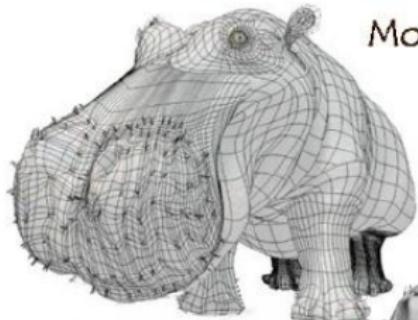


CS 461 - Computer Graphics

Texture Mapping

Textures



Model



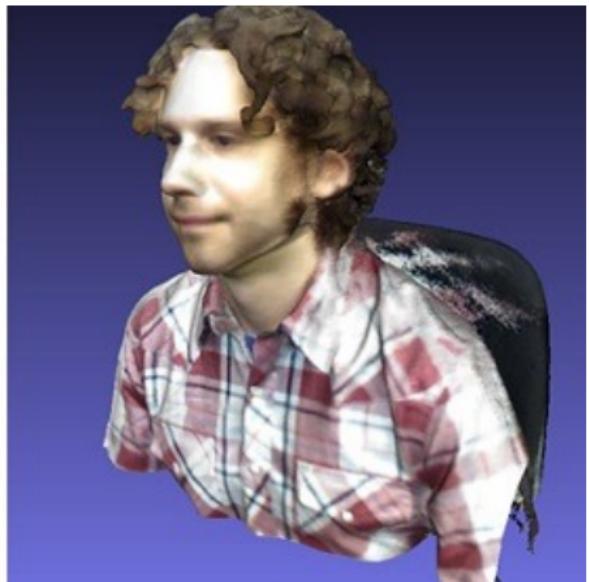
Model + Shading



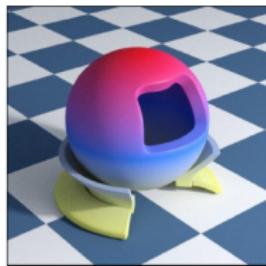
Model + Shading
+ Textures



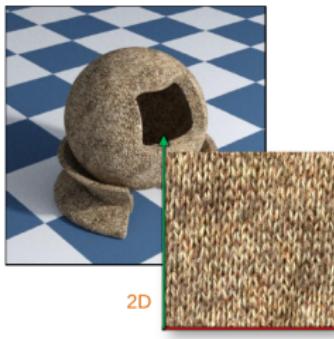
Textures



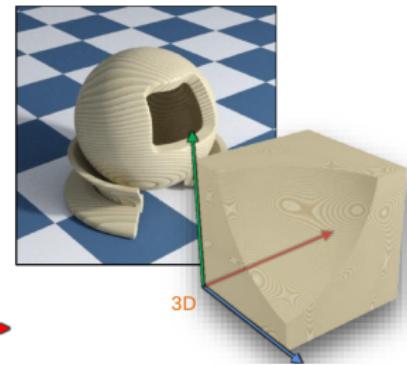
Textures



1D

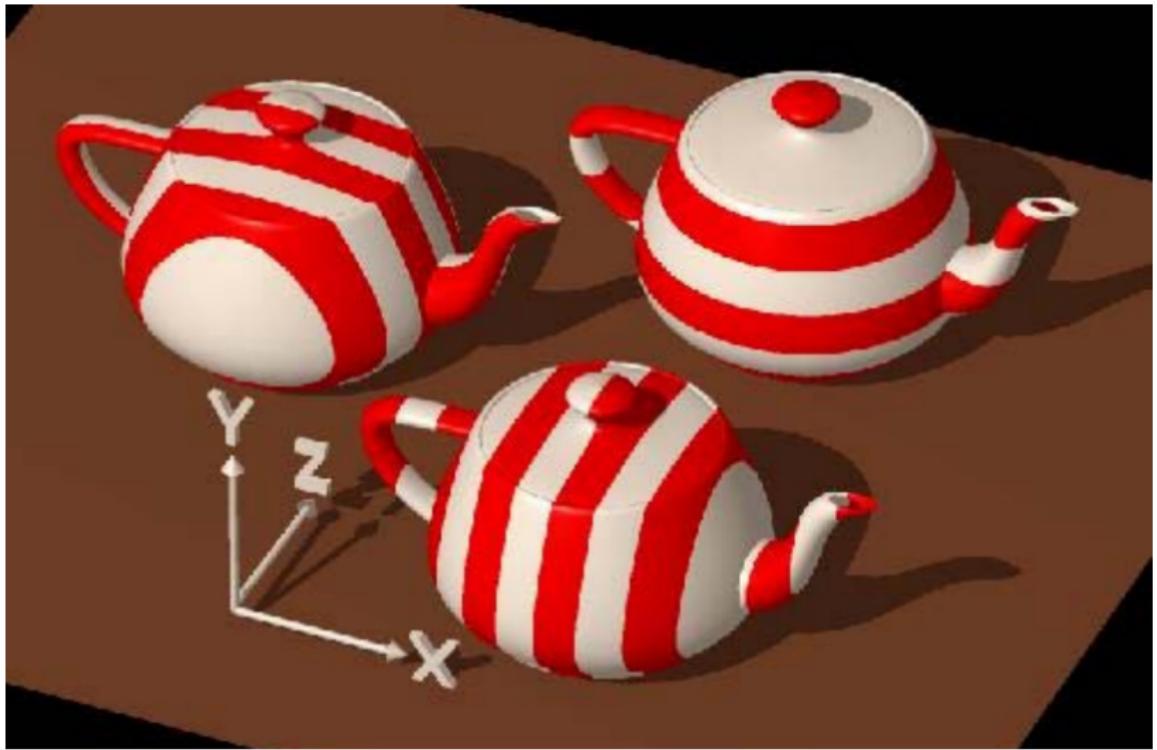


2D



