CS125: Introduction to 3D Computer Animation
Fall 2009

Shading Assignment

Date	What should be done	Handin name	Files to handin
Oct 14, 10am	UV tutorial from Getting started with Maya	uv_tut1	o <login>_box.mb o REPORT.txt
Oct 19, 10am	Getting started with maya and basic shading tutorials	shade_tut	o <login>_apple.mb o <login>_orange.mb o maya and image files from basic shaders tutorial o REPORT.txt
Oct 21, 10am	Progress: do as much of the shading as you can	shade_progress	o <login>_mug.mb o <login>_shade_progress.mb o REPORT.txt
Oct 26, 10pm	Final shading	shade_final	o <login>_mug_final.mb o <login>_shade_final.mb o shader_description.txt o REPORT.txt that includes description of the main shader in both your mug and your object

Goal

The goal of this assignment is to learn how to create and assign surface properties to models. This process may include the assignment of UV coordinates to a poly or subd model.

Introduction to Renderers

Rendering in computer graphics is the process of making 2d images from 3d geometry. Just as you had choices in modeling techniques, there are several choices in renderers and as long as you meet the design criteria for your projects, you may choose which one(s) to use. The underlying principles are the same. In order to provide a common foundation, everyone will be required to learn the Maya software renderer and the basics of working with shaders and lights using the Hypershade interface. This is the vanilla renderer that comes with Maya and you will learn it from tutorials

Beyond Maya, another choice is Renderman for Maya and the Slim interface. Renderman is Pixar's renderer and both the renderer and the Slim interface are plugins to Maya. The MS lab machines are licensed for Renderman. We will offer tutorials and a help session to get you started with Renderman. Many people believe that Renderman is superior to the Maya renderer in results and ease of use. Information about documentation, tutorials, and help sessions will be coming soon.

Finally, Maya offers an additional renderer which is mental ray. The interface for mental ray is the same as for the Maya renderer. mental ray is a more physically accurate renderer which means that it more accurately simulates the physics of how light interacts with materials in real life. There are few tutorials or doc for mental ray. If you want to pursue it, we suggest you buy the book *mental ray for Maya, 3dsmax, and XSI*. This book is a reference, not a teaching book. It does not have tutorials, so you need to know what you are doing first – i.e. you should have taken cs123 and/or have previous experience with shading. mental ray shaders are narrowly defined which means that there are many "base" shaders that have special purposes, but each base shader does not have very many parameters to tweak. Maya and Renderman offer fewer "base" shaders, but these are infinitely customizable.

The choice is yours. If this all seems confusing, stick with Maya. If you're willing to put in some extra time to figure some things out on your own, you might explore one of the other renderers. Your work will be evaluated based on how well it meets the design criteria, not how much extra stuff you learned. There is a lot to learn in this assignment already, so you might choose not to explore one of the other renderers for this assignment, but you can always check them out for future assignments.

Reading and Tutorials

Read Chapters 9 and 10 in Jeremy Birn, *Digital Lighting and Rendering*. This is important reading.

UV Tutorials

Before you can assign textures (typically 2d images) to an object, you need a way to map the textures: a correspondence between the 3d object and the 2d mages. This is achieved by assigning UV coordinates. Make sure you understand pp.313-323 in Birn.

Do Getting Started with Maya>Polygon Texturing Lesson 1. This is a ridiculously simplistic example of uv mapping, but will get you started with the interface for performing this task.

Basic shading tutorials

1. Do Getting Started with Maya>Rendering>Lessons 1 and 2. The files for these are in /course/cs125/asgn/shading_tut/getting_started. Hand in your resulting maya files.

2. Do the Basic Shaders tutorial on the cs125 google site.

3. Do the Layered Texture vs Layered Shader tutorial on the cs125 google site.

Shading your models

Life is trying things to see if they work. Ray Bradbury

In this part, you will design the surface properties for the mug and for the object you created in the modeling assignment. The mug will have a surface that is something real, but not necessarily what the object would have in reality. For the complex model, you will create photorealistic materials that mimic the real object.

Mug

For this part of the assignment, you may work with your own mug or this one: /course/cs125/asgn/shade/cs125_mug.mb. Copy it to your own folder. You will have to create your own UV mapping.

Choose something that exists in the real world and be able to tell us what it is. Some examples are leather, bread, aluminum, felt, eggshell, rock. By having a target, you will not be caught saying, "Uh, I dunno, what do you think it looks like? Stepped on popcorn from the movie theatre floor? Uh, yeah, that's what I was trying to do!" You will find it helpful to have a real sample of your target material and you will need to hand in a photograph of the sample with your assignment. This shader can be a series of painted texture maps or a shader network, or combination. You do not have to add dirt, scratches, and other wear and tear to this shader.

