Sampling and Reconstruction of Visual Appearance

CSE 274 [Fall 2018], Lecture 11

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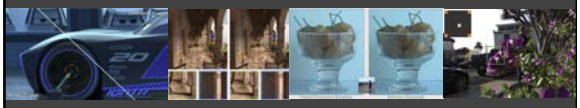
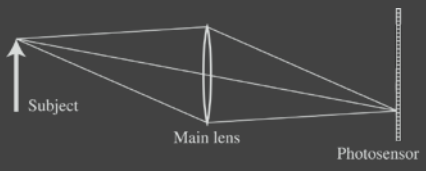


Applications

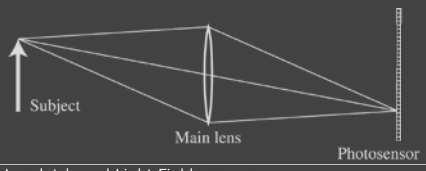
- Monte Carlo Rendering (biggest application)
- Light Transport Acquisition / Many Light Rendering
- *Light Fields and Computational Photography*
- Animation/Simulation (not covered in course)

- Compressive sensing for light field reconstruction
- Newer (deep) machine learning approaches

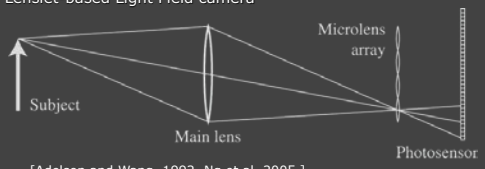
Light Field Inside a Camera



Light Field Inside a Camera



Lenslet-based Light Field camera



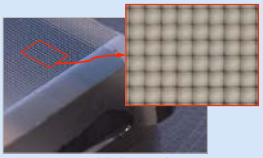
[Adelson and Wang, 1992, Ng et al. 2005]

Stanford Plenoptic Camera [Ng et al 2005]

Contax medium format camera

Kodak 16-megapixel sensor

Adaptive Optics microlens array

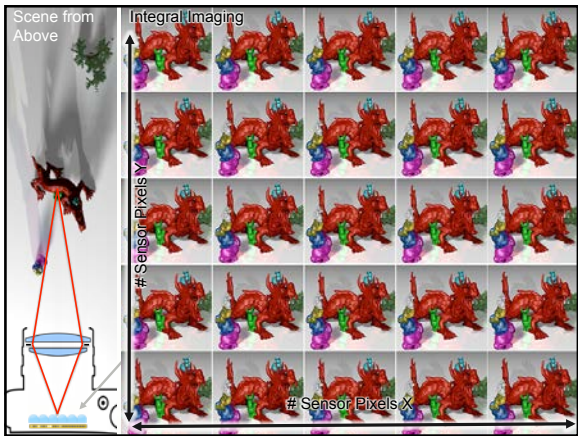


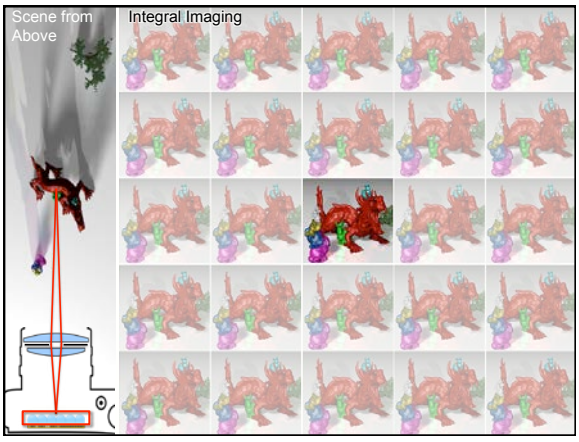
125μ square-sided microlenses

4000 × 4000 pixels ÷ 292 × 292 lenses = 14 × 14 pixels per lens

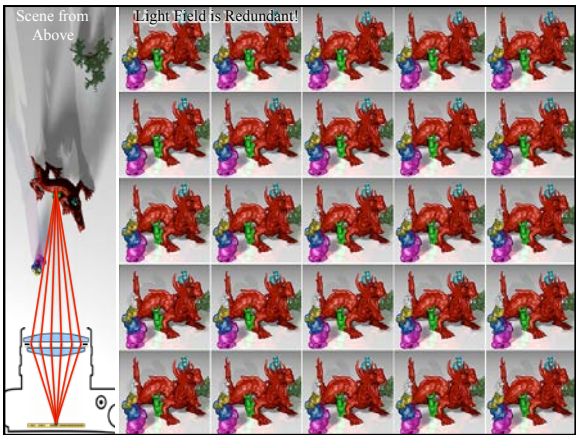
Digital Refocusing

[Ng et al 2005]


Scene from Above
Integral Imaging
Sensor Pixels Y
Sensor Pixels X


Scene from Above
Integral Imaging

Scene from Above
Integral Imaging
Spatio-Angular Resolution Tradeoff!
Example
1000 pixels
views,
200 pixels
lore ways to
on tradeoff!
Sensor Pixels Y / # Views Y
Sensor Pixels X / # Views X


Scene from Above
Light Field is Redundant!