MP4 Histogram-based Skin Color Detection

In this homework, a histogram-based color detector is implemented to separate the hand in the image from the background.

Histogram-based Color Detector

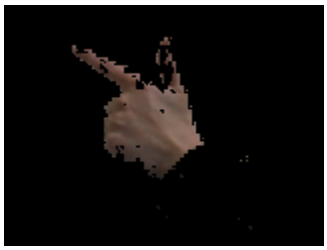
The function takes training images' Hue and Saturation to generate a 2d histogram as a reference table and compares the Hue and Saturation of pixels in the test image with the histogram to separate skin color from the background. Two color spaces are tested for this detector: HSV and HLS. When the function read the image, it will convert it from RGB color space to the new color space. For the training image, the function collect all H and S values and use them to generate a 2d histogram. For the test image, the function extracts H and S for each pixel and gets the corresponding confident value from the histogram. If the value is higher than the threshold value, the function will keep the pixel and use all reserved pixels to generate a picture that only contains skin color.

The result should only contain the skin color from the original image. The result processed by HSV color space histogram above matches our expectations. However, the function is not perfect because the result has a lot of noise.

The HSL color space is also used to compare the performance of skin color detection with HSV color space. From the result, it is clear that the image process through HSV has less noise than

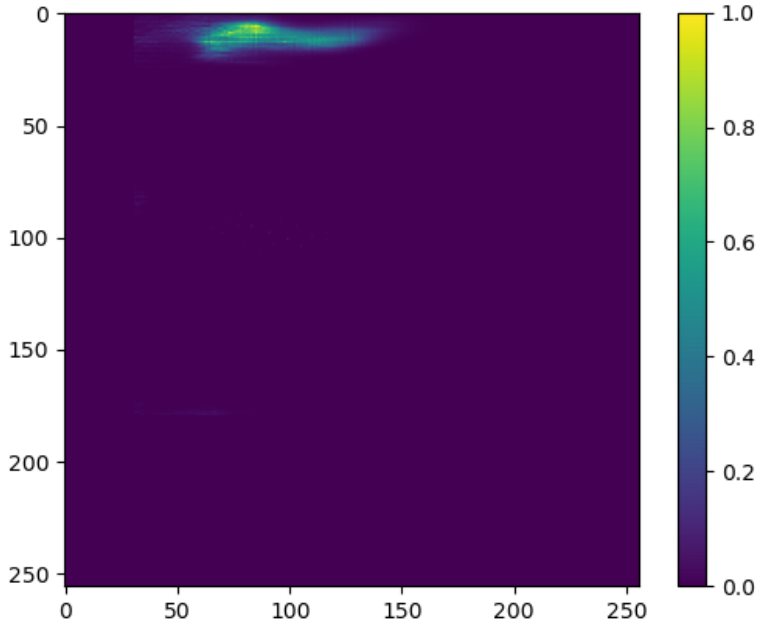
the image process through HSL, which means HSV has a better performance. (Even though both color space contains Hue and Saturation, the color spaces are actually different.)

HSV:



HSL:

Histogram Output:
HSV Histogram:



HSL Histogram: