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CIS4930 Special Topics - Computer Vision
2/19/19
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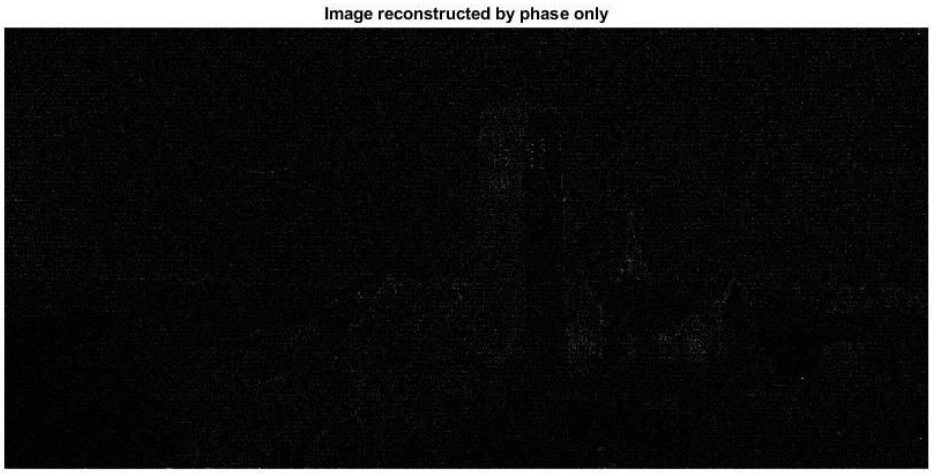
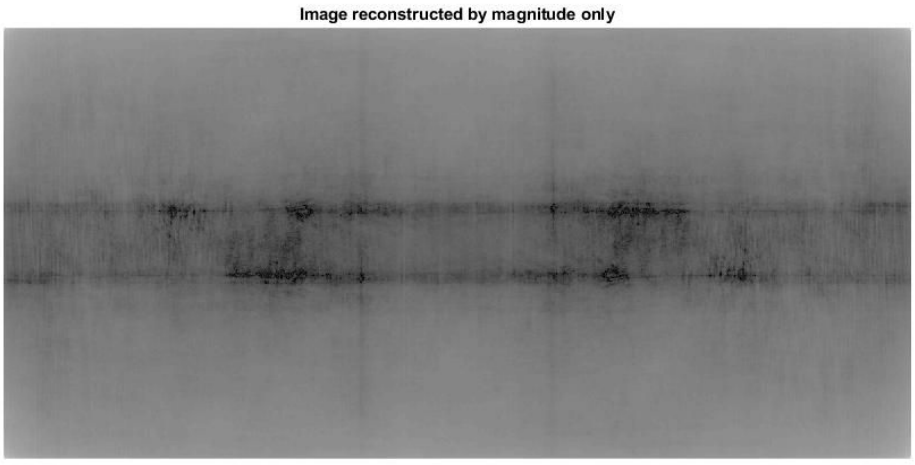
Programming Assignment 2 Report

1) **Phase Reconstruction**

a) *Write a MATLAB program that takes the FFT (use MATLAB FFT routine) of an input image (Century-Tower.jpg), hard limits (forces) the magnitude of the FT to 1 and reconstruct the the phase-only image.*