Complex model

The shader for this model should look as similar to your physical object as you can create. This will help you learn to really look at an object to determine its color, various textures and surface "imperfections," and how it reflects light. Many opponents of computer graphics imagery complain about how it all looks like perfectly manufactured plastic. Here is your chance to show them otherwise. If your object is made of more than one material, you should apply different shaders to each part accordingly, up to about three. That is, if your object has more than three distinct surfaces, you can use a less-finessed basic shader on the least significant 4^{th}-n^{th} parts.

You should create one or more UV maps for your object. When creating your shader, you may want to make some parts procedural based on the nodes that Maya provides like

noise, fractal, etc. but Maya still uses the UV map to figure out where these go. The exception is 3d textures. All-over procedural shaders are good for showing a base texture. However, some marks on your object will be localized and for this you need the UV mapping so you can use an image to show where the imperfections go.

We are giving you a setting for shading your object. This stage has carefully designed, but simple lighting that will both show off your shading and provide you with a medium level of light. You wouldn't want to design the shading in very dim lighting for example, because it would appear too bright in normal lighting. Start using the stage in the beginning or you will waste your time fixing the shading later. For both your mug and your complex object, copy the file /course/cs125/asgn/cs125_stage.mb into your own workspace and rename it appropriately by saving it. Bring in your own model using File->Import. Scale your model to be about the same size as the chess pawn that is already in the scene and then delete the chess pawn. You should end up with three spot lights in your scene. You should render your image using the predefined render_cam (in a view window, choose Panels>Perspective>render_cam). If you are having problems with your shaders not appearing the way you think they should, it is probably your shader. See the TAs for help. You will be rendering a single high resolution image of each object.

You may use shaders from other sources or tutorials *as reference or for learning, but not for what you hand in.*

For the first critique, you should get as much done as you can. We will discuss improvements in class and you can implement these for the final handin.

With the final handin, you will include a description of the main shader for each object. An example is given in the technical requirements below.

Design criteria - what we are looking for

1. A good UV mapping.
2. For the mug, the shader should look close to its photographic reference.
3. For your own model, the rendered image should look like your real object. In addition to the basic textures, you will need to show evidence of wear and tear. Your object should not look like it was just manufactured.

Tips

- Pay close attention to the look of your actual object so you can customize the material for it. Look for dirt, dents, scratches, and other signs of wear and try to incorporate these into your surface design. This is what makes objects look real. It is tempting to use noise patterns to create these imperfections, but few objects have the all over texture that these provide. You will need to modify the noise

images in Photoshop or combine them with transparency maps so that the noise isn't consistent everywhere.

- You can use Photoshop to create texture and colormap images by exporting the uv map directly to PS from the Maya UV Editor. You can scan or import a photograph of the object and manipulate this into texture images. You can use a photograph to find colors with the eyedropper. (Remember that the photograph was taken under certain lighting conditions and beware of surface reflections of other objects.) You can scan other objects or find photographs that can be manipulated using filters or other image processing techniques. If you need the image to wrap in the shader, either put the seam somewhere on your object where it won't show or, you can use the Photoshop operation Filter->other->offset to put the seams in the middle of your image and then paint (using offset brush, typically) over the new seams so that the image is continuous at top and bottom, left and right. TAs can show this to you if you aren't familiar with it

- Mapped images should have a resolution of at least 512x512 pixels and be square unless the area you are covering is small or your texture is repeated many times. Grayscale images work best for dirt, bumps, scratches, wear and tear, and displacement maps. This decouples the surface color from the texture. Of course if you are making a colormap, then it will be in color.

Technical requirements

- Create a single rendered frame for each model. Using Window>Render Editors>Render Global Settings, set the following:
  - **File Name Prefix** should be as described at the top of this assignment.
  - **Frame/Animation ext** should be name.ext (Single Frame) where name is the handin name for the image.
  - **Image Format** should be TIFF since these are not compressed.
  - **Resolution** should be Full 1024 (1024 x768). No little pictures!

  Hand in both the scene file (.mb) and the image for each object.

- For the *main shader* in each object, describe in your evaluation the details of the shader. For example:

  "For the body of the camera, I used a layered lambert shader and added a bump map generated from noise for the subtle texture. The smudges are generated from clouds and used as a diffuse map. The other layer of the shader was another bump map made from a picture of scratches I painted in Photoshop."