

"Hello students! I wanted to let you know that the task I gave you is based on the topics covered in our lectures from video 17 to video 25. These lectures focused on advanced techniques in computer vision and image processing, including color recognition, Reinhard color transfer, simple and adaptive thresholding, and morphological transformations. The task is designed to challenge you to apply your knowledge and skills in these areas to a practical problem, and to explore new and creative solutions to complex challenges. I hope you find this task engaging, informative, and fun, and that it helps you develop your expertise in computer vision and image processing. If you have any questions or difficulties, don't hesitate to reach out to me or to your fellow students for help. Good luck and have fun!"

Task 2 :

Write an OpenCV program that performs advanced color recognition, Reinhard color transfer, adaptive thresholding, and morphological transformations on a set of images. The program should take a set of input images and perform the following steps:

1. Advanced color recognition: The program should identify and classify the objects in the images based on their color, shape, texture, and context. You can use advanced computer vision techniques such as object detection, segmentation, feature extraction, and machine learning to achieve this. You can also use multiple color spaces, color models, and color histograms to capture the color information of the objects.
2. Reinhard color transfer: The program should adjust the color balance of the objects in the images so that they look more natural, realistic, and consistent across different lighting conditions and cameras. You can use the Reinhard algorithm or

other color transfer methods such as histogram matching, color transfer by interpolation, or color transfer by optimization. You can also apply spatial constraints, color constraints, or perceptual constraints to preserve the local and global structure of the images.

3. Adaptive thresholding: The program should use a combination of global and local thresholding techniques to segment the objects in the images. You can use pre-processing steps such as color normalization, noise reduction, and contrast enhancement to improve the quality of the images. You can then use global thresholding to separate the background from the foreground, and local thresholding to refine the boundaries and remove the noise and artifacts. You can also use adaptive thresholding to handle the variations in illumination, contrast, and texture.
4. Morphological transformations: The program should apply a set of advanced morphological operations to the segmented objects in the images. You can use operations such as skeletonization, thinning, pruning, filling, and smoothing to extract the shape, topology, and geometry of the objects. You can also use operations such as dilation, erosion, opening, and closing to modify the size, position, and connectivity of the objects. You can also combine different operations to create more complex transformations.

The output of the program should be a set of annotated images that show the results of each step. You can use different visualization techniques (e.g. bounding boxes, masks, contours, overlays, etc.) to highlight the objects of interest and the changes in color, shape, and texture. You can also use metrics such as precision, recall, and F1 score to evaluate the performance of the program. You can also use user feedback to improve the accuracy and usability of the program.

I hope this more challenging task pushes you to explore the state-of-the-art in computer vision and image processing, and to develop new and innovative solutions to complex problems. Good luck and have fun experimenting!