COMS31000 Character and Set Design 2018
Lighting, Texturing and Rendering

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1 Introduction

This report explains the entire process of lighting, texturing and rendering my architectural reconstruction on Autodesk Maya 2018, from design to my final composition. As discussed during the first assignment, my chosen interior is the lounge area of the Everyman Cinema on Whiteladies Road [1].

Before beginning to light and texture my model, I visited the Everyman Cinema once again. Rather than studying the geometry and composition of the interior, I was now focused on the lighting, colours and textures in the room. I took photographs of many elements of the room to help me accurately recreate the colour and texture of each object. I took note of where the brightest and darkest areas of the room were and how shadows are cast by the light sources.

For a direct comparison to my ambient occlusion render, I decided that I would use the same camera angle for my submission image as I did for the first assignment.

Figure 1: Professional photograph of the Everyman Cinema lounge area [3].

2 Challenges and Highlights

2.1 Initial Lighting Set-up

Although the Everyman Cinema lounge area has no windows, it has a very complex lighting arrangement due to its large number of artificial light sources. Including the main ceiling light pieces, recessed ceiling lights and wall lamps, there are approximately 80 light sources (individual bulbs) around the room. This would make accurately recreating the lighting a challenging task.

I first wanted to establish a base level of lighting in my scene by creating each light source and setting the exposure and intensity parameters to values that appear to be roughly correct when using the default Lambert shader on every object. I started by inserting three different types of light into my model: I created mesh lights from the spherical bulbs on the ceiling light pieces and above the cinema doors; I put small disk-shaped area lights where each recessed ceiling light is and I put point lights inside each wall lamp. The result of this initial lighting set-up can be seen in Figure 2.

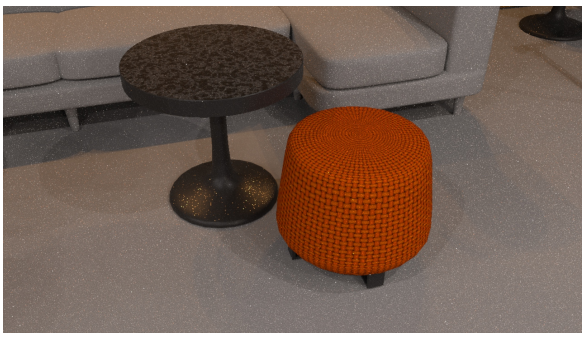
Figure 2: Initial lighting test render using only the default Lambert shader.

After experimenting with the exposure and intensity parameters, I was able to achieve relatively realistic lighting and shadows so I decided to begin shading and texturing. Once each surface is given the correct diffuse and specular parameters, I would be able to tune and improve the lighting as this would change how objects appear and how light bounces around the room.

2.2 Texturing

Using Arnold's aiSurfaceShader and just assigning colour, specularity and roughness, I was able to quickly increase the realism of many elements of my scene without using any textures. However, some objects, especially those close to the camera, needed more detail and texture information to become photo-realistic.

For the sofas and stools, I was able to use Maya's procedural cloth 2D texture to recreate the woven fabric appearance of these objects. I was able to accurately texture the highly specular marble coffee tables using Maya's procedural marble 2D texture. I used the Copper aiSurfaceShader preset to recreate the shiny gold appearance of the door handles and wall lamps. These textures can be seen in Figure 3.



(a) Coffee table using marble 2D texture and stool using cloth 2D texture

(b) Lamps using Arnold's copper preset

Figure 3: Test renders using Maya's built in 2D textures and Arnold's preset shaders.

When applying these textures to objects with multiple geometry components, I had to scale and rotate the component's UVs to make the texture appear uniformly across the entire object. For example, when I initially applied the cloth texture to the black and white checkered sofa, I scaled the checkered pattern to look correct on the cushions, but the texture was stretched and distorted on other parts of the sofa. To fix this, I created new UVs for some of the components of the sofa and scaled the texture on each component until the checkers were uniform across the entire object. This uniform checker pattern can be seen in Figure 4.

To recreate the photographs on the walls, in picture frames and on booklets, I projected images I downloaded from the internet[1,4-5] onto objects. To make the image fit onto the object with the right scale and orientation, I had to translate and scale the frame on the object's UV space. Figure 7(a) shows a photo that has been projected onto a wall.

