

Exercise 2 Intensity Transformation

How bright an image appears in comparison to another image could be a relative measure of image intensity. A global measure of an image's intensity can be referred to as the mean pixel intensity of that image. The goal of intensity transformation is to modify the intensity of images to make them suitable for a specified task. In this exercise, we will learn to apply some basic intensity transformation.

Exercise Goal:

- Understand the concepts of grayscale, histogram computation, and equalization
- Learn basic intensity transformation algorithms

Task:

- Calculation of the **Histogram** for the 8-bit image ([test02_a.png](#)).
- Then convert it to 4-bit and recalculate the histogram.
 - ✓ Consider why the image and histograms are changing.
 - ✓ You can also experiment with transforming the image into different grayscales to see how they differ.
- Perform **Histogram equalization** and display the transformed image after the processing ([test02_b.jpg](#)).
 - ✓ Talk about why the process has such an impact.
- Visit the link:
<https://au.mathworks.com/help/images/contrast-adjustment.html>

Perform image contrast adjustment:

Contrast adjustment, histogram equalization, decorrelation stretching

Note:

- You can use the function **rgb2gray** to obtain a grayscale image for the tasks.
- You can use the function **bar/imhist** to draw histograms and **histeq** to perform histogram equalization.
- The function **cumsum** can be used to compute the cumulative sum of a matrix starting at the beginning of the first array dimension.
- The function **find** can be used to return the indices that correspond to a given condition.

Additional Task (optional):

Apply log transformation with this formula ([test_2_add.jpg](#)):

$$s = c \cdot \log(1 + v \cdot r); \quad r \in [0, 1]$$

where r represents the pixel values of the input image.

The value of r can be normalized from $[0, 255]$ to $[0, 1]$.

The variables v and c are constants.

The output image is represented by s .

In this task, c is set to 1 and v can be 0.1, 0.5, 1, 2 or 10 to investigate the effects.

- ✓ Most importantly, consider why different factors have such an impact on this work and write your answer in the report.