Image-Based Representation

COS 598d

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Motivation: Why IBR?

Geometry-Based Rendering and its Problem

- Scene Complexity
  - Many Polygons/Pixel
  - 3D geometry out of range of most platforms
- Non-Realistic Rendering
  - hard to get accurate data
  - real life geometry is complex

Photos are Good

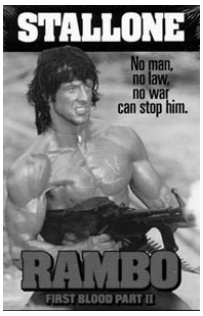
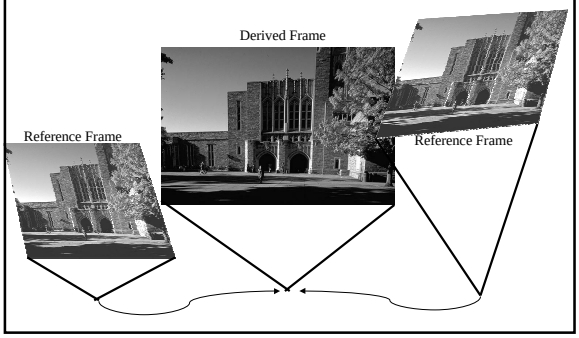
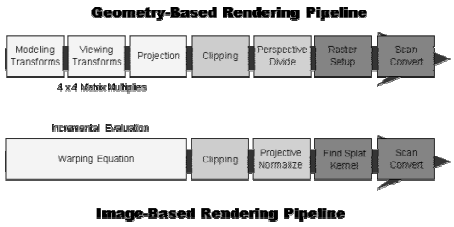


Image-Based Rendering

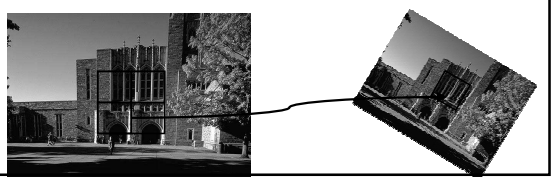


New Rendering Pipeline

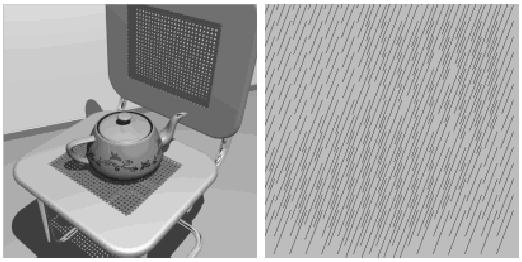


View Interpolation: Overview

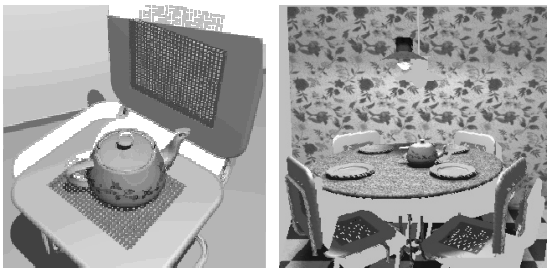
- Image ‘Morphing’
  - given two images, ‘morph’ one into the other
- Morph Maps
  - each pixel given explicit mapping, directional



View Interpolation: Morph Maps

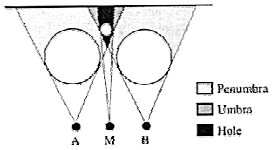


View Interpolation: Artifacts



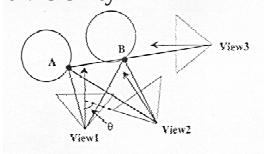
View Interpolation: Artifacts

- Overlap
  - image contraction
  - multiple layers of pixels
- Holes
  - local expansion
  - hidden objects



View Interpolation: Optimization

- Quadtree Compression
  - interpolate blocks, not just individual pixels
  - threshold determines level of subdivision
- View-Independent Visibility
  - gaze separation

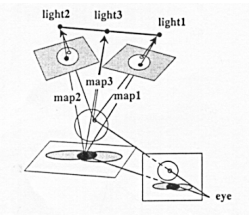


View Interpolation: General Implementation

- Preprocess
  - input data, morph map, quadtree, draw blocks back to front
- Interactive Implementation
  - input data, interpolate image w/background color, fill in holes with neighbors' colors

View Interpolation: Other Applications

- Light Interpolation
  - interpolate shadow maps
- Motion Blur
  - interpolation instead of temporal supersampling



View Interpolation: Problems

- Anti-Aliasing
  - not possible since view-dependent
- Static Scene
  - movement of camera only
- Visibility Problems
  - flow fields based upon shared visible images

IBR: What is it (really)?

- Definition of Problem
  - what's an image?
  - what's the metric?
- Is it new?
  - Textures, sprites, shadow and environment maps
  - rendering solution or interpolation problem?

IBR: Why is it Good?

Photo-realistic Rendering

Ease of Data Acquisition

Computation Proportional to Number of Pixels

Image-Based Primitives

Other Goodies

IBR: What are its Problems?

Lighting (specular highlights)

Static Scene Assumed

No Anti-Aliasing

Camera Paths Unpredictable

Difficulty of Data Acquisition

Visiblity/Occlusion

IBR: What is its Future?

Hardware implementation

Software Exploitation

HYBRIDIZATION!