The wood textures in this interior were very difficult to accurately recreate. The wood 3D texture seemed to be more difficult to use than the 2D textures so I decided to use a tutorial that explains how to create a realistic wood texture from Maya's procedural textures [6]. This tutorial explains how to use the Hypershade to create a shading network that outputs a realistic wood texture. However, I found that following this tutorial did not

Figure 4: Uniform sized checker pattern across the entire sofa object.

accurately produce the wood texture found in the Everyman interior. Instead of this, I found a pre-made wood texture and images of wood on a website called *Poliigon* that closely resemble the appearance of the wood that I was trying to recreate [7]. I used the downloaded images as a colour map and a specularity map to produce the wood texture that I was hoping for.

In the Everyman interior, the wooden floorboards are arranged in a chevron pattern. To recreate this, I created a shading network which uses a checkerboard 2D texture to divide the floor into strips, two more checkerboard 2D textures to divide these strips into smaller angled strips and then the wood texture with some UV noise and slight variations in colour. The shading network graph for this floorboard texture can be seen in Figure 5. I am very happy with how this floorboard texture looks compared to its real-life counterpart. The finished floorboard texture can be seen in Figure 7(b) along with a patterned seat that was created in a similar way.

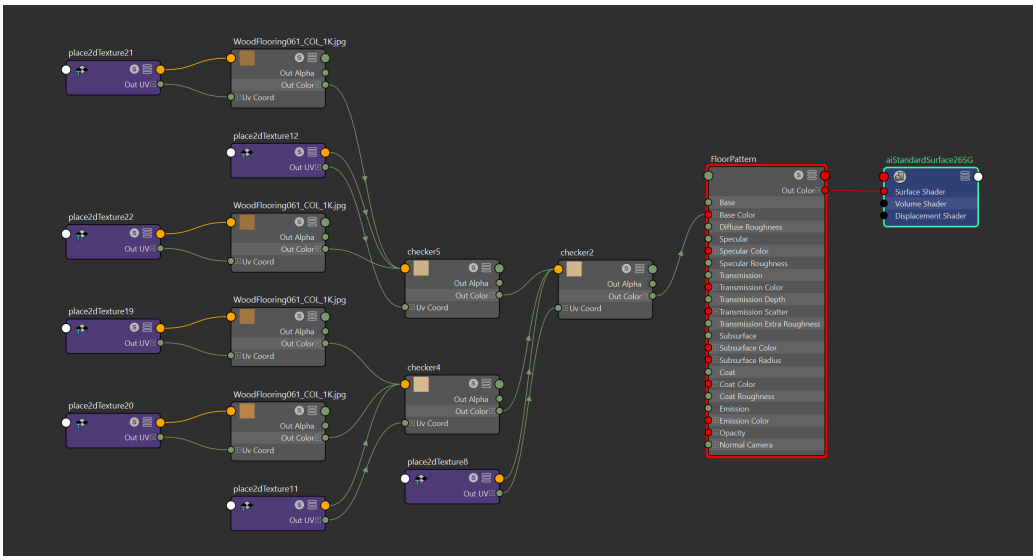


Figure 5: Hypershade graph for the floorboard texture used in my scene.

2.3 Improving the Lighting

After texturing most of the objects in the scene with at least the correct colour and specularity, I noticed that the lighting was not very accurate compared to the real-life interior shown in Figure 1. The Everyman Cinema lounge area has dark shadows and warm, vivid lighting that varies in brightness around the room. I was initially using area lights to recreate the recessed ceiling lights, but this was creating weak shadows and a very uniform, bland lighting effect more similar to daylight. I therefore decided to change each of these recessed ceiling lights into spot lights and increase the warmth of the light colour. After experimenting with the spot light parameters such as cone angle, falloff, exposure and intensity, this change greatly increased the accuracy and photo-realism of my interior reconstruction.

I added the neon writing above the cinema door to my scene as the red glow that this light produces is a prominent feature of this interior. The reflection of this light in the highly specular marble coffee tables is an effect I am very happy with. Figure 4 shows the difference that these changes made to my scene.

