Assignment 1: Image Processing Report

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Task 2: Image Processing

1. Objective

To apply classic image processing techniques to enhance and analyze an image using OpenCV.

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2. Steps Performed

a. Grayscale Conversion

Converted the original color image to grayscale to reduce complexity.

b. Histogram Equalization

Enhanced contrast of the grayscale image using `cv2.equalizeHist()`.

c. Gaussian Blur

Reduced noise and smoothed the image using a 5x5 Gaussian kernel.

d. Canny Edge Detection

Detected strong edges using the Canny method with thresholds of 50 and 150.

e. Morphological Dilation

Emphasized detected edges by dilating them using a 3x3 rectangular kernel.

f. Watermarking

Overlayed my full name on the final image as a watermark.

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3. Output Samples

| Step | Image | |---|---| | Grayscale | `gray.jpg` | | Histogram Equalized| `hist_eq.jpg` | | Edges | `edges.jpg` | | Final Dilated Edge | `dilated_with_name.jpg` | | Demo Video | `demo_video.mp4` |

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4. Code Link

Refer to `task2_image_processing.py` and `generate_demo_video.py` in the `code/` directory.

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5. Observations

- Histogram Equalization improves detail in dark/light areas.
- Canny edge detection is sensitive to noise — hence Gaussian Blur is important.
- Morphological operations help refine the detected features.

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6. Learnings

- Practical usage of OpenCV’s core functionalities.
- Structured approach to image preprocessing.
- Importance of step-wise debugging and visual verification.

End of Report