Université Ibn Tofaïl
Faculté des Sciences

Master Artificial Intelligence
&
Virtual Reality

Practical work n°1

Introduction to Image Processing and Analysis

1. Histogram construction/manipulation for luminance correction

Sometimes the luminance of an image is weak due to the environment of the image capture. We will try to correct this using histogram manipulation.

1.1) Using OpenCV and Numpy libraries, load the *dark_lena.png* grayscale image from the ressources provided in this practical work.

Visualize the image to be sûre of your approach before moving to the next question. How the image is looking ?

1.2) Compute the histogram of the image and visualize it using matplolib.pyplot library. What can you say about the histogram ? Is it in correlation with your response of the question 1.1 ?

1.4) In order to correct the luminance of the image what can you do to the image to stretch the image ? Code it and visualize the resulted image.

1.5) Compute the histogram of the resulted image. What do you remark ?

2. Histogram construction/manipulation for contrast correction

Histogram equalization consists in correcting an image that lacks contrast: its gray levels, are concentrated on only a few values. The goal is to use all possible range of grayscale values and to have approximately as many pixels of each level.

2.1) Using OpenCV and Numpy libraries, load the *weak_contrasted.png* grayscale image from the ressource provided in this practical work using OpenCV library.

2.2) Compute the histogram and cumulative histogram of the image and visualize them using matplolib.pyplot library.

2.3) Normalize values of the cumulated histogram in order to bring them in [0 255] : divide each value of the cumulated histogram by the total number of pixels, then multiply the result by 255.

The goal is to use the cumulated histogram as a conversion table of grayscale values to perform equalization.

2.4) Complete the equalization of histogram taking into account this goal and visualize the resulted image. Compare it with the original image.

2.5) Plot the histogram of the resulted image. What happened to the histogram ? Can you explain more in details what happened when you consider the cumulative histogram ?

2.6) If we perform both processes (histogram stretching then histogram equalization), does the resulting image will be better ?

3. Histogram construction/manipulation for colored contrast correction

Image weak_colored_contrast.png suffers from a lack of contrast. Doing the same process as above with some adjustments could correct this lack of contrast.

To your keyboards!