
Light Field Rendering

— Marc Levoy, Pat Hanrahan —

[From Marc Levoy's slides]

Topic

Generating new views from previously rendered or digitized views without depth information or features matching.

Key word:

- Light field parameterization and representation
- Light field creation
- Resampling and different views generation
- Compression

Previous work

- Image based rendering
 - Environment map based
 - fixed viewpoint
 - or need depth information for view interpolation
 - challenge if the new view discloses an occluded area among original view
- Finding correspondences among the points in different view for wrapping

Assumption

- Space free of occluders
 - most geometric models are bounded from a convex hull

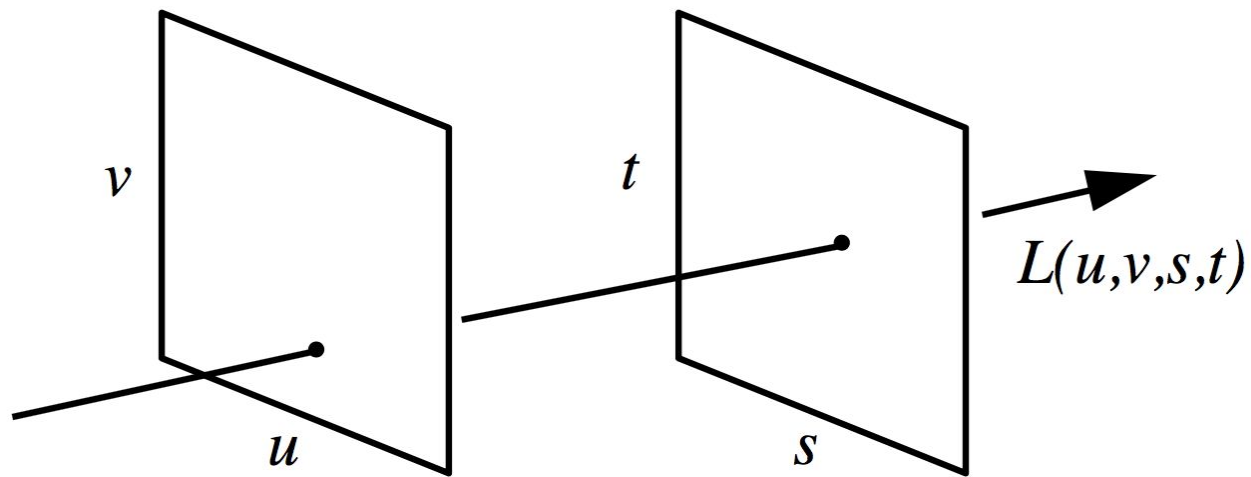
Light field

- A light flow representation
- The radiance as a 4D function of position and direction
- Generated from a sequence of different angle's original view

An image

- A 2D slice of 4D function
- Resampled from light field but need not to look like any certain original view

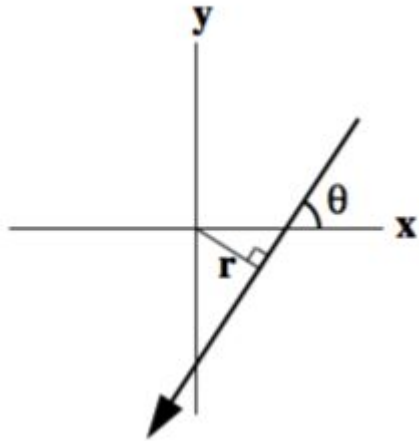
Representation



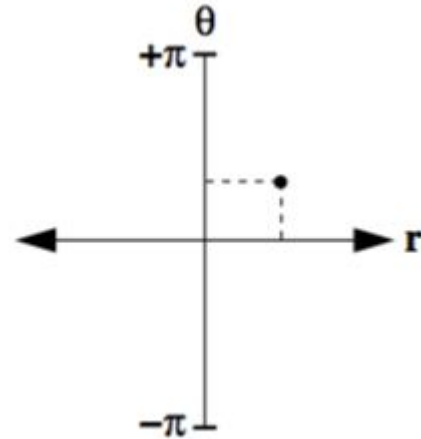
Light Slab

- Two plane parameterization
- Lightflow from uv to st
- uv, st between 0 and 1 for quadrilateral mapping

