Introduction

Topics in Image-based Modeling and Rendering
CSE291 J00
Lecture 1

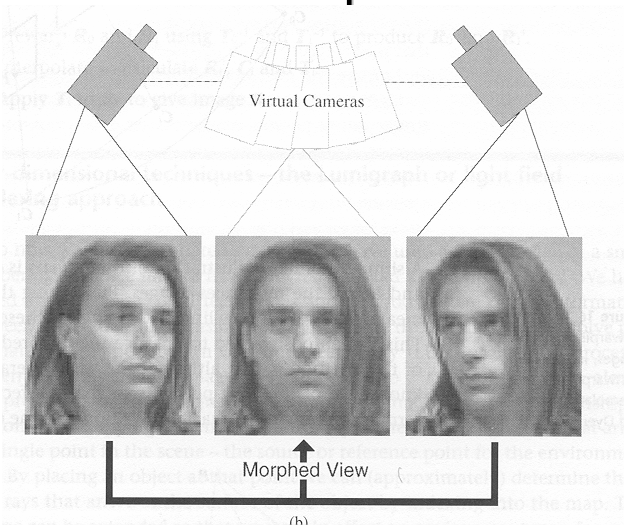
Class outline

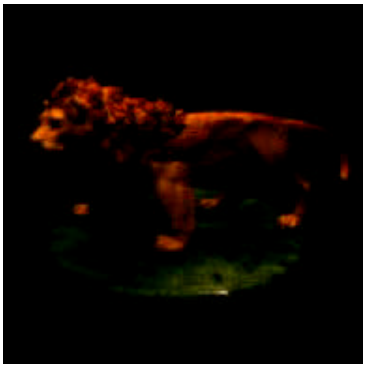
1. Introduction
2. Plenoptic Function
3. Light field rendering
4. 3D Reconstruction
5. Image Transfer Methods
6. Single view modeling
7. Measuring Light
8. Compositing and Matting
9, BRDF Models
10. Relighting
11. Texture and BTF Synthesis
12. Face Modeling
13. Video Textures

Rendering from Novel Viewing Positions

- Quicktime VR / Mosaicing
- Morphing
- Plenoptic Function/Lumigraph/Light field
- Scene Reconstruction:
  - Laser range finders
  - Stereo
  - Structure from Motion
- Image Transfer

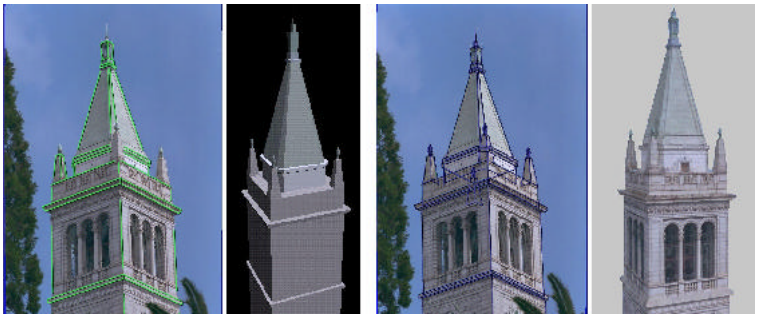
View Interpolation





Reprinted from "The Light Field," by M. Levoy and P. Hanrahan, Proc. SIGGRAPH (1996). \copyright 1996 ACM, Inc. Included here by permission. Courtesy of Marc Levoy and the Stanford Computer Graphics Laboratory.

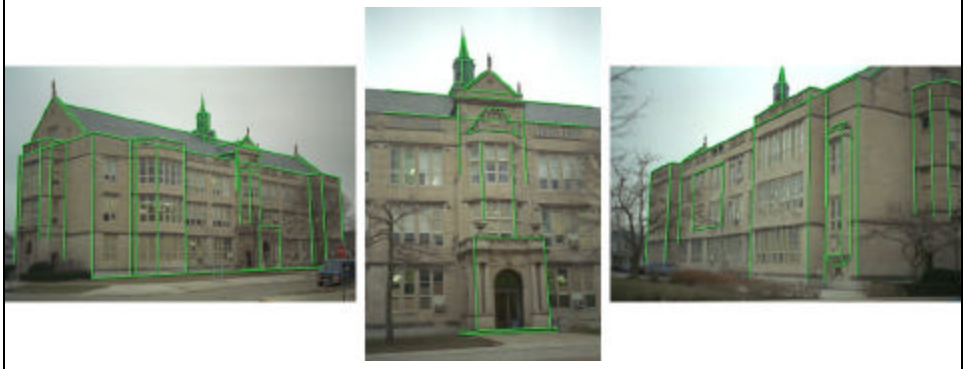
Façade (Debevec, Taylor and Malik, 1996)

