影像處理 Image processing
系級：統碩二
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作業3

1. Remove salt-and-pepper noise

(20%) Write a routine that performs two-dimensional 5x5 median filtering to try to clean up the noise of ‘bab_noise.bmp’ and ‘peppers_noise.’ You need to exclude the noise pixels before applying median filtering and report PSNR before and after denoising as the table below shows.

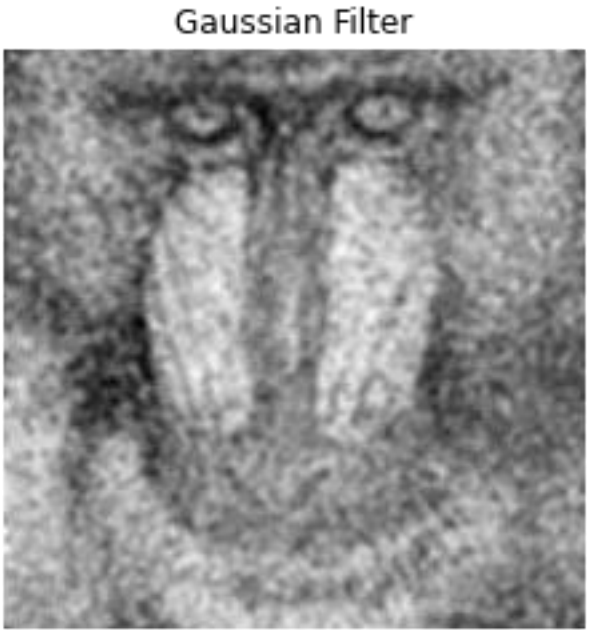
Median filter

Median Filter

PSNR	Before denoising	After denoising
Baboon	28.994	20.027
Peppers	29.673	24.641

發現兩張圖片經過 denoising後，圖片的PSNR皆下降，但圖片相較清楚了。

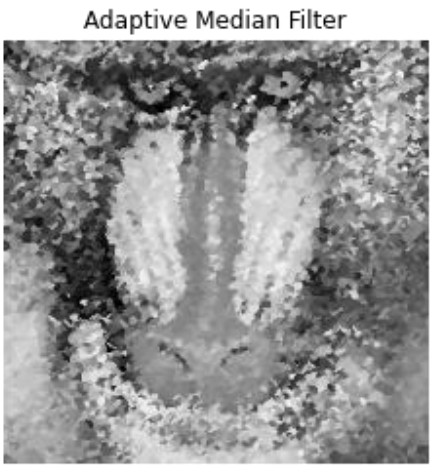
b. (20%) Following the previous question, use two-dimensional 5x5 Gaussian filtering with its kernel as below and report the PSNR results:



PSNR	Before denoising	After denoising
Baboon	28.994	19.140
Peppers	29.673	18.418

發現兩張圖片經過 denoising後，圖片的PSNR皆下降，但圖片相較清楚了。

c. (10%) Write a rotine that performs two-dimensional median filtering with an adaptive kernel size on bab_noise_90.bmp. For each noise pixel “p”, the adaptive kernel size needs to be the same as the smallest size of the sliding window centered at “p” with at least one non-noise pixel. Please also report the PSNR results in the table format like Q1.a.



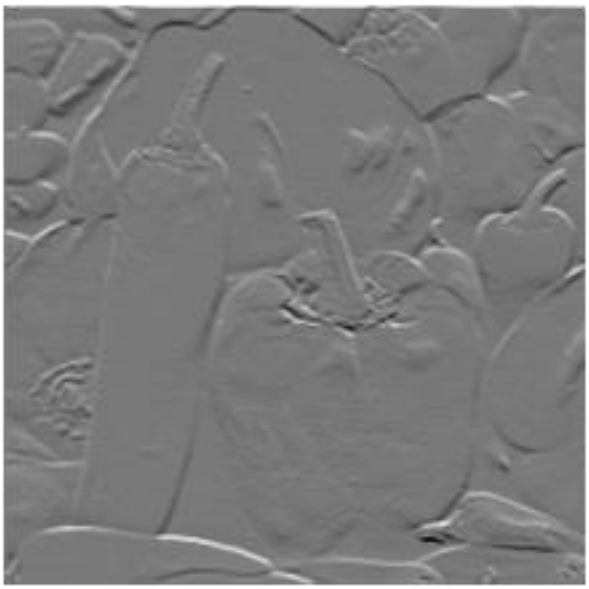
PSNR	Before denoising	After denoising
Baboon	28.524	17.519

由於之前的雜訊點實在過多，經過denoising過後有稍微清楚了。

2. Edge Detection

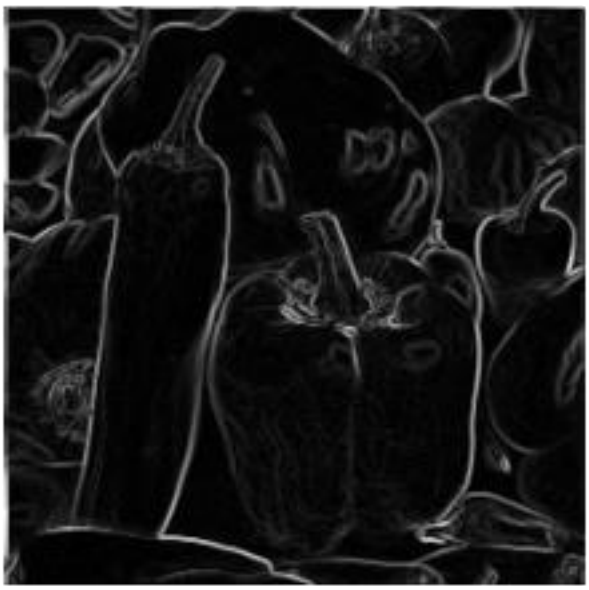
a. (25%) Please implement Sobel filtering to find the edge map for ‘pepper.bmp’, whose result should look like https://www.mathworks.com/discovery/edge-detection.html (please implement the Sobel filter by yourself)

sobel y



sobel x

Sobel



G x

-1	0	1
-2	0	2
-1	0	1

用來偵測 vertical edge

G y

-1	-2	-1
0	0	0
1	2	1

用來偵測 horizontal edge

b. (25%) Following the previous question, please use 5x5 Marr-Hildreth operator (shown below) to find the edge map.