profile or front on view. The creator of these characters, never intended them to be viewed from any other angle. They simply wouldn't be recognizable from a top view or rear view. In the following tutorial, we will create a 2D flat character.

Tim is a character that was created by the folks at Honkworm International He is a part of their popular Siliconites series, a Flash based cartoon that is kind of Seinfeldish in nature. These types of characters are very versatile, and utilize many of the traditional tricks that have made 2D animated characters vivid and appealing for so many years now. We will not be using any toon shading, as it doesn't allow for the precise control of the ink line that is needed for these types of characters. Our methods will be simple and effective, and offer far more in the way performance than other automated solutions.

Part 1 - templating the reference image(s)

Drag and drop the following image into an XSI viewport to download the reference drawing.



When you are done, open up the front rotoscope view, and load the image into your rotoscope. Before you begin rotoscoping, use the **Z** key to zoom the grid out a little so that the image is a little larger in relation to the grid spacing.

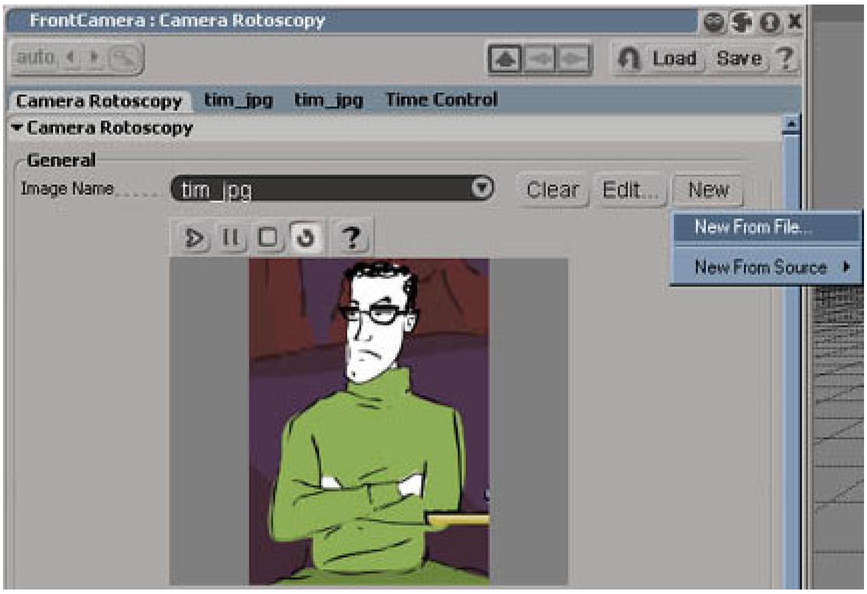
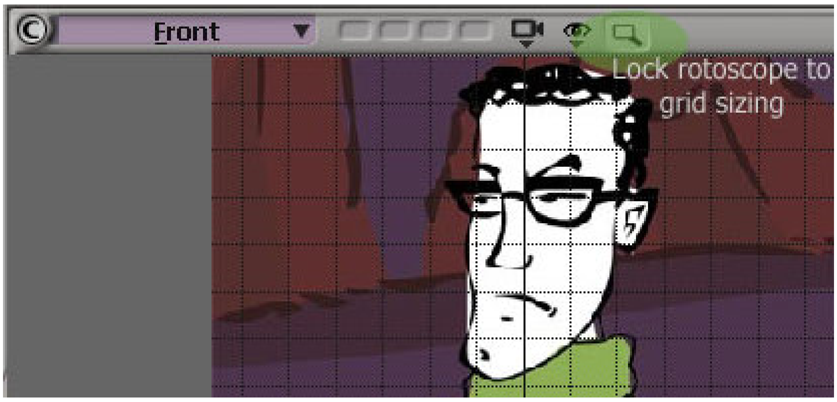


