Practical Assignment on Frequency Domain Filters in Image Processing

Objective

- Understand the concept of image representation in the frequency domain.
- Learn how to apply frequency domain filters (Notch Filter, Low-pass, High-pass, Band-pass).
- Compare and evaluate the impact of different filters on images.

Tools Required

- Python
- Libraries: `numpy`, `opencv-python` (cv2), `matplotlib`

Tasks

Task 1: Load and Preprocess Image

- Load a grayscale image.
- Resize for simplicity.

Task 2: Apply Fourier Transform and Show the Fourier Spectrum

Task 3: Implement Frequency Domain Filters

(A) Notch Filter
(A) Low-pass Filter (Ideal and Gaussian)
(B) High-pass Filter (Ideal and Gaussian)

Task 4: Analysis

- Compare the original image with the filtered versions.
- Discuss the effects of each filter.
- What happens when you change the radius (10, 30, 60, 160 etc.)?

Use the following Images for your experiments: