# 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 $\gamma$ are positive constants.

In (a) the only free parameter is $c$, but in (b) there are two parameters, $c$ and $\gamma$ 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.