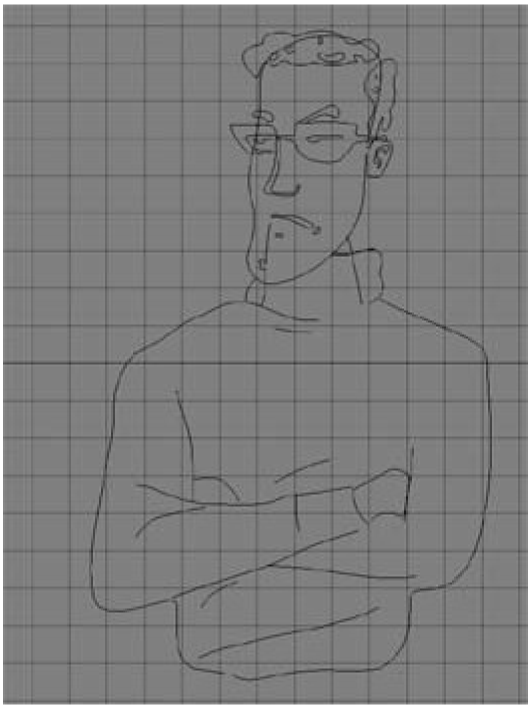
Image Name tim_jpg

grid spacing.

When you are satisfied with your image to grid ratio, lock the relationship by clicking once on the magnifying glass icon in the front viewport.

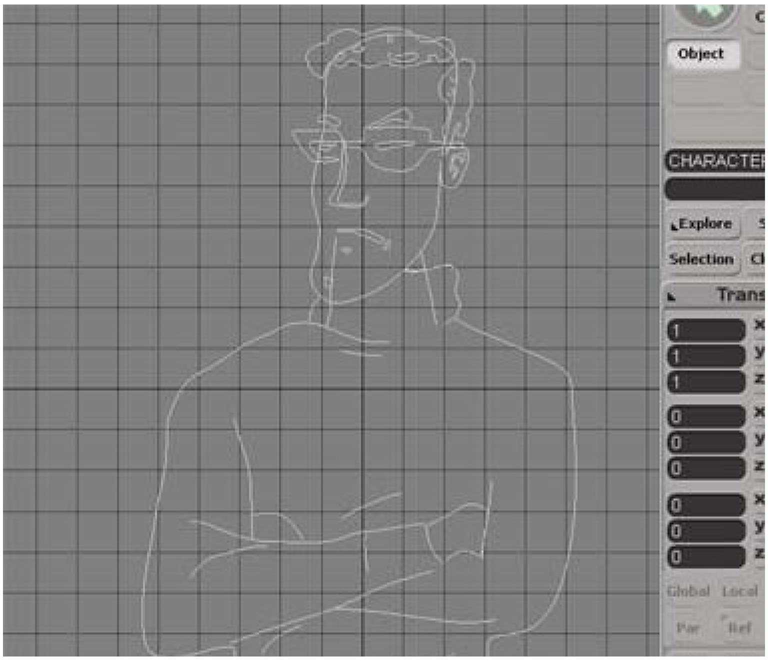


The first thing I usually do when importing an image for rotoscoping is to trace off all of the curves of the character using **Create>Curve>Draw CV Nurbs**. I trace all of the features using Nurbs curves, until I have recreated the entire character in the 3D program.

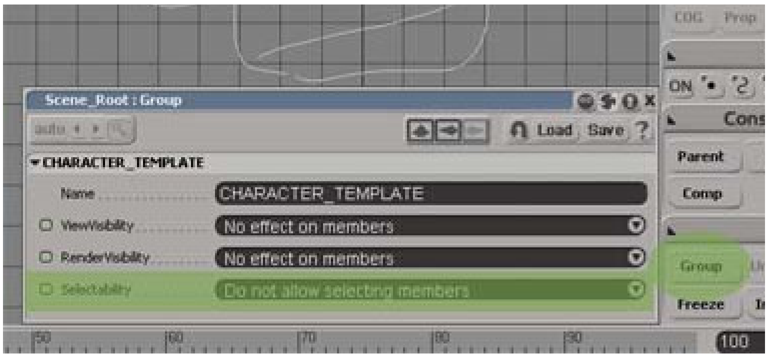


When you have finished tracing all of the various parts, multi select each of the curves, and make them into a group by clicking the group button under the edit menu. Name the group **CHARACTER TEMPLATE**. In an explorer, click on the icon to the left of the group to bring up the property page for the group. In the pull down menu for the selectability option, make the group unselectable by choosing 'do not allow selecting members'

