Assignment No. 1

Total Marks. 20

Instructions for Submission:

1. Implement all the activities using MATLAB or Python.
2. Submit a printed (hard copy) report that includes the code, output images, and a brief analysis.
3. Show the code and the output results for each activity (original image + filtered/enhanced image).

Basic Gray Level Transformations

1. Thresholding

Thresholding is a gray-level transformation technique that enhances image contrast by modifying pixel intensity values based on a specified threshold, m. Pixel values below the threshold are set to a lower intensity (e.g., black), and values above the threshold are set to a higher intensity (e.g., white). This results in a binary or high-contrast image that highlights specific features of interest.

Activity 1:
Implement thresholding using MATLAB or Python. **Show the code and the output result** (original image and thresholded image).

2. Negative Transformation

Negative transformation inverts the gray levels of an image. For an image with intensity values ranging from 0 to $L – 1$.

$$s = L - 1 - r$$

This transformation reverses the intensity levels, making light areas appear dark and vice versa. It is useful for enhancing features in dark regions.

Activity 2:
Write a MATLAB/Python script to perform negative transformation of an input image. **Show the code and the output result** (original and negative image, along with histograms).

3. Logarithmic Transformation

Logarithmic transformation is used to expand the range of dark pixel values while compressing the range of bright ones. It is defined as:

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

This is particularly effective for images with a large range of intensity values and improves detail visibility in darker areas.

Activity 3:
Implement a logarithmic transformation in MATLAB/Python. **Show the code and the output result** (original image and log-transformed image).

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4. Power-Law (Gamma) Transformation

This transformation modifies the contrast of an image according to the equation:

$$s = c \cdot r\text{^}\gamma$$

where γ determines the degree of enhancement, it is widely used in gamma correction and image enhancement.

Activity 4:
Write MATLAB code to apply a power-law transformation on an image using different values of γ. **Show the code and the output result** (original image and transformed images for various γ values).