Hybrid Image

Original image 1

Original image 2

Low passed image 1

High passed image 2

Hybrid Image Visualization

Hybrid Image

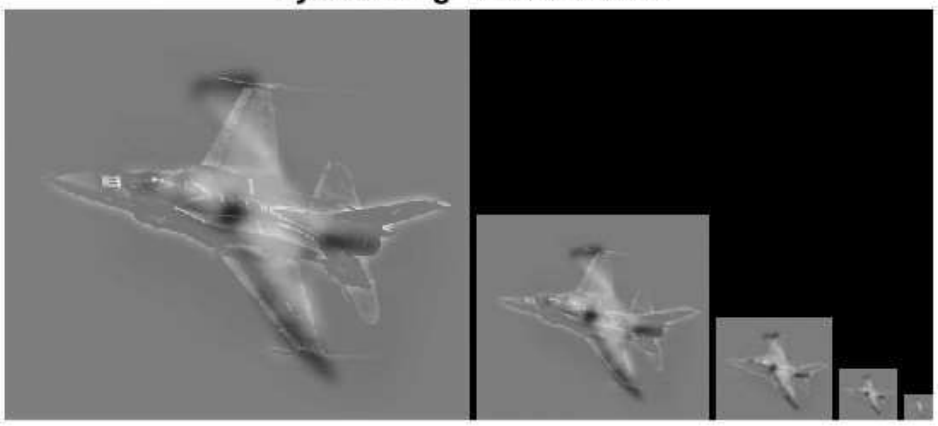
Original image 1

Original image 2

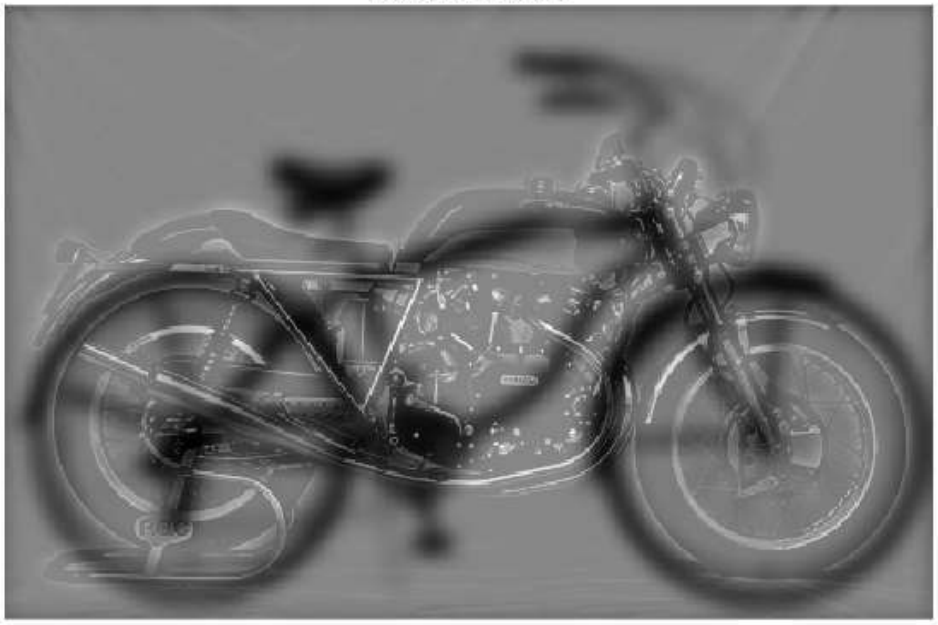
Low passed image 1

High passed image 2

Hybrid Image Visualization



Hybrid Image



Original image 1

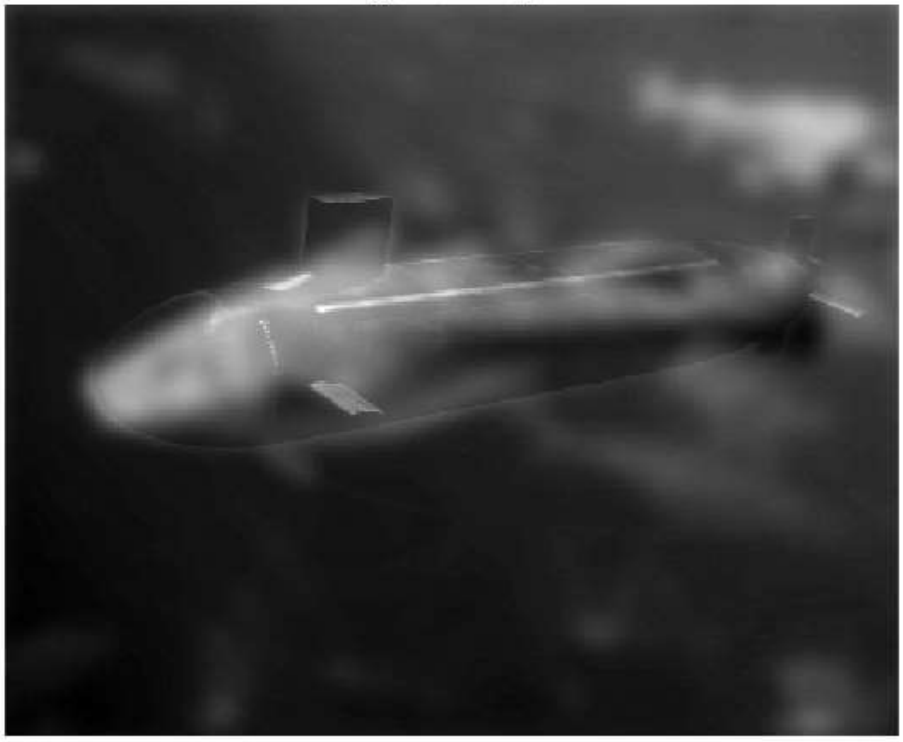
Original image 2

Low passed image 1

High passed image 2

Hybrid Image Visualization

Hybrid Image



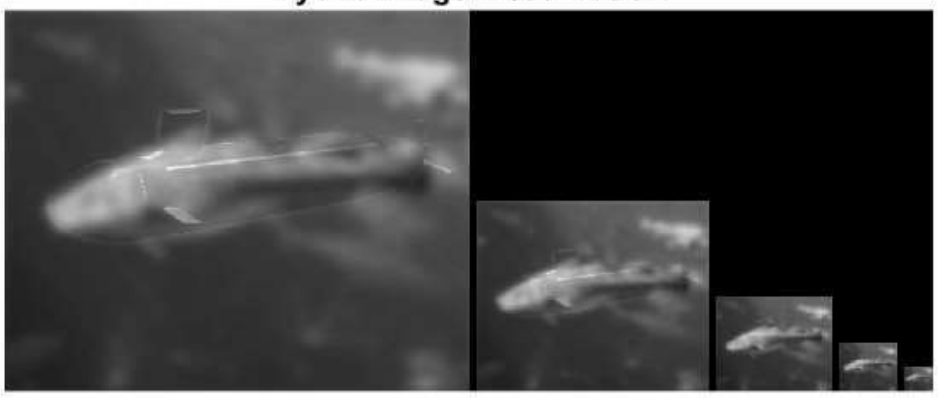
Original image 1

Original image 2

Low passed image 1

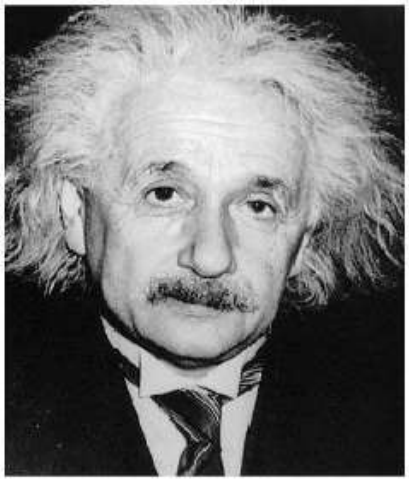
High passed image 2

Hybrid Image Visualization



Hybrid Image

Original image 1



Original image 2

Low passed image 1

High passed image 2

Hybrid Image Visualization

Published with MATLAB® R2017a

Part 1:

The Sigma and alpha used in this first batch of experiments was 5 and 0.5.

The impact of Alpha determines if which image has a stronger presence within the final hybrid image. Since it is directly scaling the image and 1-Alpha determines the scale of second image alpha must be bound within 0 to 1 otherwise the finale image might have pixels values greater than the allowed signed bits.

When I changed Sigma, I noticed the first image becoming much blurrier losing details while the second image's edges is greatly heightened.

Part 2:

