6.869 PSet 3

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Problem 1

For this problem, I wrote a Gaussian filter dependent on a sigma value, as well as a box filter dependent on size. Below you will see some of the results:

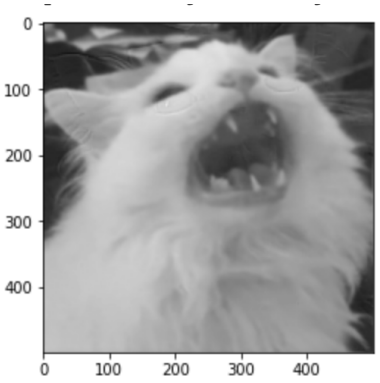

Figure 1: Box Blur of Size 5

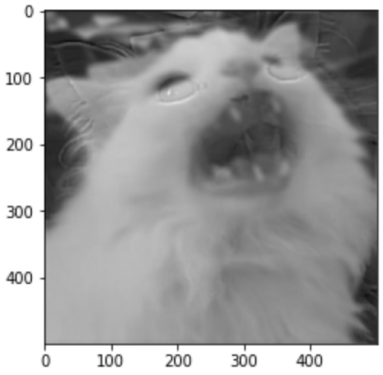

Figure 2: Box Blur of Size 10

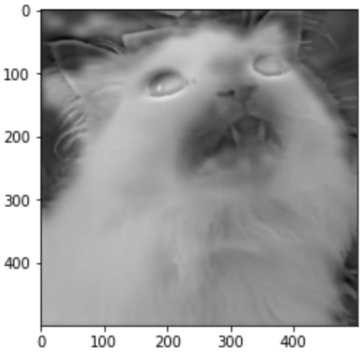

Figure 3: Box Blur of Size 20

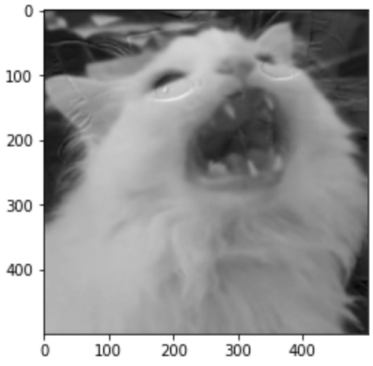

Figure 4: Gaussian, Sigma = 2

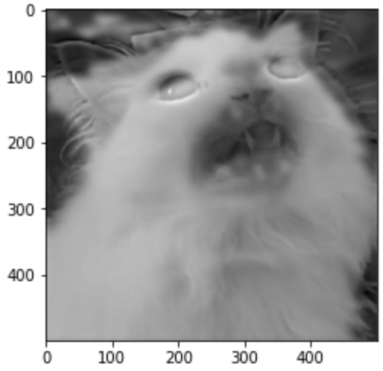

Figure 5: Gaussian, Sigma = 5

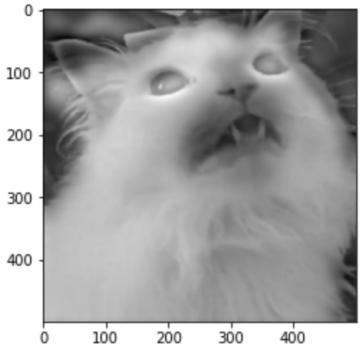

Figure 6: Gaussian, Sigma = 10

With the Gaussian filter, we can see that as I made sigma smaller, image B was blurred less as we were taking more of the image in the filter. This means that as sigma got smaller, we favored image B as it was easier to see up close and far away. However, as sigma got bigger, we blurred B more, making A easier to see up close, and we needed to step back further to start seeing B clearly without artifacts of A.

