

DIP assignment 1

Muhammad Saad Khan

October 2023

Technical Report: Image Processing Solutions for Various Problems

1 Introduction:

Image processing is a fundamental field in computer vision and artificial intelligence that involves the analysis and manipulation of images to extract meaningful information. In this report, we present solutions to six different image processing problems, each addressing a unique challenge. We discuss the relevance of these solutions in the context of image processing techniques.

2 Problem 1: Detecting Rectangles and Squares

2.0.1 Proposed Solution:

The first problem involves detecting rectangles or squares in an image, finding their parameters, and calculating the centroid. The solution utilizes OpenCV to convert the image to grayscale, threshold it, and identify contours. By approximating these contours as polygons and checking for 4 corners, we identify rectangles or squares. The perimeter and centroid are calculated and displayed.

2.0.2 Relevance:

This problem showcases fundamental image processing techniques such as contour detection, polygon approximation, and moment calculation. It demonstrates how to identify specific geometric shapes in an image, which is useful in various applications, including object recognition and computer vision.

3 Problem 2: Gender Classification from Cartoon Images

3.1 Proposed Solution:

In the second problem, we aim to determine the gender of cartoon images (e.g., boy or girl) using image processing. The solution involves analyzing the dominant colors in the images by converting them to the HSV color space. It calculates color dominance ratios and uses heuristics to classify the images.

3.1.1 Relevance:

This problem demonstrates the application of color analysis and feature extraction in image processing. It is relevant in cases where image-based gender classification is needed, such as in facial recognition systems.

4 Problem 3: Distinguishing Blurred and Original Images

4.1 Proposed Solution:

Problem 3 focuses on distinguishing between blurred and original images. The solution calculates the Laplacian variance for both images and sets a threshold to determine blurriness. It then displays the images accordingly.

4.2 Relevance:

The ability to differentiate between blurred and clear images is crucial in various domains, including medical imaging and quality control in manufacturing. This solution showcases the importance of image sharpness assessment.

5 Problem 4: Measuring Color Bar Areas

5.1 Proposed Solution:

In this problem, we measure the areas of color bars in an image. The solution involves converting the image to grayscale, applying adaptive thresholding, and finding contours. It calculates and displays the areas of the color bars.

5.2 Relevance:

Measuring areas of objects within an image is a common task in image processing, relevant in fields such as industrial automation, agriculture, and quality control.

6 Problem 5: Percentage Area Covered by an Arrow

6.1 Proposed Solution:

Problem 5 deals with calculating the percentage area of bars covered by a red arrow. The solution uses color masking to isolate the red arrow and calculates the area it covers on each bar, displaying the results.

6.2 Relevance:

This problem demonstrates the application of color-based segmentation and area calculation, which can be useful in tasks like object tracking and image annotation.

7 Problem 6: Segmenting Finger Bones

7.1 Proposed Solution:

Problem 6 involves segmenting and measuring parts of a finger bone structure. The solution identifies different parts using color thresholds and calculates the maximum width and height for each part, displaying the results.

7.2 Relevance:

Segmentation and measurement are fundamental in medical imaging and object analysis. This solution highlights the importance of region-based processing and measurement.

8 Conclusion:

In this report, we presented solutions to various image processing problems, each demonstrating different aspects of image analysis and manipulation. These solutions are relevant to diverse applications, from object recognition and quality control to medical imaging and gender classification. Image processing techniques continue to play a

vital role in computer vision and AI, enabling machines to interpret and extract information from visual data.