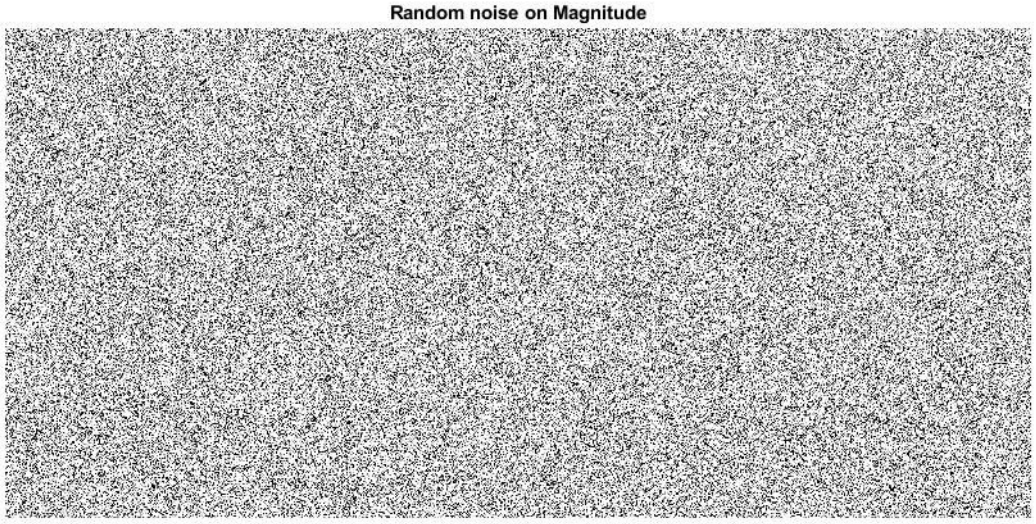


b) *Repeat the reconstruction for magnitude only case i.e., zero out the phase in the FT and reconstruct the image.*

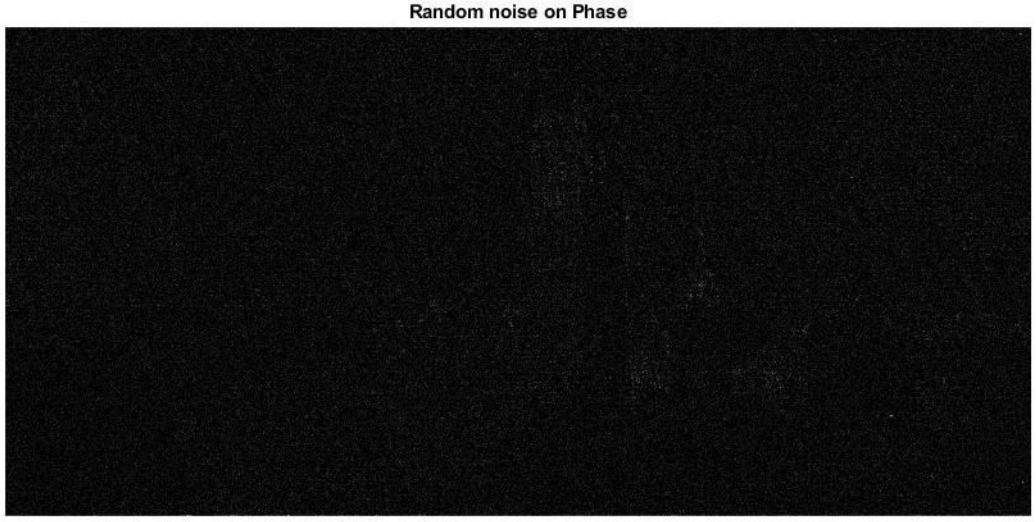


c) *Now perform the following tests:*

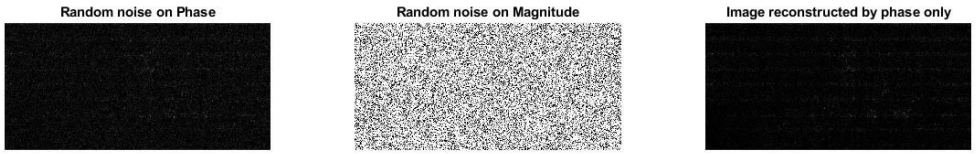
i) *Add uniform random noise to the magnitude kI(u, v)k but do not change the phase and reconstruct the image,*



ii) *Add uniform random noise to the phase but do not change the magnitude and then reconstruct.*



d) *Display all the 3 images (from c-(i), c-(ii) and the phase only reconstruction with no noise in (a)) side by side for comparison.*



Reflections:

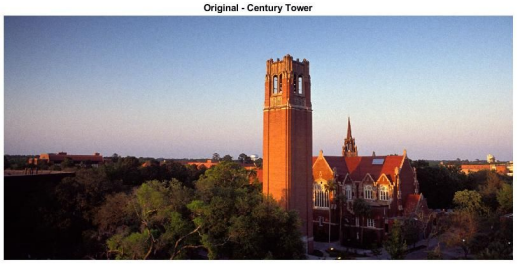
The first part of this assignment centered around the Fourier transformation of an image and its decomposition of an image and the resulting subsets or "ingredients" left over. Viewing the purely magnitude and then phase reconstructions granted more clarity towards the various configurations behind an image. Comparing contents of the reconstructed images from part c(i) and c(ii) portrayed a dissimilarity between the portions of the original century tower image represented by each reconstruction with added noise. While the magnitude added noise graph indeed seemed to reflect a myriad of activity and changes in gradient intensity throughout the image, it failed to preserve any substantive semblance to century tower. The phase added noise graph on the other hand, while quite dim and faint, did depict a faint outline of the tower itself and in this was comparable to the original pre-decomposed image.

