Image Processing Final Project

University of Burgundy

Master's in Computer Vision and Robotics

(VIBOT & MScV)

Pixel-based Skin Color Detection Techniques

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1 Introduction

Human skin color has been used and proved to be an effective feature in many applications such as human face detection, hand tracking, image content filtering, content-aware video compression and many more. In this project we implemented the algorithms mentioned in the paper "A Survey on Pixel-Based Skin Color Detection Techniques" by Vladimir Vezhnevets, Vassili Sazonov, and Alla Andreeva.

1.1 UCI skin segmentation data set

The Authors of the paper mentioned using the Compaq skin database for comparing the results of all algorithms. However, we could not find any source for the Compaq database, therefore we decided to use the UCI skin segmentation dataset, provided by Center for Machine Learning and Intelligent Systems at University of California, Irvine. the dataset can be downloaded from here: https://archive.ics.uci.edu/ml/datasets/Skin+Segmentation

According to the dataset website, the skin dataset is collected by randomly sampling B,G,R values from face images of various age groups (young, middle, and old), race groups (white, black, and asian), and genders obtained from FERET database and PAL database. Total learning sample size is 245057; out of which 50859 is the skin samples and 194198 is non-skin samples.

This dataset is of the dimension 245057 * 4 where first three columns are B,G,R values and fourth column is of the class labels (decision variable y), in the dataset file Skin colors are labeled as number 1 and Nonskin elements as 2.

1.2 Dataset visualization

First step to start any project with big amount of data, is to visualize this data to see its distribution and roughly expect the behavior of your algorithms. for our data set, we wrote a simple code Plot-Dataset.py that plots skin data in blue, and nonskin in red, the 2 axes are the Cb and Cr components of the colors. Figure shows the visualization of the dataset.

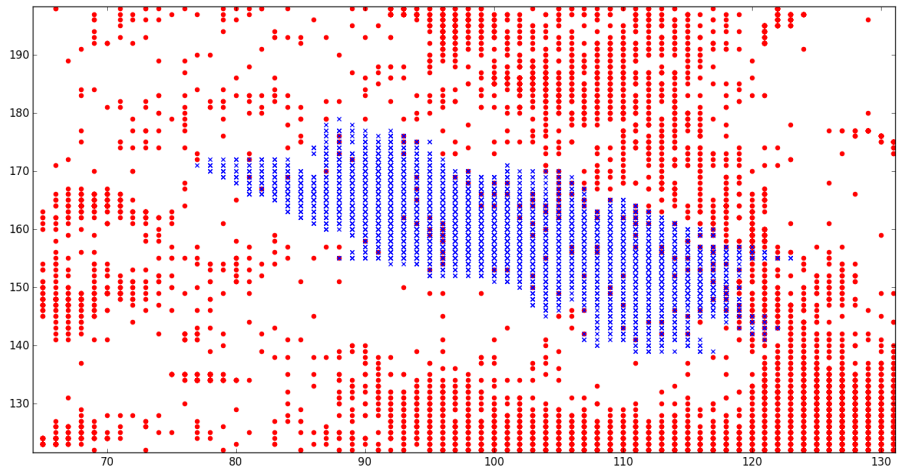

Figure 1: UCI Data set visualization

1.3 How to run ?

For the code implementation we used Python 3.5, with some help from Scikit-Learn 0.18.1 library when needed. We put all the algorithms in different files, and different directories, so for running any code, you can use any python IDE, or by Linux terminal change the directory for the code directory, then write:

Python FileName.py

All source code is available on Github Repository: https://github.com/abdelrahman-gaber/Pixel-based-Skin-Color-Detection

2 Non-parametric skin distribution modeling

The final goal of skin color detection is to build a decision rule, that will discriminate between skin and non-skin pixels. This is usually accomplished by introducing a metric, which measures distance (in general sense) of the pixel color to skin tone. The type of this metric is defined by the skin color modeling method.