Digital Image Processing (1131)

Homework #3 (DUE: 2024.11.20)

(Please note that you have to upload your source codes (and a brief description about your codes or algorithms, optional) to the server before the deadline. Please check the course website for more details.)

1. For the 24-bit color image: “Lenna_512_color.tiff”, please do the following processing with Python:
   (a) Display the original image.
   (b) Obtain its “Red component image”, “Green component image”, and “Blue component image” and display them as 24-bit color images respectively.
   (c) According to the definition of RGB model and HSI model, try to convert RGB to HSI model, and display its Hue, Saturation, and Intensity components as gray-level images respectively.
   (d) Do color complements to enhance the detail in the image by using RGB model.
   (e) Display the histograms of RGB and HSI components respectively. (A total of 6 histograms should be shown.)
   (f) Do histogram equalization for all RGB components and display the original and processed images for comparison.
   (g) Please do image smoothing with a 5x5 average kernel and sharping with the Laplacian to this “Lenna” image by using RGB and HSI models respectively. Display the results and also show the difference from the original one. Please also show the difference between results obtained by using RGB and HSI models.
   (h) Find some proper masks of saturation and hue component images to this “Lenna” image so that the blue feathers of the hat can be segmented by simple logical or arithmetic operations of these 2 images. Demonstration of images from each step as well as the final result is required.

   Bonus: to design a GUI or integrate all these functions to the one you constructed earlier is strongly encouraged.