Assignment No. 2

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).

Spatial Domain Processing

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1. Contrast Stretching

Contrast stretching improves the visibility of features in low-contrast images by expanding their gray-level range.

Activity 1:
Write a MATLAB/Python script to perform piecewise linear contrast stretching.

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2. Gray Level Slicing

Gray level slicing highlights specific ranges of intensities in an image, enhancing features of interest such as tissues or structures.

Activity 2:
Take an input image and implement gray-level slicing in MATLAB/Python.

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3. Bit-Plane Slicing

Bit-plane slicing decomposes an image into its individual binary bit planes to study the contribution of each bit to image quality.

Activity 3:
Implement bit-plane slicing in MATLAB and extract all 8 bit planes. **Show the code and the output result** (original image and bit planes from MSB to LSB).

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4. Smoothing/ Sharpening Filters

Enhance and analyze hidden or less-visible objects/features in an image by applying both **smoothing** and **sharpening spatial filtering techniques**.

Activity 4.

Part A – Smoothing Filters (Noise Reduction & Background Enhancement)

Select an image of your choice and investigate hidden or obscured objects in the background using the following smoothing techniques:

- **Smoothing Spatial Filtering** (e.g., 3×3 Moving Average Filter)
- **Order-Statistic Nonlinear Filters**
    - Median Filter
    - Min Filter
    - Max Filter

Part B – Sharpening Filter (Detail Enhancement & Edge Detection)

Use the same image to enhance important visual features (e.g., edges, textures, fine details) using the following sharpening technique:

- **Laplacian Filter**