Content-aware seam carving for image resizing

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Overview

- Seam Carving
- Issues with Seam Carving
- Approach
- Preliminary Results
- Conclusion
- References
Seam Carving

- Seam Carving resizes images taking into account content
- Content is considered using an energy function
- A “seam” is an 8-connected path of minimal energy
- Removing seams allows image to shrink
- Adding interpolated pixels along seams will grow image

Simple Energy Function

$$e_1(I) = |\frac{\partial}{\partial x} I| + |\frac{\partial}{\partial y} I|$$

Reference: [2]
Seam Carving

Image interpolation

Castle distorted

Seam carving
Issues with Seam Carving

- Seam Carving is not simple scaling
- Computationally complex
- Artifacts can get generated in images
- Aspect ratio changes are susceptible to shearing
Defects

Castle distorted

Arch distorted
Approach

- Want to improve appearance of aspect ratio changed images
- A few approaches are under evaluation
  - Perform aspect ratio enlargement change, then apply scaling
  - Perform masking over edge areas to increase energy gradient through them to reduce distortion
  - Modify energy function
Preliminary Results

- Perform masking on edge areas to increase energy gradient through them to reduce distortion
- Very little noticeable difference, likely due to gradient energy function being used
Preliminary Results

- Performing aspect ratio change through seam carving and then scale.
Conclusion

- We have been able to find some techniques to improve image quality when changing aspect ratio using seam carving
- Seam carving works better on images with sparse objects
- When images have objects uniformly distributed, seam carving works similarly like interpolation
- Remaining work before project due date:
  - Try some other energy functions with the edge mask
  - Fix object distortions
  - Compare different energy functions with testing images
  - Characterize performance
Questions?
References