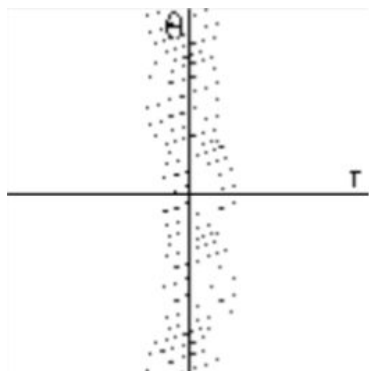
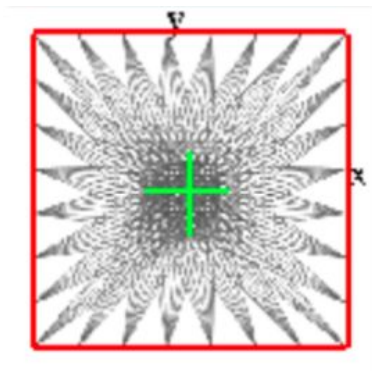
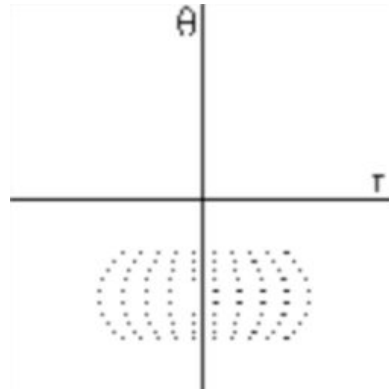
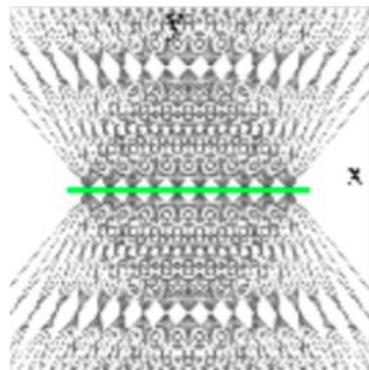
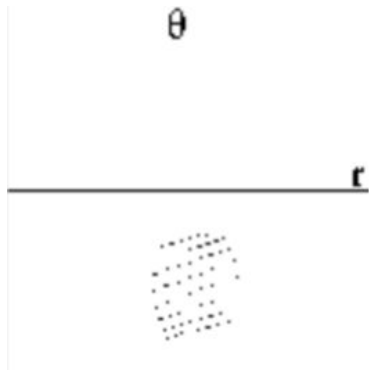
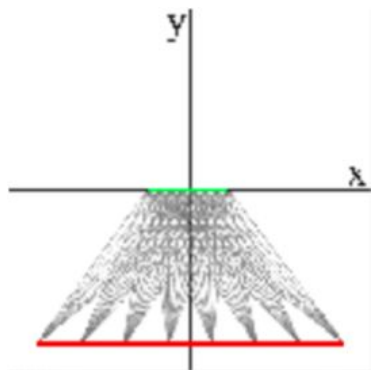
Point space & Line space