3D

Parameterization



Two-part mapping

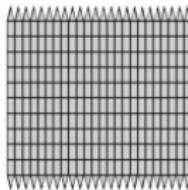
3-D Model



$$p = (x, y, z)$$



UV Map



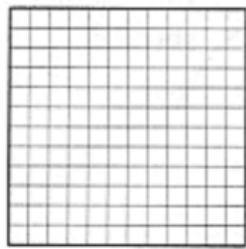
$$p = (u, v)$$

Texture

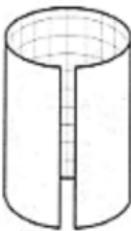


Two-part mapping

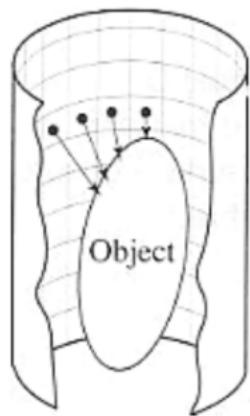
2D texture map



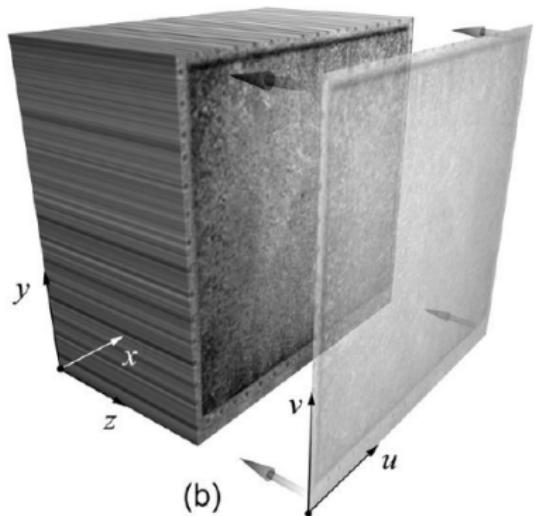
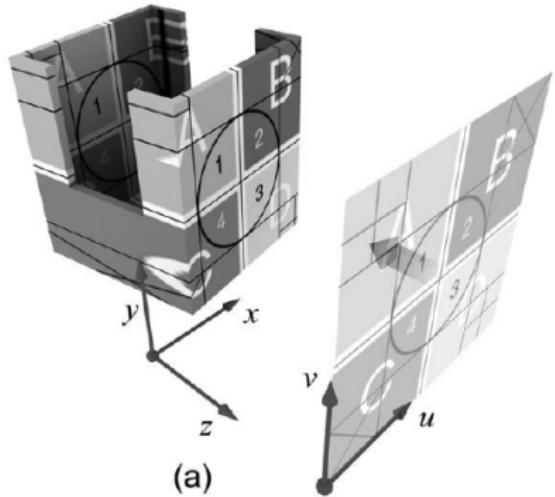
S
→



