PROBLEM ASSIGNMENT 2

Due: March 31, 2015 (12:30pm)

Content-Aware Image Retargeting using Seam Carving

Content-aware image retargetting aims to resize an input image to a new aspect ratio while preserving important elements of the image content, as defined by some energy function. In this assignment, you will implement a simple version of Seam Carving, a well-known image retargetting algorithm proposed by Shai Avidan and Ariel Shamir [1]. The basic idea is to remove or duplicate less significant image pixels horizontally or vertically for reducing or enlarging a given image.

![Image of a seam carving example](image.png)

Figure 1: A seam carving example (taken from [1]).

Your program will take an input image and will shrink that image (either horizontally or vertically) to a given dimension. You should follow the following steps:

1. Determine the significance of each pixel by using a energy function (e.g. the sum of gradient energy across the 3 color channels)
2. Until the image is resized to the desired dimension:
   a. Find the lowest significance seam in the image using dynamic programming.
   b. Remove this seam from the image

Using a variety of images of your choice (at least 3) try to shrink the given images to different dimensions and comment on your results. You should include both successful and unsuccessful results.

Extra Credit:
Implement one or more of the following extensions. Test with different images and dimensions and describe your results.

- Implement at least two alternative energy functions and compare their retargeting performance.  
  *Hint: You can use saliency maps.*
- Implement content-aware image expansion by adding horizontal and vertical seams to the given image.
- Implement object removal by re-weighting the energy function and then performing seam insertion.

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1Adapted from the assignment developed by Alexei Efros at Berkeley University.
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 pset2.zip and email to my email address (aykut@cs.hacettepe.edu.tr).

Each student must individually do the coding and prepare detailed HTML report which contains a brief overview of the problems, details of your implementation and results with your observations. If your implementation failed to give a satisfactory results, provide a brief explanation of the reason(s).

Late Policy

You may use up to five extension days (in total) over the course of the semester for the three PSets. Any additional unapproved late submission will be weighted by 0.5.

Academic Integrity

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, 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