Computer Vision HW4

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Description:

Histogram-based Skin Color Detection:

Generally histogram based color segmentation can be used to detect different color segments in an image. Here we are specifically using it for the color segmentation of skin color in the images. It is a fast method because we only iterate through the whole image once. The image segmentation works well when robust training images are used. Below is the description of the algorithm used

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ALGORITHM DESCRIPTION

Training

1.) First training images containing skin color images are collected and they are cropped to obtain skin color.
2.) Then the hsv components of the training images are calculated.
3.) Then we build a 3D color histogram from the hsv values where the bin contains the frequency of a particular h,s value that appear in the dataset.

Testing

1.) We calculate the hsv components for the testing image as well
2.) At a certain pixel we find the h,s value of it and index the histogram according to the values found.
3.) If the value is above the threshold value then we retrain the pixel value (i.e the pixel contains skin color otherwise we do not retain it.
4.) Finally we get the skin color region in the image.

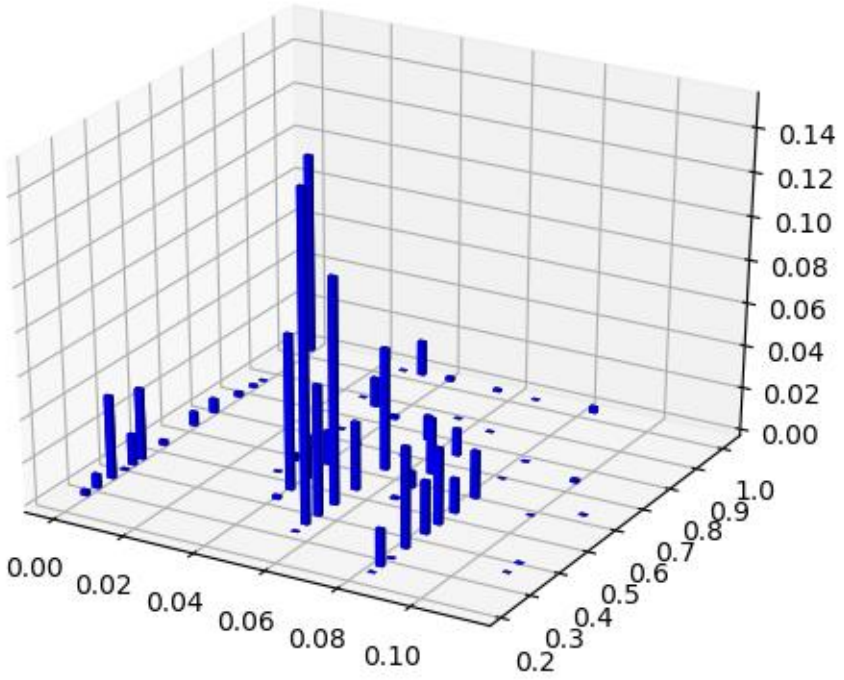
Parameters used:

3 Test Images, 2 different Thresholds, 4 different size training sets (4,8,12,16)

Results in Results folder:

Histograms (Hist_Imagename1+ TrainingSize + threshold)

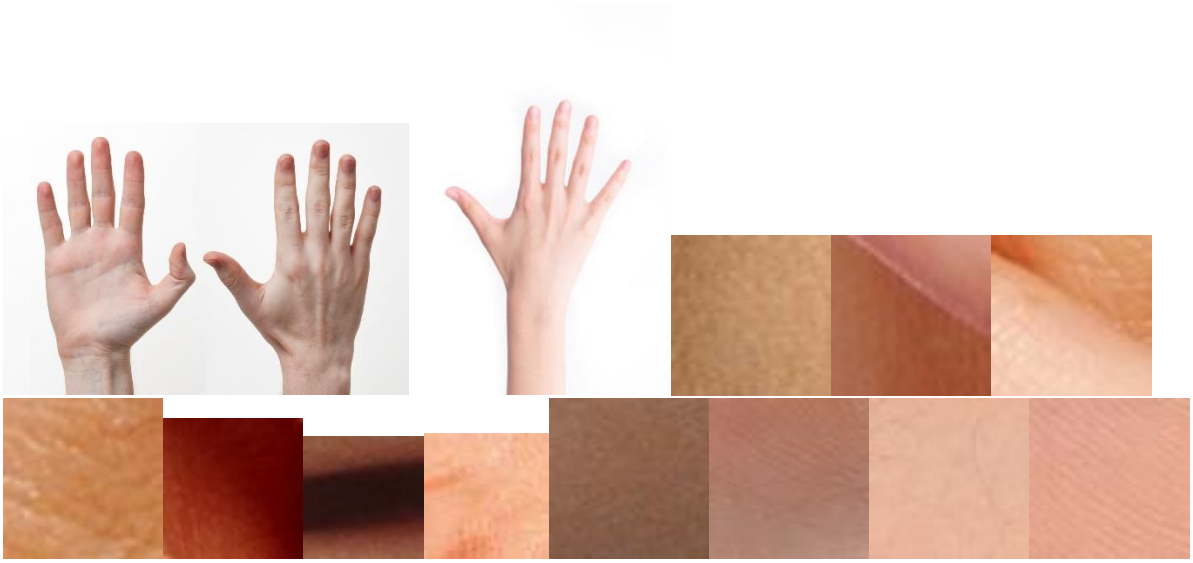
Images (Segmented_Imagename1+ TrainingSize + threshold)