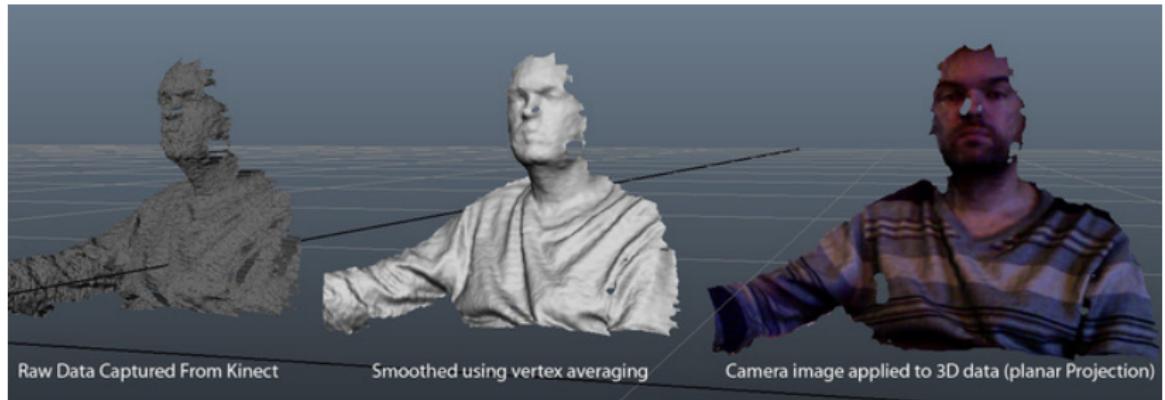
O
Intermediate
surface



Two-part mapping - Plane



Two-part mapping - Plane



Two-part mapping - Cylinder

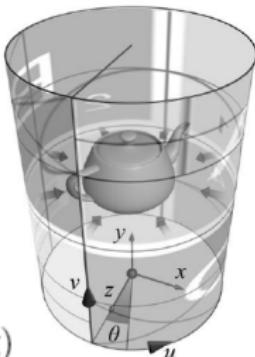
$$\theta = \tan^{-1}(x/z),$$

$$h = y,$$

$$r = \sqrt{(x^2 + z^2)},$$

$$u = \frac{1}{2} + \frac{\theta}{2\pi} = \frac{1}{2} + \frac{\tan^{-1}(x/z)}{2\pi},$$

$$v = h = y.$$



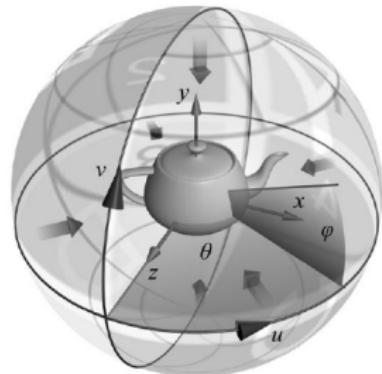
Two-part mapping - Sphere

$$\theta = \tan^{-1} \left(\frac{x}{z} \right) \quad -\pi < \theta \leq \pi$$

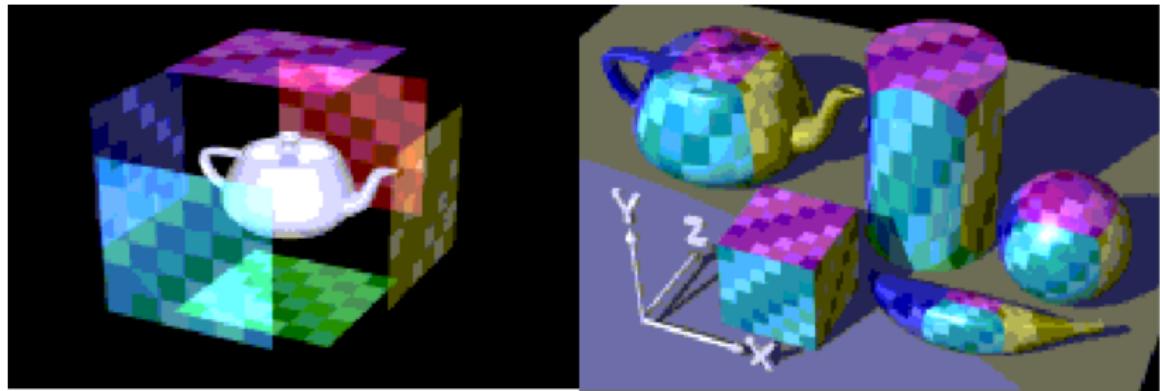
$$\varphi = \tan^{-1} \left(\frac{y}{\sqrt{x^2 + z^2}} \right) \quad -\frac{\pi}{2} < \varphi \leq \frac{\pi}{2},$$

