Project Mid-Term Report, CS 766, Spring 2018

Group Members

- Shuo Sun, ssun99@wisc.edu
- Shilu Zhang, szhang256@wisc.edu

Current progress:

- Write code to compute the image importance measure for an input image
- Implement the dynamic programming code to compute the cumulative minimum energy M for all possible connected seams and find the path of the optimal seam to remove along vertical or horizontal direction.
- Implement the dynamic programming algorithm to retarget the image to a new size with four different strategies: 1) Remove horizontal seams first, 2) Remove vertical seams first, 3) Alternate between horizontal and vertical seams, 4) Optimal seams-order.

Current Results:

1. Aspect ratio change

1) Remove vertical seams:

Remove 100 columns:

(a) original input (with vertical seams) (b) Seam Carving

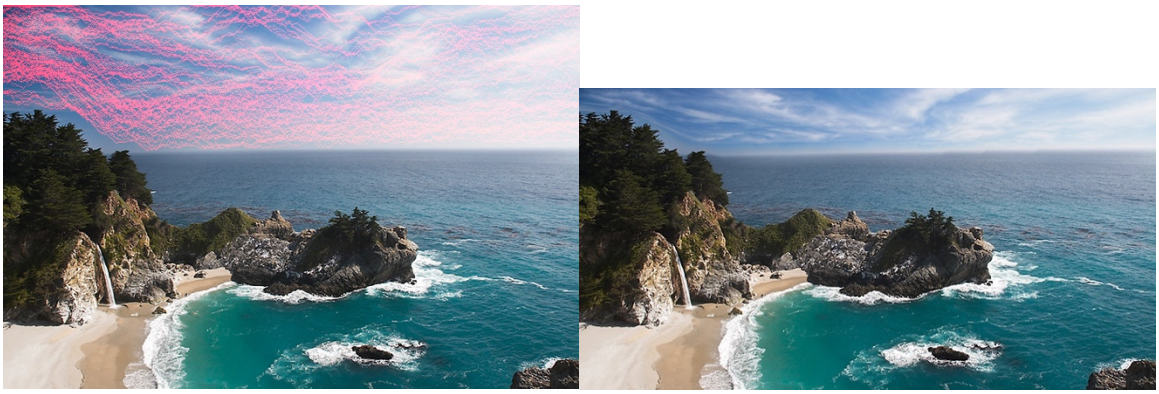
Remove 100 columns:

(a) original input (with vertical seams) (b) Seam Carving

2) Remove horizontal seams:
Remove 100 rows:

(a) original input (with horizontal seams) (b) Seam Carving

Remove 100 rows:



(a) original input (with horizontal seams) (b) Seam Carving

2. Retarget the image to a new size

Here, we compare four different strategies to retarget the image to a new size.
1) Remove horizontal seams first and then remove vertical seams:

(a) Original input (with horizontal seams)

(b) Seam Carving 1 (removing 100 rows)

(c)Seam Carving 1 (with vertical seams)

(d)Seam Carving 2 (removing 100 rows first and then 100 columns)

2) Remove vertical seams first and then remove horizontal seams:

(a) Original input (with vertical seams)

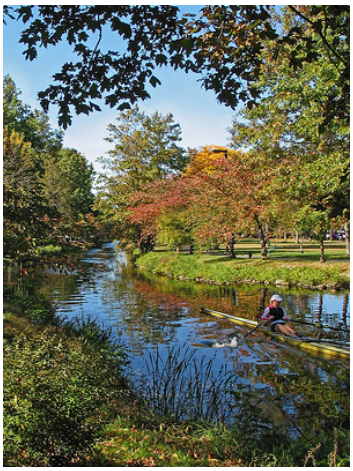
(b) Seam Carving 1 (removing 100 columns)

(c) Seam Carving 1 (with horizontal seams)

(d) Seam Carving 2 (removing 100 columns first and then 100 rows)

3) Alternate between horizontal and vertical seams:
Remove 1 horizontal seam and then 1 vertical seam, and repeat 100 times to resize from 500*400 to 400*300.

(a) Original input



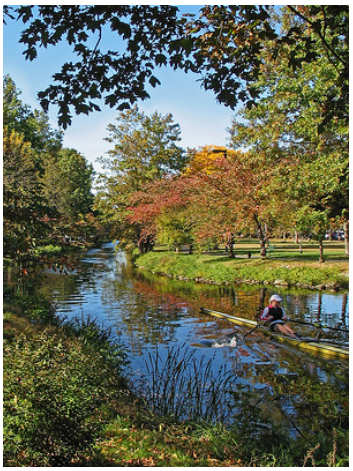
(b) Alternate between horizontal and vertical seams

4) Optimal order retargeting:
Calculate a transport map T(r × c) that specifies the cost of optimal seam removal operations using dynamic programming, and keep a record of a bitmap B(r × c) with the vertical/horizontal seam removal options, then backtrack from T(r, c) to T(0, 0) to get the optimal seam removal sequence (here r=c=100).

Comparison of four different strategies:

(a) removing horizontal seams first

(b) removing vertical seams first



(c) alternating between horizontal and vertical seam removal

(d) Optimal order retargeting

Difficulties in Implementation

- The paper (Seam Carving for Content-Aware Image Resizing) seems a bit confusing about retargeting with optimal seams-order (section 4.2), where we think we discovered some tiny mistakes (i.e. we think the bitmap should be r-by-c not n-by-m, and the dynamic programming recursive function should have $I_{n-r+1\times m-c}$ and $I_{n-r\times m-c+1}$).
- Seams are hard to illustrate, especially when we alternate between horizontal and vertical seams since this causes the seams to have various lengths.
- We may need to refer to more recent papers and optimize our Matlab code further since sometimes it could run very long time (several hours for optimal order retargeting).

Changes to our Schedule

- Probably we will stick to our original plan. If we finish early we will try video resizing.