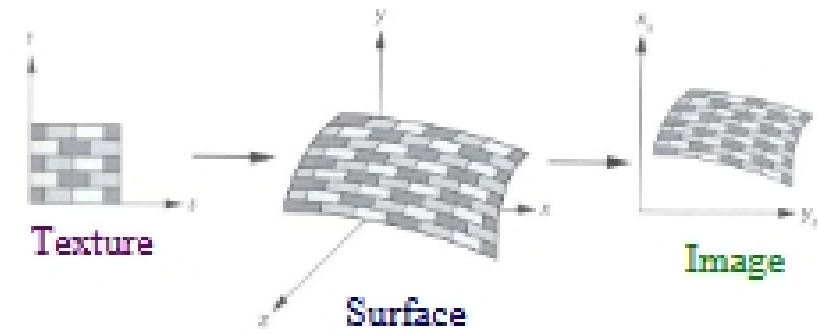


Texture Mapping

Adam Finkelstein
Princeton University
COS 426, Spring 2003

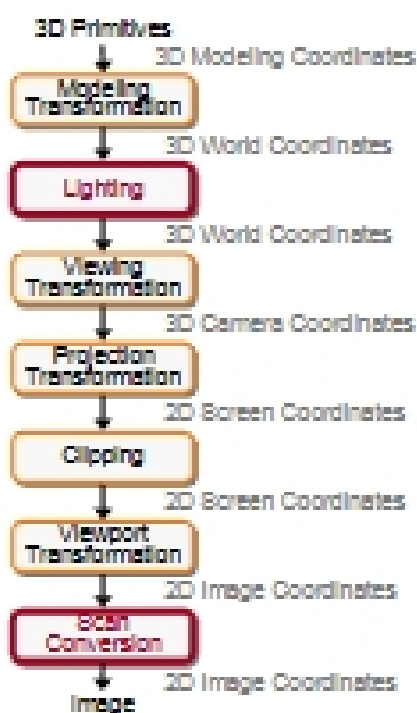
Textures

- Describe color variation in interior of 3D polygon
 - When scan converting a polygon, vary pixel colors according to values fetched from a texture



Angel Figure 9.3

3D Rendering Pipeline (for direct illumination)



Texture mapping

Surface Textures

- Add visual detail to surfaces of 3D objects



Surface Textures

- Add visual detail to surfaces of 3D objects

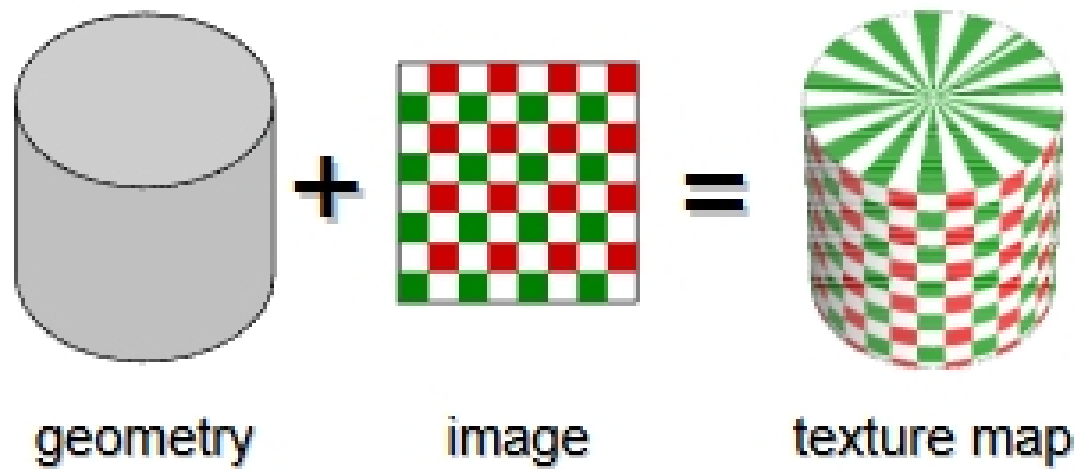


[Daren Horley]

