

Introduction

We had been tasked with creating a program that can restore images using frequency filters. This program consists of 5 main functions. The first is used to create a degraded image using motion blur. After applying it we then use an inverse filter function and wiener filter function restore the image respectively. After completing this we compare the restore ration functions performance using a Mean Square Error (MSE) and Signal to Noise Ratio (SNR) functions.

Design Approach

When it came to design my implementation of the code, I choose to make each function and independent and global function as what mattered to me more was applying and comparing this function in order of use. As I treated this project as a research experiment with multiple comparison points. I repeated the experiment 3 times with 3 different sigma values for my distorted images gaussian blur effect. This allowed me to see how the filters performed on different levels of distortion.

Experiment Procedure:

Call original image

Apply motion blur with the following parameters $a=0.1$, $b=0.1$, $T=1$

Apply Gaussian blur with different values for the variance leading to different levels of distortion. (0.0065, 65, 650)

Apply inverse filter and record the MSE and SNR

Apply Wiener Filter and record the MSE and SNR

Compare results of different filters

Compare results of different level of blurring

Experimental Results P1

Due to errors in the implementation of my restoration function, I was unsuccessful in replicating the results provided as reference in the document how ever the images still show aspects of collecting information form the noise

Original Image



Motion Blurred Filtered Image Sigma = 0.0065

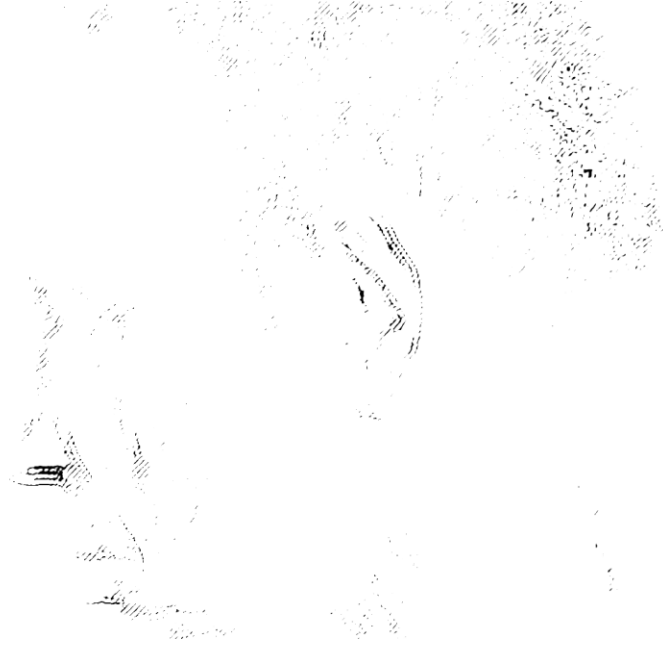


Inverse Filter Restoration Results (image is mainly white)

MSE = 5158237

SNR = -34.69

Wiener Filter Restoration Results



MSE = 14731

SNR = -9.2516

Motion Blurred Filtered Image Sigma = 65



Inverse Filter Restoration Results (image is mainly white)



MSE = 986882.795

SNR = -27.5118

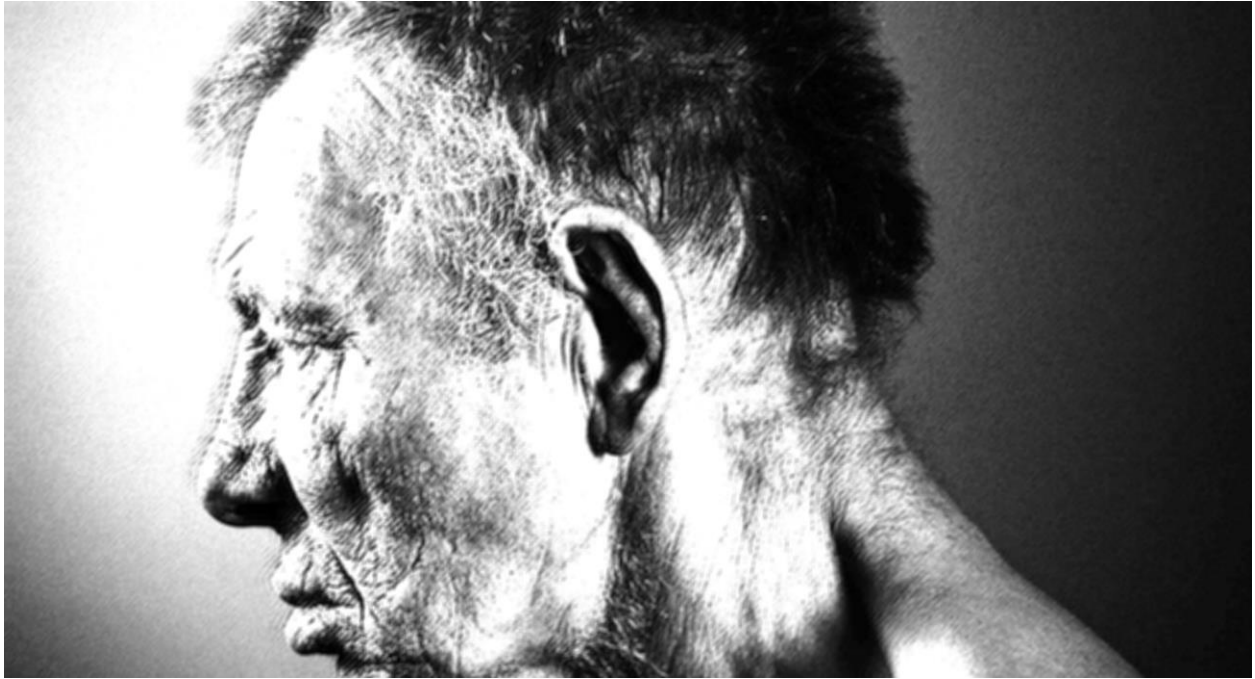
Wiener Filter Restoration Results (image is mainly white)



MSE = 14267.123

SNR = -9.1125

Motion Blurred Filtered Image Sigma = 650



Inverse Filter Restoration Results (image is mainly white)



MSE = 9868882.795

SNR = -27.5118

Wiener Filter Restoration Results (image is mainly white)

MSE = 14267.1235
SNR = -9.1125217

Though I believe my MSE, and SNR function are working I think the values being returned are far too high due to the error in my restoration function implementation. Common partners that are clear from the data is that the wiener performance on average better than the inverse function and led to more consistent results.

Conclusion

In conclusion, all this experiment has highlighted the powerful theories for image restoration and manipulation but require more nuance in real-life application for correct results. I believe that my results, while not perfect, demonstrated the behavior and effects of each function.