

SGN-12007 Introduction to Image and Video Processing

EXERCISE 4

09.11.2017 - 10.11.2017

The tasks should be completed and presented to TA during the lab session. Questions about exercises should be addressed to the TA personally or via email: (firstname.surname@tut.fi).

1- Image Enhancement Intensity Transformations

The focus of this part is to experiment with **intensity transformations** to **enhance an image**. Download the image *university.png* and enhance it using:

(a) The **log transformation**

$$s = c \log(1 + r),$$

Where c is a constant and it is assumed that $r \geq 0$. We would use a transformation of this type to **expand the values of dark pixels** in an image while **compressing the higher level values**.

(b) a **power-law transformation** of the form

$$s = cr^\gamma,$$

Where c and γ are positive constants.

In (a) the only free parameter is c , but in (b) there are two parameters, c and γ for which values have to be selected. As in most enhancement tasks, experimentation is a must. The objective of this exercise is to **obtain the best visual enhancement possible with the methods in (a) and (b)**.

Once (according to your judgment) you have the **best visual result for each transformation**, explain the reasons for the **major differences between them**.

2- Histogram Equalization

Implement your own **histogram equalization function (histequal.m)**. Perform histogram equalization on the images (*moon.png*, *house.png*, *spine.jpg*, *church.png*) by your OWN method. Compare the histograms and images before and after processing. (for loops are allowed. !Do not use MATLAB *histeq* function!). Compare outputs to the **ContrastStretch** results (Matlab code for “ContrastStretch” is already provided).

3- Histogram Matching

Implement a function that will **apply histogram matching from image A to image B**. You can use **simple interpolation**, if necessary. (see http://en.wikipedia.org/wiki/Histogram_matching)

Use *corel.png* as A and (*spine.jpg* or *church.png*) as image B. What can you observe?

4- Explain in your own words why **applying histogram equalization multiple times will have no additional effect**.

5- For the case of the **localized histogram equalization**, how do you think the images *moon.png* and *spine.jpg* would look like after processing? Justify your answers.