Overview

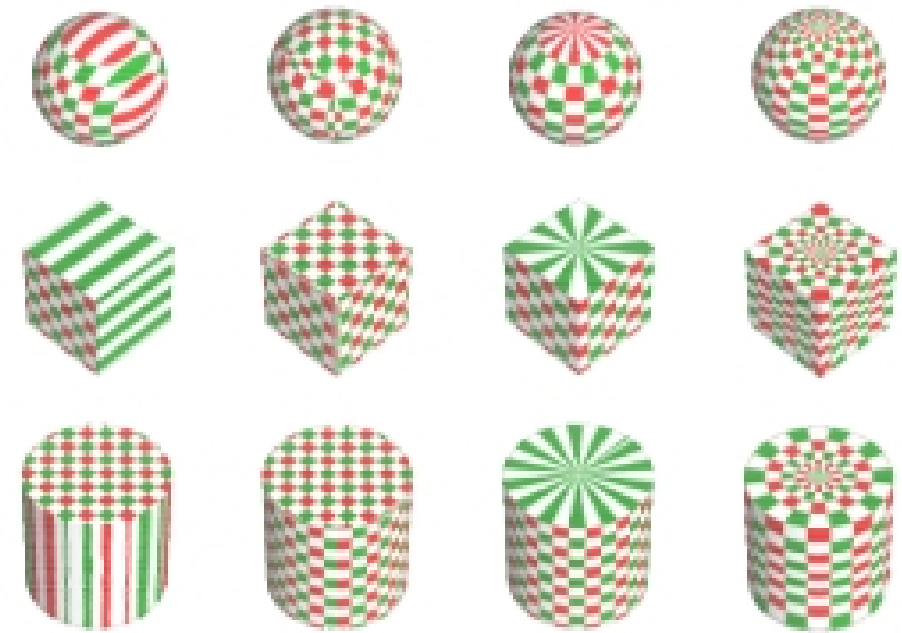
- Texture mapping methods
 - Parameterization
 - Mapping
 - Filtering
- Texture mapping applications
 - Modulation textures
 - Illumination mapping
 - Bump mapping
 - Environment mapping
 - Image-based rendering
 - Non-photorealistic rendering

Parameterization



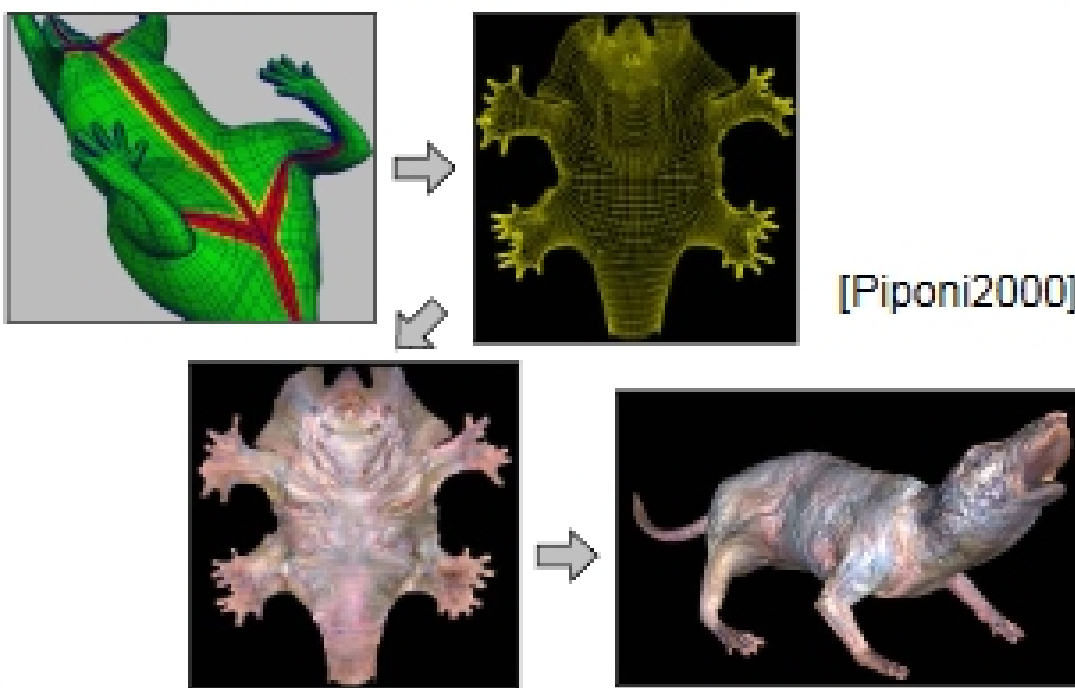
- Q: How do we decide *where* on the geometry each color from the image should go?