Turn off the rotoscope view, by clicking on the eyeball icon in your front view and unchecking



your front view and unchecking the rotoscope option. You should now only see the greyed out splines in your viewport. This step of templating splines isn't absolutely necessary, but I find that interaction is much quicker when I use the templates to build surfaces as opposed to the roto image.


Scene_Root : Group

▾ CHARACTER_TEMPLATE

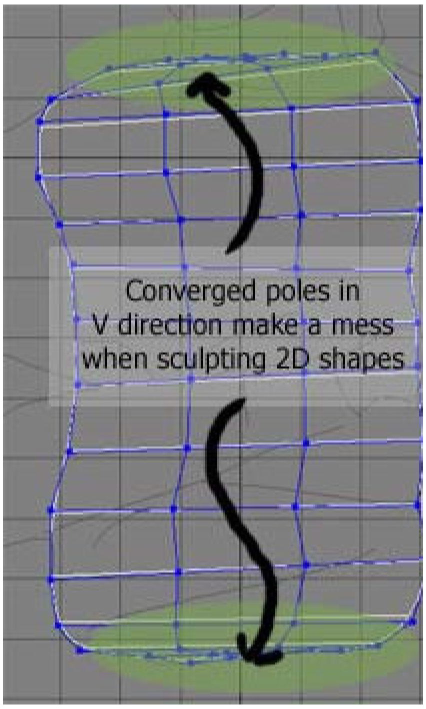
Name: CHARACTER_TEMPLATE

○ ViewVisibility: No effect on members

○ RenderVisibility: No effect on members

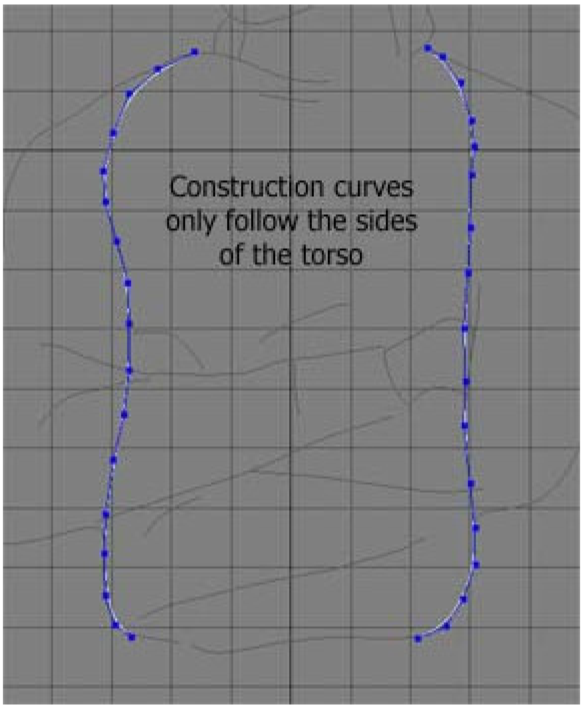
○ Selectability: Do not allow selecting members

