CS 376
Computer Vision

– Problem Set #1 –

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Problem Set #1
(file2.pdf)

II

5. Figure 1 shows the resized and carved results of "basketball.jpg". We can see that in the simply resized image, the basketballs just shrink and change their aspect ratio. However, in the carved result, the basketballs are distorted and squeezed together, and they look no more like the original basketball. The reason is that there is much less energy between the boundary of basketballs, as well as along the stripes. Therefore, those regions will be carved first, resulting in the distorted shapes and textures.

   Figure 2 shows the resized and carved results of "taipei101.jpg". Basically, both results are acceptable and reasonable. However, in the carved result, since there is less energy in the middle of the building, most of the lower floors are removed. In addition, since the textures of the fireworks are complicated and have more energy, most of them are kept, making the whole building shining and bright.

   Figure 3 shows the resized and carved results of "veyron.jpg". The car in the resized image is squeezed as expected. However, in the carved image, the car is distorted. The reason is that the surface of the car body is quite smooth, with only some shining areas, so there is less energy in the hood and door. Therefore, they are first removed while other parts of the car remain the same, and the car body no longer maintains a rigid shape, resulting in the funny, liquid-like look.

Extra Credit

2. This part has been demonstrated in Part II.4. Different types of energy function have been implemented, including Laplacian, Laplacian of Gaussian, and Sobel filters. Please see the attached code "computeEnergyMap.m" for implementation details.

4. The functions to increase both the height and width are implemented. Figure 4 shows the results of vertically resized and increased "prague.jpg", and Figure 5 shows the results of horizontally resized and increased "mall.jpg". For "prague.jpg", we can see that the tower in the center is widened in the simply resized image, while it remains almost the same size in the increased image. Similar results can be seen for other buildings, where they are all widened in the simply resized image. To prevent the problem of increasing similar seams at the same region with minimum energy, larger energy are inserted in the pixels of the selected seam after it is increased. However, this technique may introduce little distortion, as the boat body in this particular case.

For "mall.jpg", we can see that both simply resized and increased images extend the length of the tree. However, in the simply resized image, the statue next to the tree is also stretched, while it remains the same size in the increased image. Therefore, we can also see that the effects of seam carving really depend on the content of the image, especially the texture. Seam carving is able to achieve content-aware resizing and produce more satisfying result most of the time, but sometimes it can fail or generate unexpected results.

The original image of "basketball.jpg"