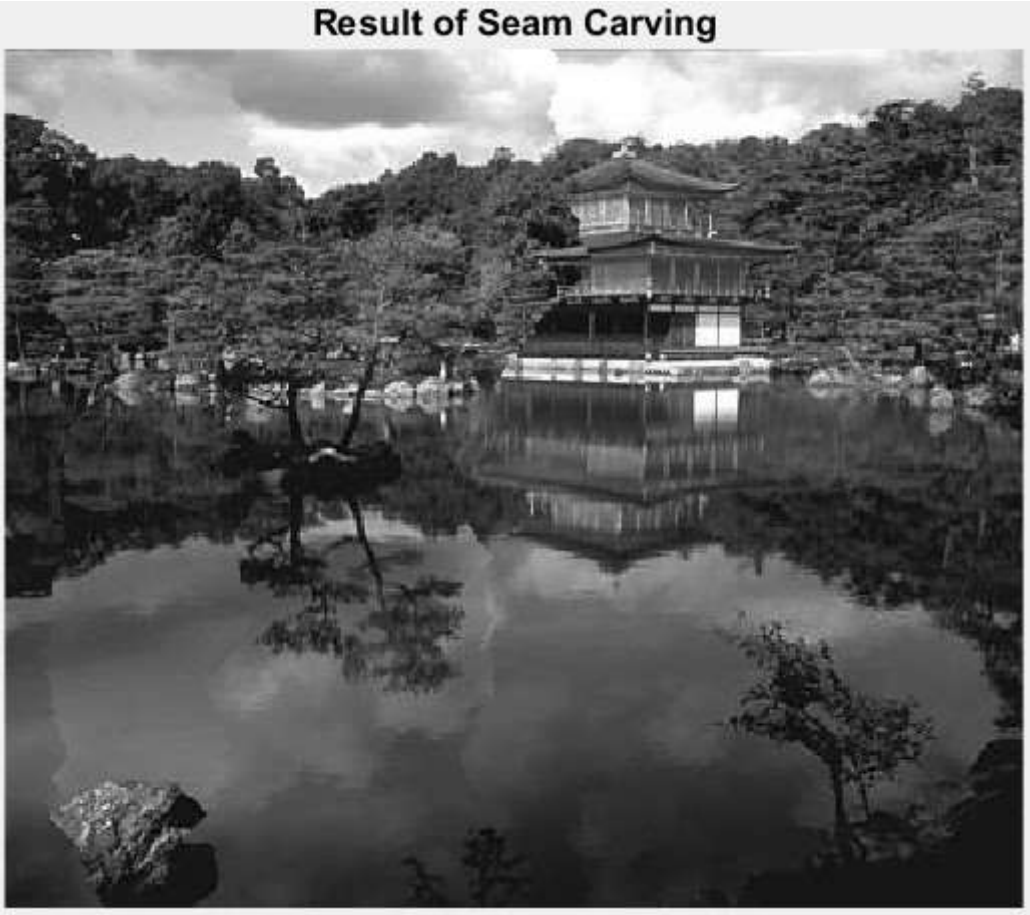
Original image 320x480x3

grey scale input

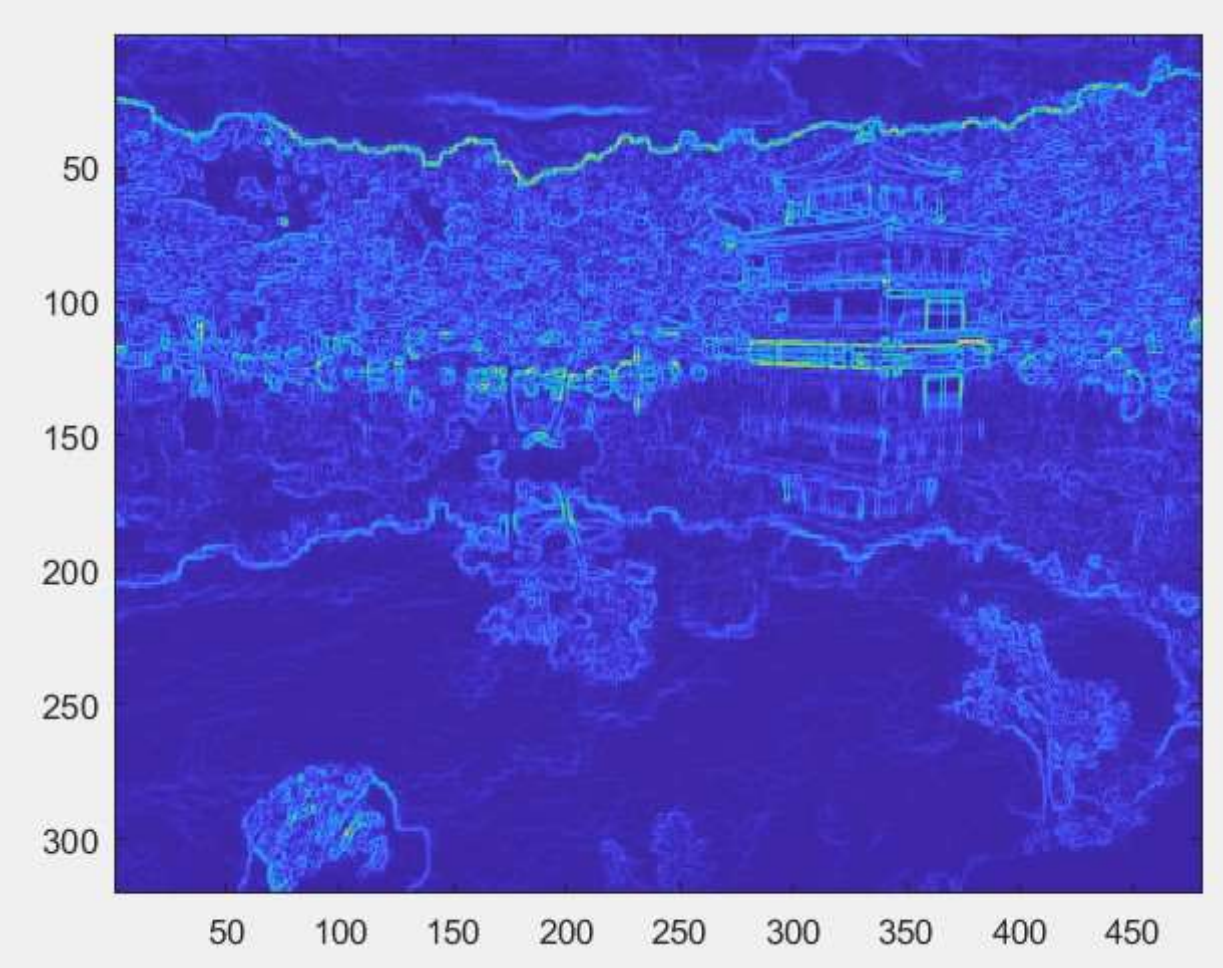
300x480

Output: 300x380

After 100 iterations the algorithm kept the details relating to the building and the reflection of the building but it chose to remove a few trees on the left hand side of the image possibly due to those trees being too blurry to produce a strong enough energy for the algorithm to consider.