2) **Seam Carving Algorithm**

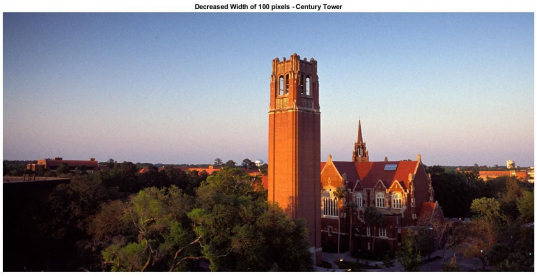
a) *Run your reduceWidth and reduceHeight functions on Century-Tower.jpg and alligator-crossing.jpg respectively, with numpixels=100 i.e., shrink the width by 100 pixels in the first case and shrink the height by 100 pixels in the second case respectively.*

i) ***ReduceWidth***

Original - Century Tower



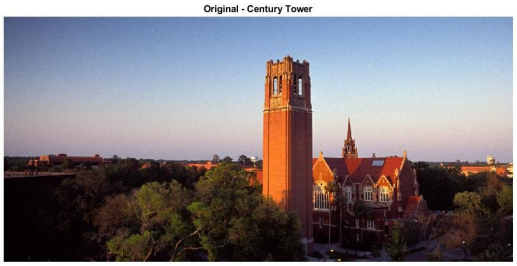
Decreased Width of 100 pixels - Century Tower

