Digital Image Processing CSL 783

Assignment 3: Seam Carving and Image Pyramid

Due Date: Oct 26, 2015

Seam Carving using Image Pyramid

This assignment deals with Seam Carving of images as discussed in the class. Seam Carving is a method of re-sizing an image which is in a sense context aware. The re-sizing is not just a scaling operation. The method is described in the paper by Avidan and Shamir [1]. The main idea of re-sizing is to identify a seam connecting from top to bottom (vertical seam) and/or left to right (horizontal seam) pixels with minimum energy. The energy can be defined in terms of gradient function. Finding minimum energy can be implemented using dynamic programming [2]. This method is based on the observation that one can compute the minimum-energy seams (e.g. vertical) going through all pixels in current row i by knowing the minimum-energy seams through all pixels in the previous row i-1. One can define Cumulative Minimum Energy (CME) of a path going through some pixel (i,j) as the energy at (i,j) plus the minimum of the energies at vertical and diagonal adjacent pixels i.e. at (i-1,j-1), (i-1,j), and (i-1,j+1). The cost of the globally-minimum-energy path is then just the lowest CME found at the last row.
The implementation should use image pyramids Gaussian pyramid to store the downsampled versions of the image and Laplce pyramid to store the gradient/energy information. The results should include the following.

- Examples of reducing size of image with known number of rows and/or columns. The number of rows/columns may be given as a parameter for the implementation.
- Display of pyramids with different levels of the image.
- Display of the seam in a different color overlayed on the image.
- Computaitonal gain with using pyramids.

Note:

- Assignment can be done in a group of maximum size of two. The group should not be different from the previous assignment(s).
- You may try your implementation on images which are used in the paper [1], in addition you may acquire images yourself and try the method.
- You are encouraged to experiment with different energy functions.

References

1. [Seam Carving for Content Aware Image Resizing SIGGRAPH 2007.](#)
2. [Seam Carving in Wikipedia.](#)