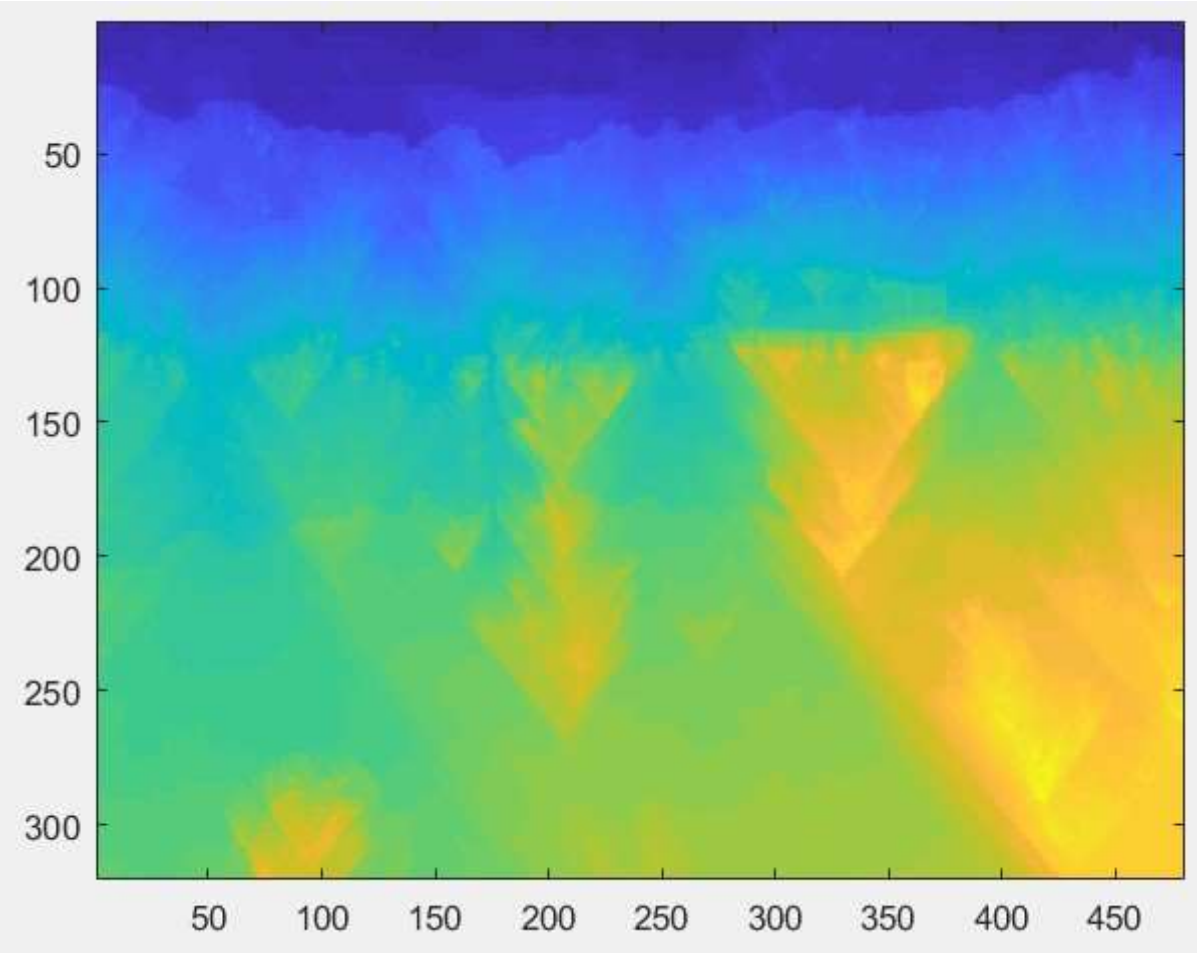


Energy Function output: 300x480



The Energy function is formed by the absolute value of the x and y derivatives it holds the energy at each pixels the spots with the greatest magnitude of derivatives is the location of the greatest energy therefore the edges usually have the greatest energy.

