

DLCV – Exercises (morphological operations, convolution)

Exercise 1 (morphological operations)

Consider the image “corruptedRect.png” (attached to the exercises on Moodle):



Using a sequence of morphological operations (possibly using different structuring elements), try to get an image with a white rectangle against a black background – the rectangle should be as “perfect” as possible, while closely matching its corresponding area in the original image.

Exercise 2 (convolution)

Using an image I and two filter kernels F_1 and F_2 of your choice, show experimentally that:

$$I * (F_1 + F_2) = (I * F_2) + (I * F_1)$$

Notes:

- Rounding operations may be a source of small (but insignificant) differences.
- Depending on the choice for the filter kernels, it may be required to compute the calculations in float matrices instead of uint8 matrices, for handling values outside the $[0, 255]$ range.

Exercise 3 (convolution, gradient)

Develop a small script that computes and visualizes the magnitude of the gradient for an image of your choice. Remember that the x and y gradient components can be estimated using Sobel filters and gradient’s magnitude can be computed using the Euclidian norm (L2-norm) of those components.

Test your script, using images “lastsupper.jpg” e “clocks.jpg” provided in the zip file attached to the exercises. Note that you’ll need to be careful with the numeric formats of the matrices used in the calculations, since the convolution with Sobel filters produces results outside the $[0, 255]$ range.