$$r = \sqrt{x^2 + y^2 + z^2}.$$

$$u = \frac{\theta + \pi}{2\pi}, \quad v = \frac{\varphi + \pi/2}{\pi}.$$

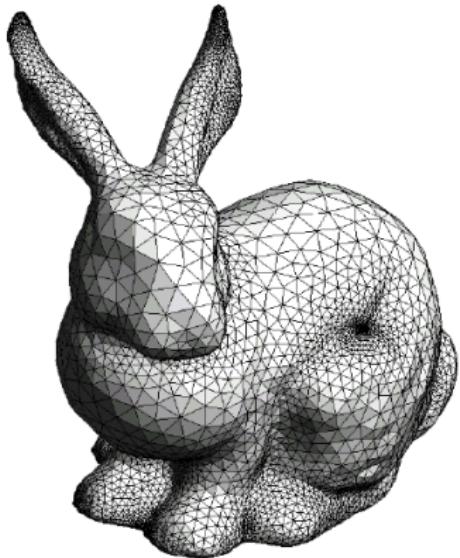


Two-part mapping - Box

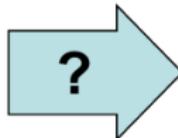


Texture Mapping

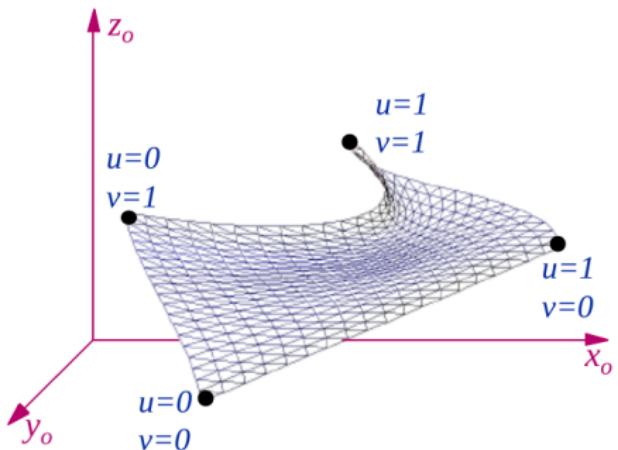
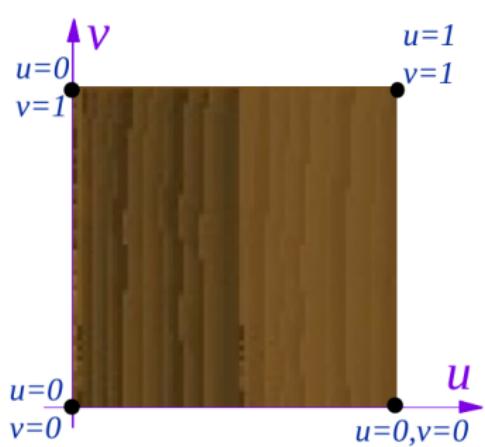
3D model



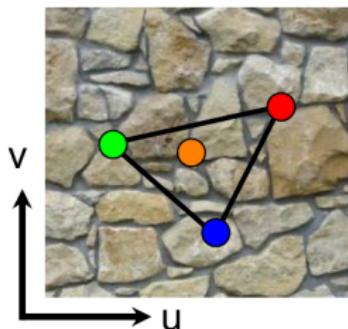
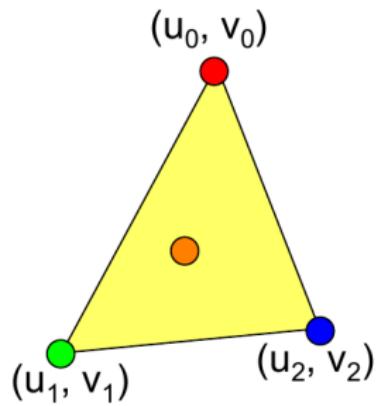
Texture mapped model



UV coordinates



UV coordinates

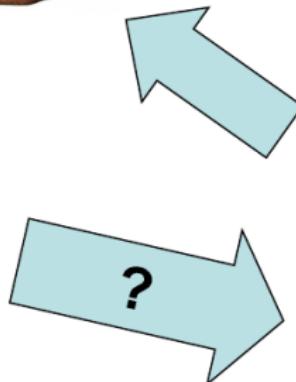
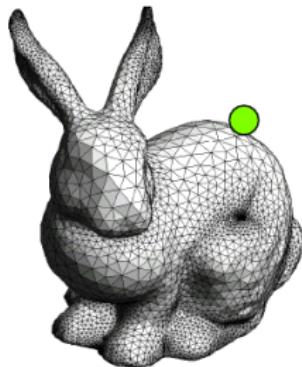


