Image Retargeting: Seam Carving for Content-Aware Image Resizing [1]

Due Date: 23:59 on Monday, April 22th, 2013

(a) Input Image  (b) Determined Seams  (c) Resized Image

Figure 1: Seam Carving Example

Assignment adapted from [2] Image from [3]

Background
Content-aware image retargetting aims to resize an input image with new aspect ratios while preserving significant image components. These significant components are determined with various image features such as gradient image. Seam Carving, is recently popular image retargetting algorithm was proposed by Shai Avidan and Ariel Shamir[1]. The algorithm based on removing or duplicating less significant image pixels horizontally or vertically for reducing or enlarging size of an image.

Overview
The goal of this assignment is to implement a seam carving algorithm that will only shrink input image either horizontally or vertically.

Details
Your programming assignment consists of the following two parts:

Part 1: Your program will take an input image and produce shrinked output image. For this goal you will code a matlab function that will take input image and new image size as inputs, and will return resized image. Your function should have the following steps:

\[
\text{RetargettedImage} \text{Seams} = \text{SeamCarving(InputImage, NewSize)};
\]

1. Determine the significance of each pixel by using a energy function. You will use gradient map to calculate energy function.
2. Until image has resized to the desired dimension:
   (a) Find the lowest significance seam in the image
   (b) Remove this seam from the image

**Part 2:** In this second part of the assignment you will add an extra capability to your Seam Carving function. You will select some pixels or regions to give high energy so that they are preserved.

\[
\text{[RetargettedImage Seams]} = \text{SeamCarving}\left(\text{InputImage}, \text{NewSize}, \text{Mask}\right);\]

Some important remarks:
- A horizontal seam is a vector from the left to the right which has one pixel at each column
- A vertical seam is a vector from top to down which has one pixel at each row
- You should use dynamic programming approach to find lowest seam.
- You must show results for at least 5 different images in your report.

**Grading**

The assignment will be graded out of 100 points:
- 0 (no submission), 20 (an attempt at a solution), 40 (a partially correct solution), 60 (a mostly correct solution), 80 (a correct solution), 100 (a particularly creative or insightful solution)

Note: Preparing good report is important as well as your solutions!

**What to Hand In**

You are required to submit all your report along with a short webpage in HTML. For that purpose, prepare a folder containing

- HTML/README.txt (text file containing details about your project)
- HTML/code/ (directory containing all your code)
- HTML/ (directory containing all your documents, including your images)
- HTML/data/ (including your data images)
- HTML/result/ (including your result images)
- HTML/index.html (html report)

Archive this folder as studentid_pset2.zip and send to karacan@cs.hacettepe.edu.tr.

Each student must individually do the coding and prepare detailed report which contains a brief overview of the problems, details of implementation and the results with comments. All results you obtain must be put to your report and observations must be specified clearly. If your implementations failed to give a satisfactory results, provide a brief explanation of the reason(s).

**Policies**

All work on assignments must be done individually unless stated otherwise. You are encouraged to discuss with your classmates about the given assignments, but these discussions should be carried out in an abstract way. That is, discussions related to a particular solution to a specific problem (either in actual code or in the pseudocode) will not be tolerated. In short, turning in someone else's work (from internet), in whole or in part, as your own will be considered as a violation of academic integrity. Please note that the former condition also holds for the material found on the web as everything on the web has been written by someone else.
References

