Lab Manual: MATLAB Image Processing

Lab 03

1. Apply Salt and Pepper Noise & Remove Using Min and Max Filtering

Theory:

Salt and Pepper noise randomly replaces pixels with black or white values. Min and Max filtering helps remove this noise by considering the minimum or maximum pixel values in a neighborhood.

Implementation Steps:

1. Load the image.
2. Apply Salt and Pepper noise.
3. Apply Min filtering (minimum pixel value in a local region).
4. Apply Max filtering (maximum pixel value in a local region).
5. Compare the results.

Functions Used:

- imread() – Read image
- imnoise() – Add noise
- ordfilt2() – Min and Max filtering
- subplot() – Display images side by side
- imshow() – Show image

2. Apply Gaussian Noise & Remove Using Gaussian Filtering

Theory:

Gaussian noise is statistical noise with a normal distribution. Gaussian filtering smooths the image by averaging pixel values with a Gaussian kernel.

Implementation Steps:

1. Load the image.
2. Apply Gaussian noise.

3. Define a Gaussian filter.
4. Apply the filter to remove noise.
5. Compare results.

Functions Used:

- fspecial('gaussian') – Create Gaussian filter
- imfilter() – Apply filter

3. Apply Noise & Restore Using Various Filters

Theory:

Noise affects image quality, and different filtering techniques can help restore an image.

Implementation Steps:

1. Apply noise to the image.
2. Apply Box filtering (averages pixel values within a defined window).
3. Apply Average filtering (similar to Box filtering but with specific weights).
4. Apply Median filtering (replaces pixels with the median value of the neighborhood).
5. Compare the effectiveness of each method.

Functions Used:

- fspecial('average') – Box/Average filter
- medfilt2() – Median filtering
- imfilter() – Apply filter

4. Image Properties & Pixel Operations

Theory:

Image properties such as size, pixel values, and intensity levels help analyze an image's characteristics.

Implementation Steps:

1. Load the image.
2. Display the image.
3. Retrieve and display pixel values.

4. Find the image size.
5. Show all available image properties.

Functions Used:

- size() – Image size
- imshow() – Display image
- impixelinfo() – Show pixel information
- imread() – Read image

5. Image Transformations & Analysis

Theory:

Image transformations modify image properties, such as color, intensity, and structure, for analysis or enhancement.

Implementation Steps:

1. Load the image in different formats (RGB, Grayscale, Indexed).
2. Convert RGB to Grayscale.
3. Convert Indexed to Grayscale and RGB.
4. Convert Grayscale to Binary.
5. Invert the Binary image.
6. Display the histogram of the Grayscale image.
7. Invert and blur the RGB image.

Functions Used:

- rgb2gray() – Convert RGB to Grayscale
- gray2ind() – Convert grayscale to indexed
- imbinarize() – Convert to binary
- imcomplement() – Invert image
- imhist() – Show histogram
- imfilter() – Blur image