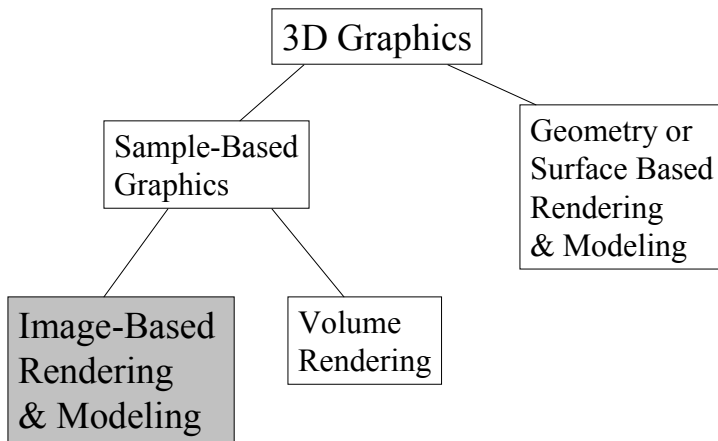


What is IBR?

September 16, 2004

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Top Level Survey



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Traditional Computer Graphics

- Input: Geometry, Material Properties (Color, Reflectance, ...etc.), Lighting.
- Transformation and Rasterization.

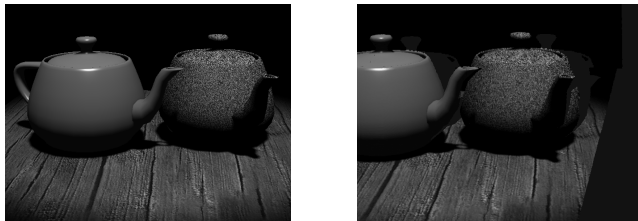


- Computer Vision methods to recover models.

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Image-Based Rendering

- Input: Regular Images or “Depth Images.”
- No 3D model is constructed.
- Example: 3D Warping.



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Another Example

- Reading room of UNC CS department
 - Source images contain depths in each pixel.
 - The depths are obtained from a laser range finder.



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Why IBR?

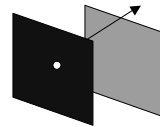
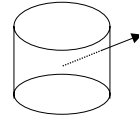
	Geometry	IBR
Modeling	Difficult	Easy
Complexity	#triangles	#pixels
Fidelity	Synthetic	Acquired

- Problems of triangle-based graphics:
 - Always starts from scratch.
 - Millions of sub-pixel triangles.

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Why is It Possible?

- 5D Plenoptic Function.
 - Color = $f(x, y, z, \theta, \phi)$
 - (x, y, z) defines the viewpoint.
 - (θ, ϕ) defines the view direction.
- 4D Light Field/Lumigraph
 - Color = $f(u, v, s, t)$
 - (u, v) defines the viewpoint.
 - (s, t) defines the pixel coord.

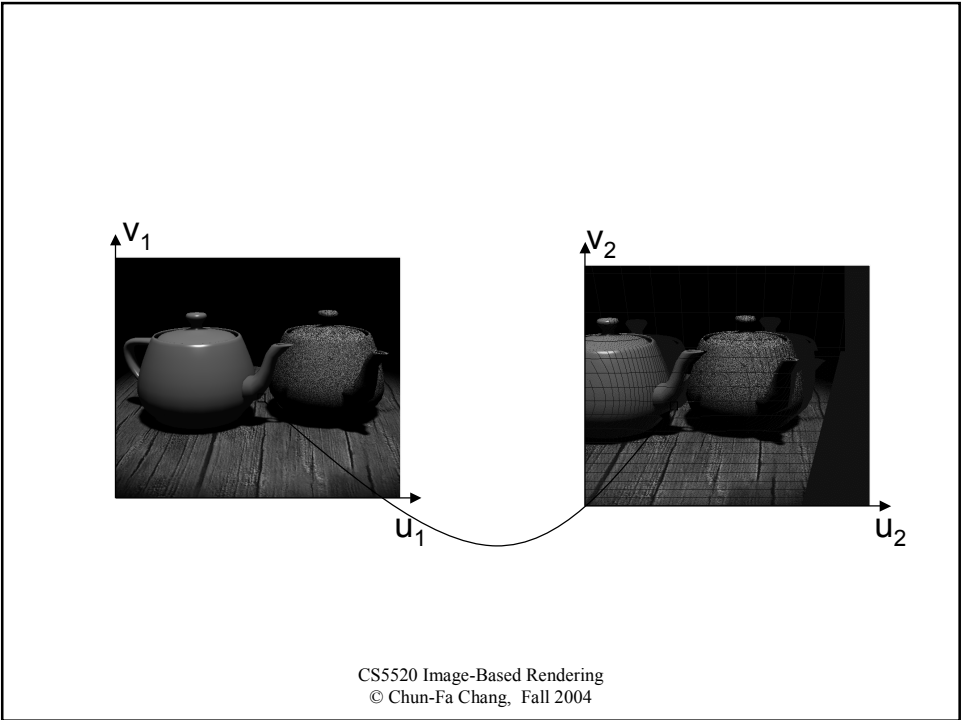
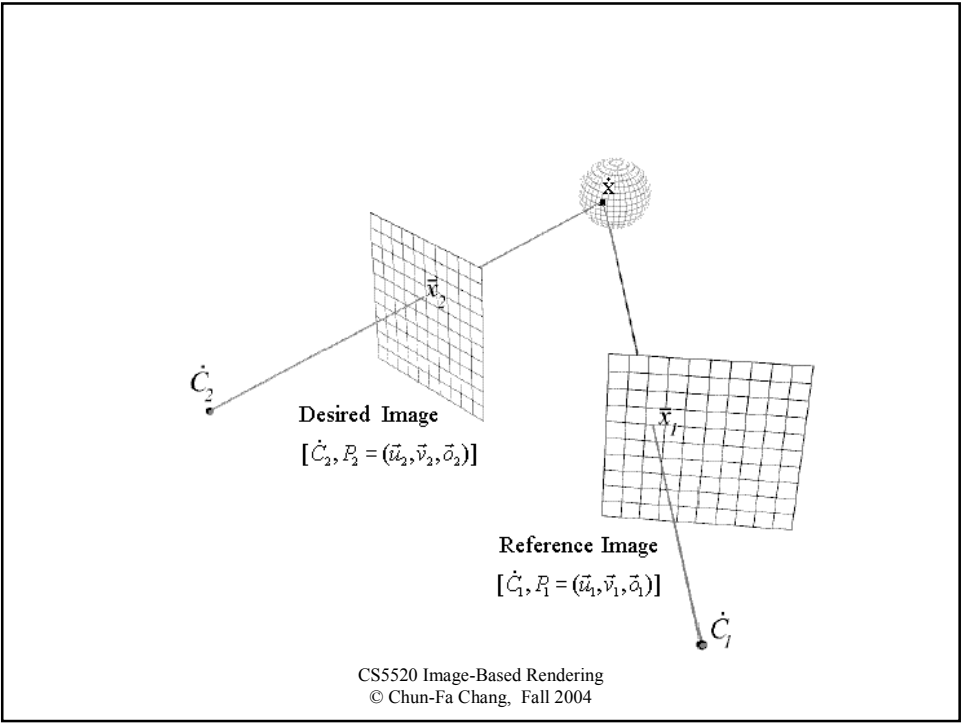


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3D Image Warping

- Each pixel in the source images has coordinates (u_1, v_1) , depth info δ_1 , and color.
- Warping Equation is applied to each pixel
$$(u_2, v_2) = f(u_1, v_1, \delta_1)$$
$$= \left(\frac{a \times u_1 + b \times v_1 + c + d \times \delta_1}{i \times u_1 + j \times v_1 + k + l \times \delta_1}, \frac{e \times u_1 + f \times v_1 + g + h \times \delta_1}{i \times u_1 + j \times v_1 + k + l \times \delta_1} \right)$$
where variables a to l are fixed for the same view.
- Rendering Time = $O(\#\text{pixels})$

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Video



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