UV coordinates

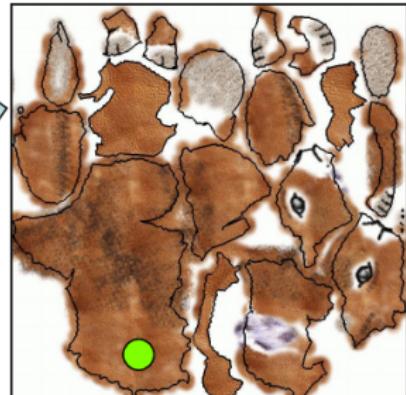
Texture
mapped model



For each point
rendered, look up
color in texture map



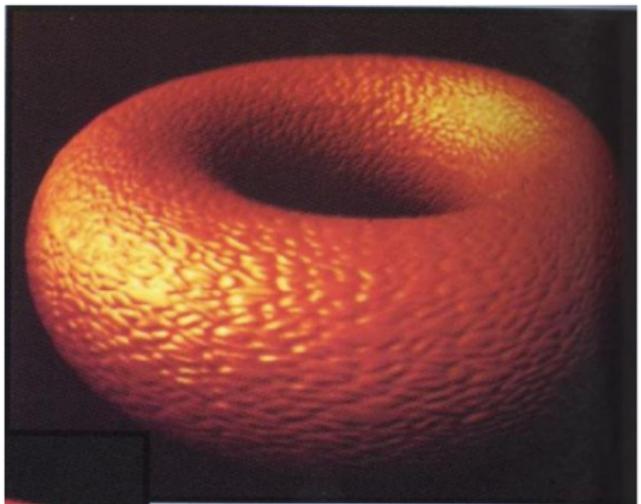
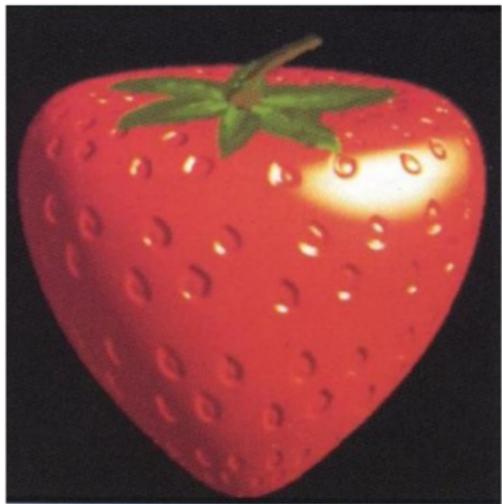
Texture map (2D image)



