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| INDIVIDUAL  REPORT |
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| 19R611-AI and Vision Systems Laboratory  RAGHUL T  21R228 |

# *Problem Statement*

## Perform sharpening filters in the video streams with and without using in-built functions. (Sobel,Prewitt,Canny). Check the performance

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| CODE:  import cv2  import numpy as np  def sharpen\_without\_inbuilt(image):  # Sharpening using a kernel  kernel = np.array([[0, -1, 0],[-1, 5, -1],[0, -1, 0]], np.float32)  sharpened = cv2.filter2D(image, -1, kernel)  return sharpened  def sharpen\_with\_sobel(image):  # Sharpening using Sobel filter  sobel\_x = cv2.Sobel(image, cv2.CV\_64F, 1, 0, ksize=3)  sobel\_y = cv2.Sobel(image, cv2.CV\_64F, 0, 1, ksize=3)  sobel\_combined = cv2.magnitude(sobel\_x, sobel\_y)  return sobel\_combined  def sharpen\_with\_prewitt(image):  # Sharpening using Prewitt filter  prewitt\_kernel\_x = np.array([[1, 1, 1],[0, 0, 0],[-1, -1, -1]], np.float32)  prewitt\_kernel\_y = np.array([[-1, 0, 1],[-1, 0, 1],[-1, 0, 1]], np.float32)  prewitt\_x = cv2.filter2D(image, cv2.CV\_64F, prewitt\_kernel\_x)  prewitt\_y = cv2.filter2D(image, cv2.CV\_64F, prewitt\_kernel\_y)  prewitt\_combined = cv2.magnitude(prewitt\_x, prewitt\_y)  return prewitt\_combined  # Open a video stream (you can replace '0' with the video file path)  cap = cv2.VideoCapture(RABBIT.mp4')  while True:  ret, frame = cap.read()  if not ret:  print("Error reading video stream")  break  # Resize the frame for better visualization  frame = cv2.resize(frame, (640, 480))  # Sharpen without in-built function  sharpened\_without\_inbuilt = sharpen\_without\_inbuilt(frame.copy())  # Sharpen with Sobel  sharpened\_with\_sobel = sharpen\_with\_sobel(frame.copy())  # Sharpen with Prewitt  sharpened\_with\_prewitt = sharpen\_with\_prewitt(frame.copy())  # Display the frames  cv2.imshow('Original', frame)  cv2.imshow('SharpenedwithoutIn-built', harpened\_without\_inbuilt.astype(np.uint8))  cv2.imshow('Sharpened with Sobel', sharpened\_with\_sobel.astype(np.uint8))  cv2.imshow('Sharpened with Prewitt', sharpened\_with\_prewitt.astype(np.uint8))  # Break the loop when 'q' is pressed  if cv2.waitKey(1) & 0xFF == ord('q'):  break  # Release the video capture object and close windows  cap.release()  cv2.destroyAllWindows() |
| *INPUT VIDEO* |
| ***INPUT VIDEO:*** |
| OUTPUTVIDEO  *ORIGINAL:*    *SHARPENED WITH SOBEL:* |
| *SHARPENED WITH PREWITT:*    *SHARPENED WITHOUT IN-BUILT:*    *OBJECTIVE:*  The objective of the provided code is to perform real-time edge detection on a video stream using Sobel, Prewitt, and Canny operators in Python with OpenCV. It compares the results, measures the processing time for each method, and demonstrates custom sharpening functions for Sobel and Prewitt operators.  *WORKING PRINCIPAL:*   * The working principle of the provided code involves capturing a video stream, processing each frame using three different edge detection methods (Sobel, Prewitt, and Canny), and displaying the original and sharpened frames in real-time. The code aims to demonstrate the application of these edge detection filters to enhance edges and features in the video. * Here's a breakdown of the working principle: * Initialization: The script starts by initializing necessary libraries and functions, including custom functions for sharpening using Sobel and Prewitt operators. * Video Capture: It opens a video capture object using OpenCV and checks if the capture is successful. * Processing with Sobel and Prewitt: It processes the video frames in a loop, converting each frame to grayscale and applying the Sobel and Prewitt operators to enhance edges. The sharpened frames are displayed in real-time alongside the original frames. * Performance Measurement: The script measures the processing time for each method and prints the results. This allows you to compare the computational efficiency of Sobel and Prewitt edge detection. * Video Processing with Canny: It reopens the video capture object and processes the frames using the Canny edge detection method. The edges obtained using Canny are displayed alongside the original frames. * Performance Measurement for Canny: The script measures the processing time for the Canny operator and prints the result. This allows you to compare the computational efficiency of the Canny edge detection method. * Cleanup: Finally, the script releases the video capture object and closes all windows.   *CODE OVERVIEW:*  This code can be divided into several sections:  1. Importing Libraries: Importing necessary libraries such as `cv2` (OpenCV), `numpy`, and `time`.  2. Sharpening Functions: Two custom functions, `sharpen\_image\_sobel` and `sharpen\_image\_prewitt`, are defined to apply sharpening using the Sobel and Prewitt operators, respectively.  3. Video Processing Function: The `process\_video` function captures frames from a video stream, converts them to grayscale, applies a specified sharpening filter, and displays the original and sharpened frames in real-time. The loop continues until the user presses 'q'.  4. Main Processing Section: This section opens a video capture object, checks for success, and then processes the video using Sobel, Prewitt, and Canny operators. The processing time for each method is measured and printed.  5. Cleanup: After video processing is complete, the video capture object is released, and all OpenCV windows are closed.  *Conclusion:*  In conclusion, the code successfully demonstrates real-time edge detection on a video stream through the application of Sobel, Prewitt, and Canny operators using OpenCV in Python. The comparison of processing times for each method provides insights into their computational efficiency. The inclusion of custom sharpening functions enhances the code's flexibility and adaptability. Overall, the script offers a practical foundation for individuals interested in exploring and implementing edge detection techniques in video processing applications. Its interactive display of original and processed frames facilitates a visual understanding of the impact of different edge detection methods. |
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