Option: Varieties of projections

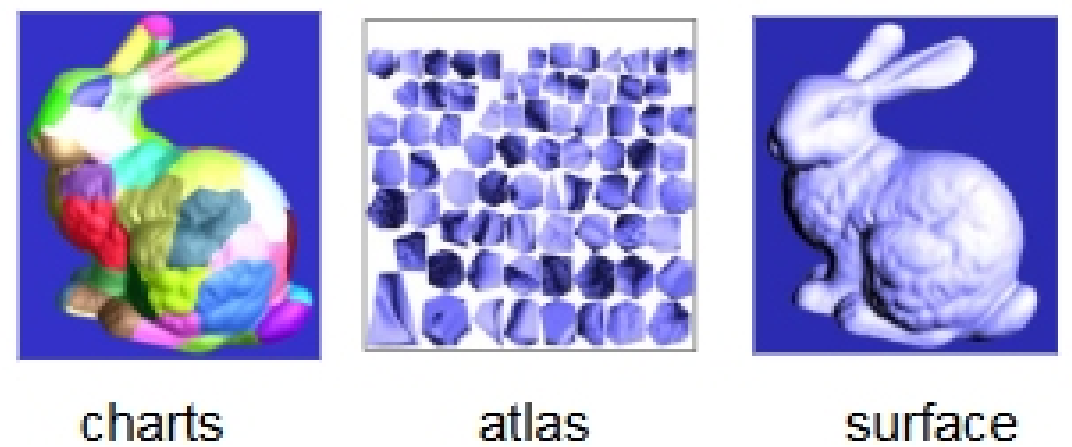


[Paul Bourke]

Option: unfold the surface



Option: make an atlas



[Sander2001]

Overview

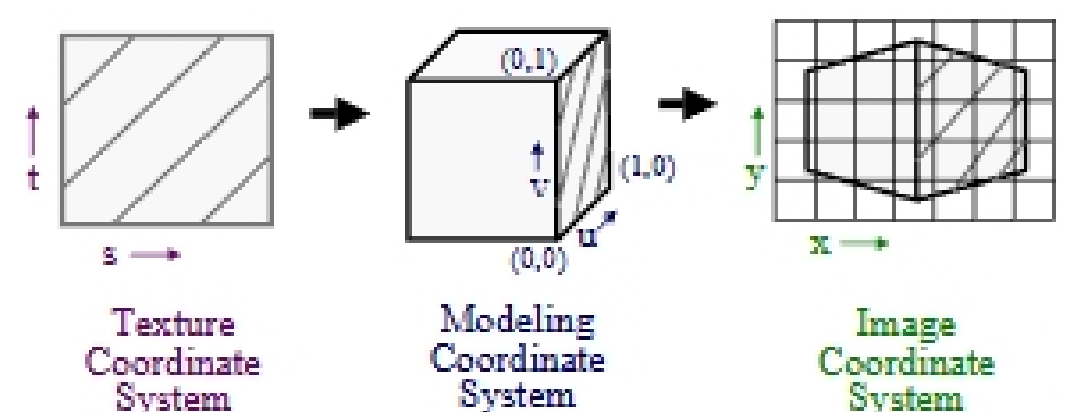


- Texture mapping methods
 - Parameterization
 - Mapping
 - Filtering
- Texture mapping applications
 - Modulation textures
 - Illumination mapping
 - Bump mapping
 - Environment mapping
 - Image-based rendering
 - Volume textures
 - Non-photorealistic rendering