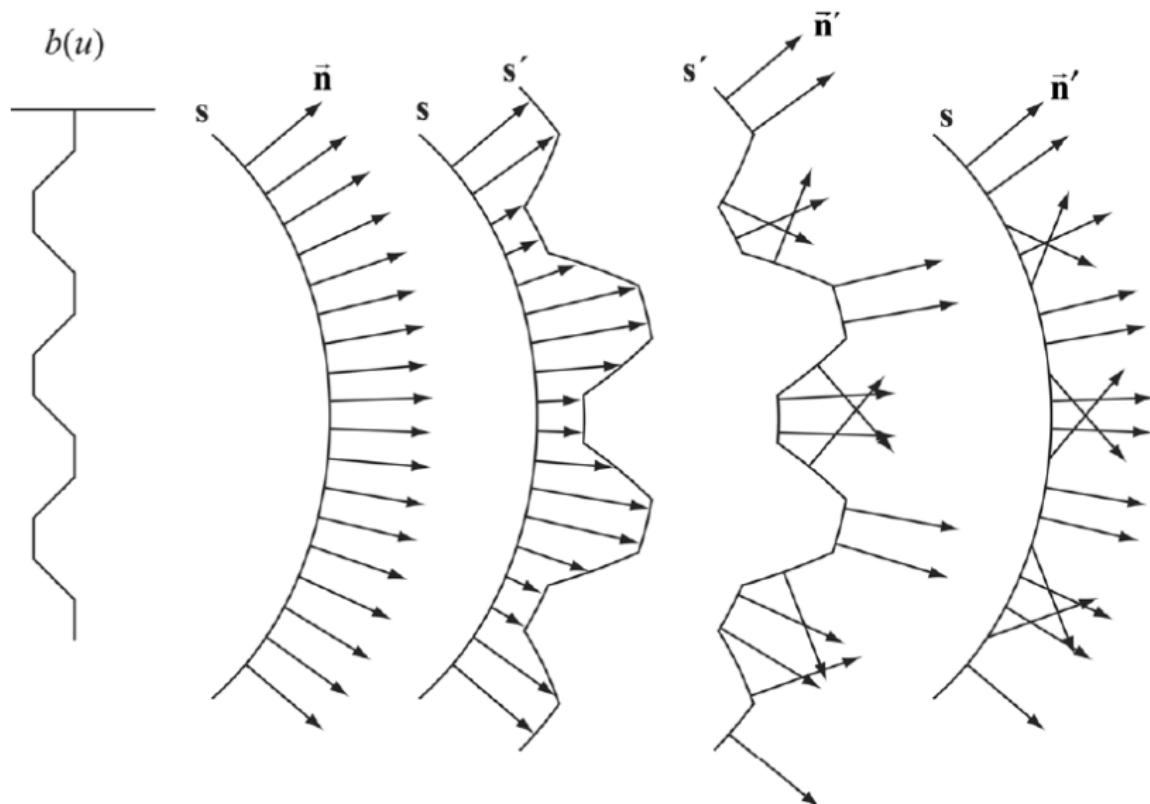
Matchmaker



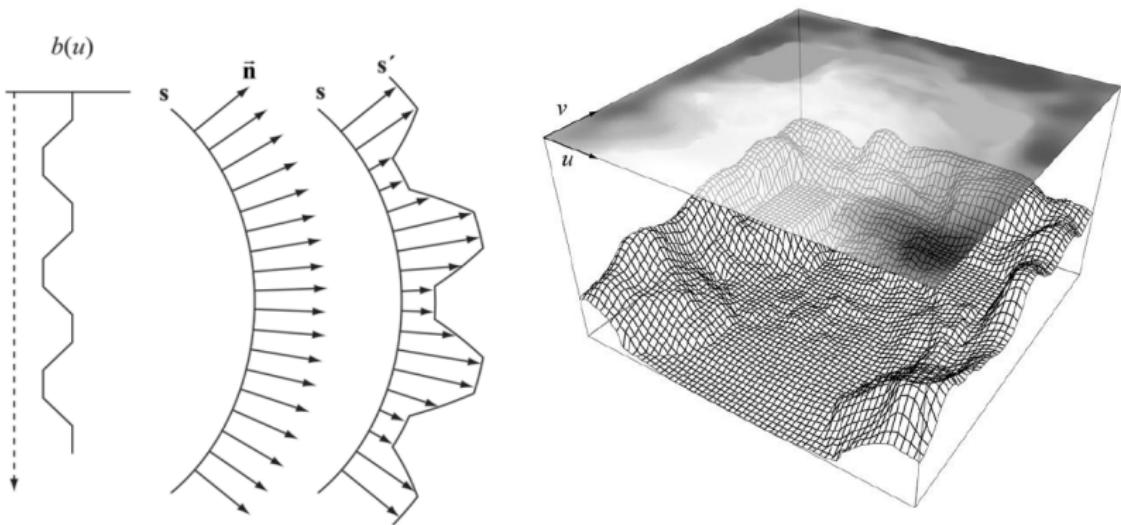
Bump mapping



Bump mapping



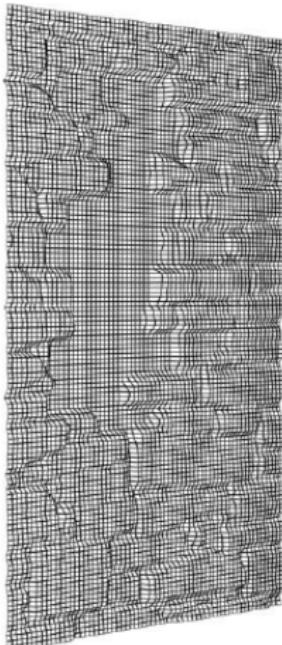
Normal mapping



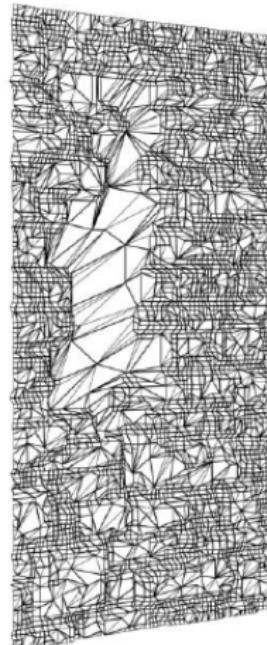
Normal mapping



Original



Uniform subdivision



Adaptive subdivision

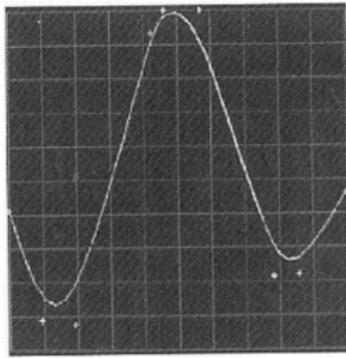
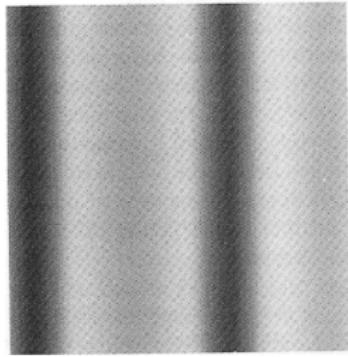