The final result I chose was the Gaussian Blur of size 50 x 50, with a sigma value of 5. This was a good balance between clearly being able to see the high frequency image up close, and also being able to see the low frequency image from far away. This can be seen below:

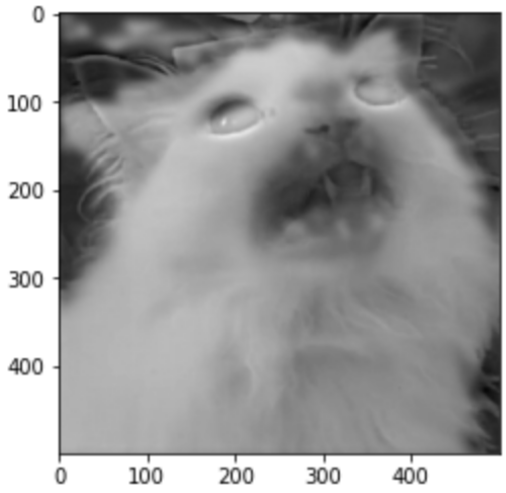

Figure 7: Final Result with Gauss Filter of Size 50 and Sigma 5

Problem 2

To do this, I knew that one image was hidden in the low frequencies of the original, and the other was in the high frequencies of the original. Thus, I knew if I came up with a correct low pass filter, I could first low pass the image to get one of the people, and then subtract the low pass filtered version from the original to get the other person in the high frequency. After doing this, I ended up with the following result:

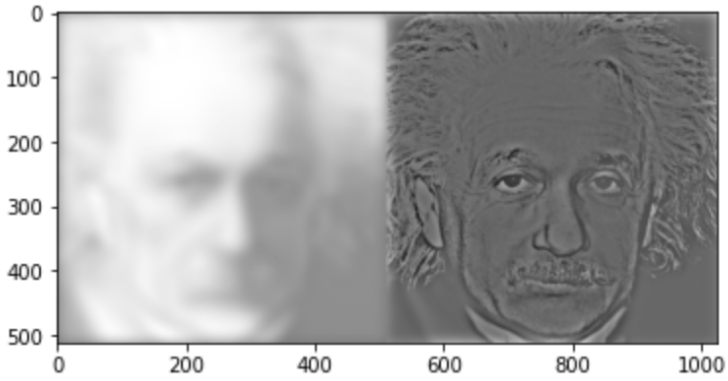

Figure 8: Separated Images of Einstein and Freud

This results in a photo of Sigmund Freud in the low frequency image, and Albert Einstein in the high frequency.

Problem 3

a) Below is the result of my magnified phase shift in one direction:

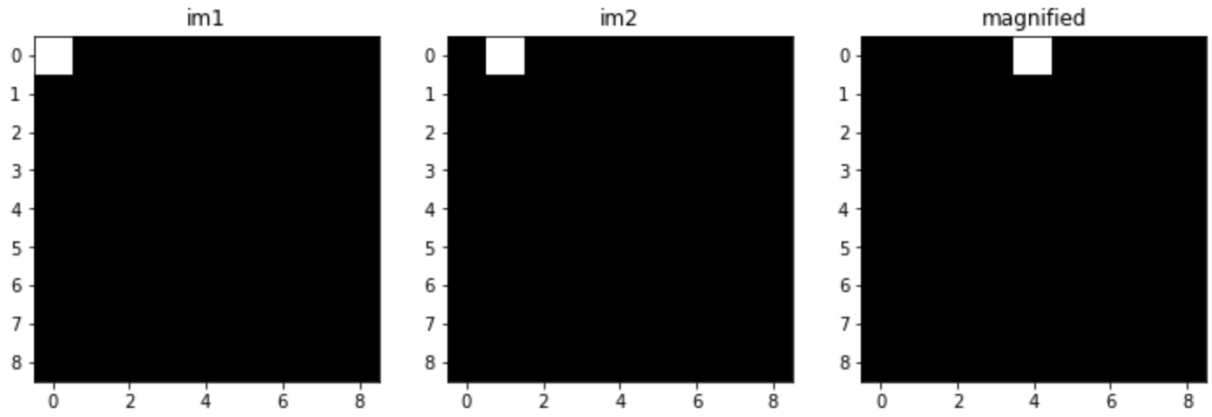

Figure 9: Magnified Motion in One Direction

b) Below you can see the result of my implementation on multiple directions:

