

In-class Activity

Ex1. Image Sensing and Acquisition (15 marks)

1. Read a given color image ('Ex1.jpg'). Display the original image and its tricolor elements: Red (R), Green (G) and Blue (B) separately.
2. Reorder the three components to create a new image as (BRG).
3. Make the original image increase the contrast by a gamma correction scale 1.2, then darker 80% using a scale value.
4. Quantize and display the grayscale image using 2 bits, 4 bits, 6 bits and 8 bits. Visualize the effect of the operations.

Ex2. Geometrics Operations, Histogram Equalization (20 marks)

1. Read a given grayscale image ('Ex2.jpg'). Contrast the original image with:
 - a. logarithm transformation with the constant $c = 256/\log(512)$;
 - b. piecewise linear transformation with

$$s = \begin{cases} 2f + 10 & \text{if } 0 < r \leq 93 \\ f - 5 & \text{if } 93 < r \leq 168 \\ f & \text{if } 168 < r \leq 214 \\ 255 & \text{if } 214 < r \leq 255 \end{cases}$$

2. Perform three different actions:
 - a. flip left to right using *fliplr*
 - b. rotate clockwise 180 degrees using *imrotate*
 - c. crop 1/2 central of the image using *imcrop*
3. Plot the histogram of the original image. Perform global histogram equalization.
4. Perform Contrast Local Adaptive Histogram Equalization (CLAHE) with the clipping ratio = 0.3.

Ex3. Image Comparison (15 marks)

1. Given two grayscale images named 'Ex3a.png' and 'Ex3b.png'. Display two images in the same figure.
2. Find differences between two images. Enhance contrast increases 40%, brighter 150%.

Ex4. Image Histogram and Equalization (15 marks)

1. Given a color image named Ex4.jfif. Plot the original image and its histogram. Save this image as 'Color_Histogram.jpeg'.
2. Apply histogram equalization for the original image. Plot the image and its histogram after being equalized. Save this figure as 'Equalization_Histogram.jpeg'.
3. Apply adaptive equalization for the original image with two kernels (default and 5x5). Save this figure as 'Adaptive_Equalization_Histogram.jpeg'.

Ex5. Image Restoration – Noise Reduction and Sharpening (20 marks)

1. Read a given noisy color image ('Ex5.png'). Display the original image in color and grayscale format.
2. Using a two-dimensional LPF to denoise the original image. Parameters of the filter are optional.
3. Using two filters to sharpen the denoise image. Parameters are optional.

Ex6. Image Restoration – Noise Reduction and Sharpening (15 marks)

1. Read a given grayscale image ('Ex6.png'). Display the original image and its binary format using global and adaptive threshold (3 by 3 kernel).
2. Use the erosion and/or the dilation to detect edges of the objects. The structuring element is optional.
3. Generate a structuring element as below. Could we count the number of coins using this structuring element?

0	1	1	0
1	0	0	1
1	0	0	1
0	1	1	0

----- End of Activity -----