Shaded result

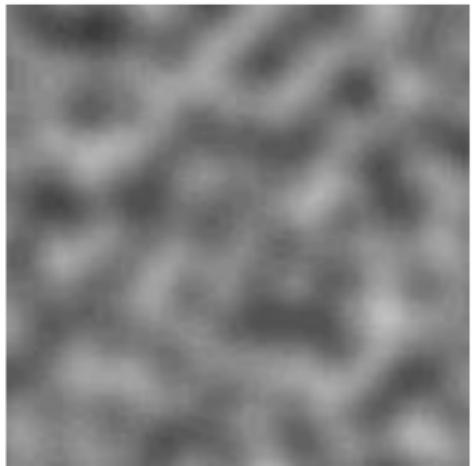
Perlin Noise



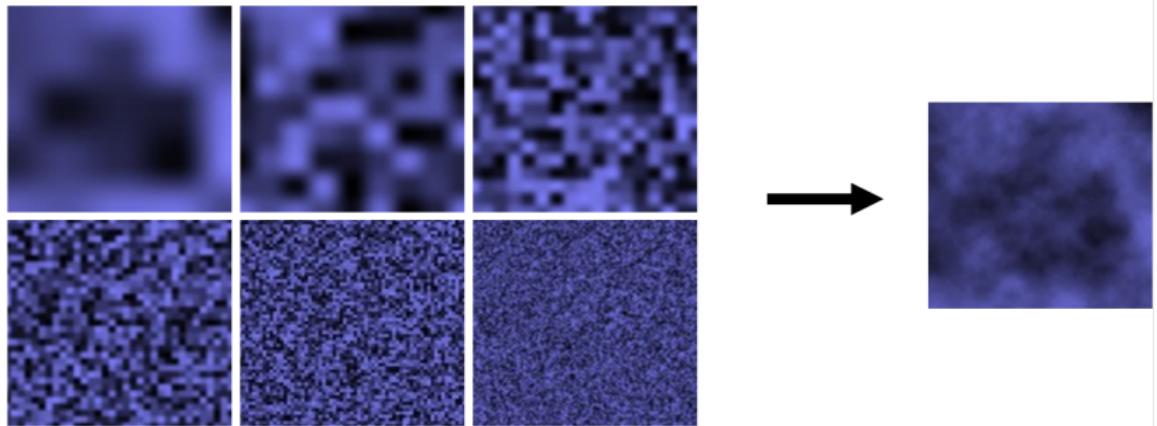
Perlin Noise



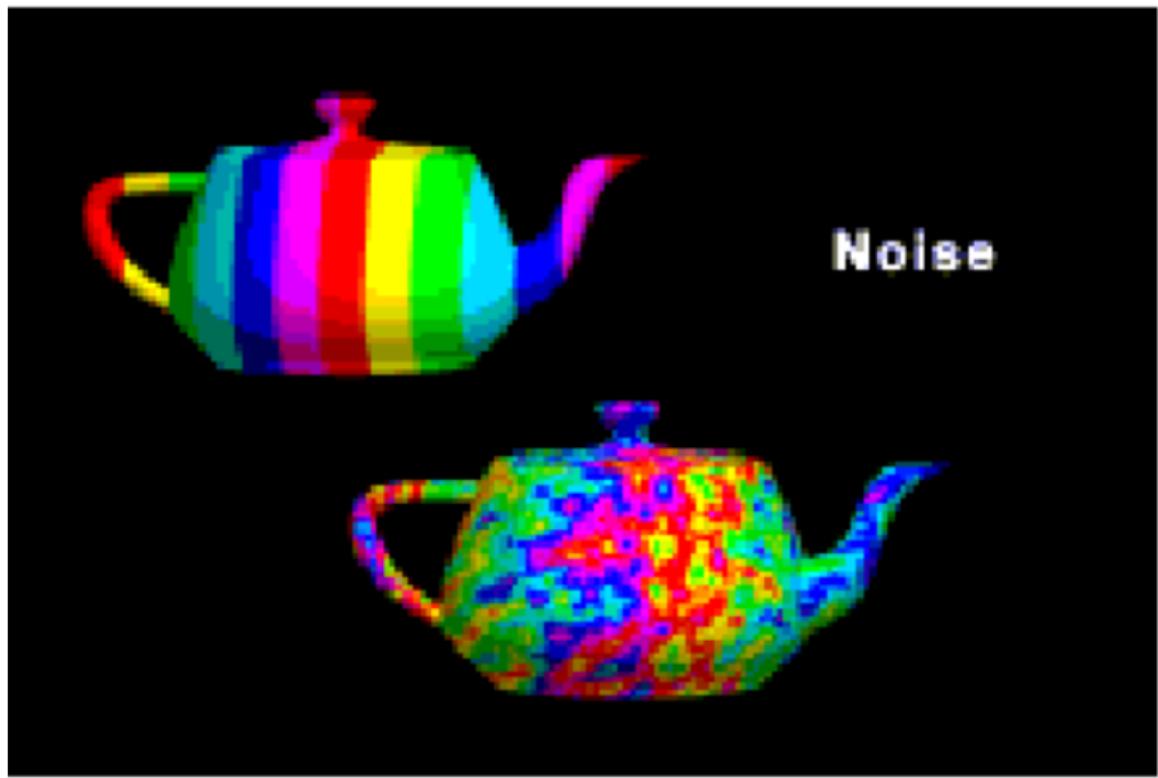