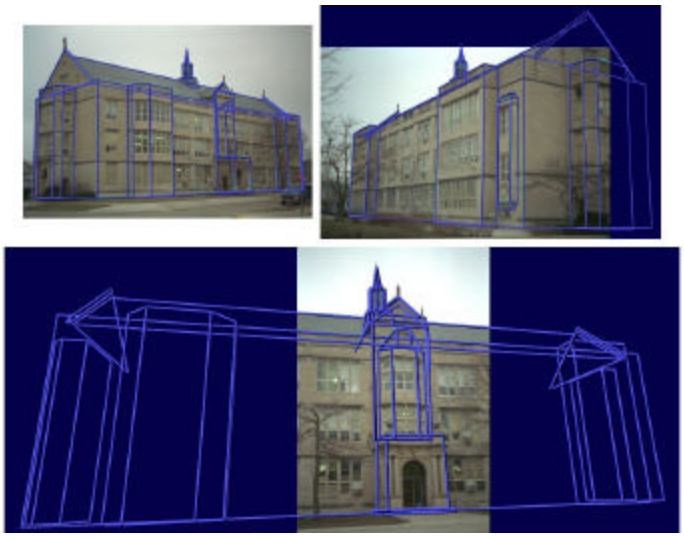


Architectural modeling:
- photogrammetry;
- view-dependent texture mapping;
- model-based stereopsis.

Reprinted from "Modeling and Rendering Architecture from Photographs: A Hybrid Geometry - and Image-Based Approach," By P. Debevec, C.J. Taylor, and J. Malik, Proc. SIGGRAPH (1996). © 1996 ACM, Inc. Included here by permission.

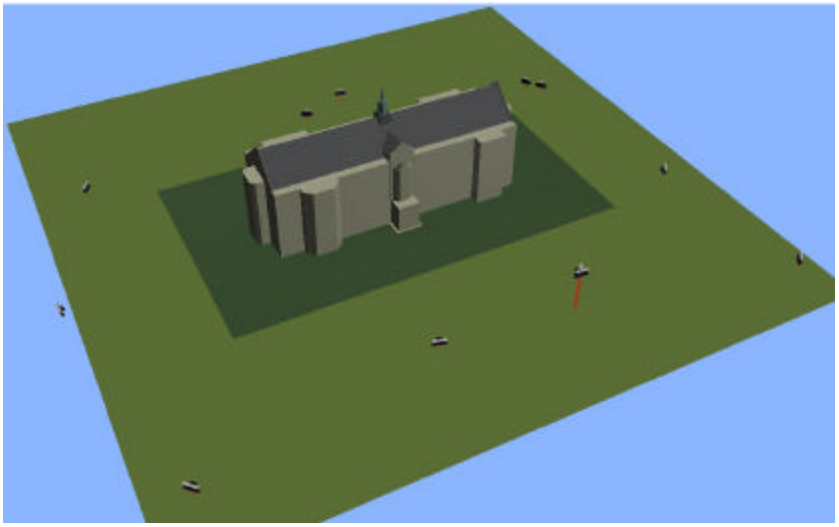
Images with marked features





Recovered model edges reprojected through recovered camera positions into the three original images

Resulting model & Camera Positions



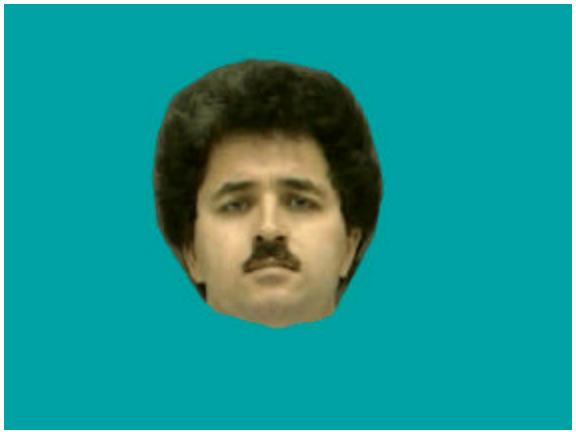
Façade

- The Uni High Movie
- The Camponile Movie

Image-Transfer/Warping

The weak-perspective (or paraperspective) images of a fixed scene made of n points form a six-dimensional variety of R.

Courtesy of Yakup Genc

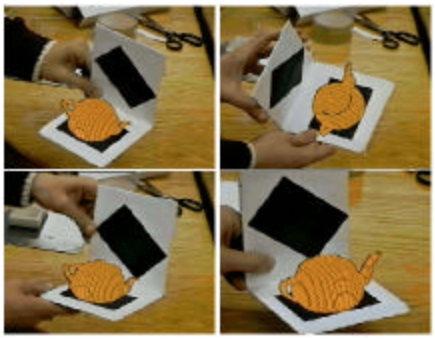


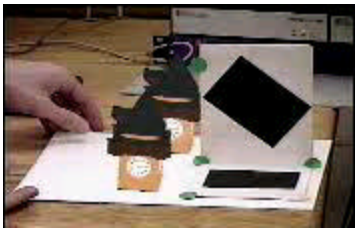
Input Clip

Synthesized Clip

Courtesy of Yakup Genc.

Augmented Reality Experiments

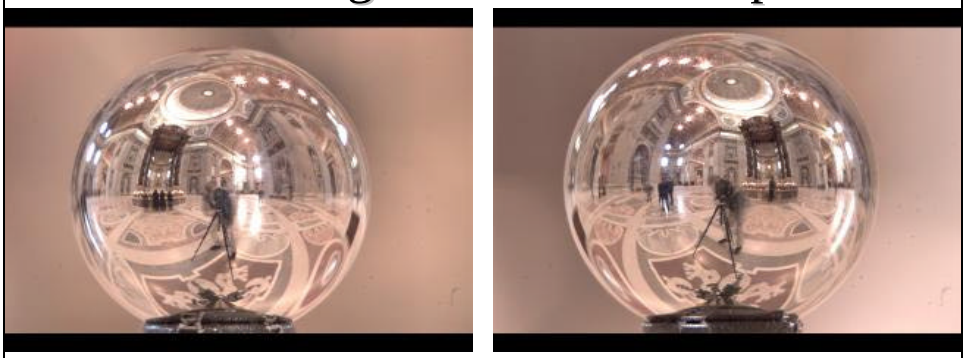




Courtesy of Kyros Kutulakos.

Reprinted from :Calibration-Free Augmented Reality," by K. Kutulakos and J. Vallino, IEEE Trans. On Visualization and Computer Graphics, 4(1):1-20 (1998). © 1998 IEEE.

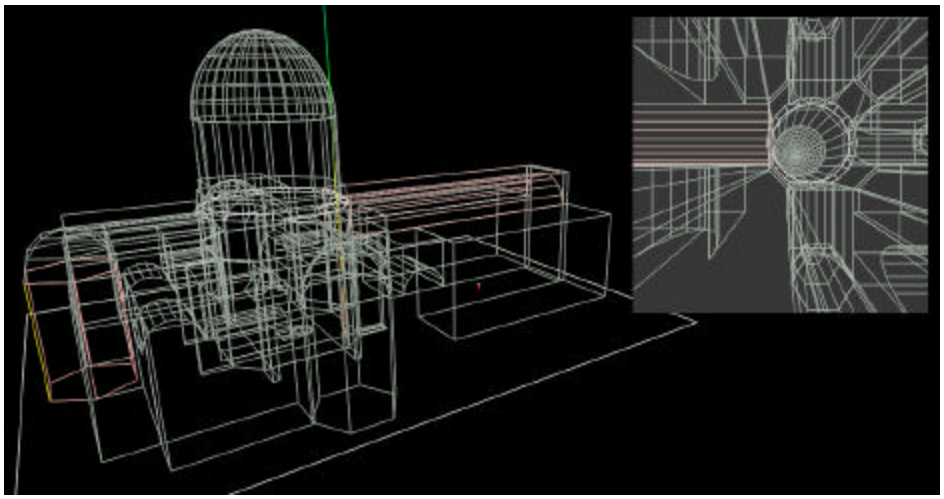
Toward Fiat Lux: Creating the Radiance Map



Two images of a two-inch mirrored sphere placed in front of Bernini's Baldacchino inside St. Peter's

St. Peter's Panorama

Model of St. Peters constructed with Façade

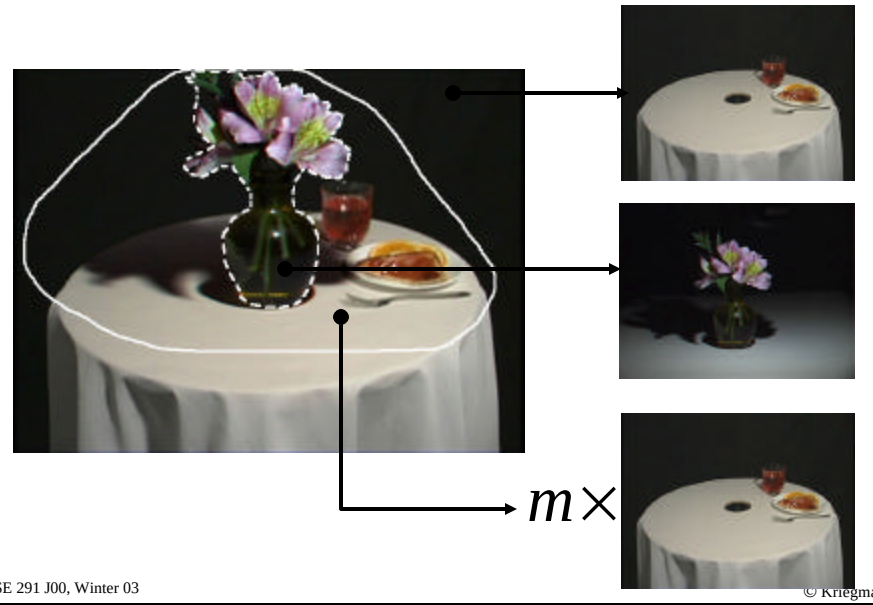


Fiat Lux

- Movie

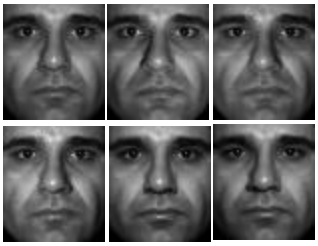
Modeling from One Image

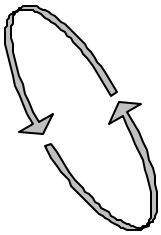
Compositing: Computing Pixel Values

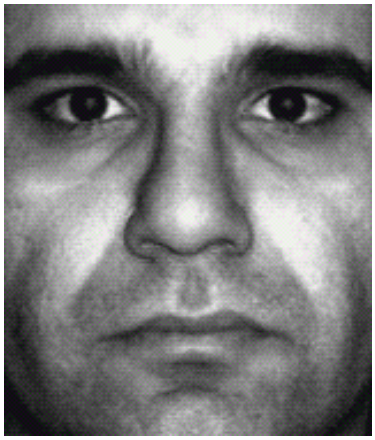


Compositing Real Objects in Video

Relighting



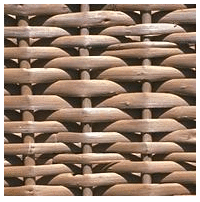


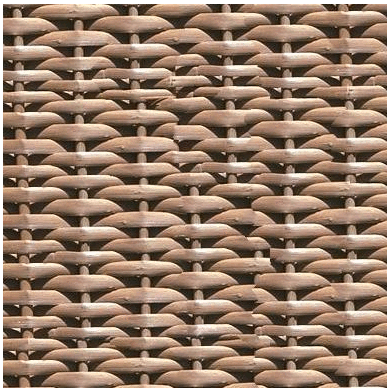


Single Light Source

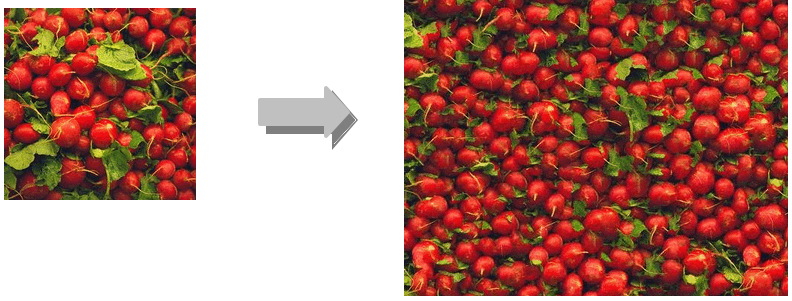
Face Movie

Texture Synthesis: Quilting





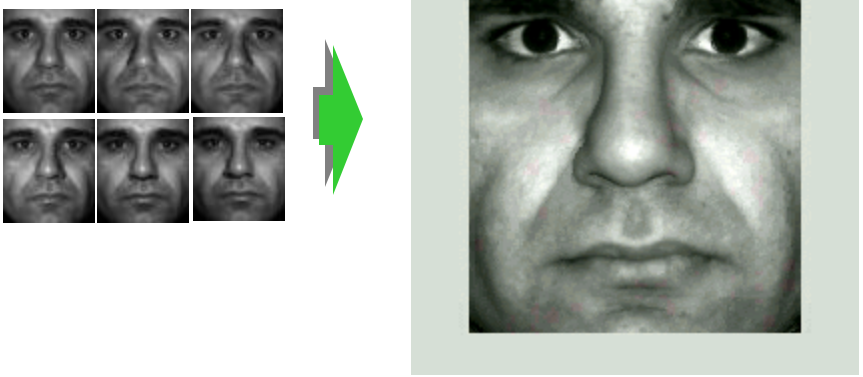
Texture Synthesis: Quilting



Polynomial Texture Maps

- **http://www.hpl.hp.com/ptm/**

3D head modeling from Images



Video Textures

Video Textures

Do you know?

- Radiance vs. Irradiance
- Affine camera model
- Epipole
- Fundamental Matrix
- Z-buffer
- Convex hull
- Visual hull
- Texture map
- Bump map

Questionnaire