The vertically resized "basketball.jpg" by 100 pixels

The vertically carved "basketball.jpg" by 100 pixels
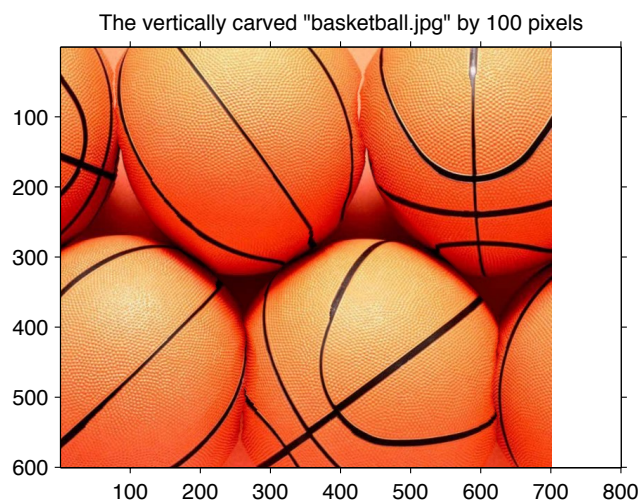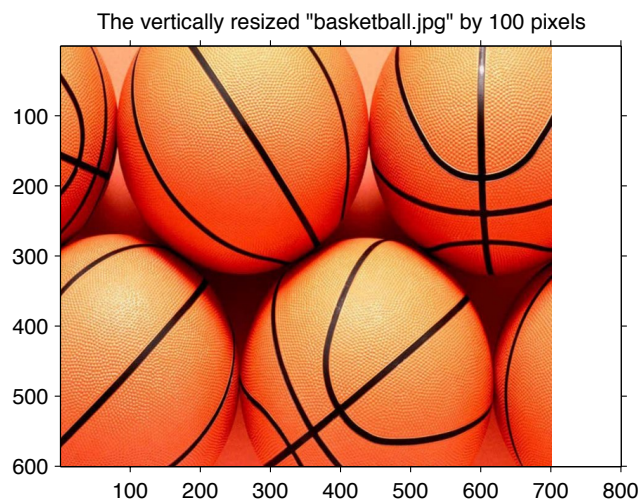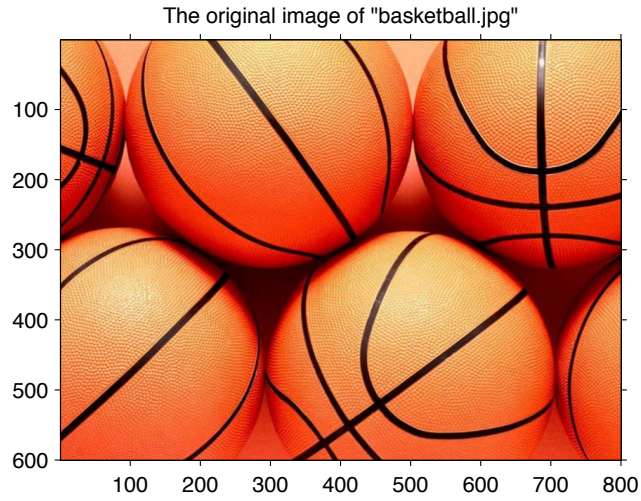
Figure 1: Part II. 5: "basketball.jpg"