Perlin Noise



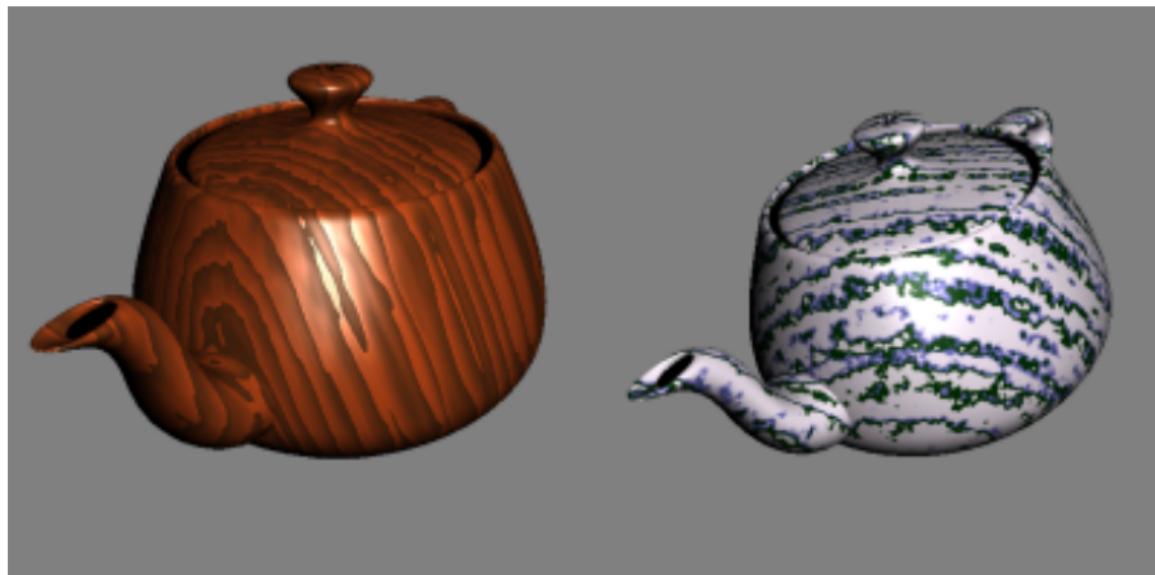
Perlin Noise



Perlin Noise



Perlin Noise



Next class

- ▶ Date: 26th October 9-10
- ▶ Topic: Ray Tracing