**Project 1: Image Enhancement and Filtering**

Description:

Develop a tool that takes an input image and applies various enhancement techniques such as histogram equalization, noise reduction (using median filter), and edge enhancement.

Techniques Used:

Histogram processing

Spatial filtering

Noise reduction algorithms

Steps:

Load an input image.

Implement histogram equalization to enhance contrast.

Apply a median filter to reduce noise.

Use edge detection algorithms to highlight edges.

Provide a comparison of the original and processed images.

**Project 2: Image Segmentation**

Description:

Create a program that segments an image into its constituent parts using different segmentation techniques like thresholding, region-based segmentation, and edge detection.

Techniques Used:

Thresholding

Region-based segmentation

Edge detection

Steps:

Load an input image.

Apply Otsu's thresholding method to separate foreground and background.

Implement region-based segmentation to identify distinct objects.

Use edge detection to highlight boundaries.

Visualize the segmented output.

**Project 3: Morphological Image Processing**

Description:

Build a project that applies morphological operations to an image to demonstrate effects like dilation, erosion, opening, and closing.

Techniques Used:

Dilation and erosion

Opening and closing

Hit-or-Miss transform

Steps:

Load an input image.

Implement dilation and erosion to understand their effects.

Use opening and closing to remove noise and small objects.

Apply the Hit-or-Miss transform to detect specific patterns.

Display the results of each morphological operation.

**Project 4: Color Image Processing**

Description:

Develop a tool that processes color images, applying pseudocolor transformations and enhancing color features.

Techniques Used:

Pseudocolor image processing

Color enhancement techniques

Color space transformations

Steps:

Load a color image.

Convert the image to different color spaces (e.g., RGB to HSV).

Apply pseudocolor transformations to highlight specific features.

Enhance the color contrast using histogram equalization.

Display the original and processed images for comparison.

**Project 5: Motion Detection and Segmentation**

Description:

Create a motion detection system that segments moving objects in a video stream using techniques like frame differencing and background subtraction.

Techniques Used:

Frame differencing

Background subtraction

Motion-based segmentation

Steps:

Capture video from a camera or load a video file.

Implement frame differencing to detect motion.

Apply background subtraction to isolate moving objects.

Use morphological operations to clean up the segmented output.

Display the detected motion in real-time.

**Project 6: Feature Detection and Description**

Description:

Build a project that detects and describes features in an image, such as edges, corners, and blobs, using different algorithms.

Techniques Used:

Edge detection

Corner detection (e.g., Harris corner detector)

Blob detection (e.g., Difference of Gaussians)

Steps:

Load an input image.

Apply edge detection algorithms like Canny to find edges.

Use the Harris corner detector to identify corners.

Implement blob detection to find blob-like structures.

Visualize the detected features on the image.