Cumulative minimum energy map:300x480



This image shows matrix M. M is calculated pixel by pixel by taking the minimum of the three pixels above it and adding to the pixel's magnitude. This way the energy at the top is always lower than the energy at the bottom. Which explains the color shift from blue to yellow orange.

This is the first selected seam of this image

300x480(479 soon) 300x480

This seam is the optimal seam for this picture since it follows the energy map of the image and back propagates across to the column with the lowest energy.

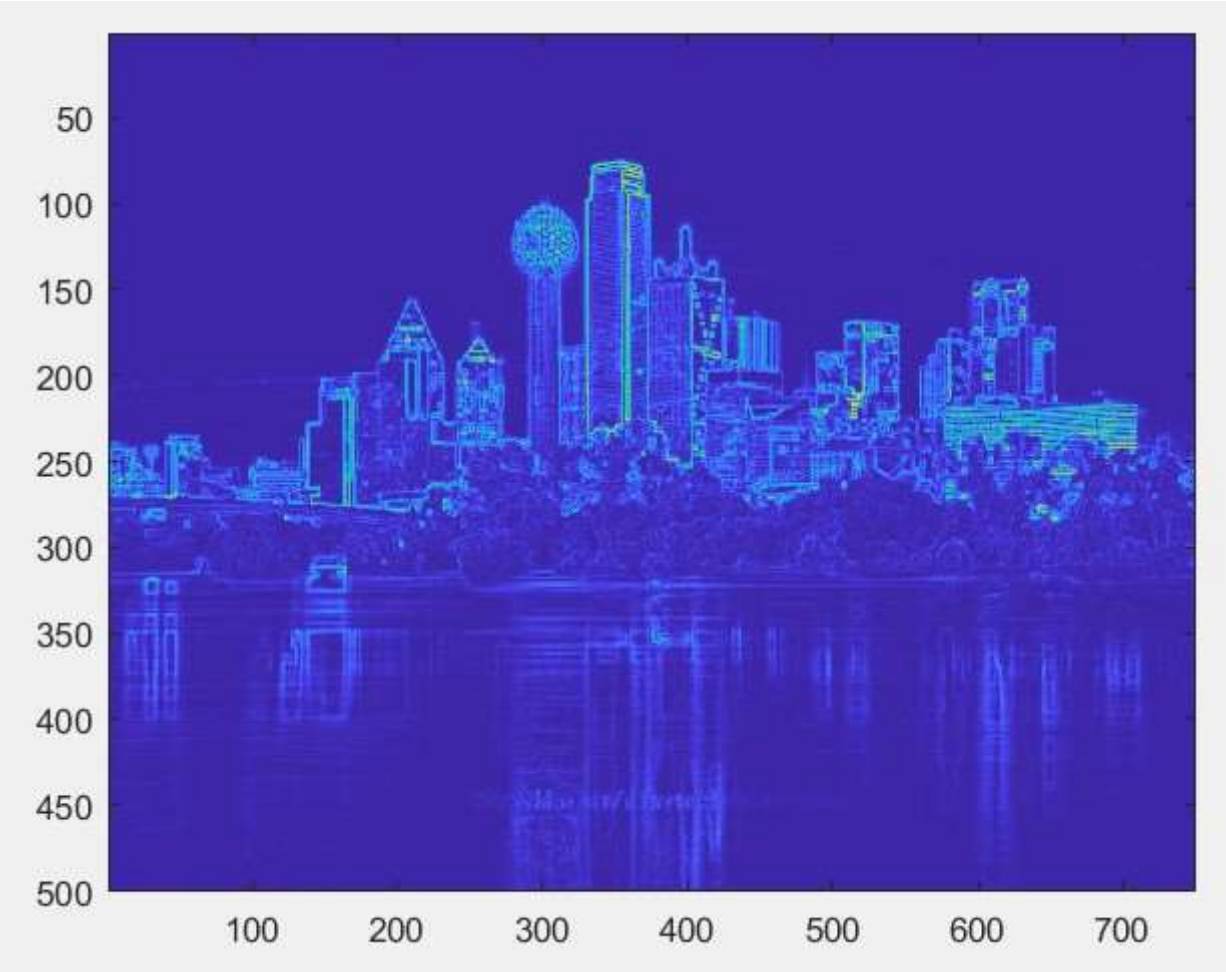
Dallas Skyline Picture: Original RGB 500x750x3

