LAB 5: MATERIALS AND ILLUMINATION IN POVRAY

24/10/2016
1. MATERIAL PROPERTIES: finish

In this lab, we will change material properties, to achieve different levels of diffuse and specular reflection. Your objective is to achieve something like the following output:

- `phong = 0`
- `phong_size = 0`
- Increasing **diffuse** values
  - `diffuse = 0.5`
  - `phong_size = 120`
  - Increasing **phong** values
  - `diffuse = 0.5`
  - `phong = 0.5`
  - Increasing **phong_size** values
For positioning the spheres, you may use this following template (you need to simply change the material properties):

http://www.scss.tcd.ie/John.Dingliana/cs7029/spheres.pov

Change **finish** parameters to create the following effects

- Spheres of increasing diffuse reflectance (change the **diffuse** value)
- Spheres of increasing specular reflectance (change **phong**)
- Spheres of increasing shininess (change **phong_size**)

```pov
sphere {
  <-0, -1, 0>, .3
  pigment {
    rgb <1, 1, 1>
  }
  finish {
    diffuse .5
    phong .5
    phong_size 100
  }
}
```
2. NORMAL MAPS: normal

Only attempt this if you have completed Task 1 and are comfortable with material properties.

Experiment with the normal property of an object. See if you can add procedural bumps, dents, wrinkles and waves to objects.
SAMPLE SCENE (WITHOUT ANY NORMAL MAPS)

//code for the lower box
box
{
  < -4, -.25, -4 >    < 4, .25, 4 >
pigment    {    White   }
finish
{
  reflection .4
}
}


N.B. Sky Background and reflective box are added for fun. We’ll discuss this in the next class
```pov
#include "colors.inc"  //required for english color
  //definitions e.g. White, Red, Blue
#include "skies.inc"    //for the sky texture

sky_sphere
{
  S_Cloud2
}

camera
{
  location <3, 3, -5>   //the camera position
  look_at <0, 0, 0>     //the camera's target
}

light_source
{
  <10, 7, -5>   //the position of the light source
  color White    //color names defined in colors.inc
                  //White is equivalent to <1, 1, 1>
}

box  //checkered box   (leave this alone)
{
  <-0.5, -0, -0.5>, <0.5, 1, 0.5>
pigment
  {
    checker
      Blue
      White
  translate <0, 0.5, 0>
        //move texture up a bit to center it on
        //the box in all directions
  }
}

box  //shiny box (change normal map properties of this)
{
  <-3, 0, -3>, <3, -.5, 3>
pigment   { White }
finish
  {
    reflection .4
  }
}
```

BUMPS

normal
{
  bumps 1
}

3D image of a block on a bump map.
DENTS

```java
normal {
  dents 1
}
```
normal
{
    wrinkles 1
}

WRINKLES
normal
{
  ripples 1
}

RIPPLES
WAVES

```plaintext
normal
{
  waves 1
}
```
BUMP MAP

normal
{
    bump_map
    {
        gif "bumpmap.gif"
    }
    rotate <90, 0, 0>
    scale 8
}

(or use your own image — ideally greyscale)
3. OTHER THINGS TO TRY (OPTIONAL)

- Apply materials to your own objects and scenes
- Apply normal maps and bumps to other objects (in particular, try it on something more complicated than a box)
- Transforming bump and normal maps (scale, rotate, translate)
- Combine textures with material properties
- Experiment with different pattern modifiers e.g. turbulence
- Try varying ambient illumination