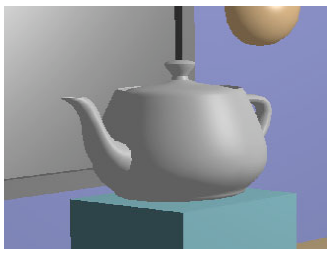
# Mapping Techniques

## Texture Mapping



- Phong shaded scenes look plastic-like

- Texture Mapping makes it more “real”

## Texture Mapping

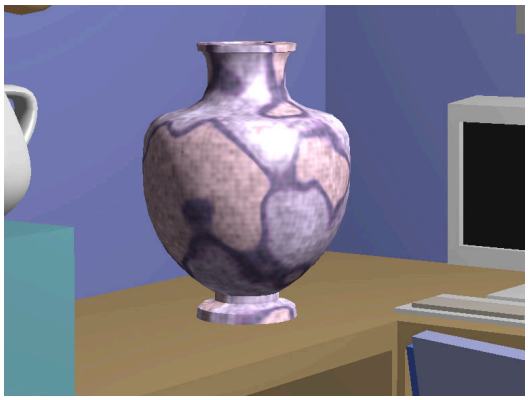
- Uses polygons with few vertices
- Give the impression of a very detailed object
- Cheap to render – make use of standard rendering method

## Modulated Properties

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

## Color

- Modulate diffuse reflection coefficient

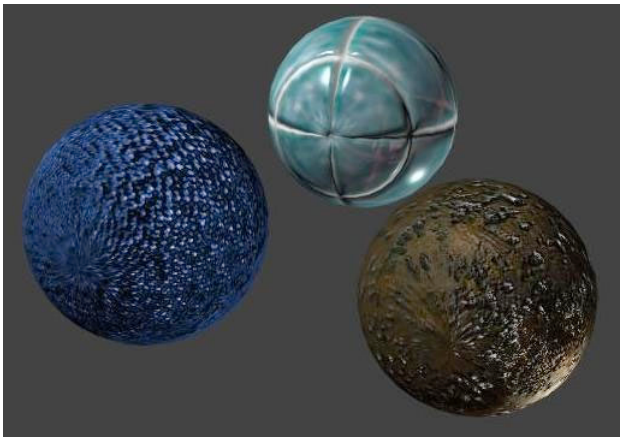


## Specular Color

- Maps the environment

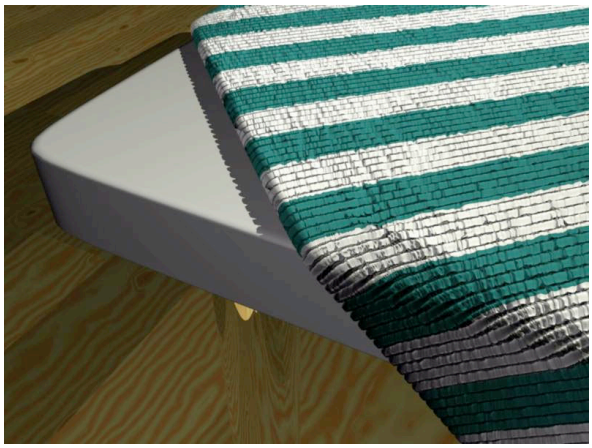
## Normal Vector Perturbation

- Bump Mapping



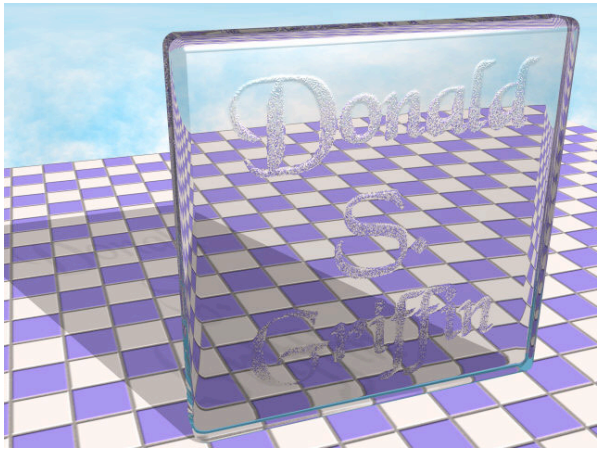
## Displacement Mapping

- Perturb a surface point along the direction of the normal
- http://www.realsoft.fi/gallery/v45/

