Problem

- Image retargeting: content-aware adaptation of image content to satisfy different display screens
- Two kinds of strategies to reduce visual distortion:
  - Region warping: remove image content within the regions
    - Suffer serious distortion when obvious structure exists
  - Region occlusion: change the spatial relationships among regions
    - Cause serious content loss when too many objects exist and obvious artifacts when the objects have complex structures

How to utilize region warping and region occlusion together to reduce visual distortion in image retargeting?

[Mansfield et al., ECCV 2010][Lee et al., CVPR 2012]: depend on image decomposition

Our Solution

- Combine region warping and region occlusion in an unified framework without image decomposition

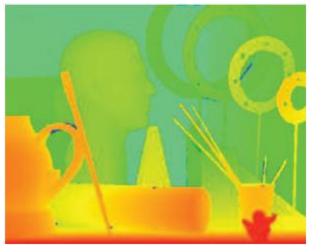
original image

energy map (saliency)

$$e_{ij} = (1 - \mathbf{\Omega}'(i,j))e_{ij}^{W} + \mathbf{\Omega}'(i,j)e_{ij}^{O}$$
$$e_{ij}^{W} = \alpha \mathbf{E}_{sal}(i,j) + (1-\alpha)\mathbf{E}_{dis}(i,j)$$
$$e_{ij}^{O} = \mathbf{E}_{sal}(i,j)$$

retargeting

target image



depth information

occlusion probability map

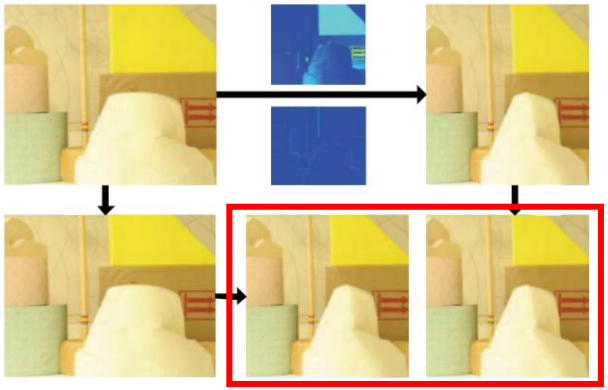
seam carving:

$$\mathbf{M}(i,j) = \min\left\{\mathbf{M}(i-1,j-1) + e_{ij}^{L}, \mathbf{M}(i-1,j) + e_{ij}^{U}, \mathbf{M}(i-1,j+1) + e_{ij}^{R}\right\}$$

pixel warping: $\max \sum_{i=1}^{m}\sum_{j=1}^{n}(e_{ij}x_{ij})$

$$\mathbf{\Omega}'(i,j) = \max\{0, \mathbf{D}(i,j) - \mathbf{D}(i,j-1), \mathbf{D}(i,j) - \mathbf{D}(i,j+1)\}$$

Experiment



different resizing orders

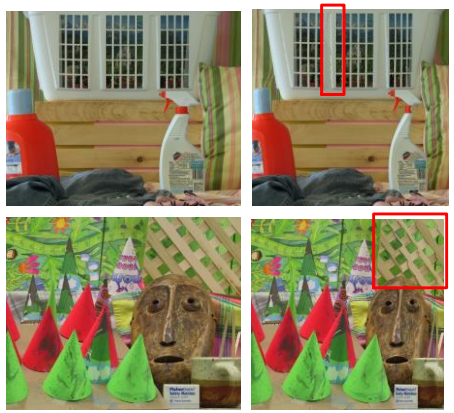
comparison

seam carving:

	Better	Similar	Worse
seam carving	36	24	10
curve-edge grid warping	31	24	15
scale-and-stretch	27	25	18
enhanced segmentation	33	26	11
scene carving	26	32	12
scene warping	23	33	14

pixel warping:

	Better	Similar	Worse
seam carving	34	22	14
curve-edge grid warping	29	30	11
scale-and-stretch	32	26	12
enhanced segmentation	40	18	12
scene carving	30	25	15
scene warping	29	32	9



failure