

# DIP ASSIGNMENT 3

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## 1 Radial Sinusoid and its Frequency Response:

Created radial sinusoidal image with different frequency( $f_0$ ) values of [2,10,20,50,100]. After taking the Fourier transform using FFT, the Image in the frequency domain was obtained and again the image was reconstructed using the inverse Fourier transform. Looking at the below figure 1-5, we can observe that with the increase in the frequency values, the image in the frequency domain becomes bigger and various patterns are formed inside the circle.

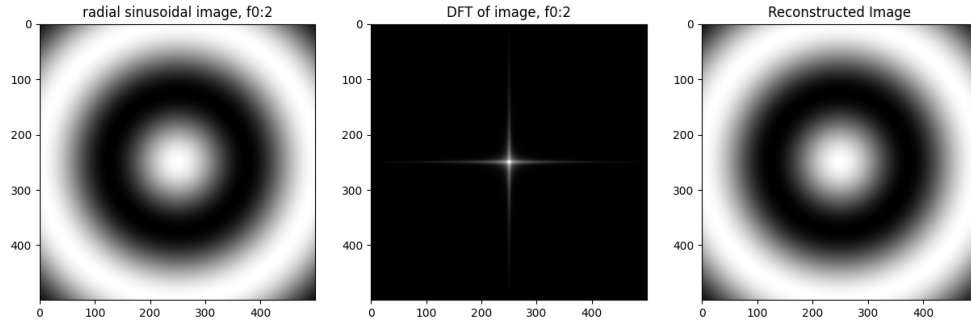


Figure 1: for frequency = 2, a) Radial Sinusoidal image, b) DFT of the image, c) reconstruction using inverse DFT

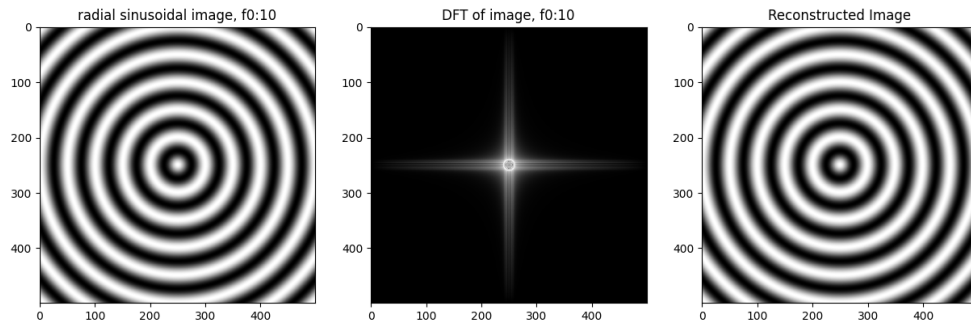


Figure 2: for frequency = 10, a) Radial Sinusoidal image, b) DFT of the image, c) reconstruction using inverse DFT

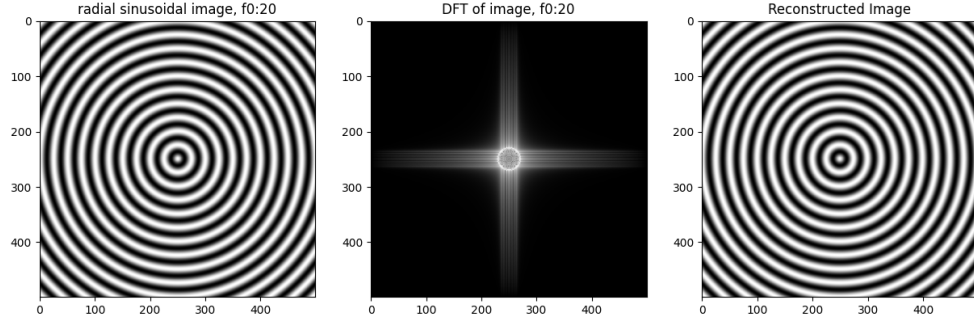


Figure 3: for frequency = 20, a) Radial Sinusoidal image, b) DFT of the image, c) reconstruction using inverse DFT