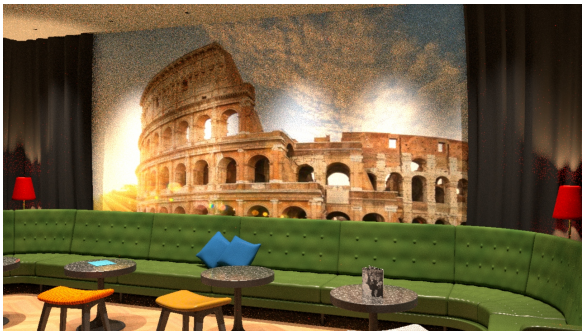
(a) Initial lighting set-up

(b) Improved lighting set-up

Figure 6: Test renders before and after improving the lighting in my scene.

2.4 Improving the Geometry

Based on my feedback from the first assignment, I wanted to increase the realism of my interior reconstruction by adding some more irregular geometry to my scene. To do this, I modelled the curtains and the pillows on the sofas. I modelled the curtains by drawing a random, waving curve, lofting the curve into a surface and then slightly moving random vertices to create a natural, imperfect look. Each pillow in my scene is unique as I moved vertices around each time I created a duplicate. These imperfections definitely helped to increase the photo-realism of my interior reconstruction. The curtains and pillows can be seen in Figure 7(a).



(a) Test render showing the curtains, cushions and image projections.

(b) Test render showing two texture patterns I created in the Hypershade.

Figure 7

2.5 Rendering

Due to the large number of light sources in my scene, it takes a long time to render an image even when using a small number of samples because the Arnold renderer has so many light ray calculations to compute. This made it difficult to quickly see the impact of the changes I made to the lighting or textures. However, using Arnold Render View meant I could quickly get a rough idea of the impact of my changes.

As seen in Figure 6, my renders were initially quite grainy and unwanted white dots were appearing on the image. I managed to fix this by increasing the number of diffuse and specular samples and hiding the light sources that were behind the camera.

For my final render, in order to make the image as photo-realistic as possible, I increased all of the light sources samples and render settings samples. Increasing the light source samples increased the realism of the lighting and shadows in my scene. Increasing the anti-aliasing, diffuse and specular samples made my final image much sharper and higher quality. However, my final render took several hours to complete. I found that enabling ray-tracing did not increase the photo-realism of my scene, so I did not use it when rendering.

3 Discussion and Conclusion

I am very happy with the outcome of my final render. I believe I have accurately recreated the geometry, lighting, colours and textures of the Everyman Cinema lounge area. The reflections on the coffee tables, the glow of the light bulbs, the dark shadows and the wood textures have all helped to make my image very photo-realistic.

I have modelled all of the objects close to the camera to a suitable level of detail. However, some objects further away from the camera or out of the shot have been textured with very little detail or accuracy. If I had more time I would texture these objects such as the books on the bookshelves and the picture frames more accurately.

Some of the painted surfaces in my scene do not look completely photo-realistic because they are too perfect. For example the ceiling is completely off-white and the walls are completely charcoal. If I had more time I would try to increase the realism of my model further by adding a small amount of noise to these surfaces. The ceiling has a repeating pattern of indents on it which I could have tried to recreate using bump maps or displacement maps.

If I had more time, I would also like to try to accurately model and texture the Chesterfield-style sofas. I could have experimented by doing this either by creating complex geometry or by applying a bump map or displacement map to my simplified geometry.

If I were to start this project again from the beginning, I would model all of my geometry with UV mappings in mind. This was not really a problem during the second assignment as I was able to use the UV editor to adjust the UV mapping of objects, but the texturing process could have been sped up if I had thought about this previously.

Figure 8: Final Render of my lit, textured interior reconstruction model.

References

[1] Bristol, *Everyman Cinema*, https://www.everymancinema.com/bristol

[2] Everyman Cinema - Bristol, *The Contract Chair Company*, https://www.thecontractchair.co.uk/projects/everyman-cinema-bristol.

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[5] Lighthouse Image, *Nova Scotia*, https://www.novascotia.com/explore/road-trips/lighthouses

[6] Creating Realistic Wood Texture in Maya, using only Procedural Textures, *Pixelophy*, http://www.pixelophy.com/2011/01/creating-realistic-wood-texture-using-only-procedural-textures/

[7] Wood Flooring 061, *Poliigon*, https://www.poliigon.com/texture/wood-flooring-061.