Lab1 : Image and Video Manipulation with OpenCV, NumPy, and Matplotlib

Tools: Python, OpenCV, NumPy, Matplotlib

1. Introduction

- Overview of OpenCV, NumPy, and Matplotlib for image and video processing
- Understanding images as NumPy arrays
- Differences between images and videos

2. Image Manipulation

Task 1: Load and Display an Image

- Load an image using OpenCV
- Display it using OpenCV (`cv2.imshow`)
- Convert the image from BGR to RGB and display it using Matplotlib

Task 2: Resize and Crop an Image

- Resize an image to a fixed size (e.g., 300x300 pixels)
- Crop a **centered** portion of the image and display it

Task 3: Convert an Image to Different Color Spaces

- Convert the image to **grayscale**
- Convert the image to **HSV color space**
- Display both images

Task 4: Modify Image Pixels using NumPy

- Print the pixel value at (100, 100)
- Change the pixel at (100, 100) to **green**

Task 5: Extract and Modify Color Channels

- Split the image into **B, G, and R** channels
- Set the **Red channel to zero** and display the modified image

Task 6: Create a Binary Mask

- Convert the image to grayscale
- Use NumPy to create a **binary mask** where pixel values above 200 become white (255) and the rest become black (0)

Task 7: Flip and Rotate an Image

- Flip the image **vertically**
- Rotate the image **90 degrees counterclockwise**

Task 8: Adjust Brightness and Contrast

- Increase the brightness by adding **50** to all pixel values
- Increase the contrast by multiplying all pixel values by **1.5**

3. Video Manipulation

Task 9: Capture Video from Webcam

- Open the webcam and display a live video stream
- Press **'q'** to close the video window

Task 10: Save a Video to File

- Capture a video from the webcam and save it as an MP4 file
- Stop recording when the user presses **'q'**

Task 11: Draw Shapes and Text on a Video Feed

- Draw a **rectangle** around a region of interest (e.g., face area)
- Add **text** to label the rectangle

4. Conclusion & Discussion

- Recap key concepts
- Discuss real-world applications