Mapping Techniques

Texture Mapping

- Phong shaded scenes look plastic-like
- Texture Mapping makes it more “real”
Mapping Techniques

Texture Mapping

- Uses polygons with few vertices
- Give the impression of a very detailed object
- Cheap to render – make use of standard rendering method

Modulated Properties

- Color
- Specular Color
- Normal Vector Perturbation
- Displacement Mapping
- Transparency
Color

- Modulate diffuse reflection coefficient

Specular Color

- Maps the environment
Normal Vector Perturbation

- Bump Mapping

http://www.realsoft.fi/gallery/v45/

Displacement Mapping

- Perturb a surface point along the direction of the normal

http://www.realsoft.fi/gallery/v45/
Transparency

- Control the opacity of a transparent object

2D Mapping

- Forward Mapping
- Inverse Mapping

Parameterization

Projection

Screen
Mapping Techniques

## Aliasing

- **Bilinear interpolation**
  - Find correspondence between \((u,v)\) texture coordinates and \((x,y,z)\) object space
  - OpenGL: assign textures coordinates for vertices

- **Intermediate surface**
  - Map the texture onto an intermediate surface
  - Eg: Plane, Cylinder, Cube, Sphere
OpenGL

- Create a texture object and specify it
  - `glGenTextures(…);`
  - `glBindTextures(…);`
  - `glTexImage2D(…);`

- Specify how to apply
  - `glTexParameteri(…);`

- Enable
  - `glEnable(GL_TEXTURE_2D);`

- Draw scene
  - `glTexCoord2f(…); glVertex3f(...);`
Billboards

- Texture map onto a plane in 3D
- Plane normal to the viewing direction

Bump Mapping

- Perturb the surface normal using a 2D bump map function
Environment Mapping

- Shine objects reflect environment around it
- Approximates ray tracing

Cubic Mapping

- 3D to 2D
Sphere Mapping

- Problems:
  - Minification
  - Magnification

- Solution:
  - Mip-mapping

Anti-aliasing

- Problems:
  - Minification
  - Magnification

- Solution:
  - Mip-mapping