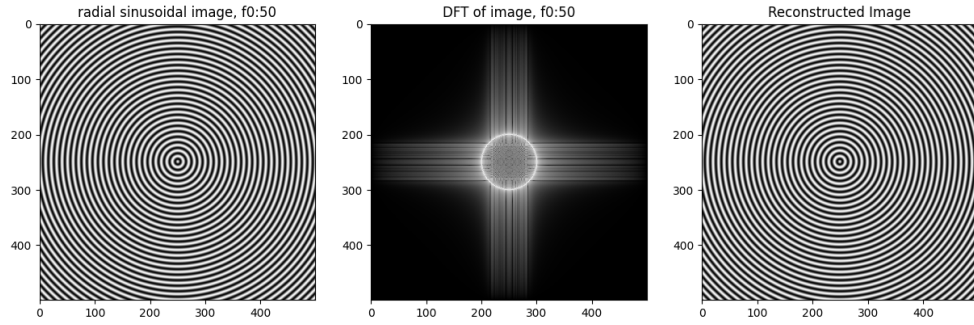


Figure 4: for frequency = 50, a) Radial Sinusoidal image, b) DFT of the image, c) reconstruction using inverse DFT

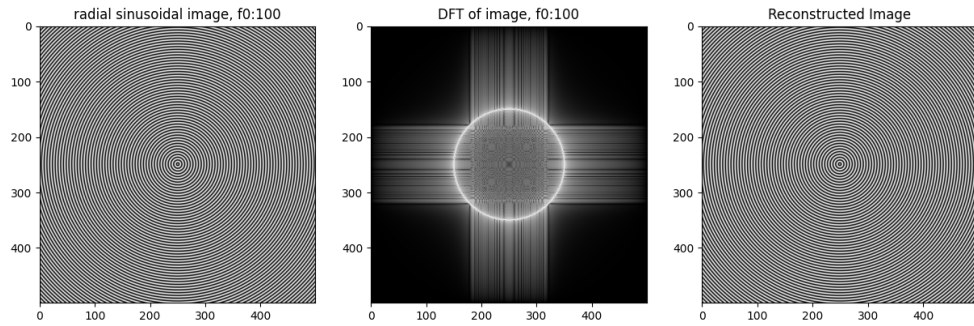


Figure 5: for frequency = 100, a) Radial Sinusoidal image, b) DFT of the image, c) reconstruction using inverse DFT

## 2 Frequency Domain Filtering:

After applying an ideal low-pass filter artifacts were observed as shown in Figure 7(a). But in the case of the Gaussian low pass filter such artifacts were not observed instead there was slight blur around edges of objects in image.

