

Holes

Why do we get holes?

- expansion
 - pixels spread apart (zoom, looming)
- exposure
 - occluded surface in reference image is exposed

Solutions

- expansion: interpolation techniques
- exposure: much harder (have to guess)

Filling Holes

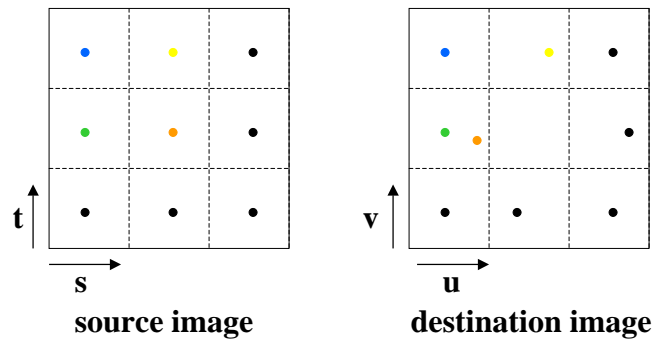
Fixed background

Color interpolation

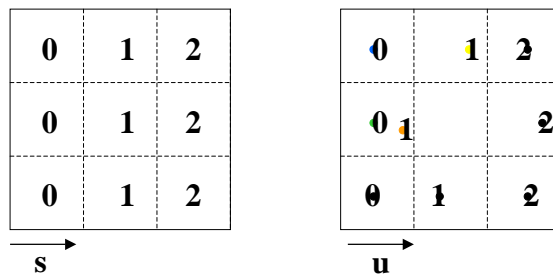
Displacement interpolation

Texture Synthesis

Color Interpolation



Displacement Interpolation



Destination (u,v) image contains (s,t) coords

- map each (s,t) value to (u,v) image
- bilinear interpolation in (u,v) image
- for each pixel in (u,v) image, inverse map and use bilinear interpolation to compute color from (s,t) image

Exposures

Interpolation stretches the image

- not always what you want
- what if you want to keep the same frequencies?
- texture synthesis
 - Efros and Leung
 - » http://www.cs.berkeley.edu/~leungt/Research/ICCV99c_abstract.html
 - Debonet
 - » <http://www.ai.mit.edu/~jsd/Research/TextureSynthesis/>

Layered Representations

2.5-D image representations

- more than one value per pixel
- roots in cel animation
- video games: “sprites”
- computer vision: “layers”

Today: layer extraction and rendering

- Wang and Adelson “Layered Video”
- Shade et al. “Layered Depth Images”
- Horry et al. “Tour into the Picture”

Related work

- Talisman (Torborg, Kajiya, Snyder, Lengyel), SIGGRAPH 96, 97, 98

Wang and Adelson

For each pair of two consecutive images

- compute optical flow (Lucas & Kanade)
- find candidate affine regions (K-means clustering)
 - minimize $\|\text{optical flow} - \text{affine flow}\|$ for each pixel
 - pixels with large residual are outliers
- for each outlier, assign a region based on color
 - warp pixel based on each affine region
 - choose affine region which gives least color error

Now we have regions for each image pair

Aggregate into a single set of layers for the sequence

- warp all regions into a common reference image
- use median to solve for opacity, color