Image-Based Modeling, Rendering, and Lighting

SIGGRAPH 99 Course #39

Tuesday, August 10, 1999

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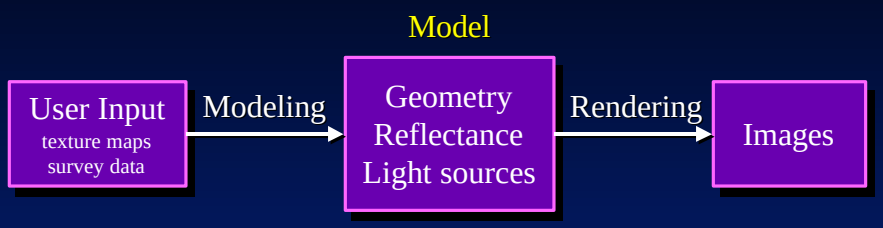
What is Image-Based Modeling and Rendering?

Traditional Modeling and Rendering

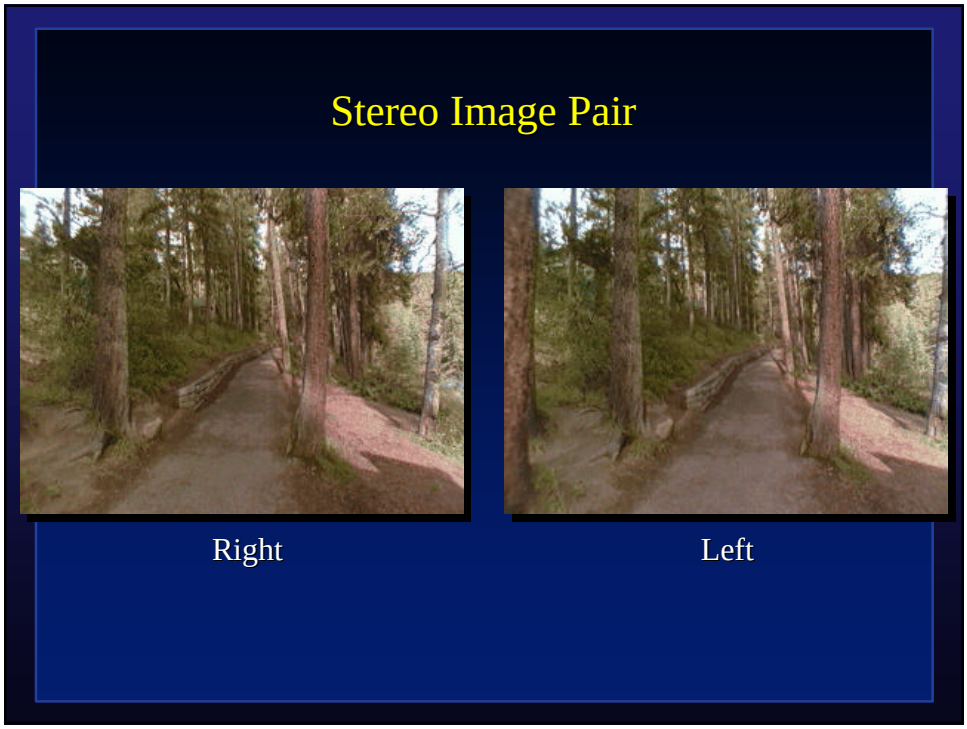


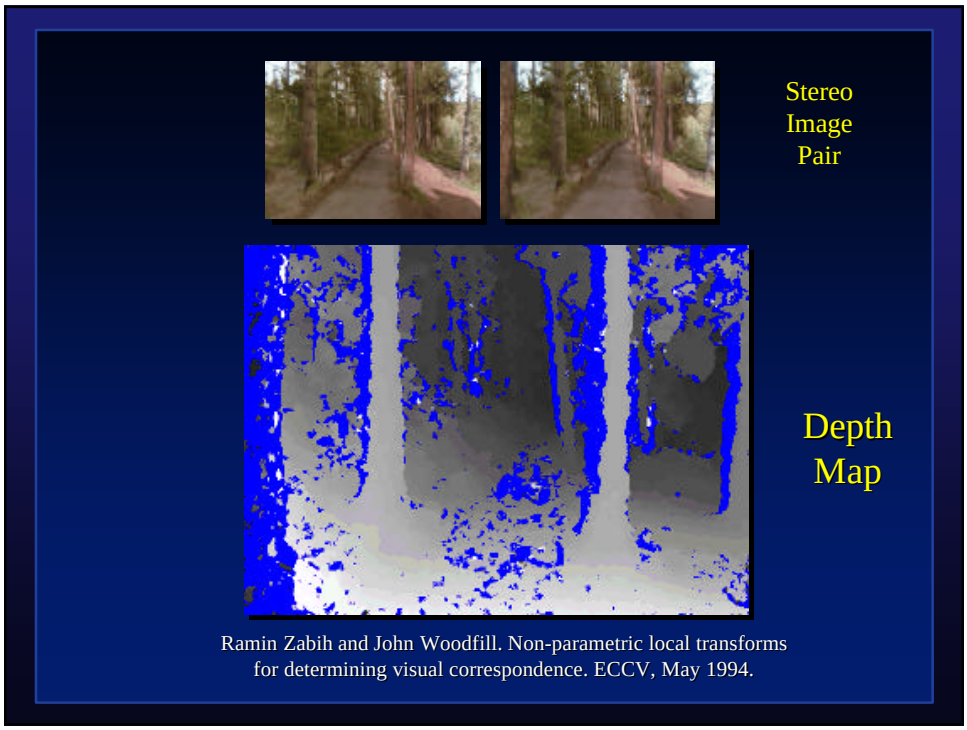