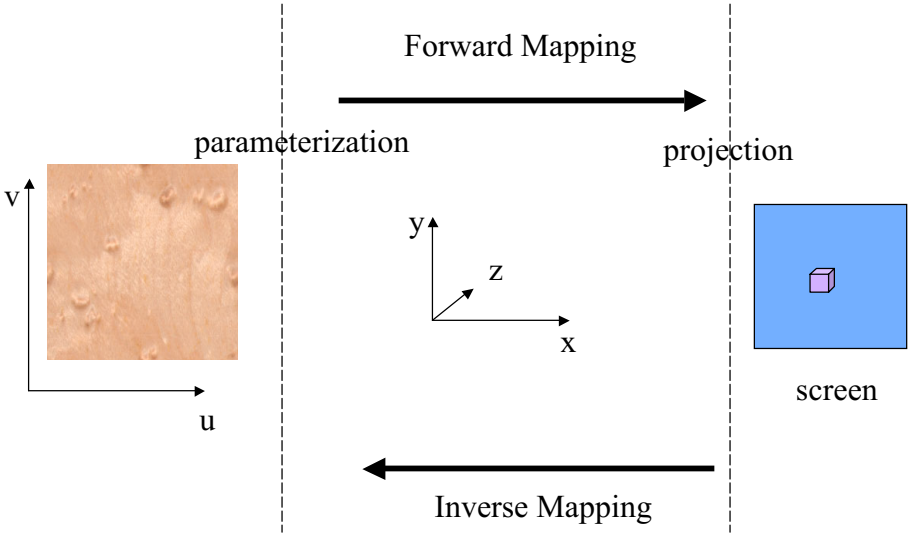


# Transparency

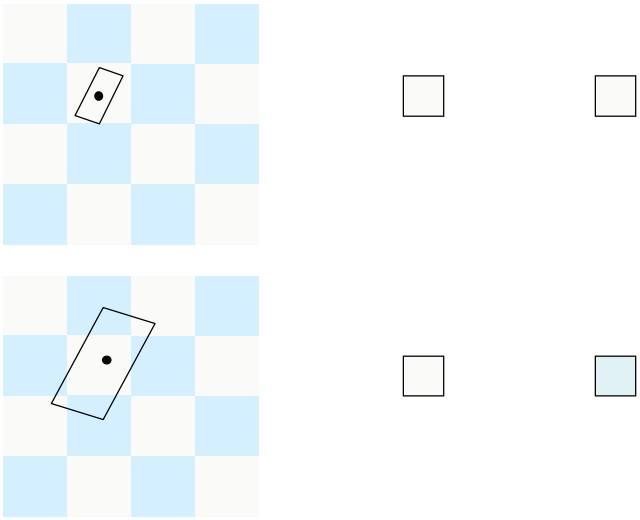
- Control the opacity of a transparent object




# 2D Mapping



## Aliasing



## Implementation

- 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(…);

## OpenGL

- Specify how to apply
  - glTexParameteri(…);
- Enable
  - glEnable(GL_TEXTURE_2D);
- Draw scene
  - glTexCoord2f(…); glVertex3f(...);

## Billboards

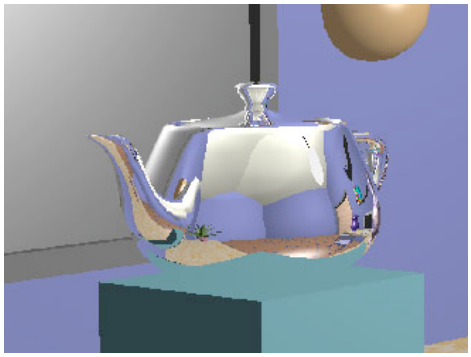
- Texture map onto a plane in 3D
- Plane normal to the viewing direction

## Bump Mapping

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

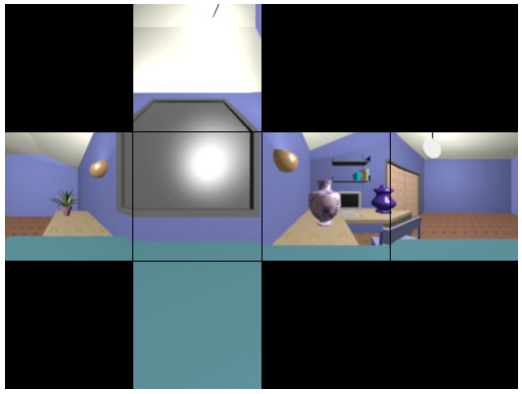
## Environment Mapping

- Shine objects reflect environment around it
- Approximates ray tracing



## Cubic Mapping

- 3D to 2D



## Sphere Mapping

## Anti-aliasing

- Problems:
  - Minification
  - Magnification
- Solution:
  - Mip-mapping