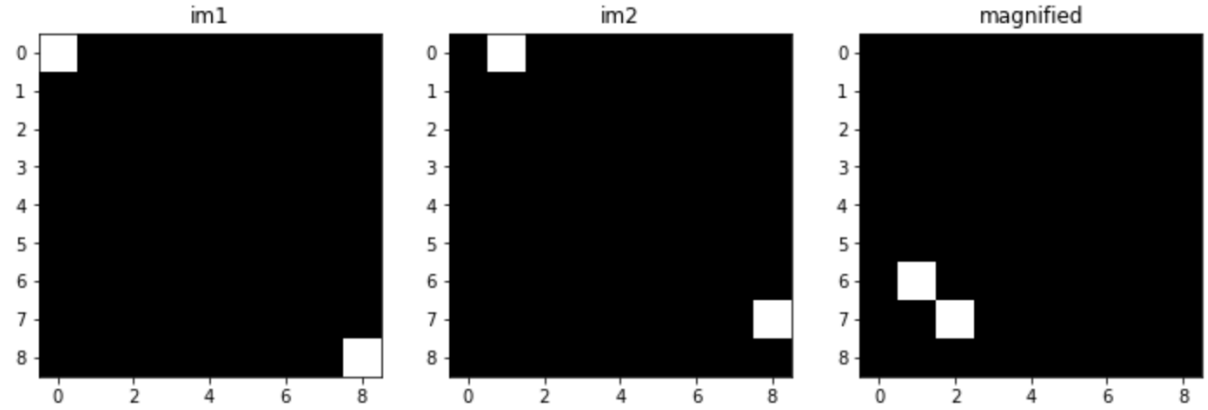

Figure 10: Magnified Motion with Multiple Directions

This ended up breaking because simply subtracted out the phases to find the phase shift resulted in a diagonal phase shift that was then performed on both pixels. Thus, we needed to fix this such that each pixel was only shifted by its own movement, not by some combination of all the movement in the image.

c)

d) The video result can be found as an attachment in the zip.

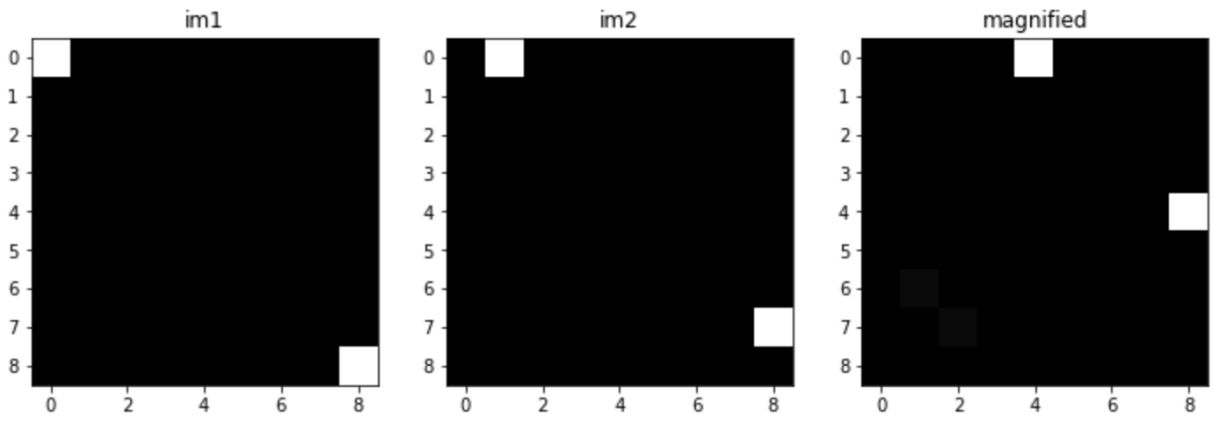

Figure 11: Magnified 1D Phase Shift