3D Histogram - (Hue, Saturation, Frequency)

This is a 3D histogram calculated from the training Data. The X axis is -> Hue and The Y axis is -> Saturation. The value in the z axis denotes the normalized frequency Magnitude.

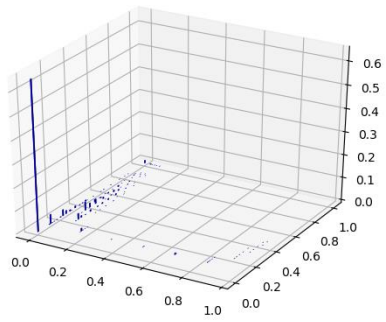
Training Images:

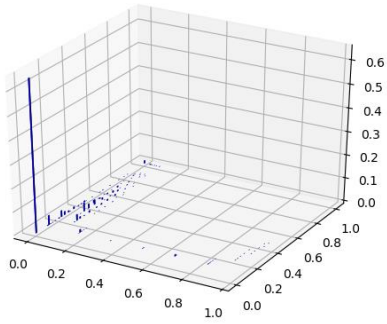


Model Histograms

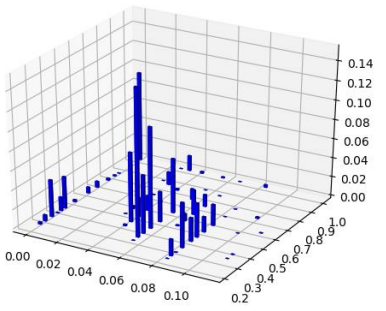
(Threshold = 0.002) **Image Gun (Threshold = 0.0012)**

