Procedural Modeling

Last Time?

Today
• Texture Mapping
• Common Texture Coordinate Mappings
• Solid Texture
• Procedural Textures
• Perlin Noise
• Procedural Modeling
• L-Systems

Texture Mapping Difficulties
• Tedious to specify texture coordinates
• Acquiring textures is surprisingly difficult
  – Photographs have projective distortions
  – Variations in reflectance and illumination
  – Tiling problems

Common Texture Coordinate Mappings
• Orthogonal
• Cylindrical
• Spherical
• Perspective Projection
• Texture Chart
**Projective Textures**
- Use the texture like a slide projector
- No need to specify texture coordinates explicitly

**Projective Texture Example**
- Modeling from photographs
- Using input photos as textures

**Texture Chart**
- Pack triangles into a single image

**Questions?**

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**Texture Map vs. Solid Texture**

“Solid Texturing of Complex Surfaces”, Peachey, SIGGRAPH 1985
Procedural Textures

\[ f(x,y,z) \rightarrow \text{color} \]

Procedural Textures

- Advantages:
  - easy to implement in ray tracer
  - more compact than texture maps (especially for solid textures)
  - infinite resolution

- Disadvantages
  - non-intuitive
  - difficult to match existing texture

Perlin Noise

Ken Perlin,
“An Image Synthesizer”, SIGGRAPH 1985
“Improving Noise”, SIGGRAPH 2002

Cellular Textures

www.worley.com

Questions?

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Procedural Displacement Mapping

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L-Systems

Prusinkiewicz & Lindenmayer,
The Algorithmic Beauty of Plants, 1990
http://algorithmicbotany.org/

L-Systems for Cities

“Procedural Modeling of Cities”, Parish & Müller, SIGGRAPH 2001

Cellular Texturing for Architecture

“Feature-Based Cellular Texturing for Architectural Models”, Legakis, Dorsey, & Gortler, SIGGRAPH 2001

Questions?

Image by Justin Legakis