Digital Image Processing Homework 4

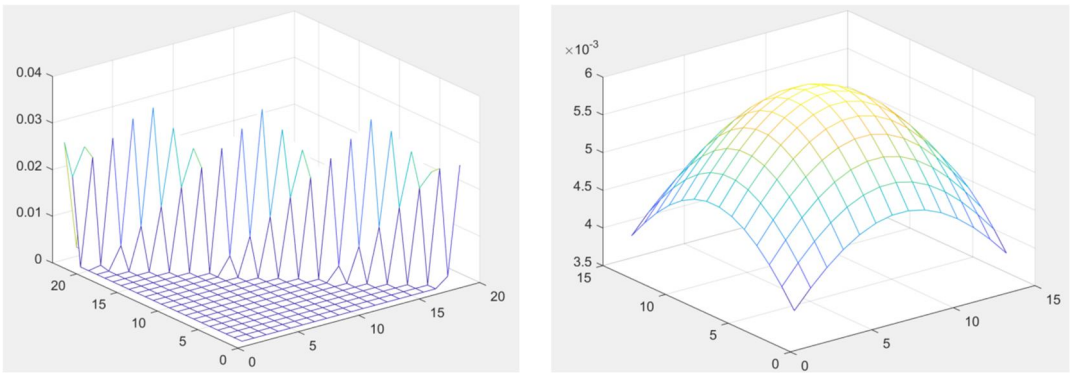
310581003 黃子軒

1 Methodology

The purpose of this experiment is to restore images that have been subjected to Gaussian Blur and Motion Blur using Image Restoration techniques. The methodology of this experiment employs the Wiener Filter, as depicted by the mathematical expression in Equation 1, where the values of K are set to 0.02 and 0.05 for motion blur and Gaussian blur respectively, H(u,v) represents the Fourier transform of the Point Spread Function.

$$\hat{F}(u,v) = \frac{H^*(u,v)}{|H(u,v)|+K} G(u,v) \quad \text{(Equation 1).}$$

For Gaussian Blur, a Gaussian function of size 14 by 14 with a sigma of 10 is employed. In the case of Motion Blur, a motion function of length in 29 pixels and an angle of 50 degrees is utilized. These Point Spread Functions for Gaussian Blur and Motion Blur can be observed in Figure 1.



(a) (b)

Fig 1. The visualization of the point spread functions. (a) Motion PSF and (b) Gaussian PSF.

2 Result and Discussion

Figure 2 illustrates the images restored by the Wiener filter utilized in this experiment. From the results, it can be observed that the initial blur has significantly reduced. However, the restoration images are not complete reproduction of the clear original images.

Additionally, Table 1 presents the recognized corresponding text in the image reconstructed after the restoration process of input2.bmp.

Table 1. The recognized corresponding text in input2.bmp.

WYS 573		2455	MKA 532	405 ZHU
MAV 794	AFV 2818	993 KCM	YUY207	7121AM8
YMX 544	XXS 604	MKM 239	378984K	JJS 269
VS7 SFL	JJS 131	552 AOY	2AA4510	RCA3412
992 KCM	9427AC6	HPR 476	YUT042	HLF V4
8 A231	4144 LGI	YSE068	MHF 686	342 A8
YUT 002	HHG 352	JGN 048	SA83399	11H38

(a)

(b)

Fig 2. The results of this experiment. On the left-hand side is the blur image and on the right-hand side is the outcome after performing Wiener filter. (a) input1.bmp and (b) input2.bmp.