

Light Field Warping



Given L_0 & L_1 , warp L_0 to L'

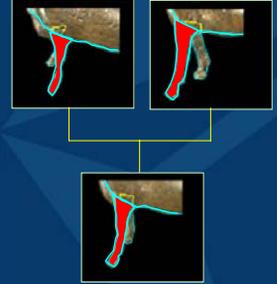
- Obtain feature elements of L'
- Compute GVM of L'
- Warp ray bundles of L_0 view-by-view
 - Ray-space warping equation
- Treat background rays (pixels)

Feature Elements of L'

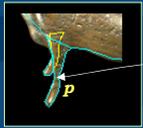


Linearly interpolated from L_0 & L_1

- Feature points, lines, & polygons
- Background edges



Warping Ray Bundles



$L_0(8,0)$

Use the ray-space warping equation to find $p = \text{pre-image}(p')$ in the same view of L_0



$L'(8,0)$

Warping Ray Bundles



$L_0(8,0)$

If p visible
 $\text{color}(p') = \text{color}(p)$
 else
 p' is in a hole



$L'(8,0)$

Ray-space Warping

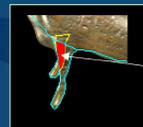


• Motivation: Fill the holes encountered during ray bundle warping

- Holes are caused by visibility changes (due to object shape changes)
- Holes can be arbitrarily large

• Basic idea: Approximate occluded rays by taking rays from nearby views

Ray-space Warping



$L_0(8,0)$

$p = \text{pre-image}(p')$ not visible in the same view of L_0



$L'(8,0)$

Ray-space Warping

$L_0(8,0)$ $L_0(24,8)$

p' $L'(8,0)$

pre-image(p') visible in a different view of L_0

Ray-space Warping

$L_0(8,0)$ $L_0(24,8)$

p' $L'(8,0)$

color(p') = color(r), where r = nearest visible ray of p

Nearest Visible Ray

The nearest visible ray

- A heuristic to best approximate non-Lambertian surfaces
- Search for nearest visible rays
 - Starts from V_i 's immediate neighbors
 - Expands out in breadth-first order
- **Search will never fail**

3D Facial Morphing

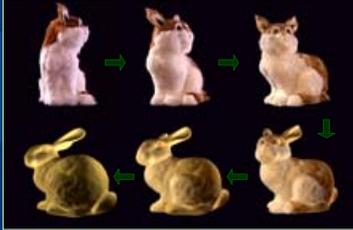
Complex Surface Properties

Large Visibility Change

Other Applications



Key-frame morphing



Other Applications



Plenoptic texture transfer



Other Applications



Discussion



- **LF morphing generalizes image morphing**
- **Compared w. geometry morphing**
 - Handling complex surface properties is easy with LF morphing
 - LF morphs are only good for viewing (& for restricted viewing range only)

Conclusion



- **A general framework for image-based 3D morphing**
 - Based on ray correspondence
 - Easy-to-use UI for specifying features
 - Ray-space warping for visibility changes
- **Future topics: topology change, more tasks automated, other LF operations.**

Acknowledgements



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