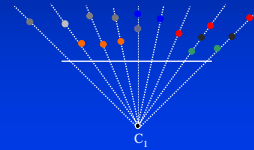


## Layered-Depth Images (LDIs), Image-Based Objects (IBOs) and Creating Depth Images from Real Environments

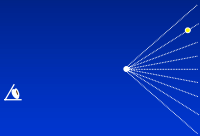
## Layered Depth Images (LDIs)

- Contain an arbitrary number of samples per ray
- Reduce the occurrence of holes in the novel views
- Warped in occlusion-compatible order



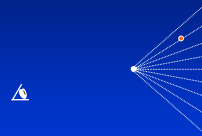
## Rendering LDIs

- Samples are warped from back to front



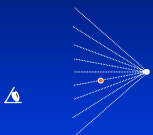
## Rendering LDIs

- Samples are warped from back to front



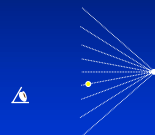
## Rendering LDIs

- Samples are warped from back to front



## Rendering LDIs

- Samples are warped from back to front



## Image-Based Objects [Oliveira 99]

- Alternative representation for 3-D objects
- Support for dynamic scenes
- Warp-based approach
- Exploit occlusion-compatible order
- Web-based applications (electronic catalogs)



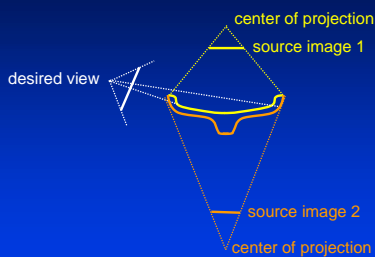
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## Multiple Views



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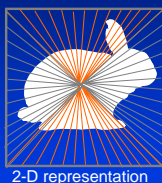
## Image-Based Objects (cont.)

- Images acquired from different viewpoints
- 
- Resampled from a single COP
  - Represented by six LDIs sharing a common COP

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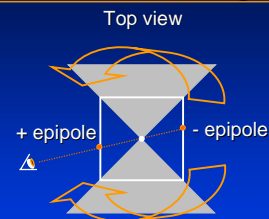
## Resampling from a Single COP



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## IBO Rendering

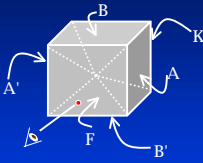


- Two epipoles
- Images are warped from back to front in occlusion-compatible order

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## Resolving Visibility



Warp faces closest to the positive epipole last  
Possible orders: (K, B, A, A', B', F) or  
(K, B, A', A, B', F)

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## Results: Venus

- Original model: 90,044 polygons
- IBO model: six 150x150 LDIs



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## Results: Old Clock

- Six source images
- IBO model: six 150x150 LDIs



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## Results: Real Object

- Four reference images acquired with a laser rangefinder
- IBO model: four 150x150 and two 100x100 LDIs



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## IBO Scenes

- Multiple objects
- Independent transformations (translations, rotations, scaling)
- Dynamic scenes
  - Occlusion compatible order for scenes
  - Dynamic BSP-tree



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## Image-Based Objects Demo

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## Warping Images from Real Environments [UNC Chapel Hill]



Reading room: courtesy of the UNC Chapel Hill Image-Based Rendering Group

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## Depth Acquisition



- Movable cart containing the necessary hardware to acquire range data: rangefinder and panning motor, computer display and B/W monitor (for showing the laser position), PC and battery
- Problems with specular and black surfaces

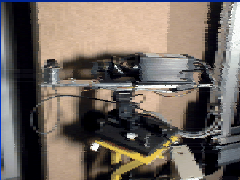
Courtesy of Lars Nyland, UNC Chapel Hill

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## Rangefinder and Panning Motor

- The rangefinder, scanning mirror, and pan-tilt unit. The hi-ball tracking unit is on top, with 6 lenses looking at the ceiling



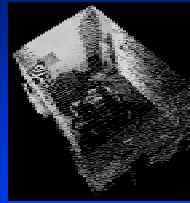
Courtesy of Lars Nyland, UNC Chapel Hill

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## Range Maps

- Examples



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## Color Images



- After an environment is scanned, the laser is removed from the panning unit and replaced with the camera
- Camera's COP at the approximate location of the "rangefinder's COP"
- Use of an optimization procedure



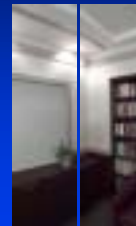
Images courtesy of Lars Nyland, UNC Chapel Hill

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## Color Images (Cont.)

- In order to minimize lens distortions, several overlapping images are taken and only the central portions of the images are used



Courtesy of Lars Nyland, UNC Chapel Hill

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