Cartesian space

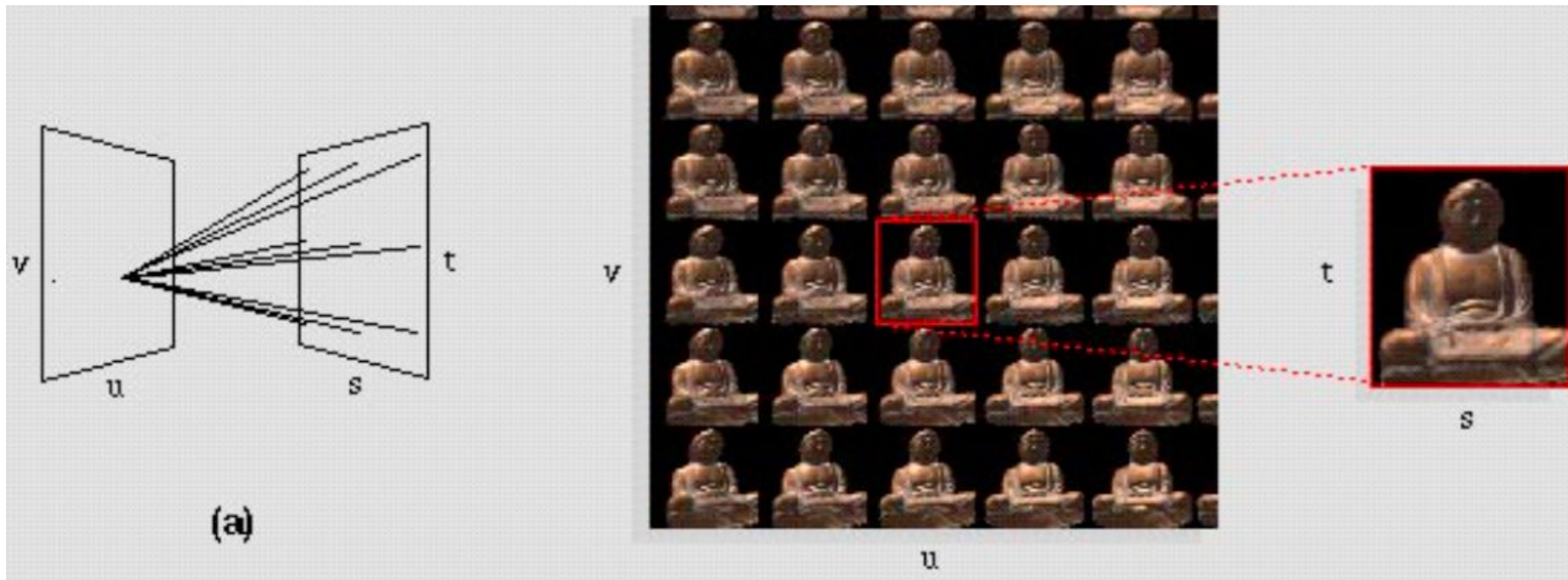


Line space

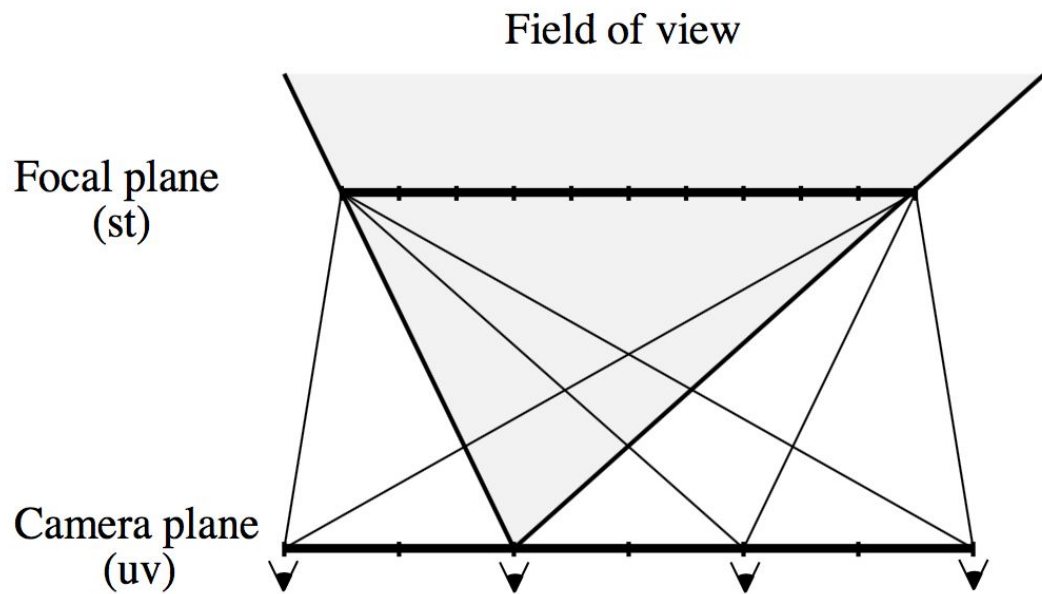


- Sample pattern
- Uniform sampling
 - the # of lines in interval between samples is constant
 - the distribution of points in line space
- Single light slab vs multiple light slab

