Lab 04 Manual

1. Sharpen Image using Unsharp Masking and High Boost Filtering

Objective:

To enhance image details and contrast by applying Unsharp Masking and High Boost Filtering techniques.

Theory:

- **Unsharp Masking** works by subtracting a blurred version of the image from the original, emphasizing high-frequency components (edges and fine details).

- **High Boost Filtering** is a generalized version of Unsharp Masking, which adds a scaled original image to the mask to intensify sharpening beyond simple edge enhancement.

Functions Used:

- **imread() – Read image**

- **imgaussfilt() – Apply Gaussian blur**

- **fspecial('laplacian') – Create Laplacian filter for mask**

- **imfilter() – Apply filters**

- **imshow() – Display image**

- **subplot() – Compare results side by side**

2. Sharpen Image using Laplacian Filtering

Objective:

To sharpen an image by enhancing areas with rapid intensity changes using Laplacian filtering.

Theory:

Laplacian filtering uses the second-order derivative to detect and highlight edges. Adding this Laplacian image to the original results in a sharpened image by emphasizing transitions in intensity.

Functions Used:

- **fspecial('laplacian') – Create Laplacian filter**
- **imfilter() – Apply filter**
- **imshow() – Display image**
- **subplot() – Compare results**

3. Edge Detection using Roberts-cross, Sobel, and Prewitt Operators

Objective:

To detect edges in an image using gradient-based edge detectors: Roberts, Sobel, and Prewitt.

Theory:

- **Roberts-cross** uses 2×2 diagonal kernels for fast edge detection.
- **Sobel** uses 3×3 filters to approximate gradients in horizontal and vertical directions with smoothing.
- **Prewitt** is similar to Sobel but uses uniform weights, making it simpler and less sensitive to noise.

Functions Used:

- **edge(Img, 'roberts') – Roberts edge detection**
- **edge(Img, 'sobel') – Sobel edge detection**
- **edge(Img, 'prewitt') – Prewitt edge detection**
- **imshow() – Show results**
- **subplot() – Display multiple results for comparison**

4. Performance Comparison of Edge Detection Techniques

Objective:

To compare the visual effectiveness of different sharpening and edge detection techniques.

Theory:

This step involves a comparative analysis of various methods: Unsharp Masking, High Boost Filtering, Laplacian Sharpening, and edge detectors (Roberts, Sobel, Prewitt). The goal is to identify which method provides the best result for a given image based on visual quality and edge clarity.

Functions Used:

- **All relevant sharpening and edge detection functions mentioned above**
- **subplot() – Visual side-by-side comparison**
- **imshow() – Display results**