

Report of Rendering Assignment

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ABSTRACT

The report demonstrates the work flow done as a part of Simulation and Rendering module on modelling a real-world object using RenderMan and its associated API.

1 MODELLING THE OBJECT

The real-world object is a coke can which can easily saw around the world. basically,it is a cylinder-shaped can, made of aluminium or iron, with a pull ring, so that they could be easily opened without a can opener. The sizes of Coca-Cola 330ml cans are as follows: 1. The outer diameter of the cylinder is 66.10mm, and the inner diameter of the cylinder is 57.7mm. 2. The total height of the tank is 123.10mm, and the height of the cylinder is 102.10mm. 3. The thickness of the top cover is 0.28mm, the thickness of the sidewall is 0.11mm, and the thickness of the bottom is 0.21mm.

showing in the figure 1 below:



Figure 1: The Size of Can.

2 IMPLEMENT THE MODEL OF COKE CAN

The implement of the can separate into three parts:

1. The top of the Can(Figure 2) contains a disk and a torus, and because of the complication of the pull-ring, a rib file exported from Maya is imported as the pull-ring.



Figure 2: The Top of Can.

2. The body of the Can(Figure 3) contains a cylinder and a Hyperboloid. However, in the upper part of the cola Can, the bevel smoothly connected to the top is very hard to generate by simple primitives.



Figure 3: The Body of Can.

3. The bottom of the Can(Figure 4) contains a Hyperboloid, a torus and a half part of Sphere.



Figure 4: The Bottom of Can.

3 MATERIALS AND TEXTURES

The actual materials of Coke Can. The materials in the RenderMan of the Coke Can are simple but also very complex. Since the actual material of the entire can is aluminium or iron, the same material can be used for the entire can. At the same time, it is said to be complicated because there is a clear difference between the tank body and the tank top/bottom: the tank body is more shiny/metallic and smoother than the top/bottom.

showing in the Figures 5-6 below:



Figure 5: The Actual Body of Can.



Figure 6: The Actual Top of Can.

At the same time, the stain and shading texture of the tank body(Figure 5), the layer texture / similar with scratches on the top of the Can(Figure 6) should also be paid attention to.

4 IMPLEMENT THE MATERIALS OF COKE CAN

global material: PxrDisney

The PxrDisney shader is a "catch-all" shader, designed to be flexible and dynamic in a production shading pipeline(Burley

(year?)). It is more Intuitive rather than physical so that it is more friendly for the artist.

UV Mapping

UV problems for the simple primitives. the sample primitives have an obvious issue, that is all kinds of primitive don't have parameters to control *uv* attribute, the *uv* is all the same, a Square, no matter it is a cylinder or a disk(Disney 2019).Therefore, the texture needs to be manually edited to fit the primitives. For instance, the normal map of the top disk of Coke must be converted to polar coordinates before it can be used, as shown in Figure 7.



Figure 7: Normal Map converted to polar coordinates

Texture Mapping

diffuse/base-colour texture has been used in two part in this screen: the body of the Coke Can and the table. The Coke Cans are placed on a simple cube with a wooden table texture applied as PxrTexture pattern and PxrDisney BXDF to take RGB reference color from the provided texture giving the effect of the tabletop. Using the same way, the base-colour of the Coke Can is applied by a diffuse texture through PxrTexture and PxrDisney like Figure 8.



Figure 8: Diffuse Color texture for the Coke Body

Normal Map

Normal map is mainly used to increase the details of the model surface. Normalmap uses RGB information to directly mark the corresponding X, Y, and Z axes in 3D space, and this RGB information can control the surface normal direction of Polygon, thereby creating the illusion of depth to increase the details of the model surface, but should be aware of that the details created are all fake(Pluralsight 2014). For instance, the most obvious place to use this tech is on the top of Coke Can.

Using the normal map(Figure 7) through the parameter called bumpNormal in PxrDisney will add more details on the top, showing like Figure 9 .



Figure 9: The difference between having or not having the Normal map

Displacement Maps

When adding details to the low model, the displacement is undoubtedly the best effect, it will add real surface bumps, normally, the model surface must be subdivided enough to get good results(Pluralsight 2014). Its disadvantage is that it is very difficult to create real surface bumps in real-time, which is mainly related to the performance of the computer.

in this screen, the displacement map has been used in the wood table in order to increase details on the desk. The reason why need to use displacement maps is that when the angle between the camera and the table is too small, the details created from the normal map look a bit fake. working together with the Normal map, the effect seems to be much more real, showing like Figure 10.



Figure 10: The difference between having or not having the Displacement Map

Implement of scratch texture

From the Figure 6, an obvious strip texture almost like scratches can be sawed in the top of the Coke Can. They are very small and smooth, simultaneously, and very obvious. For reasons of above, the traditional way using displacement map or normal map to add the scratch details is not working. so I try to find another way.

PxrMix function could mix two colors together according to the specified mix percentage. Linescratch.osl has been designed to generate this detail and by commanding the parameter called mix in Pxrmix, showing like Figure 11(Macey 2019).



Figure 11: The difference between having or not having the effect of scratch

5 CAMERA AND LIGHTING

PxrCamera

It is a camera model similar to the physical effect of the real world, more friendly to artists, and supports all traditional prman perspective camera settings, including stereotyped motion blur and bokeh effect(Disney 2019).

PxrDomeLight

It works via Image Base lighting (IBL) to illuminate sets and characters with an environment map. "This is usually captured on-set and later used for replicating that lighting in your scene. In many ways, this gets your lighting 80 percent of the way to finished. All that's left for the artist to do

is further polish the lighting for a great final shot!(Disney 2019)"

6 FINAL OUTCOME

Here is the final Outcomes about the Coke cans.



Figure 12: The Final Outcome



Figure 13: The Final Outcome

7 CONCLUSION

This project helped me have a more detailed understanding of the rendering process, such as modelling objects using simple primitives, the work and application of shaders, and the process of using maps and textures. Although the model is still relatively close to the real object, some improvements are still needed, and the material can be further improved to further increase the detail and realism of the tank. Although there are some shortcomings in some areas, I am satisfied with the overall results of the project.

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