Exercise Sheet 5

Docente: Miguel Tavares Coimbra

1. Edge detectors

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

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

Sobel - Gx

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

Sobel - Gy

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

$$|G| \approx |Gx| + |Gy|$$

  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. Constrast-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