The original image of "taipei101.jpg"
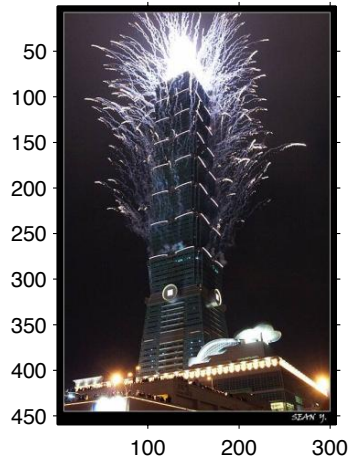
The horizontally resized "taipei101.jpg" by 150 pixels
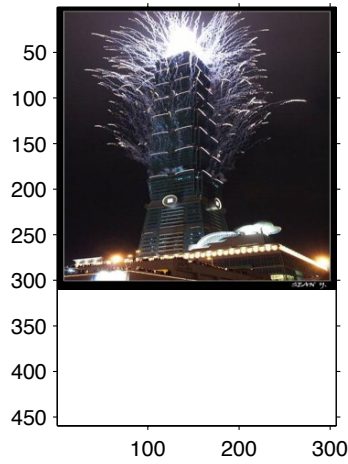
The horizontally carved "taipei101.jpg" by 150 pixels
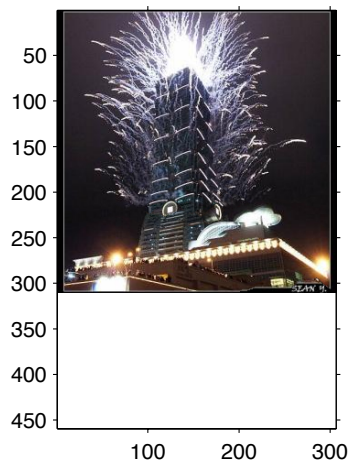
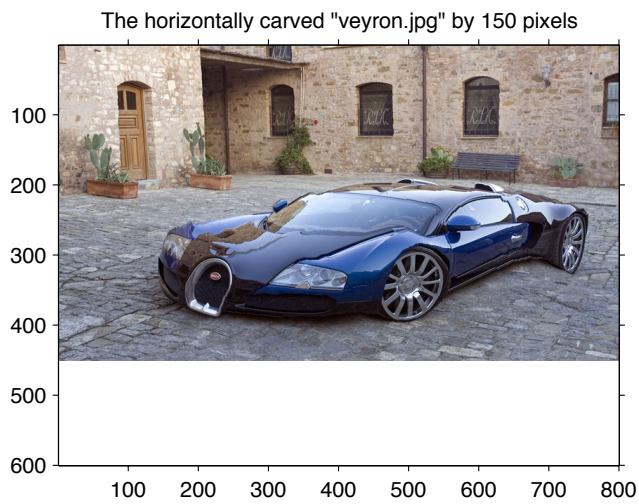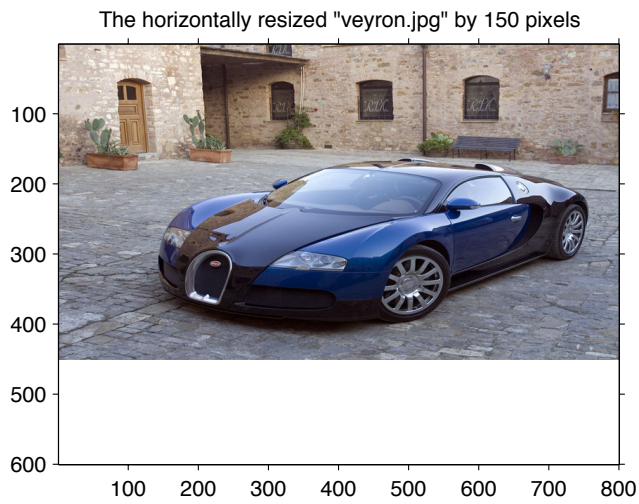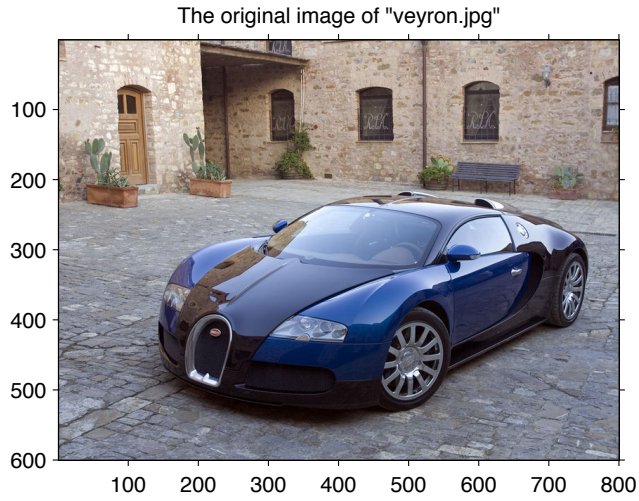Figure 2: Part II. 5: "taipei101.jpg"

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The original image of "veyron.jpg"

The horizontally resized "veyron.jpg" by 150 pixels
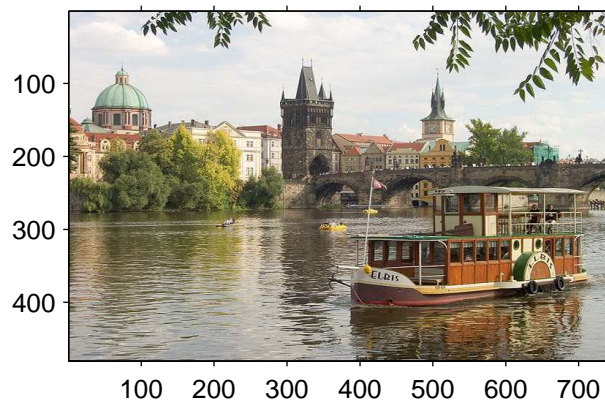

