Face Detection using RGB Model

كشف الوجه باستخدام نظام الالوان (الاحمر، الاخضر، الازرق)

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البحث مستل

Abstract

Skin tone detection had been performed by using RGB color system, it is an interested filled of working due to the great hazard facing the digital world at this time. Many of the RGB images are the most common area of that detection. In this paper, an experimental study of face detection algorithms based on "Skin Color" has been introduce using Matlab environment to detect the skin color of an image. Having a true color image is the input, then the resulted image is a skin image that are detected by the algorithm that is built for that purpose.

الخلاصة

تم اجراء عملية الكشف عن الجلد باستخدام نظام الالوان (RGB) الاساسي، و الذي يعتبر مهما في العمل في مجال المعالجة الصورية،و ذلك من بسبب الزيادة الحاصلة في المخاظرة التي تواجه العالم الرقمي. العديد من الصور الكثيرة التداول هي معتمدة على النظام اللوني المذكور (RGB) و الذي استخدم في عملية كشف الجلد. هذا البحث هو نتيجة دراسة عملية تمت باستخدام خوارزمية جديدة بنيت من قبل الباحين باستخدام النظام اعلاه و باستخدام بيئة الماتلاب (Matlab) و التي كشفت عن مواقع الجلد في الوجه و اليدين و الساقين. الصورة التي تم استخدامها هي صورة بالالوان الحقيقة و النتائج كانت صور تحتوي على مناطق الجلد فقط باستخدام الخوارزمية التي اعدت لهذا الغرض.

Abstract

Skin tone detection had been performed by using RGB color system, it is an interested filled of working due to the great hazard facing the digital world at this time. Many of the RGB images are the most common area of that detection. In this paper, an experimental study of face detection algorithms based on "Skin Color" has been introduce using Matlab environment to detect the skin color of an image. Having a true color image is the input, then the resulted image is a skin image that are detected by the algorithm that is built for that purpose.

Introduction

Detection of the human skin (face and hands mostly) are an vital area in many mainframe vision and applications such as automatic skin recognition, video inspection, human computer interaction (HCI) and large-scale face image rescue systems. The first step in any of these face skin -processing systems is the detection of the presence face an image or video. Throughout the last teen years, there has been much progress in skin detection research, particularly in the abundance of methods and approaches. Recent surveys have comprehensively reviewed various face and skin detection methods available in the literature [1].

The Skin detection in the RGB images attracted the attention in the resent years, where anther system of colors are introduced in those directions. This method of skin detection allows to detected the geometrical and texture properties of the human face to be detected by the algorithms and the different application that are using the detection, for security reasons, where the low enforcement are the great organization that are interested in that field because of dealing many criminals and the way of identify them [2].

Most of the current skin detection systems presume that faces are readily available for processing. However, in reality, we do not get images with just faces. We need a system, which will detect, locate the skin of the face or the hands in cluttered images.

System of colors

Calorimetric, computer graphics and video signal conduction values have given birth too many color paces with different properties. Wide varieties of them have been applied to the problem of skin color modeling.

A. RGB Model

The RGB color space have three preservative primaries: red, green and blue. phantom components of these colors mix additively to create a secondary color. The RGB model is represented by a 3-dimensional cube with red, green, and blue, at the corners on each axis (Fig.1). Black is at the origin, and white is at the reverse end of the cube. The gray scale follows the line from black to white. In a 24-bit color graphics system with 8 bits per color channel, red is (255, 0, 0). On the color cube, it is (1, 0, 0)[3].

The RGB model simplifies the propose of computer graphics systems but is not ideal for all the requirements that need. The red, green and blue color components are highly associated. This makes it not easy to execute some image processing algorithms. Many processing techniques, such as histogram equalization, work on the intensity component of an image only.