Part 2 - constructing the character

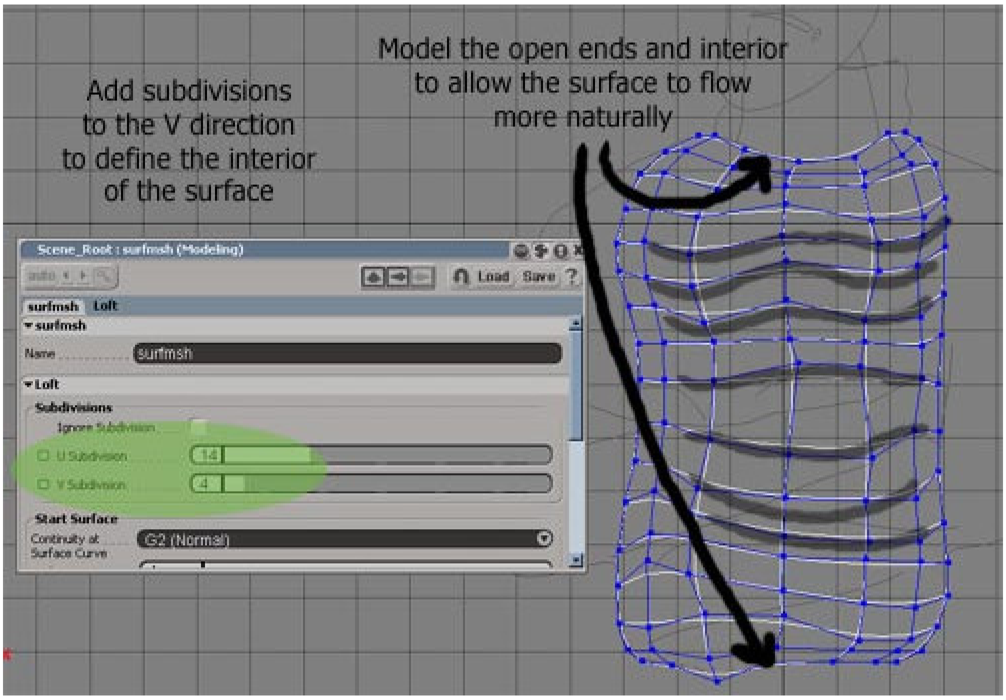


Next, you need to determine whether to use Polygons, or NURBS. If your character has parts that will not need to deform, I recommend using Polygon Meshes, as you can make some complex forms in a relatively short period of time. If you are building deformation areas, like legs, torsos, heads, and arms, I would stick with NURBS surfaces as they almost always envelope more reliably. I've always found that I require less tweaking to get the look I need with NURBS. As far as constructing your characters parts go, I like to stick with open ended lofted surfaces. If you have your construction curves converge in the U or V direction, you'll end up with CV bunching at the poles, a nightmare to deal with when you're trying to get your surface looking just right

Start off building the torso of the sample character by drawing a CV NURBS curve along one side of the character. Make sure you place the points in important areas where you need flexing. Use the templates as a guide for your curve. Don't be too stingy with your points either. Since you're dealing with flat 2D surfaces, your characters will end up being much lighter in terms of an end poly count. When you've finished drawing the first curve, duplicate it (**Ctrl D**) and use your M hotkey to move the duplicate curves points to create the curve for the other side of the torso.



When you've finished, loft the 2 curves together using **create>surface>loft**. Select each of the curves in turn, and then right click to loft them together. In the pop up box, add the curves in turn, and then right click to loft them together. In the pop up box, add subdivisions to your torso in the U or V direction to fill out the interior of the surface. If you are only using the two guide curves as your torso, you definitely won't have the control over your patch that will be needed when adding the skeleton later. After you've added enough interior rows of points, sculpt them to follow some sort of body contour, just as you would do for a 3D character. This won't effect the look of the surface, but will allow for better skeleton deformation at the enveloping stage. Pull and push the points at the top and bottom of the open ended loft to create the contours for the neck and bottom of the characters shirt. Once you are satisfied with your surface, freeze the operator stack, by clicking 'freeze' found under the edit menu. Points can be added later if necessary. Build the rest of the body parts in this manner, lofting and adding rows of points into the form. Every object on the body can be built in this way. When all of the pieces are complete, remember to freeze the operator stack. After that, you can delete your construction curves or group them and hide them using the groups property page options.


