CS 415 Machine Problem #4

1 Histogram-based Skin Color Detection

The purpose of this MP is to let you have a clear understanding and a clean implementation of color-based segmentation with application to flesh tone (skin color) detection as discussed in class. What you need to do in this MP are the steps below. <u>The due date of this assignment is 10/28/2019 (Wed)</u>.

- *Collecting flesh tone training data.* It is very easy to find on the Web some color images containing skin color (people). You can download such images from the Web. Then, you should write a program or use a software, e.g., Microsoft Photos or Adobe Photoshop, to crop the skin regions.

- *Selecting a good color space.* How can you choose a color space that is robust to illumination variation? You can use some built-in function in Python or MATLAB to convert the color space.

- *Training a color histogram-based flesh tone detector.* Basically, you just construct a 2D color histogram based on the color pixels you have collected. You need to implement your own histogram function. Note: pay attention to the range and normalization.

- *Finding skin regions in test images.* You apply your color detector to segment skin color regions in test images.

Three testing images are provided on the course website. You should test your color detector on all these three images. You can also create your own test images.

2 Gaussian-based Color Segmentation (optional)

Although Gaussian-based color segmentation is compact in terms of color model, it is computationally more intensive than the histogram-based model. Still, you can try this approach and compare with the previous one. The same as above, you need to

- *Collect training data.* The same as above.

- *Find a good color space.* The same as above.

- *Train a Gaussian color model.* You just need to estimate the mean and covariance of your training data as the parameters of the Gaussian distribution. You need to implement your own function to estimate the Gaussian parameters. Hint: review your probability book.

- *Find skin tone based on the Gaussian distribution.* It is quite straightforward. Note: you need to set a threshold.

3 What to turn in

Each individual student should turn in their own solution. What you need to turn in includes:

- your code in Python (recommended) or MATLAB;
- a short report.