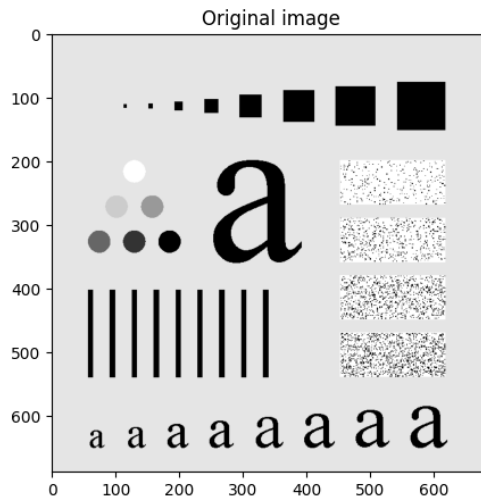


Figure 6: Original before applying filters

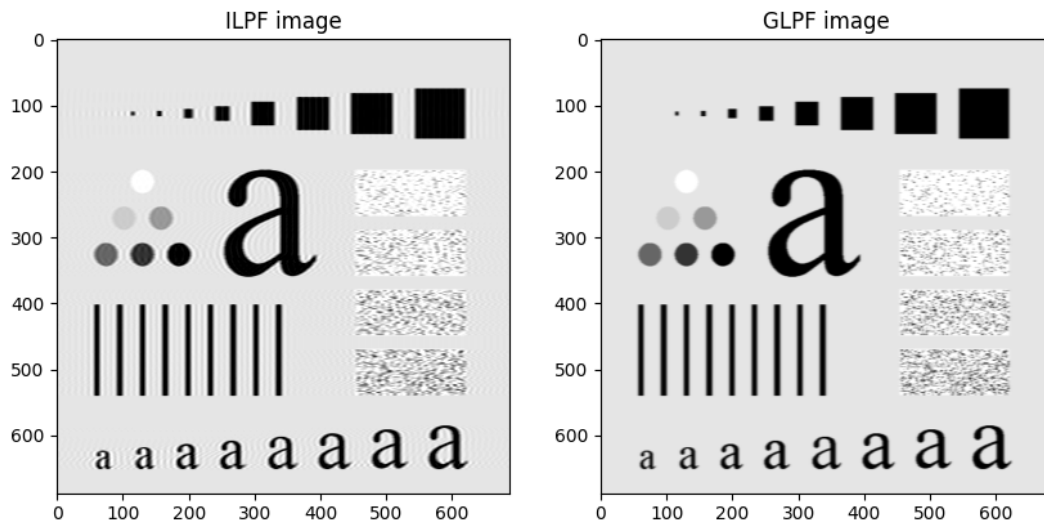


Figure 7: Comparison of images after applying filter a) ILPF b) GLPF

### 3 Image Deblurring:

Deblurring operation was carried out by using inverse filter and wiener filter. The image obtained after applying the wiener filter was sharper than the inverse filter. It was also observed that the higher the blur in the original image, the better the sharpness was obtained in the case of wiener filtering.