Texture Mapping



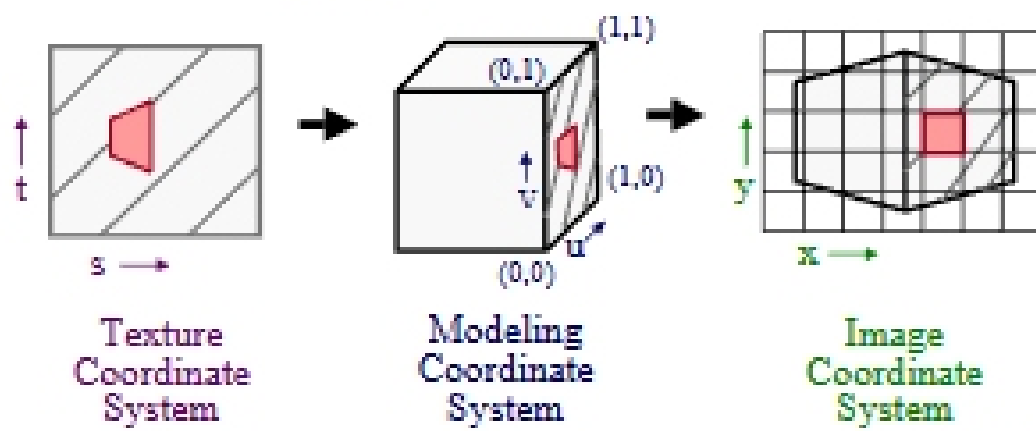
- Steps:
 - Define texture
 - Specify mapping from texture to surface
 - Lookup texture values during scan conversion



Texture Mapping



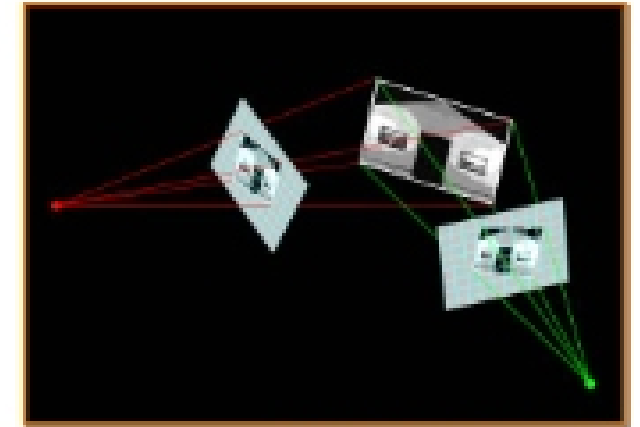
- When scan convert, map from ...
 - image coordinate system (x,y) to
 - modeling coordinate system (u,v) to
 - texture image (t,s)



Texture Mapping



- Texture mapping is a 2D projective transformation
 - texture coordinate system: (t,s) to
 - image coordinate system (x,y)