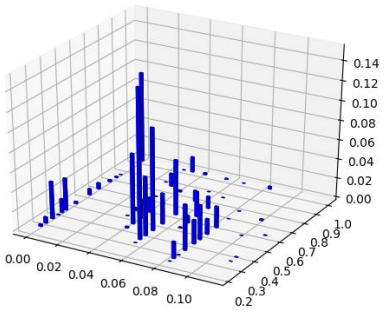
Training size: 16



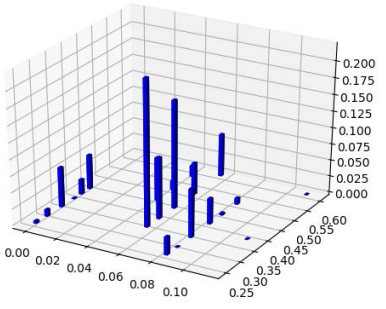


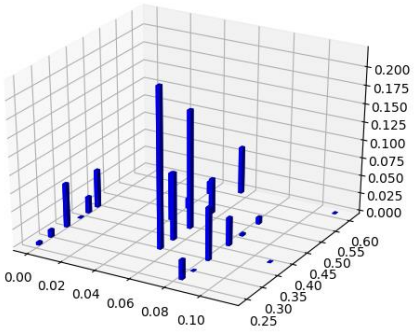
Training size: 12



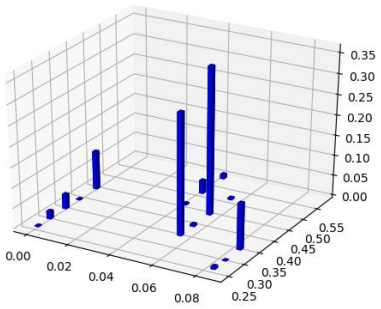


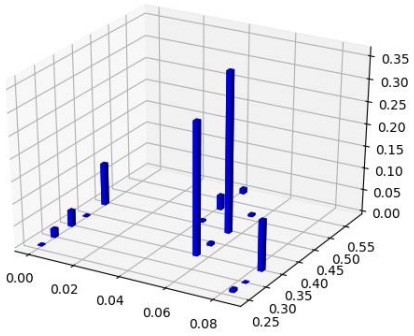
Training size: 8





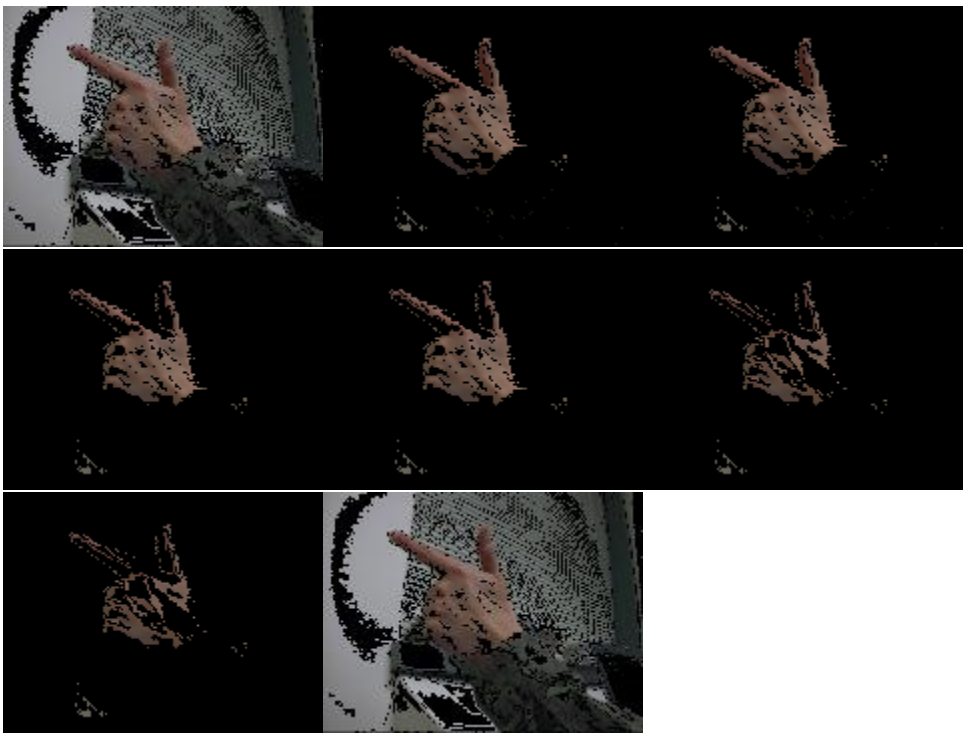
Training size: 4



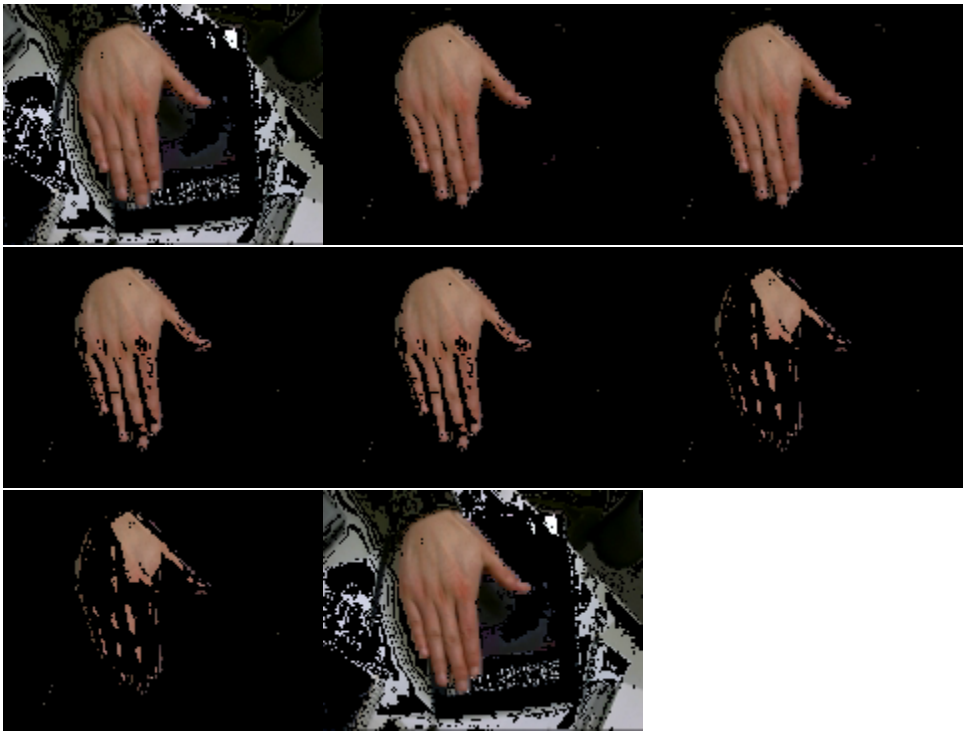


Results Images Images

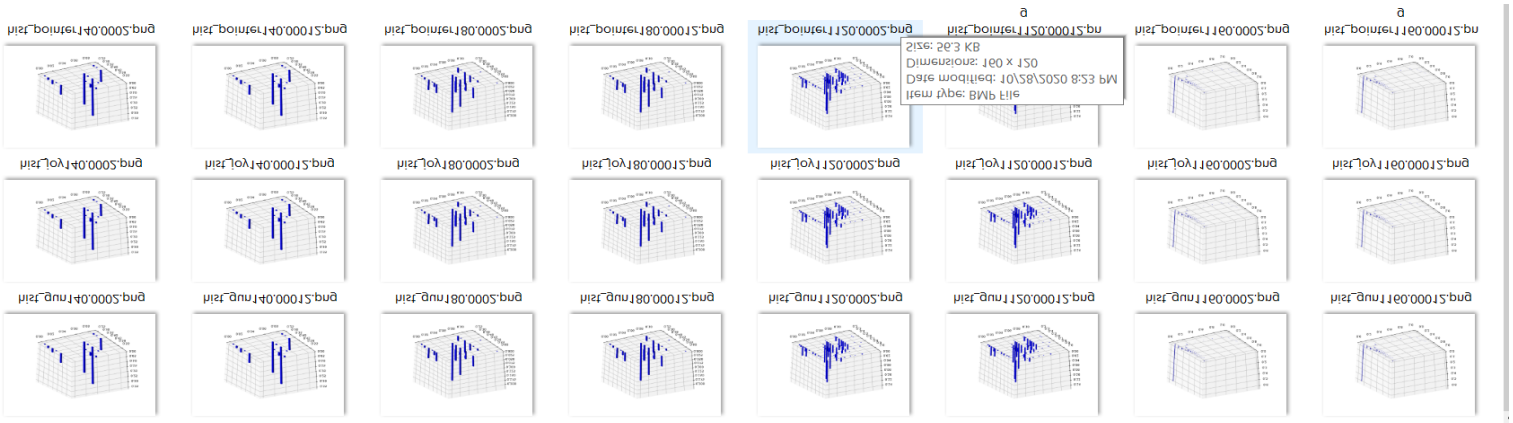
Test Image 1 – Gun1.bmp



Test Image 2 – Joy1.bmp



Test Image 3 – Pointer1.bmp



Overall Pictures in Results folder

Sample Woman face used for testing:

Analysis of results and Impact of training data:

Quality of training data significantly impacts the segmentation. Even though Ii tried to supply relevant training data to make the algorithm as robust to illumination variation, better results can be observed with much better data.

Thresholds help the segmentation differently for different images. But I tried to use uniform and optimal 0.0012 to maintain uniformity. Since we can simply observe the histogram with the single pass of all the pixels present in the data it is an efficient algorithm. Sometimes images which are not skin color can also be shown because they are quite similar in color. We can clearly see the background in the test image of woman.