Add subdivisions to the V direction to define the interior of the surface

Model the open ends and interior to allow the surface to flow more naturally

Scene_Root : surfmsh (Modeling)

Name: surfmsh

Loft

Subdivisions

□ U Subdivision 14

□ V Subdivision 4

Start Surface

Continuity at Surface Curve: G2 (Normal)

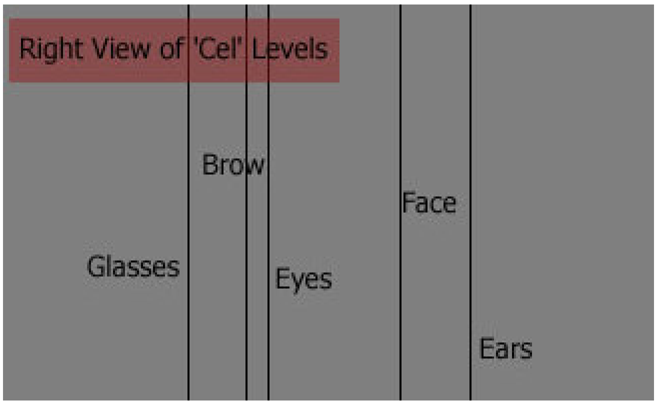
Part 3 - Cel Levels

Just like in limited 2D animation, your characters different parts will be animated on separate levels. The head may be on a lower level, while the mouth, eyes, and facial features may be o levels above the head. Levels became common place in 2D animation in the 60's when budgetary constraints limited the quality of cartoon shows being created. If a character come to a held cel in a pose of fright, some of the body parts may be frozen holds, while others stil move. The head level may be a hold, but the eyes, may still be blinking, or moving around, and the mouth may be gaping like a guppy. Held levels, mean less drawings for the animator which ultimately brings down costs in production. The other benefit to held cels was that the was no jittering in the quality of a line as it is played back on film. If an animator had to redraw the same held pose, imperfections would become readily apparent when played back.

In 3D, we take the essence of the cel level, and utilize it in much the same way to save time and money in production. Unlike full 3D animation, flat 2D characters can have dead holds, without breaking the illusion that your character is a living, breathing entity. My guess is tha it is the lack of depth in the characters that allows for this to work. The Animation Mixer in XSI, gives us a great deal of flexibility when working with levels, more on that later.

To place the various parts of your character onto separate levels, decide which body part is going to be the base level from which you offset the rest of the character. I usually designate the torso as the basis for offsetting. Since all of your characters parts were built in the front view, they should all be lying at translation values of 0 on the Z axis. Have your torso remair at 0 on the Z axis and move the remaining body parts forwards or backwards along the Z axis to create the different cel levels. At this stage, be careful that you don't move a layer too far forwards or backwards in Z as this may cause problems when animating later on. Separating each level by a value of 0.3 in Z works well for me

Because the needs of your characters will differ with each scene, I am hesitant to list which body part should be in the front and which body part should lie behind, but generally I follow the following model:.



From Top Level to Bottom Level

Lips, BrowsNose, Eyes, Teeth, Hair (bangs,front hanging strands)

Tongue

Mouth hole

Head shape

Ears

Hair (rear strands, ponytails, locks, etc…)

Neck

Shirts, Tops

Arms

Hands

Fingers

Torso (can be interchanged with arm parts if the character clasps its hands behind its back, alternatively, you may choose to place arms on either side of the torso level if the character is walking in ¾ or profile.