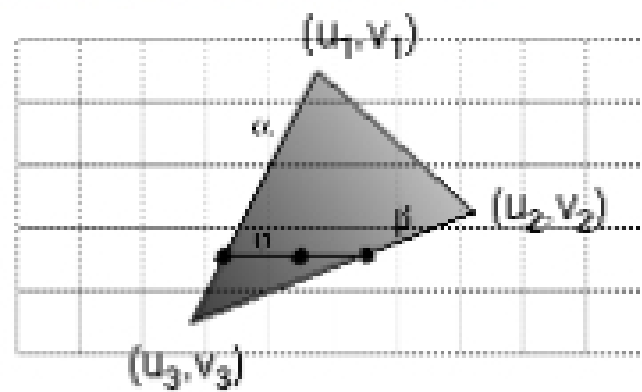


Allison Klein, Princeton

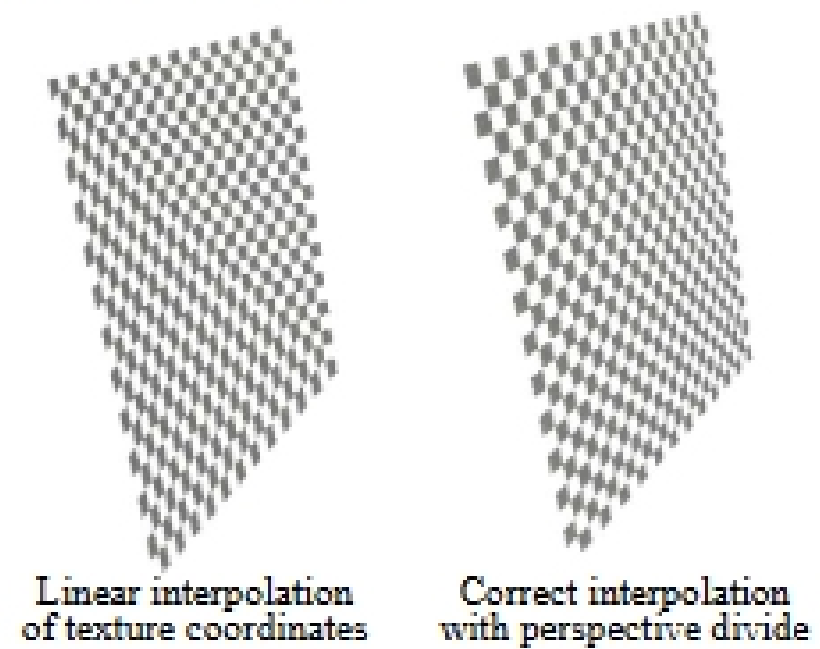
Texture Mapping



- Scan conversion
 - Interpolate texture coordinates down/across scan lines
 - Distortion due to bilinear interpolation approximation
 - » Cut polygons into smaller ones, or
 - » Perspective divide at each pixel



Texture Mapping



Hill Figure 8.42

Overview

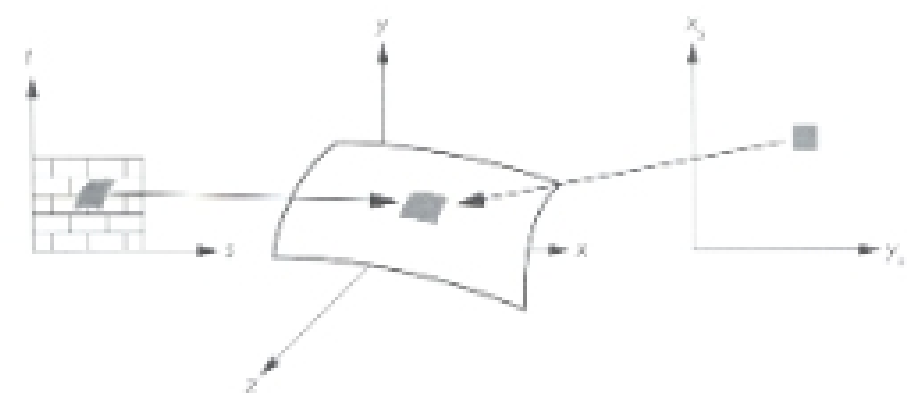


- Texture mapping methods
 - Parameterization
 - Mapping
 - Filtering
- Texture mapping applications
 - Modulation textures
 - Illumination mapping
 - Bump mapping
 - Environment mapping
 - Image-based rendering
 - Non-photorealistic rendering

Texture Filtering



- Must sample texture to determine color at each pixel in image



Angel Figure 9.4