For Photorealism:

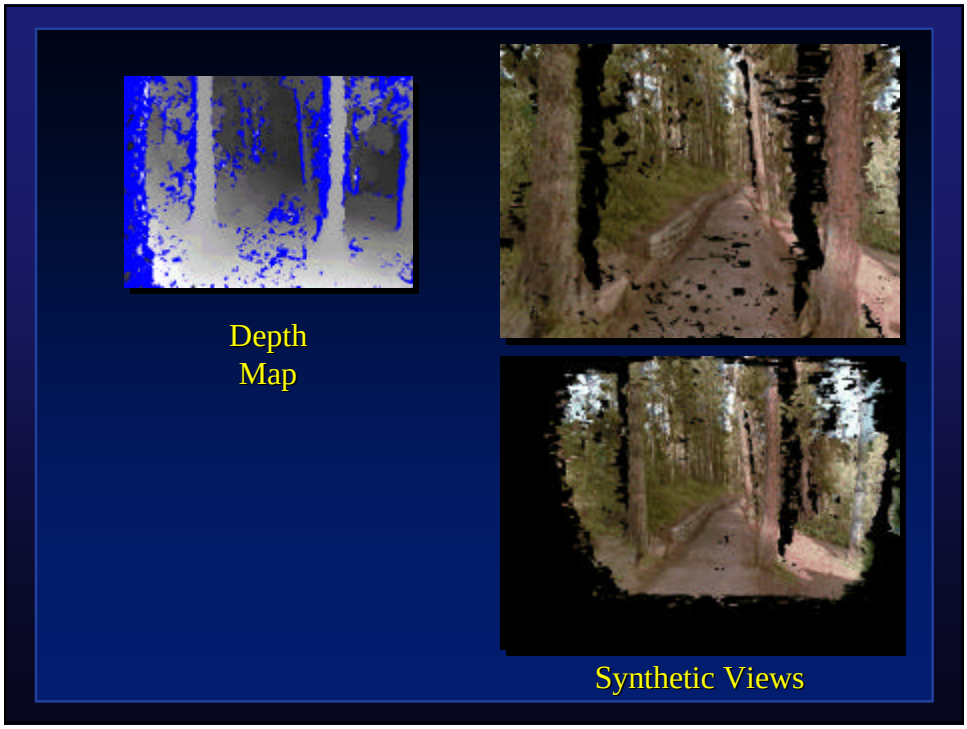
Modeling is Hard **Rendering is Slow**

Can we model and render this?

What do we want to do with the model?


Stereo Image Pair
Right
Left


Stereo
Image
Pair
Depth
Map
Ramin Zabih and John Woodfill. Non-parametric local transforms
for determining visual correspondence. ECCV, May 1994.