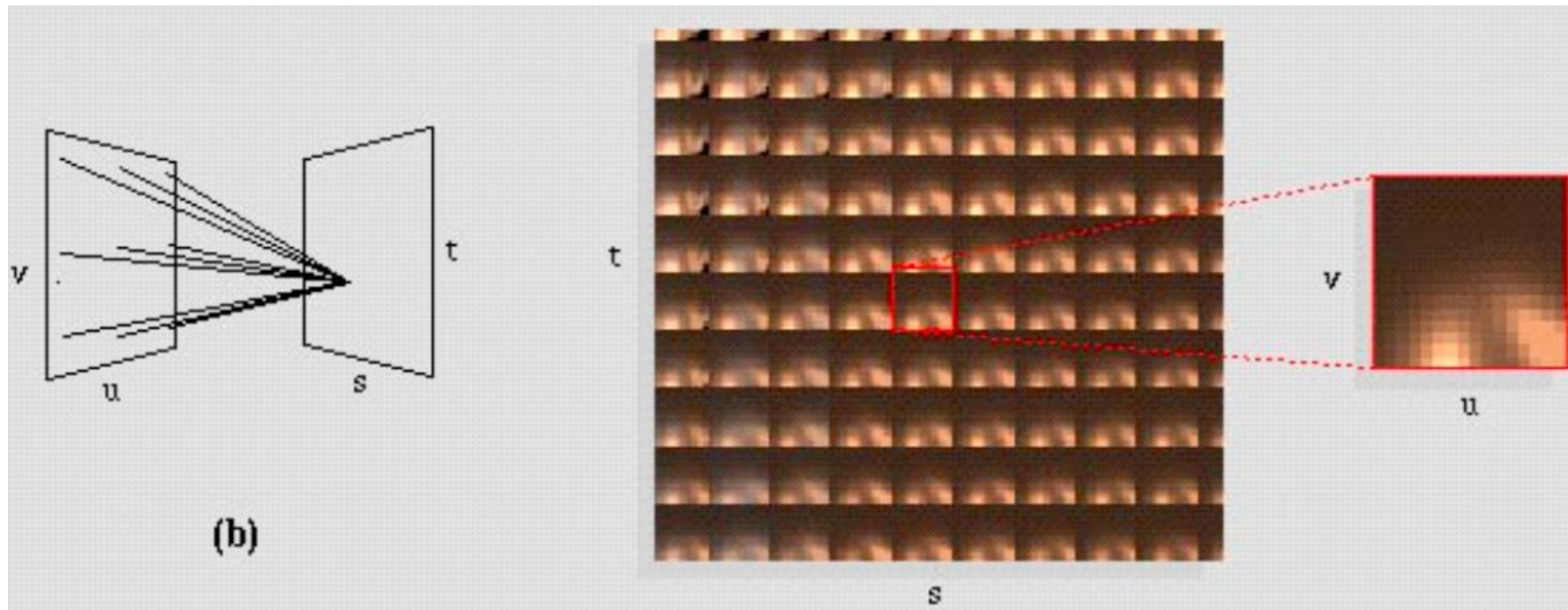
Creation from rendered images



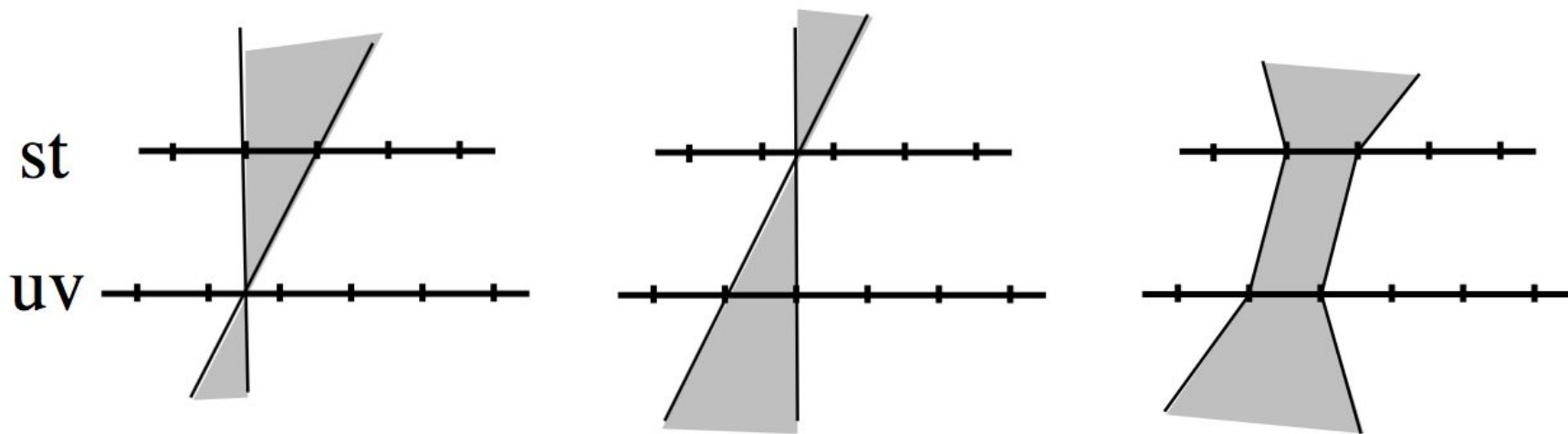
