Assignment 1: Welcome to OpenCV

COS 470/570: Image Processing and Computer Vision

Objective:

This assignment is designed to enhance your understanding and practical skills in video processing using OpenCV. You will be tasked with exploring OpenCV's documentation, applying various video transformations, and manipulating video playback speeds. This assignment will also help you learn to navigate and utilize OpenCV's official documentation for implementing sophisticated features.

Tasks:

You will work with a given video (video.mp4) and a txt file (subtitles.txt) to perform the following tasks:

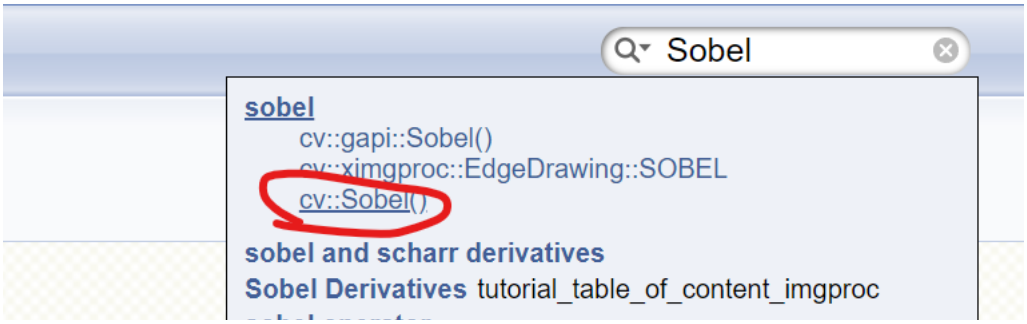
Task 1: Exploring OpenCV's Official Documentation

The primary objective of this task is to develop your ability to independently navigate and utilize OpenCV's official documentation. This skill is crucial for any software developer, as it enables self-sufficient problem-solving and continuous learning throughout your career.

Task Description:

1.1 Visit https://docs.opencv.org/4.10.0/d6/d00/tutorial_py_root.html. Focus specifically on the section titled "**GUI Features in OpenCV**". Then proceed to the tutorial "**Mouse as a Paint-Brush**". Engage thoroughly with the content, experimenting with the code examples provided. Write a concise summary of your learning experience. Attach necessary screenshots to illustrate the points or features discussed.

1.2 Learning to Use the Search function. Familiarize yourself with the search functionality on the OpenCV documentation site. Use the search bar to look up the function **'Sobel'**. Click the '**cv::Sobel()**', as shown in the following figure, which will direct you to the specific page detailing the Sobel function. Describe the information presented on the documentation page and explain how the content helps in effectively understanding the use of the function. Remember, the goal here is not to fully understand the function yet but to learn about the types of information the documentation provides.



Task 2: Video Variants and Display in 2x2 Grid

Create a Python script to process a video file (video.mp4) and **display the following variants in a 2x2 grid**:

a) Video with Watermark: Add a watermark with the text "YOUR_NAME" to the video. The position does not matter.
b) Reverse Video Playback: Display the video in reverse order.
c) Video in Different Color Space: Convert the video to a grayscale.
d) Video with Subtitles: Add subtitles from 'subtitle.txt' based on timestamps. You need to parse the txt file first then add the text to corresponding frames.

Hints for d): Retrieve the number of frames in this video and, based on the specified time interval, extract the specific frames needed to add the corresponding subtitles. You may need to use these functions: **VideoCapture.get()** and **VideoCapture.set()**. Utilize the search function in OpenCV's documentation to obtain more detailed information.

Task 3: Speed Modification

Modify the video's playback speed and **save the output without displaying**:

a) 2x Speed: Create a version of the video that plays at double the original speed.
b) 4x Speed: Create a version of the video that plays at four times the original speed.
c) 0.5x Speed: Slow down the video speed to half the normal (the most straightforward method is to show each frame twice).

Submission:

Submit your Python scripts along with a report detailing your code and approach. For Task 2, include sufficient screenshots of the 2x2 grid output. For Task 3, upload the generated speed-varying videos. The deadline of this assignment is September 23 at 11:59 PM.