

Exercise Sheet 5

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1. Edge detectors

- Implement a *Sobel* edge detector
 - i. Create the two required masks, one to estimate G_x , and another to estimate G_y .

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

Sobel - G_x

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

Sobel - G_y

- ii. Obtain, for each pixel, the magnitude of the gradient.

$$|G| \approx |G_x| + |G_y|$$
- iii. Visualize the result in a spatial image format (i.e. display it as values between 0 and 255 for each pixel).

- Implement other edge detector filters.
 - i. Sobel 5x5
 - ii. Laplacian
 - iii. LoG operator
 - iv. Difference of Gaussians

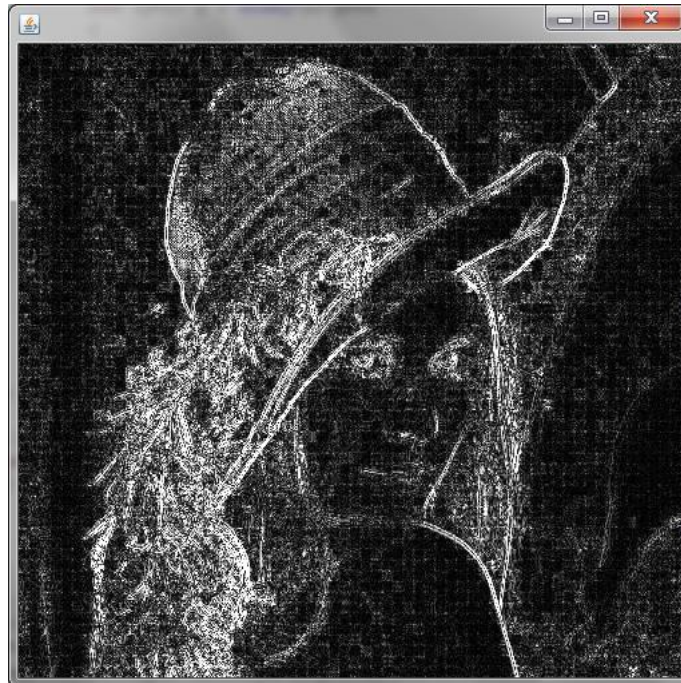


Figure 1 – Results after applying a 3x3 Laplacian filter to the *lena.jpg* image. Contrast-stretching was used for clarity. Was is the cause for the ‘little squares’ effect? (Hint: Read the slides on image compression)

2. Erosion and Dilation

- Create two morphological filter functions that operate on binary images: *Erosion* and *Dilation*. Use a 3x3 *kernel* as shown in Figure 2.
- Apply these function to image *Imagem_AP5_2*, which is the results of the segmentation of image *Imagem_AP5_1*, degraded by salt and pepper noise.
- [Optional] Make your functions more flexible, by allowing them to receive an additional parameter with the operating *kernel*.



a) Imagem AP7_2

1	1	1
1	1	1
1	1	1

b) Kernel 3x3



c) Erosion



d) Dilation

Figure 2