

7M836 – Animation and Rendering

Exercise 5a: Reflection and refraction

In this exercise

- we see the visual effects of ray tracing,
- we use the finish statement to create transparency and reflection.

Background information in the on-line documentation:

- *6.7.3 Finish*
- *6.6.4 Interior*

Open the files ch5/simple.pov. Render the scene.

You can control the size of a specular highlight by adding the *roughness* specification to a finish statement. Useful values for roughness range from 0.7 (very rough) to 0.0005 (extremely smooth). Smaller values will simulate smoother surfaces with smaller, tighter highlights. Just don't use zero as a value.

Adding a *reflection* specification to a finish statement will create a reflective surface. For a mirror surface, use the finish statement

```
finish {ambient 0 diffuse 0 reflection 1}
```

For a reflective surface that also has a color, use a mixture of diffuse, ambient, and reflective light:

```
finish {ambient .1 diffuse .4 reflection .5}
```

As a rule of thumb, the ambient, diffuse, and reflection values should add up to a value that is not much larger than one. As you increase an object's reflection, you will probably decrease its ambient and diffuse values.

Creating a transparent object requires changes to both the finish and color statements. For transparent objects you need to specify a filter value in the color statement:

```
color red 1 green 0 blue 0 filter 1
```

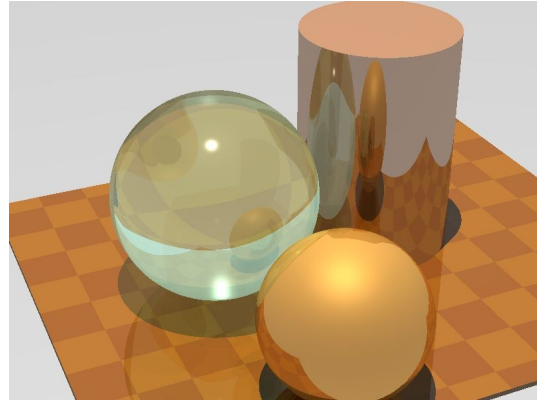
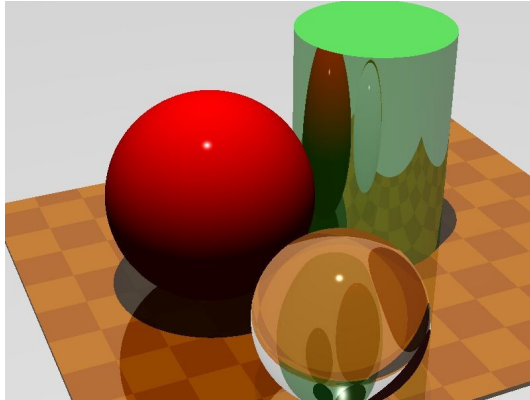
A filter value of one gives you maximum transparency. Forgetting the filter value will result in an opaque object, no matter how you change the finish statement.

To complete the illusion that an object is made of glass or other refracting material, you must add an *interior* statement to your object. It contains items which describe the properties of the interior of the object. The most important is the index of refraction, *ior*. If you are creating glass, the value of *ior* should be 1.5.

```
interior { ior 1.5}
```

First, change the specular highlights of simple.pov to be as tight as possible. Then, modify the cylinder to have a green reflective surface and the small sphere to be made of glass (try values of 1.0 and 1.5 for the index of refraction). In addition, add a little reflection to the tabletop. When you are finished, a rendering of your scene looks like the left figure.

- What value did you use for roughness?
- What finish statement did you use for the cylinder?
- What modifications did you make to the small sphere?



Exercise 5b: Materials

In this exercise

- we become familiar with predefined materials in POV-Ray.

In POV-Ray there are a wide variety of predefined materials that depict assorted glasses and metals. To see samples of these materials, look in your povray directory for a folder called scenes/incdemo. You will see that incdemo contains the folder *glasses* and *metals*. In these folders you will find the files *glass.pov*, *golds.pov*, *coppers.pov*, *chromes.pov*, *silvers.pov* and *brasses.pov*. Each of these files contains several variations on glass, gold, copper, and so on. Render them to see how they look.

If you want to use any of these materials, you must include the corresponding include statement in your .pov file, for example:

```
#include "glass.inc"
```

to use glass materials, or

```
#include "metals.inc"
```

to use metals. The # symbol must be the first character on the line. You can use these predefined materials by placing the material name in the texture statement.

Change the simple.pov file. Change the material of the cylinder to be T_Copper_5C, the material of the large sphere to be T_Old_Glass (use I_Glass for interior), and the material of the small sphere to be T_Gold_2A. The finished picture should look like the right picture. You may want to examine the contents of the .pov files in the incdemo folder to help you make these changes.

- In your new image, what is the texture statement for the cylinder?
- What is the texture statement for the small sphere?
- What is the texture statement for the large sphere?
- Compare predefined finishes to using finish statements that you create yourself. Which requires less typing? Which requires less thinking? Which provides most control over results?