Original Grey scale: 500x750

Output: 500x700

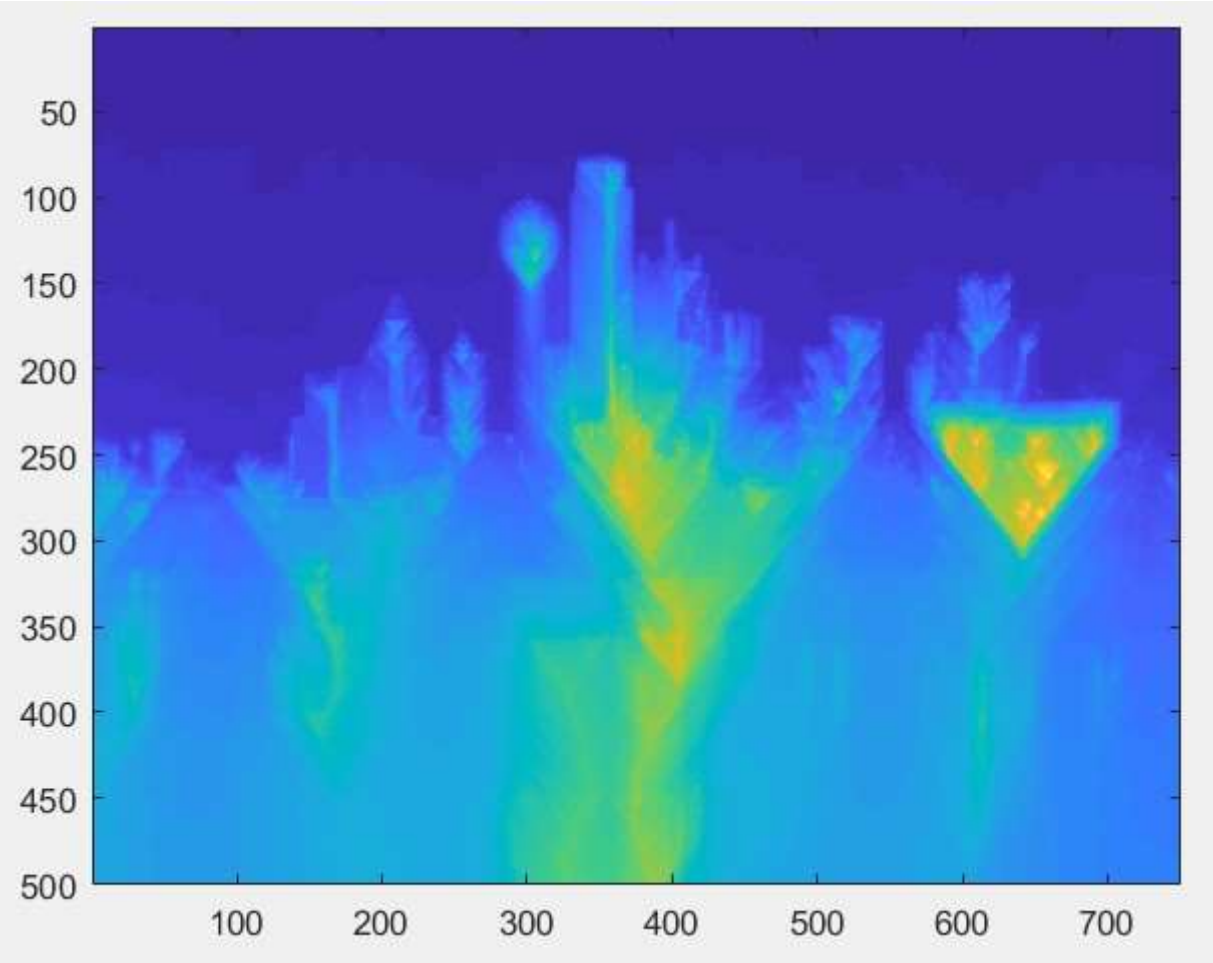
After 50 iterations the image discarded the seams on the right side image right on the edge with barely any lights or buildings or reflections on the water.

Energy function: 500x750



Most of the energy function in this image is located on the edges of buildings and their reflection on the water

Cumulative minimum energy map: 500x750



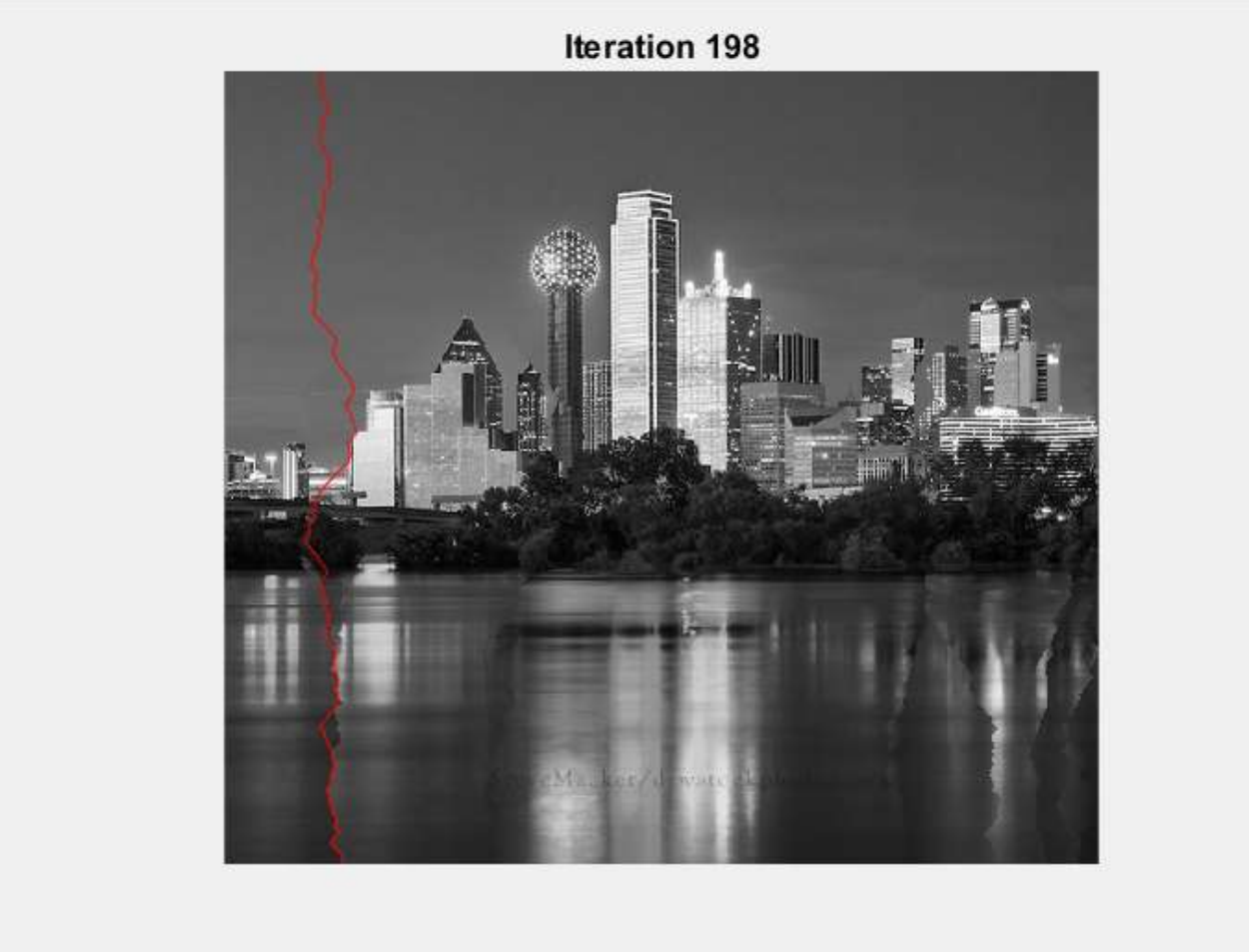
There are two giant clusters of energy right down the center and one on the right, the one on the right can be avoided by pathing the seam to the right or left side of it.