Creation from rendered images



Creation from rendered images

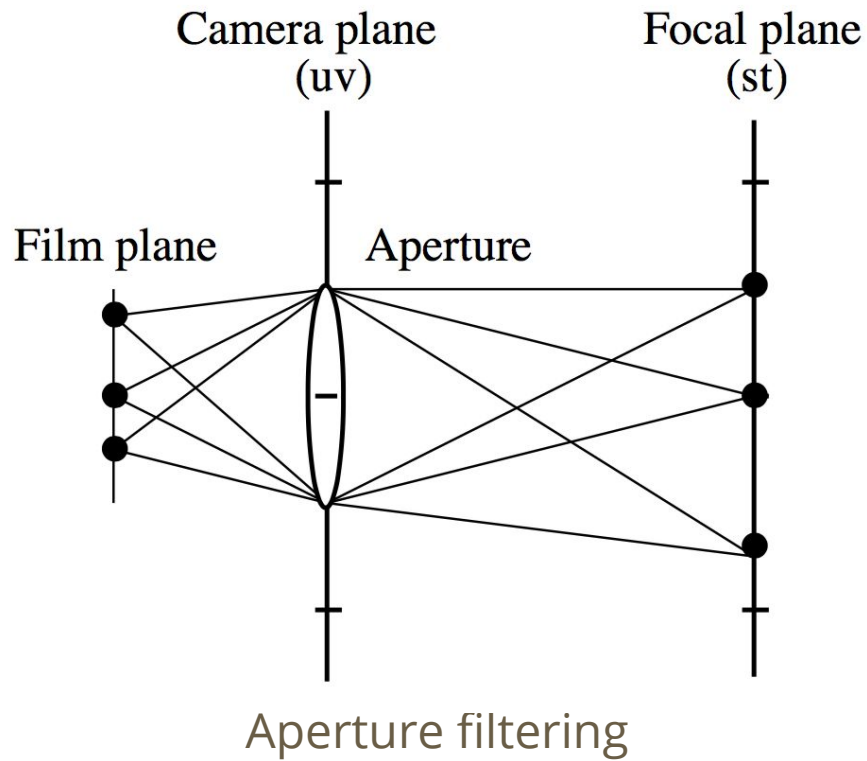