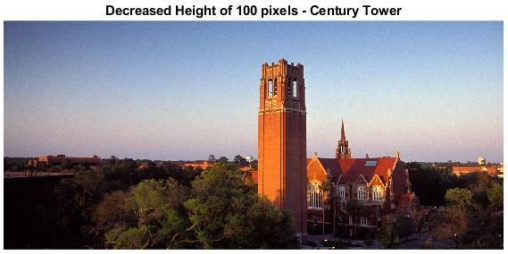


Original - Alligator Crossing

Decreased Width of 100 pixels - Alligator Crossing

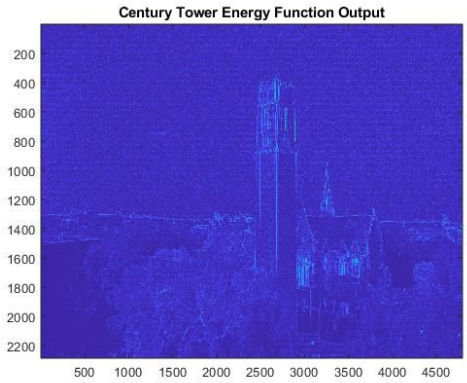
ii) ***ReduceHeight***



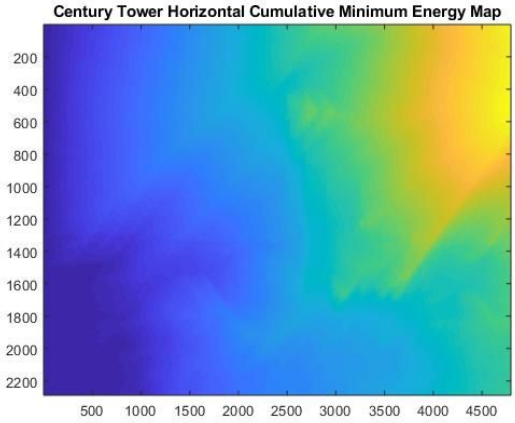


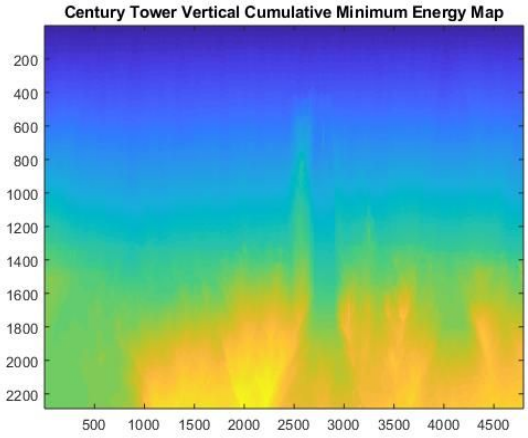
b) *Display:*

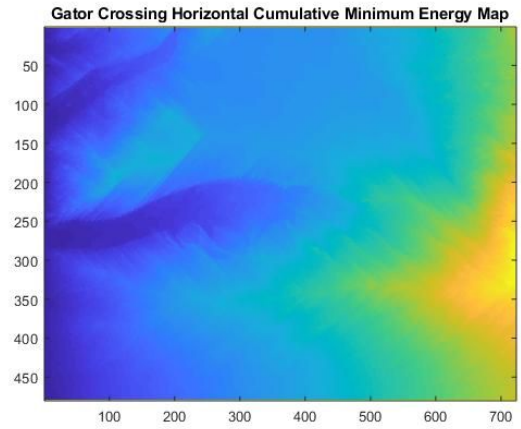
i) *The energy function output (total gradient magnitudes e1(I)) for the image Century-Tower.jpg.*

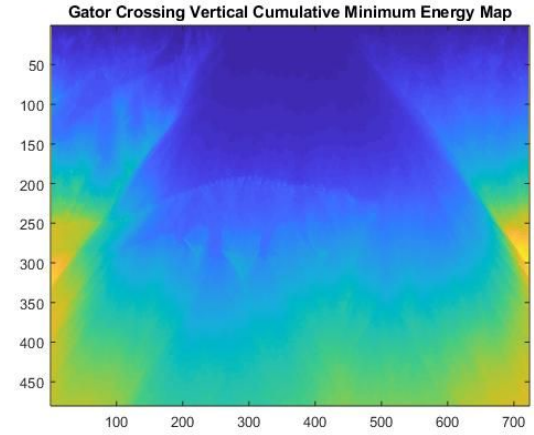


ii) *The two corresponding cumulative minimum energy maps (M) for the seams in each direction (use the imagesc function). Explain why these outputs look the way they do given the original images content.*









c) *Use your system with different kinds of input images and seam combinations, and see what kind of interesting results can be produced.*

Original input images:

Results if simple resampling were used (via MATLABs imresize):

Simple resampling of Iceland

Simple resampling of Sunrise

Simple resampling of Castle

System resized images:

Decreased Height of 150 pixels - Iceland

841x493

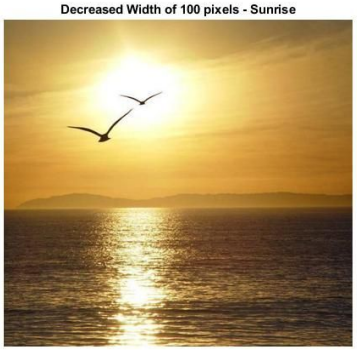
Decreased Width of 150 pixels - Iceland

741x593

Decreased Height of 100 pixels - Sunrise

680x326

Decreased Width of 100 pixels - Sunrise

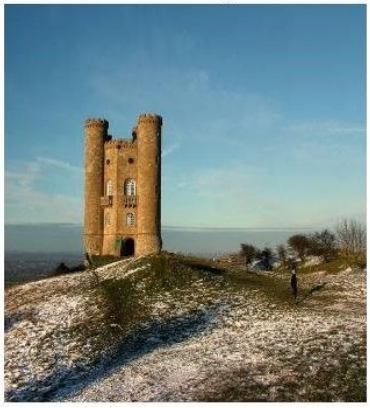


586x477

Decreased Height of 200 pixels - Castle

1366x350

Decreased Width of 200 pixels - Castle



327x374

Reflections:

Part II of this assignment implemented the seam carving algorithm, a process used for content-aware image resizing with the end goal of better portraying images. Executing the task via MATLAB involved the creation of numerous functions that would identify certain paths of minimal significance to the overall picture (seams) and eliminating them through reducing the width and height of the images. Specifically locating the seams involved finding the lowest energy path between the edges of an image, comparing each pixel's contrast to its neighbors. This explains why the energy outputs in part b) of the energy function and cumulative minimum energy maps displayed the areas of the image of greatest contrast and disparity in the horizontal and vertical directions respectively. The final section applying the algorithm to some own images of our own choice showed both the potential and limitations of seam carving in allowing for more faithfully mirror the snapped portrayal through rescaling the image, but also quickly revealing distortions and obvious discontinuities given too large a number of pixels replaced.