500x750(749 after the seam is gone)	500x750
	

This is the optimal seam since it follows the path of least energy.

Examples of bad outcomes

I set the code to run for 300 iterations and around 180-190 iterations there were noticeable and distinct errors within the image some of the buildings had misaligned edges especially on the right side. These false edges can be most clearly traced within the water reflection.

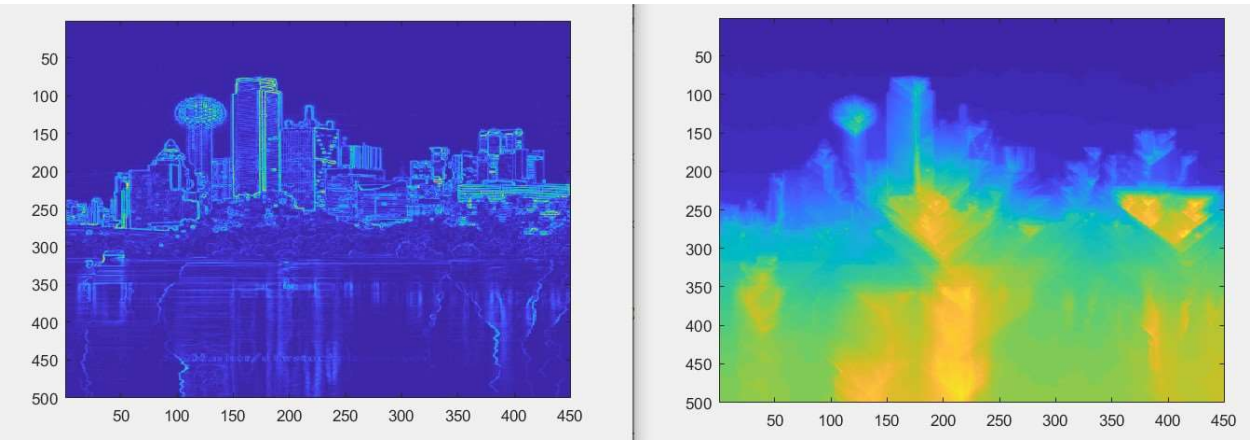


500x552

At 300 iterations

500x750 500x450

The center focus is still unchanged but there are drastic changes to the right-hand side of the image. when examining the energy and M maps of the 300-iteration seam carving:



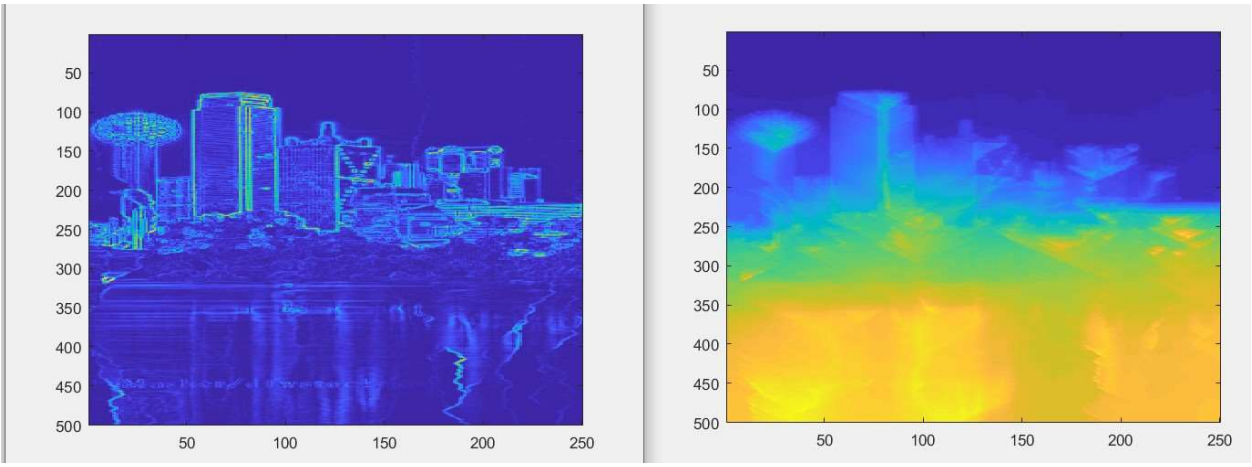
I can clearly see that the seam carving has created false edges within the water. When examining the M maps on the right there are nearly no easy paths to the top without carving away some significant chunk of energy.

The types of images that would not do well in a vertical seam carving would be images that have a large cluster of energy spread uniformly across diagonally. This would result in a huge loss of energy no matter which direction the vertical seam is placed.

An interesting result after 500 iterations was the watermark on the picture is still somehow intact the photographer picked a good place to place the watermark right at the center of the highest vertical energy cluster

500x750 500 x250

When examining the power graphs at 500 iterations:



It's clear that energy of the image is highly concentrated and that the next seam would most likely start somewhere between 150 and ~180.