The horizontally carved "veyron.jpg" by 150 pixels

Figure 3: Part II. 5: "veyron.jpg"

The original image of "prague.jpg"
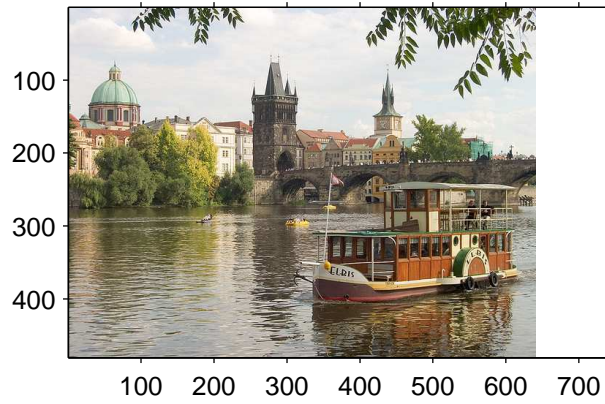
The vertically resized "prague.jpg" by 100 pixels

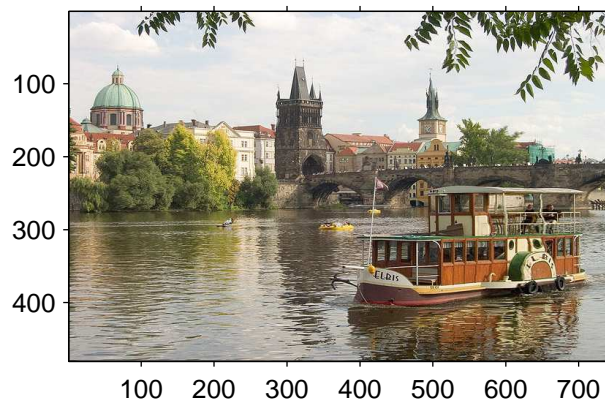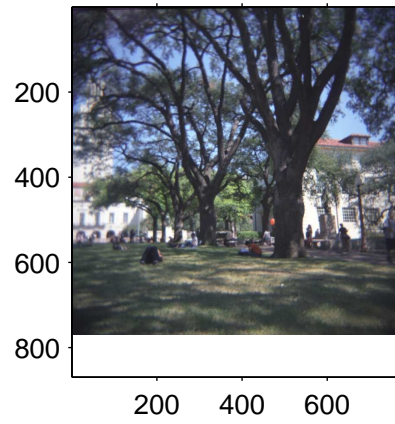
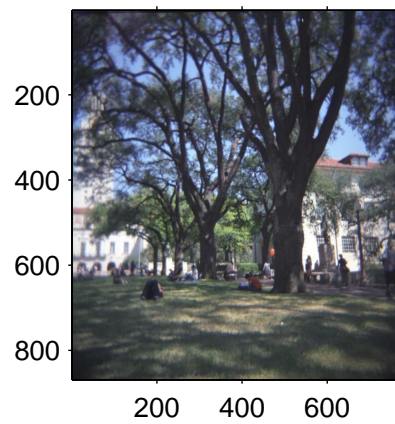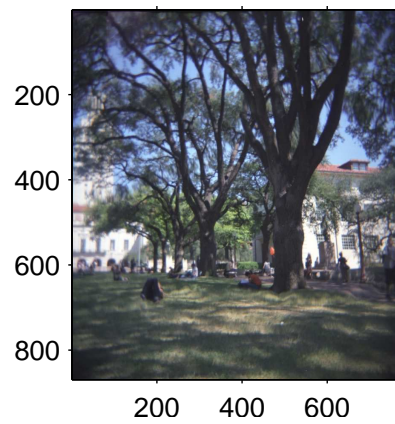The vertically increased "prague.jpg" by 100 pixels

Figure 4: Part III: "prague.jpg"

Figure 5: Part III: "mall.jpg"