Introduction to Image Processing - Final Project Report

DIP Project – Fourier Transform

0716236 劉耀文

Part I – Introduction

➔ The goal of this project is to calculate the spectrum of the image in frequency domain and enhance the result so that the result images can be seen more clearly by using techniques such as shifting and intensity transformation.

Part II – Method

1. My code is based on the sample code which is provided by T.A. and I just add the value transformation in the code.
2. First, I use cv2.dft() to obtain the value of the spectrum in frequency domain.
3. Second, I use np.fft.fftshift() to shift the zero-frequency component to the center of the spectrum.
4. Third, I use cv2.magnitude() to calculate the magnitude of the result image.
5. Then, the value of the result image is too large and the range of value is too wide, so I apply log transformation (s = c * log(1+r)) to compress the dynamic range to [0, 255].
6. However, the result image looks too bright which is not similar enough to the image provided on the textbook, so I apply gamma transformation to enhance the dark part of the image where the value of gamma is larger than 1.
7. Finally, plot the original image and the result image on the screen by using “pyplot” from package “matplotlib”.

Part III – Experimental Results

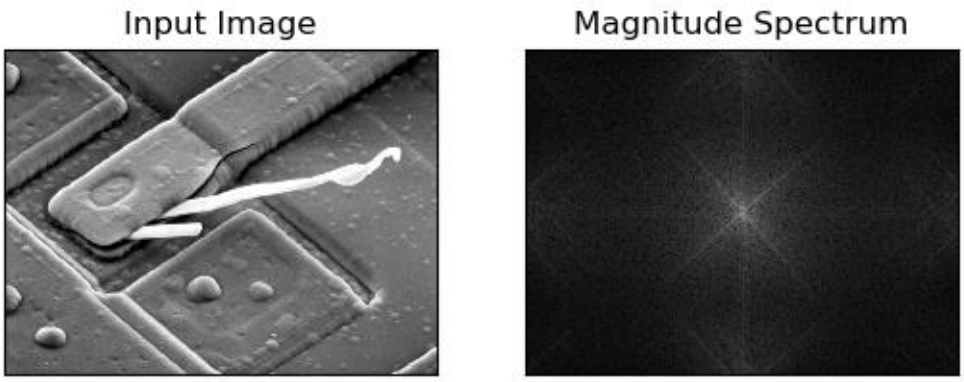

Figure 4.28 and its spectrum obtained by DFT

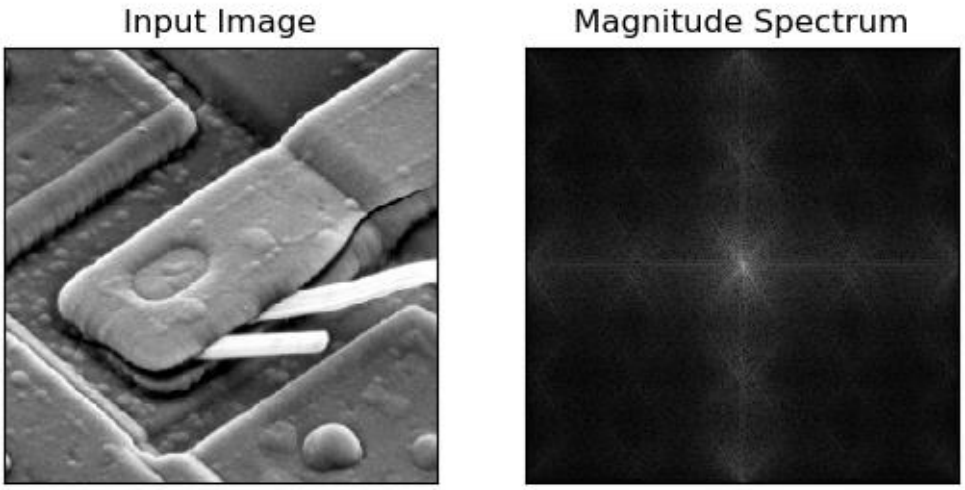

Figure 4.35 and its spectrum obtained by DFT

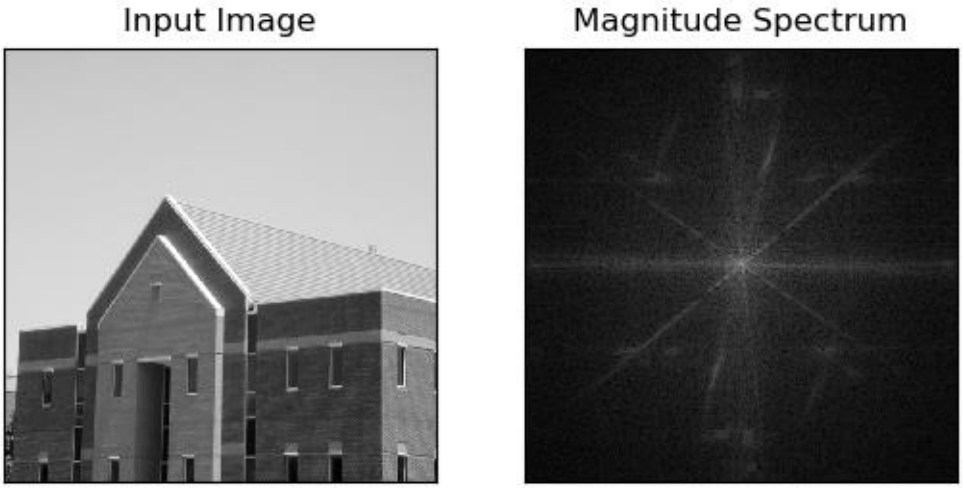

Figure 4.37 and its spectrum obtained by DFT

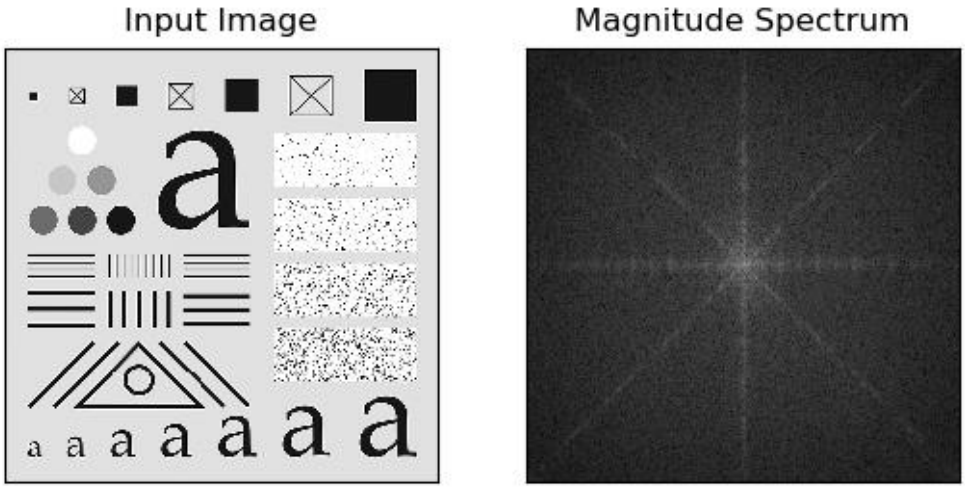

Figure 4.40 and its spectrum obtained by DFT

Part IV – Discussion

➔ I think that the most difficult part of this project is to choose the best value of gamma in the gamma transformation to make the four images which are provided by T.A. as similar as the result in textbook. I have tried gamma equals 1.5, 2, 2.1, 2.2, 2.3, 2.4, 2.5, 3.5. I think that gamma equals 2.5 is the most suitable value for all the four images. If the value of gamma equals to 1.5, the result images would look too bright which means the contrast is not good enough. If the value of gamma equals to 3.5, the result images would look too dark And I finally tried many values in the range between 2.0 and 2.5. I decide which value is better mainly by observing the second image's crosses on four quadrants. If the crosses are too clear means the result images are too bright and vise versa.