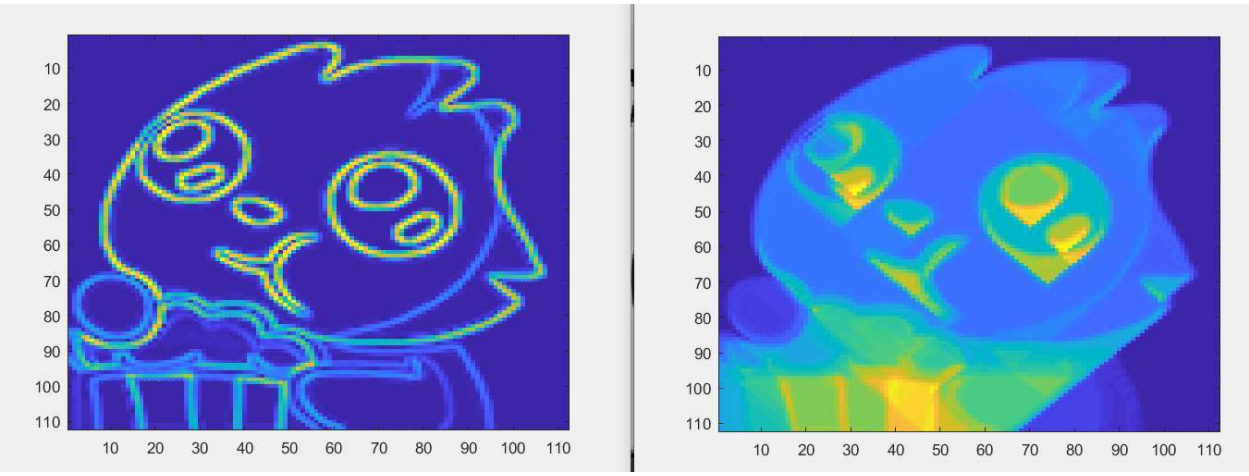
My Image: 112x112x3

Original grey scale: 112x112

Result after 10 seam carvings: 112 x 102

Nothing especially interesting happens the black beams on the right removed straight away since they have no energy at all but on later iterations some parts of the panda on the right side is cut off resulted in a more pixelated edge circled red above.

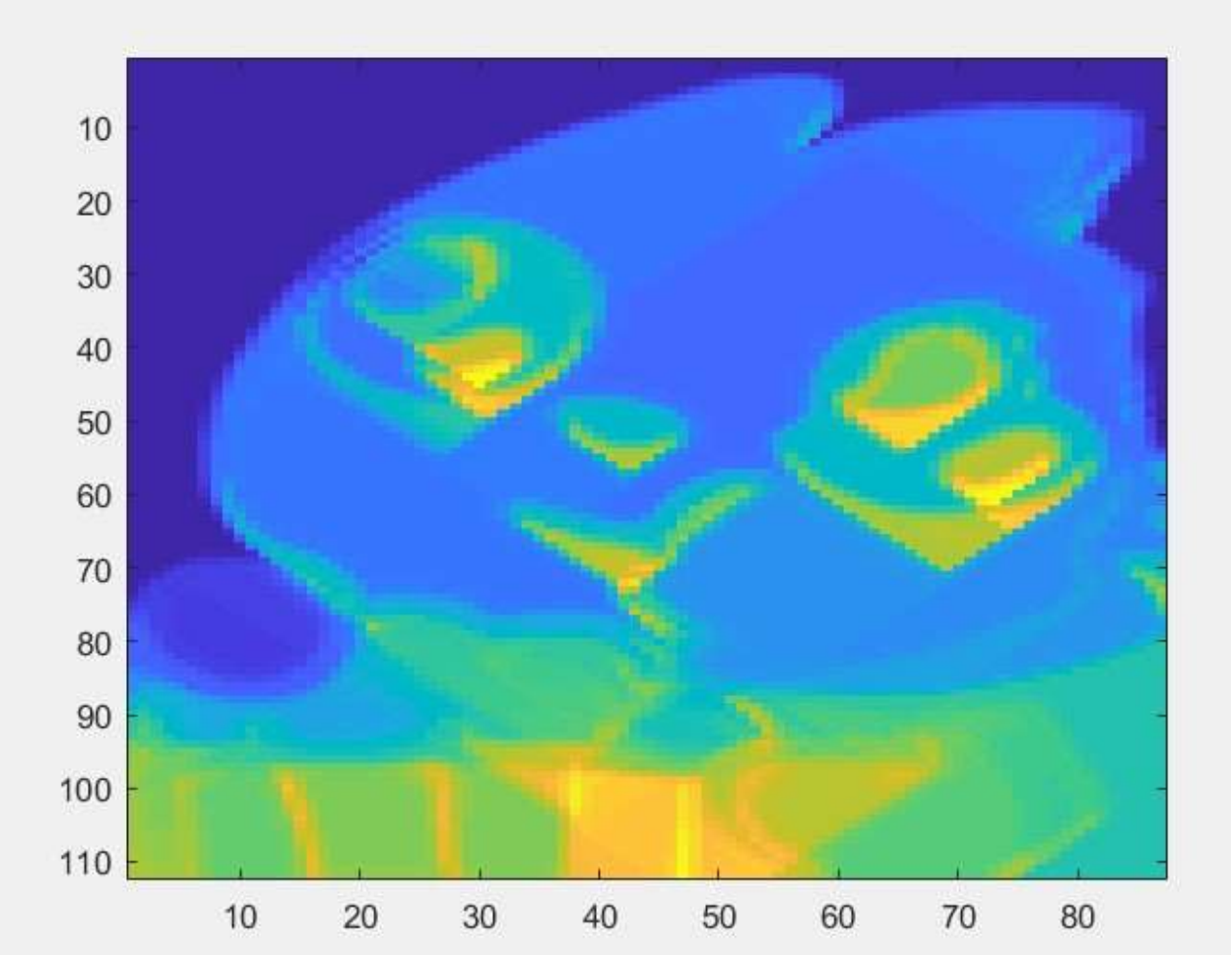
In a simple cartoon image such as this the energy is clearly defined and the paths can be clearly seen on the energy maps



However being such a small image only 112 by 112 the removal of seams is drastic as show by removing 25 seams

112 x 87

The energy cluster at the bottom quickly rose due to the small size of the image

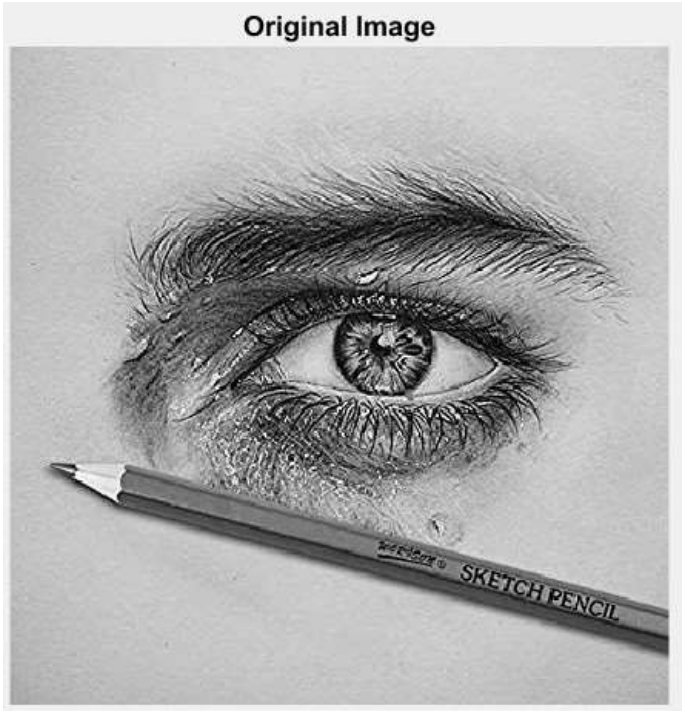


therefore each seam removed drastically alters the picture further.

