**PRAKTIKUM 7**

**Color Image Processing I**

**SISTEM PENGOLAHAN CITRA**

**PROGRAM STUDI SISTEM KOMPUTER**

**SCHOOL OF INFORMATION SCIENCE AND TECHNOLOGY**

**UNIVERSITAS PELITA HARAPAN**

**DISUSUN OLEH:**

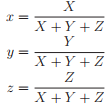
**Alfa Satya Putra, B.Sc., M.Sc.**

**Part 1 – Color Matching Function and Chromaticity Diagram**

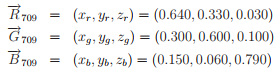
1. Load the file **data.mat** into MATLAB/Octave by downloading it into your matlab/octave folder and call the **load** **data.mat** function from MATLAB/Octave (file provided in learn.uph.edu). It contains XYZ color matching functions at discrete set of wavelengths [400:10:700] nanometers.
2. Create a new vector called **lambda** with values ranging from 400:10:700 as described in part 1.
3. **Plot X,Y, and Z** from data.mat **versus lambda** created in part 2. Put all of them in one plot (you might need to use the **hold on** command). Give this plot the necessary information (eg. x-axis,y-axis, title, legend) and *put this plot in your lab report*.
4. Compute the LMS color matching function, which corresponds to the long, medium and short cones/receptors of the retina, from the XYZ color matching function using the following formula. Save the result in a matrix.

1. **Plot L,M, and S** computed from part 4 **versus lambda** from part 2. Put all of them in one plot (you might need to use the **hold on** command). Give this plot the necessary information (eg. x-axis,y-axis, title, legend) and *put this plot in your lab report*. Compare this result to Figure 6.3 in Presentation Silde Week 10.
2. Compute x,y, and z chromaticity values from X,Y,Z as follows. Confirm that x+y+z = 1.



1. Create a new plot of x versus y computed from part 6. Force the plot’s axis to range from x=[0,1] and y=[0,1] by using the MATLAB/Octave command axis([0 1 0 1]).
2. On the same plot, plot the points that corresponds to standard Rec. 709 RGB primaries. Connect the three points with straight lines to illustrate the range of colors that can be generated by these three primaries. The points are described as follows (note you only need the x’s and y’s):



1. On the same plot, plot and label the equal energy white point, given as x=0.333,y=0.333,z=0.333.
2. Compare this plot to figure 6.5 in Presentation Slide week 10. *Put this plot in your lab report*.

**Part 2 – RGB and YCbCr Color Spaces**

1. Read the image **girl.tif** into MATLAB/Octave using imread. Take note of the dimensions of the image (image provided in learn.uph.edu).
2. Create three new matrices R,G, and B containing the Red, Green, and Blue components of girl.tif
3. Use **subplot(2,2,n)** and **imshow/image** commands to plot original image, and each of the three RGB components, where n=1,2,3,4. Note the original is a color image, and each color component separately is a monochrome image. Place a title on each image using **title** command, and *put this image in your lab report*.
4. Load the file **ycbcr.mat** into MATLAB/Octave by downloading it into your matlab/octave folder folder and call the **load** **ycbcr.mat** function from MATLAB/Octave (file provided in learn.uph.edu).
5. Create three new matrices Y,Cb, and Cr containing the luminance (Y) and two chrominance (CbCr) components of ycbcr.mat.
6. Use **subplot(3,1,n)** and **imshow/image** commands to plot the three YCbCr components, where n=1,2,3. Place a title on each image using **title** command, and *put this image in your lab report*.
7. Convert the YCbCr values into RGB using formula given in Presentation Slide Week 10.
8. Use **subplot(2,2,n)** and **imshow/image** commands to plot three RGB components from Part 7 and their combined image, where n=1,2,3,4. Place a title on each image using **title** command, and *put this image in your lab report*.

References:

* <https://www.gnu.org/software/octave/>
* GNU Octave Manual
* Class Materials, Slide Week 10
* Purdue ECE 438 Lab 10b: <https://engineering.purdue.edu/VISE/ee438L/lab10/pdf/lab10b.pdf>
* Purdue ECE 637 Colorimetry Lab: <https://engineering.purdue.edu/~bouman/grad-labs/Colorimetry/pdf/lab.pdf>