Immersion ’94

Michael Naimark
John Woodfill
Paul Debevec
Leo Villareal

Interval Research
Corporation

Stereo Image
Capture Rig

Video – Immersion '94

Image-Based Modeling and Rendering

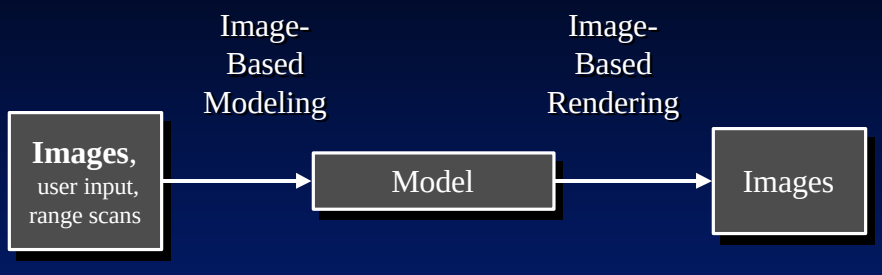


Image-Based *Modeling*

Images (photographs, renderings) are used to determine

- Scene Appearance
- Scene Geometry
- Lighting
- Reflectance Characterisics
- Kinematic Properties

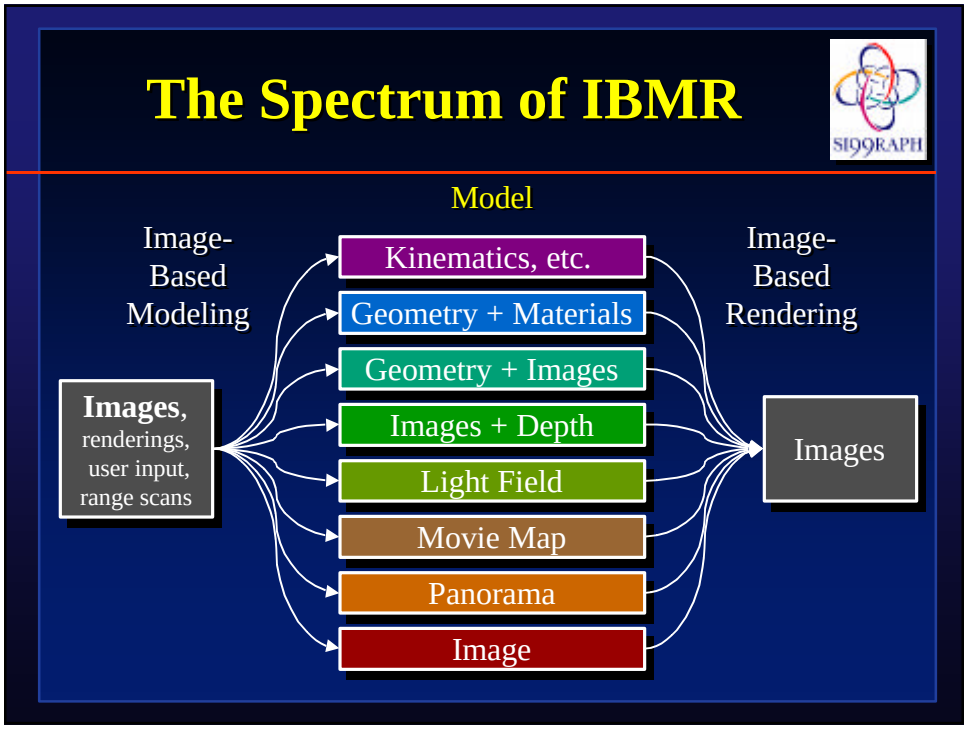
=> Modeling scenes* photorealistically *is easier

Image-Based Rendering

Appearance in available views is used to determine appearance in novel views =>

Not necessary to perform full illumination computations =>

Rendering is faster


The Spectrum of IBMR
Model
Image-Based Modeling
Image-Based Rendering
Images, renderings, user input, range scans
Kinematics, etc.
Geometry + Materials
Geometry + Images
Images + Depth
Light Field
Movie Map
Panorama
Image
Images