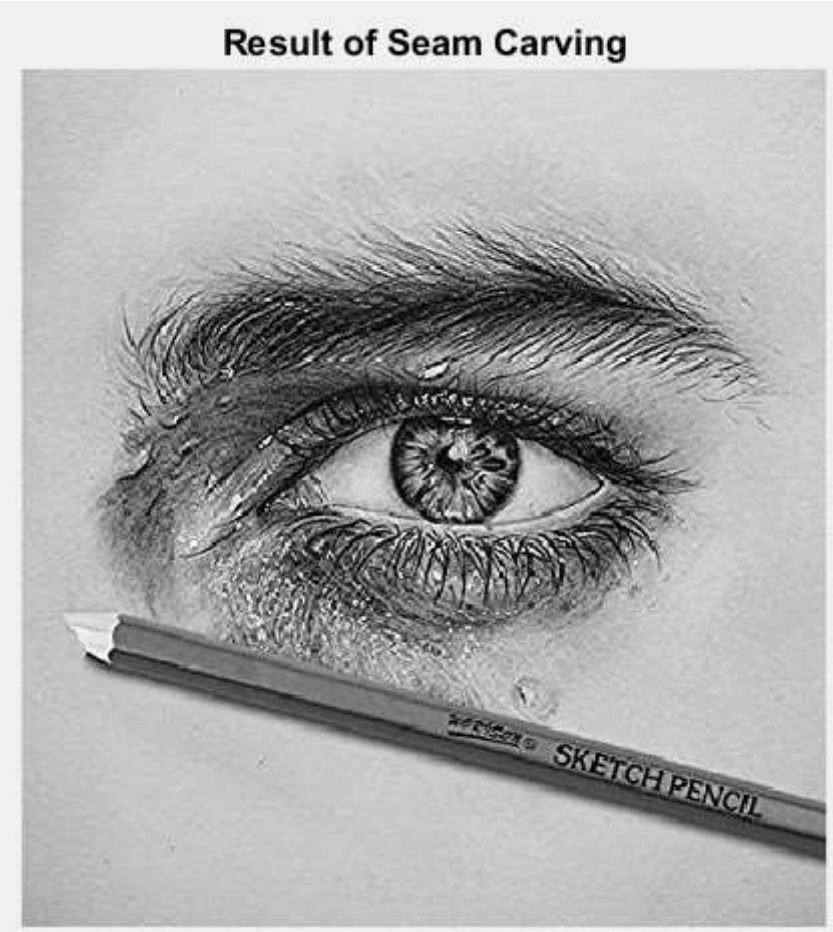
MY 2nd Image

Original: 400x400x3

Grey scale: 400 x400



Seam carving after 25 seams: 400 x 375

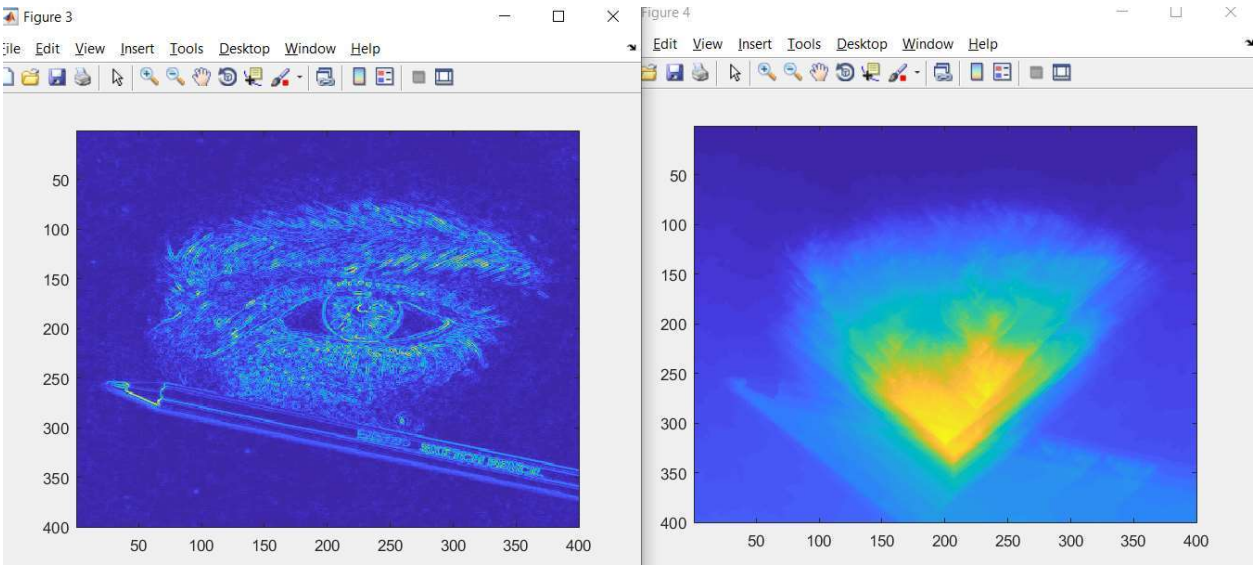


The tip of the pencil is quit latterly sharpened out as the algorithm tries to preserve the detail of the center cluster.

Seam carving after 150 seams: 400x250

Detail of the eye is still preserved but the pencil is clearly messed up from removal of crucial seams.

Energy maps of the Original image:



From this we can clearly see where the first seam would start off. As the energy of the eye and pencil keeps the center and right side of the image safe from becoming a seam the left-hand side of the image is where the first few seams will start off at. And it does as shown with the 25th iteration: