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MSAI 495 Computer Vision
MP #4

Histogram-based Skin Color Detection Report

In this assignment we implement a simple skin color detection system using a histogram. After collecting some amount of images that contain skin tones, one records each pixel's hue and saturation values in a 2 dimensional histogram. Each possible hue, saturation pair is incremented in the histogram, and then renormalized to be between 0 and 1. The color detection algorithm then takes a test image and the generated histogram to produce a bitmap image. This is done by looping over all pixels in the test image, and reading the hue and saturation value. Then reading from the histogram reports a probability that the given hue, saturation pair is a skin color pixel. We choose some threshold value, then say the pixel is a skin color if the probability is above this threshold. The final segmented image is then returned.

For the data collection, I collected 6 data points by screenshotting stock images of hands. I took care to get screenshots that represented multiple parts of the hand, and hands in various poses and skin tones. For the threshold, I first considered 0.5 as a natural threshold to try. Though intuitively this seems like a natural threshold, I saw noise artifacts both within and outside the hand shapes in the test image.

The results threshold=0.75 for *gun1, pointer1,* and *joy1* are as follows. I was surprised to see that changing the threshold did not noticeably change these artifacts. I believe this was due to my relatively small sample size, leading to a sharp definition in whether a hue, saturation pair was skin tone or not. More data, or a smoothing algorithm, might improve my results. Postprocessing with morphological operations may also lead to cleaner segmentation. Also the ring wasn't highlighted in my segmentation, which I found amusing!