Texture Mapping

Advantages

- Adds interest, detail
- Realism
- Cost
Visual Cues

- Images, patterns “glued” onto object
- Wood, stone
- Repeating patterns
- Mottling
Two basic categories

- 2D (image-based) texture mapping
- 3D texture mapping
Our pattern

Planar map shape
Spherical Map Shape
Pigment statement

- Defines the color or pattern of colors for an object

```
pigment {
  [PIGMENT_IDENTIFIER]
  [PIGMENT_TYPE]
  [PIGMENT_MODIFIER...]
}

PIGMENT_TYPE:
  PATTERN_TYPE | COLOR |
  image_map { BITMAP_TYPE "bitmap.ext"
    [IMAGE_MAP_MODS...] }
```

Image_map

- wraps a 2-D bit-mapped image around your 3-D objects

```
pigment {
  image_map {
    [BITMAP_TYPE] "bitmap.ext"
    [IMAGE_MAP_MODS...]
  }
  [PIGMENT_MODIFIERS...]
}

BITMAP_TYPE: gif | tga | iff | ppm | pgm | png | jpeg | tiff | sys
Our pattern: “ourpat.jpg”

Modifiers

- **map_type 0**
  - Planar map.
  - Image is projected onto x-y plane.
  - The image fills a square in (x,y) coordinates from (0,0) to (1,1)

```plaintext
// table top
box(<-1,-0.1,-1>, <1,0, 1>
  scale <6, 1, 5>
  translate <2, 0, 1.5>
  texture{
    pigment{
      image_map { sys "ourpat.bmp"
        map_type 0
      }
      quick_color red 0.8 green 0.4 blue 0
    }
    finish{diffuse 0.6 ambient 0.4 } 
  }
}
```
Modifiers

- `map_type 1`
  - Spherical map.
  - Center is at origin.
  - Y-axis is texture axis.
  - Top of texture is a "North Pole".
  - Texture starts at x-axis; goes west to east

```plaintext
sphere<[0, 0, 0], 1
  texture
  pigment
    { image_map { sys "ourpat.bmp" map_type=1 }
  }
  finish
    { diffuse 0.5
      ambient 0.5
      specular 1.0
      roughness 0.005
    }
  }
  scale<2., 2., 2.>
  translate<-0.5, 2., 1.62>
}
```
Modifiers

- **map_type 2**
  - Cylindrical map.
  - Center is at origin.
  - Y-axis is texture axis.
  - Texture starts at x-axis; goes west to east.
  - Bottom of image is at y = 0; top of image at y = 1

```plaintext
cylinder( <0,-1, 0>, <0, 1, 0>, 1
texture{
  pigment{
    image_map { sys "ourpat.bmp"
      map_type 2
    }
  }
  finish{
    diffuse 0.5
    ambient 0.5
    specular 1.0
    roughness 0.005
  }
}
scale<1.6, 2.33, 1.6>
translate<3.22, 2.33, 2.11>
```

```cylindrical map.
Center is at origin.
Y-axis is texture axis.
Texture starts at x-axis; goes west to east.
Bottom of image is at y = 0; top of image at y = 1
```
Modifiers

- **map_type 5**
  - Torus map.
  - Center is at origin.
  - It assumes that a torus of major radius one sits at the origin in the x-z-plane.
  - The image is wrapped around similar to spherical or cylindrical maps.
  - However the top and bottom edges of the map wrap over and under the torus where they meet each other on the inner rim

```plaintext
# Example

torus[1., .5
  texture
    pigment {image_map "sys "output.bmp" map_type(5)}
}]
finish{diffuse 0.5 ambient 0.5 specular 1.0 roughness 0.005}
}
scale 1.2 translate <1,1,-2>
```


Careful with the size of your objects

Cylinder of height 2

Cylinder of height 1
What happened here?

Repetition, Scaling, Translating

- can specify "once" in image_map
- can scale, rotate, translate image_map
Transformations and texture

Object myObject{
  texture {...}
  rotate <.>
  translate <.>
}

versus

Object myObject{
  rotate <.>
  translate <.>
  texture {...}
}

Object Maps

pigment {
  object {
    ... object ... // text, etc.
    color rgb <0,0,1>   // inside object
    color rgb <1,0,0>   // outside object
  }
}

Example