Pants

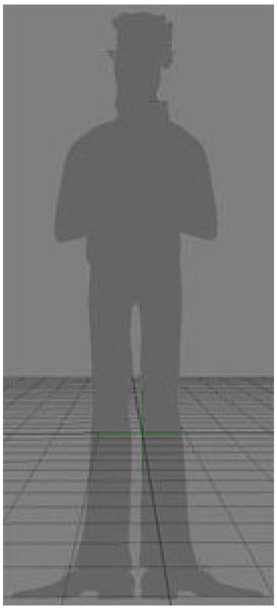
Legs

Legs

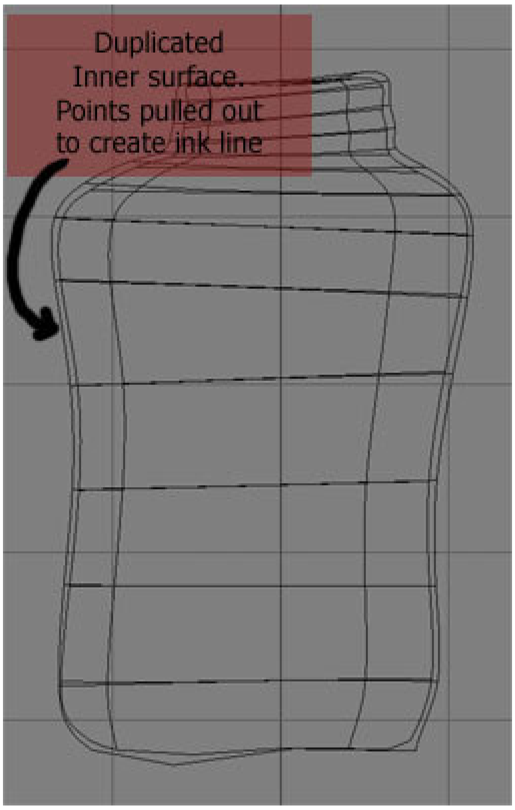
Feet

Toes At any time, the preceding levels can be interchanged, by no means is this a list that is set in stone.

Part 4 - Adding Ink Lines

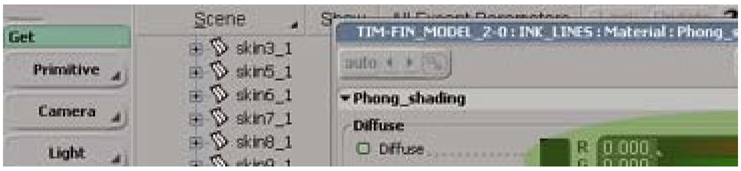


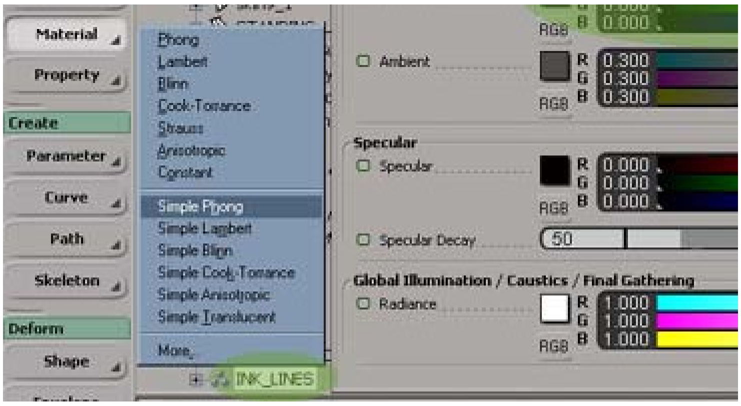
So far, you've created the general shape of the character, albeit gray and drab looking. The next step is to give the character the weight and finalform it needs by adding the ink lines. In XSI, you would apply this effect to full 3D characters by using a combination of the toon material shader as well as the toon lens shader. With 2D characters, however, the solution is much simpler. Select and duplicate your torso object. Move the duplicate object .05 of a unit in Z behind the original. To create your ink effect, use the M key to pull the points of the duplicate object, out from the original. You should end up with a surface that is slightly larger in size than the original torso



The trick to creating a good ink line is to determ where the lines weight or thickness should be allocated. I prefer to vary the thickness of the inl line around the silhouette of the character, sometimes giving thickness in rounded areas, an thinning the line along hard edges. It all depends on the needs of your shot, but the beauty of this that you have full control of this oft looked over effect. In areas where body parts attach, such as the arms to the torso, or the ears to the head, you can tuck the ink line into its parent surface to create seamless attachment points. Its all quite versatile. Later on when you envelope the character, you'll find that the line will actually animate in thickness as the character hits new poses. It comes quite close to replicating the process that goes into traditional 2D inking. Go ahead and create the rest of the ink lines for youı character, just remember to offset them back fro the original parent object, or you'll wind up with artifacts where the two surfaces intersect. Use a small offset, so that the ink lines don't intersect with any of the other levels.