Anti-Aliasing

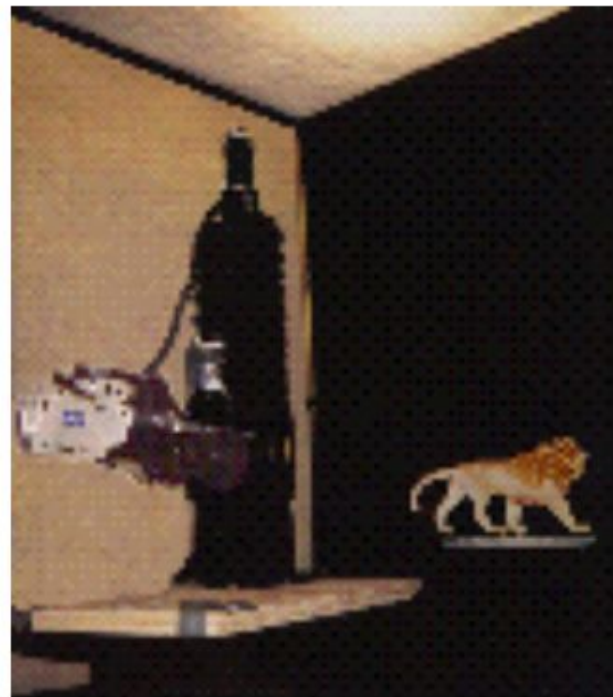
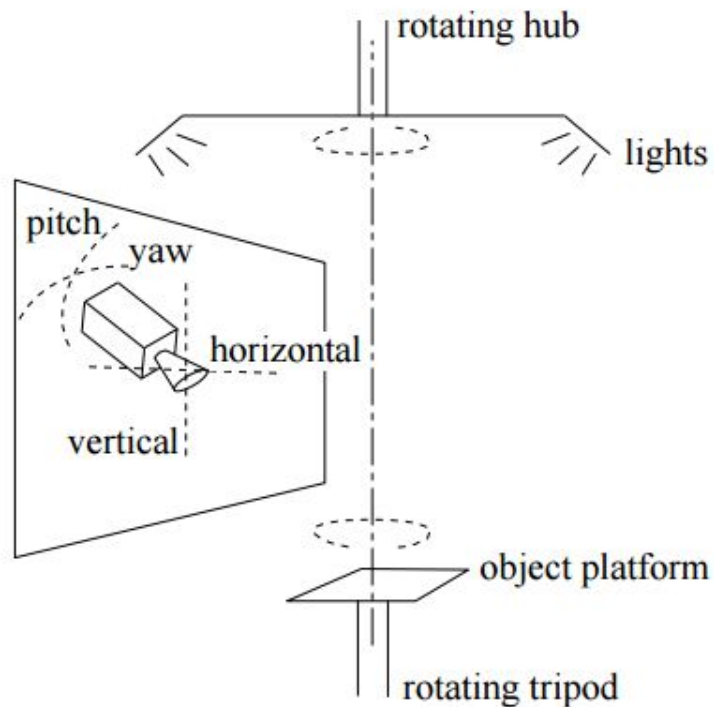


