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CS 378 Problem Set 1

Unfortunately, OpenOffice does not have a quick way to insert a large number of images, and I am short on time. Please refer to the image stack included in images.tar.gz.

In addition to the three provided images, I used four that I found on Flickr:

skyline1.jpg and skyline2.jpg, credit James Duckworth
> These are pictures of the Atlanta skyline from the Jackson Street bridge over Freedom Parkway.
> This view was part of my daily bicycle commute for two years.

raspberry.jpg credit user Kitenuk
> A picture of a raspberry creating a splash in some cream.

trackstand.jpg credit user Rober the Noid
> A picture of a cyclist track-standing next to some automobile traffic. A cyclist is said to trackstand if he or she is keeping the bicycle upright without any net forward or backward motion.

For the majority of these images, I used only the greedyResize method. Four scalings were computed, two that were either row-or-column-only, and two that scaled the image at different rates vertically and horizontally.

Generally, seam carving works well for images that have connected regions of little variation, or else images that have few regular features, so that distortion is difficult to notice, as in the case of the trees picture. Seam carving works particularly well on the raspberries image, because the milk in the background is almost totally uniform. We would have to carve around two-thirds of the image in any direction in order to begin to see distortion to the raspberry and splash. The two skyline pictures and the seals picture come out much better with more seam carving of vertical seams than horizontal ones. It appears that outdoor pictures tend to have more horizontally-oriented smooth regions, most notably the sky. In the skyline pictures, there is a "rocket taking off" effect, where triangular artifacts appear around high-cost regions, especially where those regions have upward-facing tapers.

Resizing by seam carving worked poorly on the track-stand and grocery images. This is probably because there are no clear seams that have low intensity variation, and there are regular shapes in both images. In the case of groceries, we as humans expect the shelves to be straight, and in the case of the trackstanding cyclist, we expect the line stripes to be smooth, and for the wheel to be round.

The skyline pictures, in addition to the greedy seam order, were processed horizontal-seams-first, as well as vertical-seams-first. From the results, it can be seen that even small changes in order can have a noticeable effect. This is especially true in the case of the picture taken at dusk. Taking the greedy approach seems to leave the skyline with straighter, more believable looking buildings. The traffic in the lower portion of the images is always badly distorted, however.