

Practical 2 : Image enhancement, histogram

I-Histogram visualisation

Let the small image with the following gray levels :

3	4	14	7	9	5
5	3	12	5	9	0
15	15	14	5	9	4
11	11	10	5	6	0
12	8	0	1	2	1
13	3	0	1	3	5

Draw a table having in each column : the gray levels [0 :15]and the PDF function (histogram),

II- Application on real images

- Write a function that performs the histogram for each given gray level image
- Download images spin, rice, cameraman
- Apply your function on the three images
- How to interpret each histograms
- Compare your results with the function hist of python
- Write a program that performs the cumulated histogram of the images.

III-Contrast enhancement

1) Image binarisation

- Write a function binim(Im,s) that perform the binarisation of your images
- For each image, find the adequate threshold s
- Show your results with subplot where you illustrate the original image, its histogram, the enhanced image and its histogram
- Comment your results

2) Linear stretching

- Write a function RecDyn(Im,a,b) that performs the dynamic linear stretching between a and b.
- Stretch your images for a=50 and b=140
- Show your results with the function subplot where you illustrate the original image, its histogram, the enhanced image and its histogram
- Comment your results about the advantage of the linear stretching

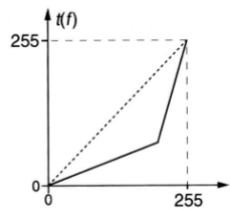
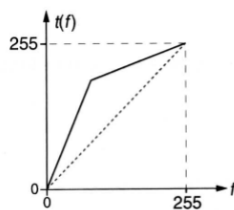
3) Negative of an image

- Write a function negim(im) that gives the negative of the gray level of the image
- Show the histogram of the original image and its inverse
- Comment the results

4) Contraction of dark areas and dilatation of bright ones

- Write a function DilCont(Im,a,pc,pd) that reinforce bright areas dynamic and contract dark ones
- Use the following function for help :

$$t(f) = \begin{cases} \frac{b}{a}f & \text{pour } 0 \leq f \leq a \\ \frac{(255-b)f + 255(b-a)}{255-a} & \text{pour } a \leq f \leq 255 \end{cases}$$



Dilatation of dark areas dynamic

Dilatation of bright areas dynamic

- Compare the dilatation of bright areas dynamic on your images with choosing the appropriate parameters
- For each image show :
 - The original image
 - Its histogram
 - Its cumulated histogram
 - The dilated image
 - Its histogram
 - Its cumulated histogram



- Do the same operation for the dilatation of dark areas dynamic
- Write down your observation on each result

5- Histogram equalization

Write a program that performs histogram equalization on a grayscale image. Your program should:

- i) compute the histogram of the input image;
- ii) compute the histogram equalizing transformation function;
- iii) apply the function to the input image;
- iv) compute the histogram of the equalized image;
- v) display and print the equalized images as well as their corresponding histograms, all in one figure.

You are not allowed to simply use the “histeq” function in Matplotlib, Compare your results with those obtained using “histeq” function