Pixel filter + Aperture filter = Ray filter

Anti-Aliasing

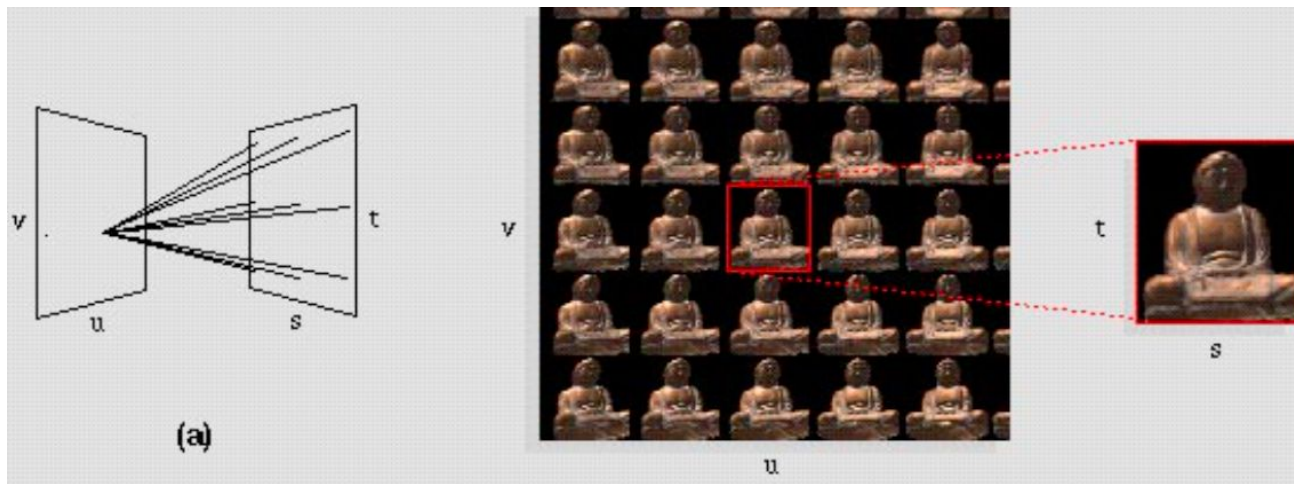
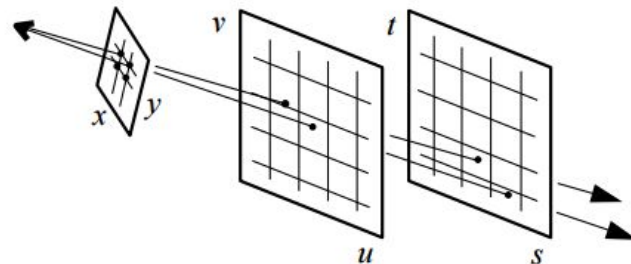


