Principles and Applications of Digital Image Processing

【Fall, 2022】

Homework 5

Part 1: (40%) Color Model Conversion

Design a computer program for color model conversion. Your program should be able to display an image in RGB, CMY, HSI, XYZ, L*a*b*, YUV color planes. Check the following web link for more information about color model conversion.

http://www.cs.rit.edu/~ncs/color/t_convert.html

Part 2: (30%) Pseudo-color Image

Develop a program to display a grayscale image in pseudo-color. In your program, you need to design an interface to both display the grayscale and pseudo-color images for comparison. You also need to show the color table (color bar) with its corresponding grayscale.

Design a user-friendly interface for flexible color table creation and multiple color tables should be provided for user selection. You may learn from popular softwares such as Photoshop or ImageJ for their interface to create a color table.

Part 3: (30%) Color Segmentation

In this assignment, you will practice image segmentation by color clustering, using the k-means algorithm. Your tasks are as follows:

1. Search internet to study the k-means algorithm.
2. Implement a program for image segmentation based on color clustering approach. You may use OpenCV or MATLAB functions for k-means algorithm or you may develop your own function.
3. Test your program with the accompanied images with various levels of complexity. Compare and discuss color segmentation results using different k values of the k-means algorithm.
4. Compare the color segmentation results using RGB, HSI, and L*a*b* color planes (using k = 2).

Notes:

1. Please submit your programs and report to the AUTOLAB course website before **Nov. 16 (2:20PM).**

2. Late submission will have a penalty of 10% discount per day of your homework total score toward a maximum of 50% discount. No late submission over five days will be accepted.