When you're happy with your ink line modeling, multi select all of the ink lines, and create a group called **INK_LINES**. Select the group in an explorer


TIM-FIN_MODEL_2-0 : INK_LINES : Material : Phong_s



Ambient R 0.300 G 0.300 B 0.300

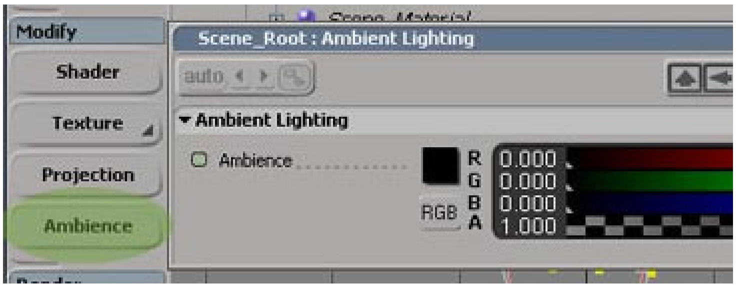
Specular R 0.000 G 0.000 B 0.000

Specular Decay 50

Radiance R 1.000 G 1.000 B 1.000

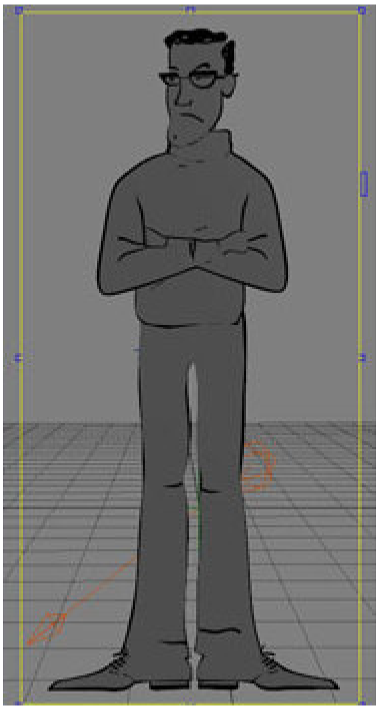
Select the group in an explorer and apply a material to the group by clicking **Get>Material>Simple Phong**. I use a simple phong material, because I don't need to worry about having transparencies, reflections, or refractions on the ink line objects. For now, make your materials diffuse Black, and turn your specular RGB values down to 0.

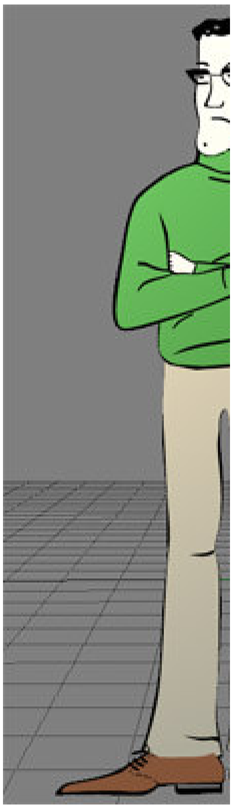
I would also disable the ambient effect on the material, by turning the scenes ambience to RGB values of 0,0,0. Do this by switching over to the render module, and clicking **modify>ambience**. Drag all of the sliders values to 0, by holding down **Ctrl** and dragging a single slider.



Ambience R 0.000 G 0.000 B 0.000 A 1.000

Preview your character.There is still much work to be done. Paint, Texturing, skeletons, and rigging have yet to be applied, but Tim is starting to come together. To complete the modeling stage, give the main pieces, such as clothing, skin, and shoes, simple Phong materials.





In the next couple of tutorials, I will cover enveloping, rigging and animating the 2D character. We will pay special attention to the different kinds of techniques needed to make these types of characters work. We will discuss replacement animation, custom parameters, shape animation and linking, specific limited animation techniques and conversion to Flash format

Modeling 2D characters using XSI was written by Adam Sale. Adam is a Technical Direc
and co-founder of Joncrow Entertainment. He can be reached at adam@joncrow.com