Creation of light fields from digitized images

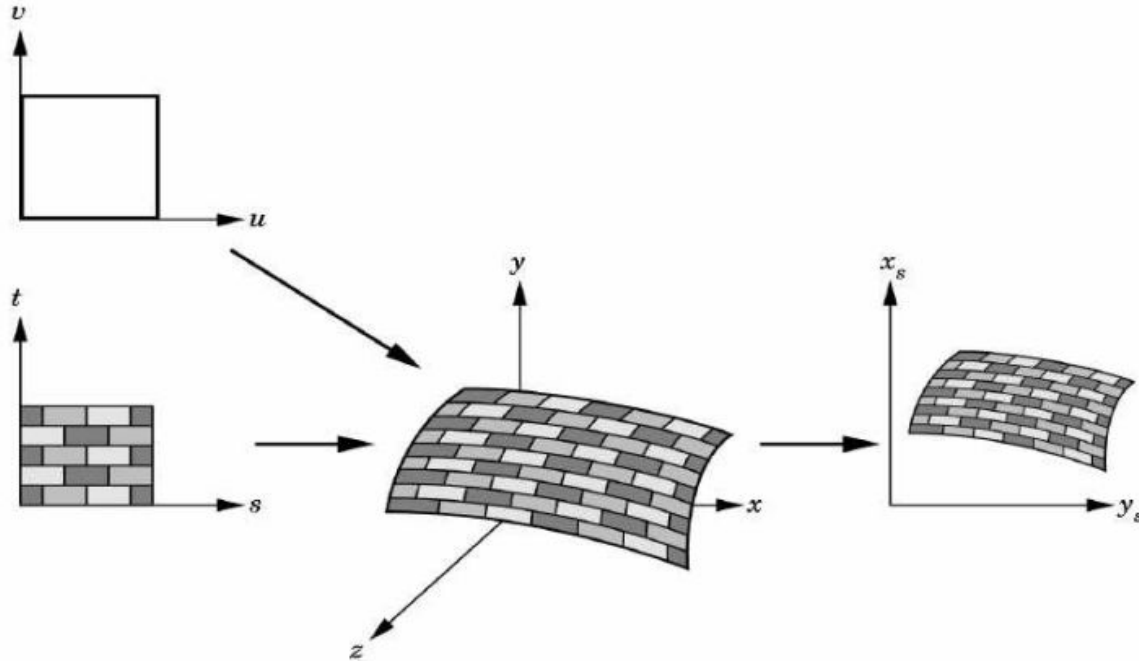


Display

- Compute u, v, s, t for each x, y
- Resample radiance

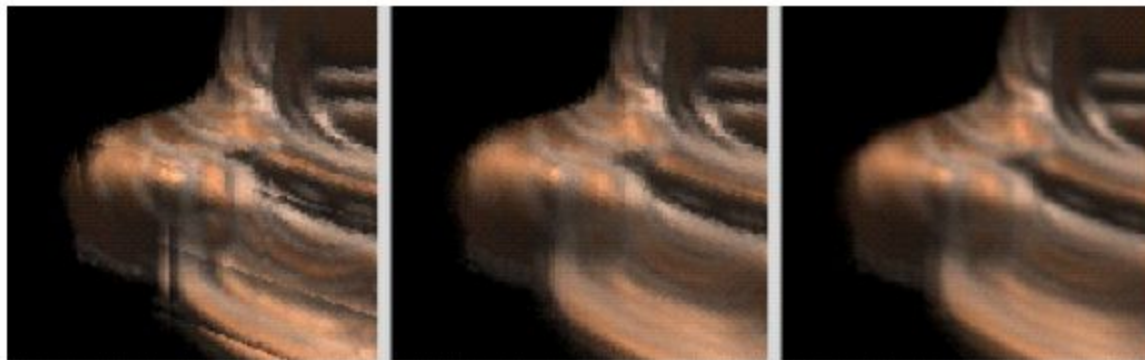


Texture coordinate calculation



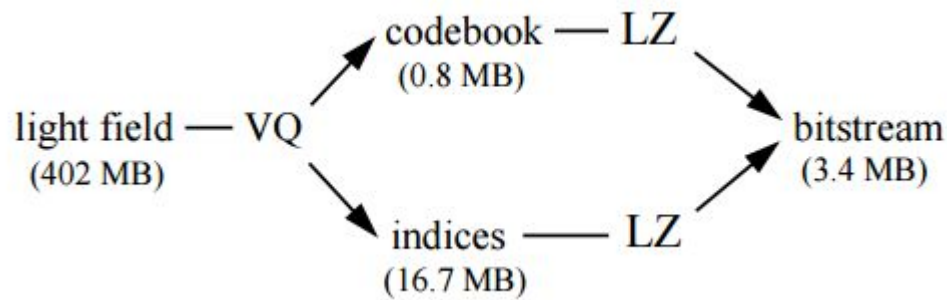
[From Ian Graham's slides]

4D interpolation



Compression/Decompression

- Redundant data
- Fast decompression for fast display
- Radiance table lookup



Rating : 1.5

Pros

- Interesting application for light field
- New solution for generating new images from arbitrary view points without extra depth information or feature matching

Cons

- Efficiency
- Robust and accurate rendering => practical use?