DSIP Assignment (third part)

What we expect from you Turn in your solution to all the exercises keeping in mind that this is a good part of your exam. You are expected to work on the exercises after you studied the theory covered in class and the labs session we went through together. If you experience any difficulty, go back to the material we covered, check the notes, and find out where you need to study more. You can ask questions anytime you want on what was covered in class and labs but you are not going to receive help on the exercises you find below.

Deadline No deadline in place.

Turn in your solution when you feel ready for the exam.

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Hand in a Python notebook which includes the following steps, organized in sections, coherently with the structure described below.

The notebook should contain short descriptions/comments and working code. The code will be run during the oral exam and you'll be asked to discuss the results that you obtain

Image processing basics

- Generate a synthetic image I of size 200x200 with a black background containing 3 squares of side 10, 30, 50 pixels the position of which (I'm referring to both the row and column components of the top-left vertex) is sampled uniformly in the range [0,140]. Each of the squares will have a constant brightness, sampled uniformly in the range [50,255]
- Rotate the image around its center (that is the point of coordinates (100,100)) of an angle θ sampled uniformly in the range [10, 80] --> I_r

2D DFT

- Compute the DFT of the two images, I and I_r, and visualize them, in the appropriate way (meaning, using the appropriate shifting) side by side. Comment what you obtain

Image filtering

- Implement high pass / enhancement filtering procedures, in space and in frequencies. Make appropriate design choices in the two cases (that is, select appropriate filters for Fourier and for space filtering).
- Use the results from the step above to obtain a coarse edge map associated with images I and I_r
- Here again, comment what you obtain