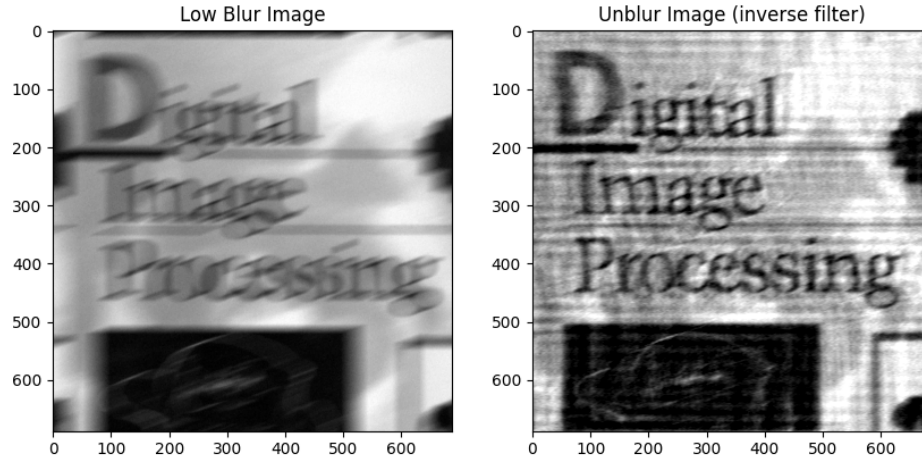


Figure 8: a) Low blur image, b) Unblur image using inverse filtering

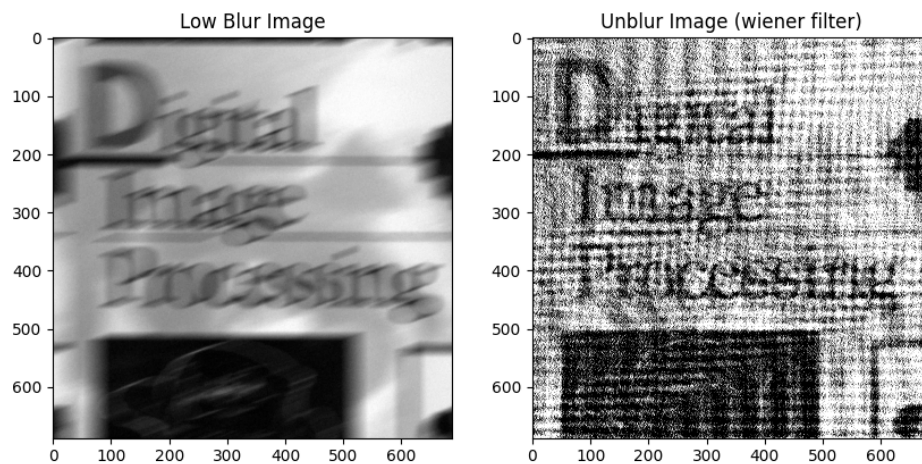


Figure 9: a) Low blur image, b) Unblur image using wiener filtering

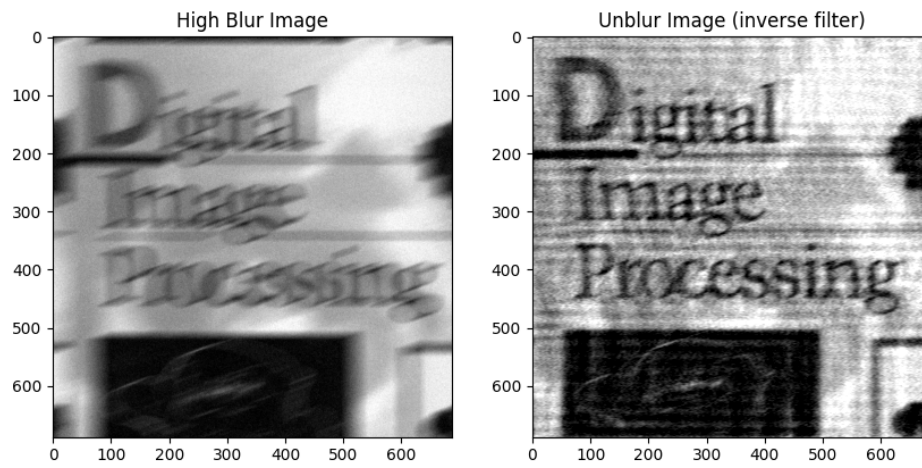


Figure 10: a) High blur image, b) Unblur image using inverse filtering

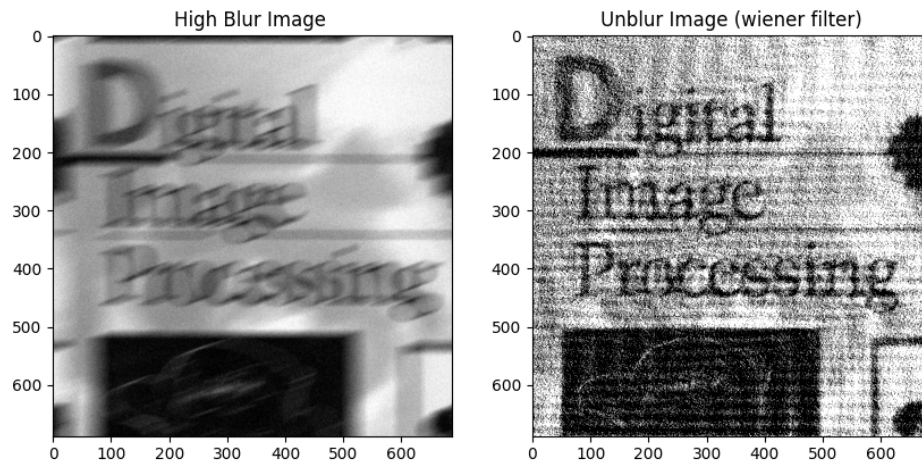


Figure 11: a) High blur image, b) Unblur image using wiener filtering