COMPUTER VISION
#MP4
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Description: Implementation of color based segmentation with an application to skin tone detection. In this case a dataset of 53 hands was used to train the data and HSV color space was selected to obtain optimal results.

Algorithm:
Collecting data- Given the path to the training dataset folder, iterated through all the images in the folder, converted each image from BGR to HSV and appended each pixel hue and saturation values to a list such that the saturation values were greater than 35. The reason for the lower bound for the pixels' saturation values had to be specified since all the dataset images had a white background which flooded the list with values corresponding to different shades of white making it impossible to read the histogram for a particular color.
Training a color histogram-based skin tone detector- Using the hue and saturation lists created above, the 2D histogram was calculated using the numpy histogram2d function and then normalizing the histogram. The resulting normalized histogram when plotted showed the area in the plot that had the most concentration of pixels. This is the part of the color space that denotes skin tone, from this plot it can be determined what the threshold value should be set for skin tone color segmentation.
Finding skin regions in test images-For skin tone segmentation, the given images were converted to HSV and I iterated through all its pixels. Using the hue and saturation values for a pixel, I checked if the histogram value for that hue and saturation is greater than the threshold value determined from the histogram plot. If true, the pixel retains its values else they are assigned black. This results in a skin tone segmented image.

Result Analysis:

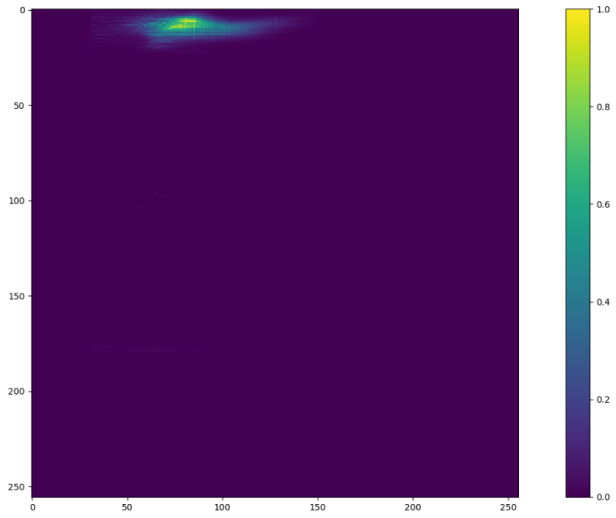

Fig 1. Shows the 2D histogram plot for a training dataset of 53 in HSV

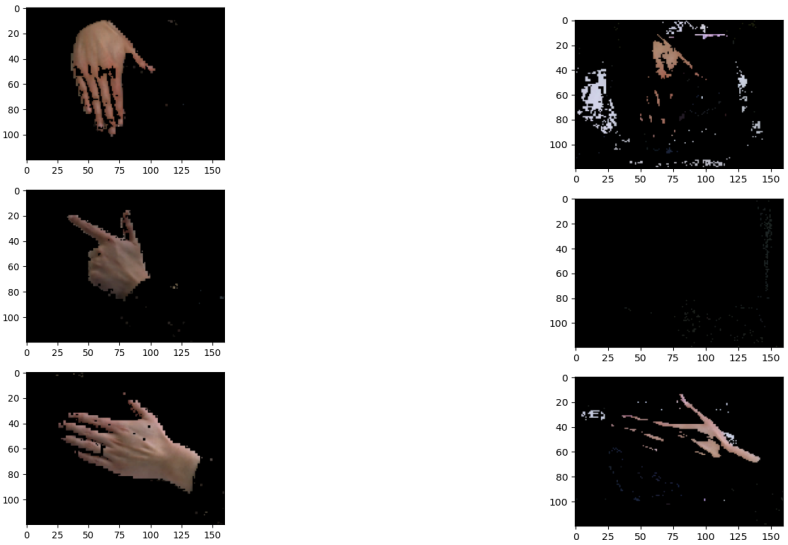

Fig 2. Shows the color segmentation results from HSV vs RGB color space

The results show a much better skin tone segmentation when done in HSV color space. The results of the RGB color space are unreliable and one of the reasons for this might be the effect light has on the RGB values.