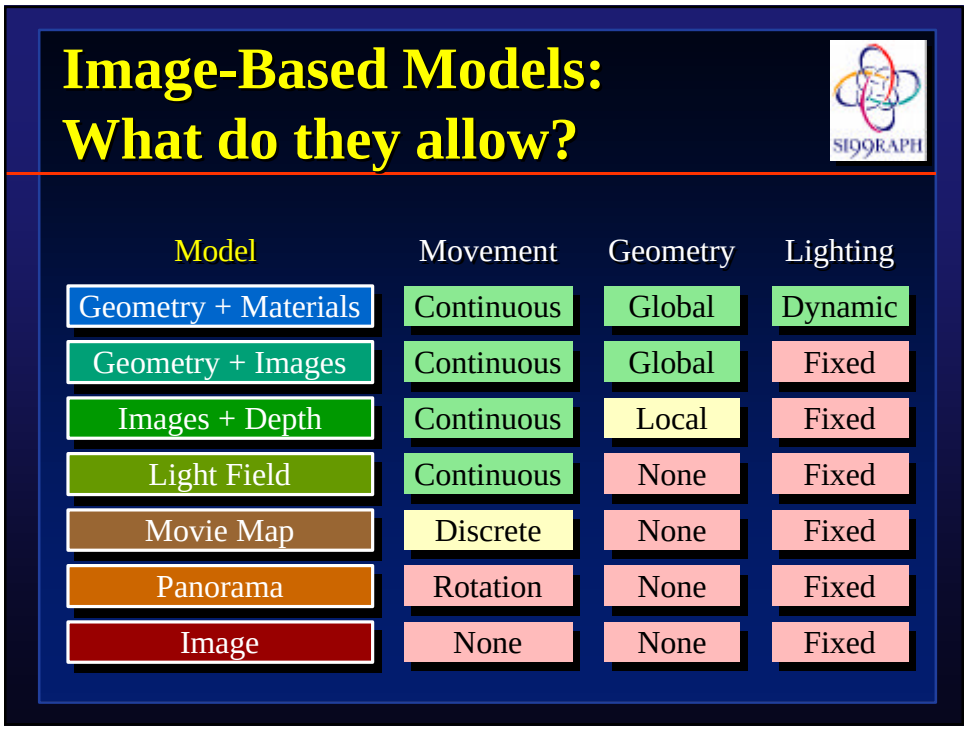


Image-Based Models: What do they allow?
Model
Movement
Geometry
Lighting
Geometry + Materials
Continuous
Global
Dynamic
Geometry + Images
Continuous
Global
Fixed
Images + Depth
Continuous
Local
Fixed
Light Field
Continuous
None
Fixed
Movie Map
Discrete
None
Fixed
Panorama
Rotation
None
Fixed
Image
None
None
Fixed

Global Illumination and Image-Based Lighting

Traditional Computer Graphics involves modeling with Matter: geometry with reflectance properties

Image-Based Modeling and Rendering involves modeling and rendering with Light, often deriving geometry and materials in the process

Image-Based Lighting allows us to combine real and synthetic graphics with consistent illumination, using images as light sources

Course Schedule

Morning

Image-Based Modeling, Rendering, and Lighting

1. 08:30 - 08:50
Introduction and Overview (Debevec)
2. 08:50 - 10:00
Fundamentals of Image Formation and Re-Use (Sillion)
Break

3. 10:15 - 11:00
Determining Geometry from Images (Szeliski)
4. 11:00 - 12:00
2D and 3D Image Warping (McMillan)
Lunch

http://www.cs.berkeley.edu/~debevec/IBMR99

Course Schedule

Afternoon

Image-Based Modeling, Rendering, and Lighting

5. 1:30 - 2:20
LDI and Lightfield / Lumigraph Representations (Cohen)
6. 2:20 - 3:00
Image-Based Lighting (Debevec)
Break

7. 3:15 - 4:05
Applications of IBMR in Human Animation (Bregler)
8. 4:05 - 4:40
Applications of IBMR in Art and Cinema (Debevec)
9. 4:40 - 5:00
Questions and Dialog (Everyone)

Stereo Image Capture Rig

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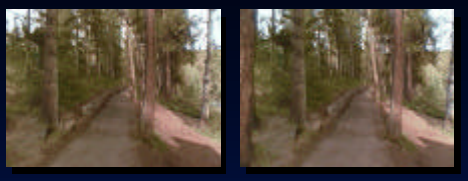
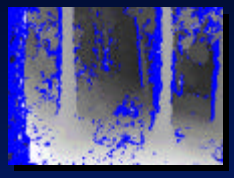
Ramin Zabih
Interval Research Corporation



Stereo Image Pair



Depth Map

Synthetic Views

Ramin Zabih and John Woodfill. Non-parametric local transforms for determining visual correspondence. ECCV, May 1994.