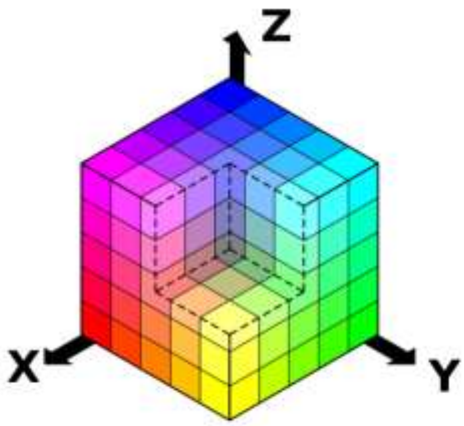


Fig.1: The true color box shows the original colors

B. YCbCr Color Space

YCbCr color space was known to respond to increasing demands for digital algorithms in handling video information, and has become a widely used model in a digital video. It belongs to the family of television transmission color system. The family includes others such as YUV and YIQ. YCbCr is a digital color system, while YUV and YIQ are analog spaces for the respective PAL and NTSC systems. These color spaces separate RGB (Red-Green-Blue) into luminance and chrominance information and are useful in compression applications[4].

However the specification of colors is somewhat intuitive. The Recommendation 601 specifies 8 bits (i.e. 0 to 255) coding of YCbCr, whereby the luminance component, Y has an excursion of 219 and an offset of +16. This coding place black at code 16 and white at code 235. In doing so, it reserves the extremes of the range for signal processing foot room and headroom. On the other hand, the chrominance components C_b and C_r have excursions of +112 and offset of +128, producing a range from 16 to 240 inclusively[5].

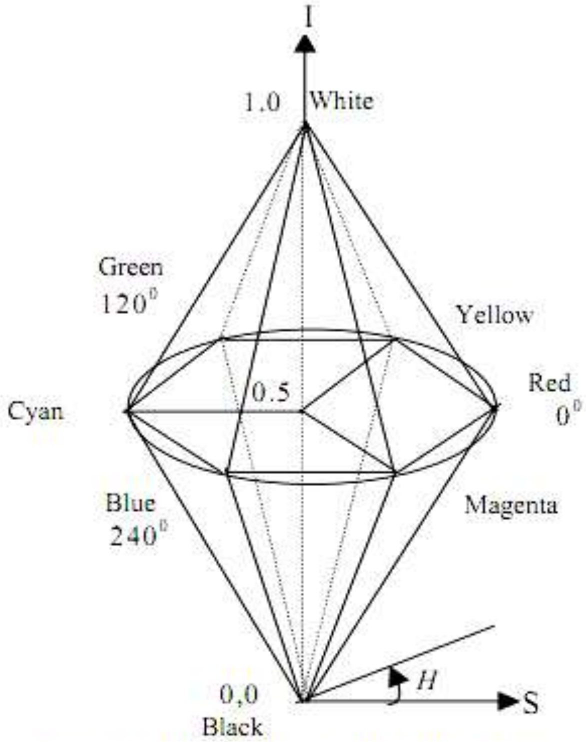


Fig.2 Double cone model of the color system

C. HSV (Hue, Saturation, Value)

Hue-saturation based color spaces were introduced when there was a need for the user to specify color properties numerically. They describe color with intuitive values, based on the artist's idea of tint, saturation and tone. Hue defines the dominant color (such as red, green, purple and yellow) of an area; saturation measures the colorfulness of an area in proportion to its brightness. The "intensity", "lightness" or "value" is related to the color luminance. The intuitiveness of the color space components and explicit discrimination between luminance and chrominance properties made these color spaces popular in the works on skin color [3].

Face Detection

Skin color has proven to be a useful and robust cue for face detection, localization and tracking. Image content filtering, content aware video compression and image color balancing applications can also benefit from automatic detection of skin in images. Face detection and tracking has been the topic of an extensive research for several decades [3]

Many heuristic and pattern recognition based strategies have been proposed for achieving robust and accurate solution. Among feature-based face detection methods, the ones using skin color as a detection cue have gained strong popularity. Color allows fast processing and is highly robust to geometric variations of the face pattern. In addition, the experience suggests that human skin has a characteristic color, which is easily recognized by humans.[4]

When building a system, that uses skin color as a feature for face detection, the researcher usually faces three main problems. First, what color space to choose, second, how exactly the skin color distribution should be modeled, and finally, what will be the way of processing of color segmentation results for face detection [5].

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 the distance (in the general sense) of the pixel color to skin tone. The type of this metric is defined by the skin color modeling method. One method to build a skin classifier is to define explicitly (through a number of rules) the boundaries skin cluster in some color space. For example:-

(R, G, B) is classified as a skin if:

$$R > 95, G > 40, B > 20 \, and$$
$$Max\{R,G,B\} - Min\{R,G,B\} > 15 \, and$$
$$| R - G | > 15, R > G, and \; R > B$$

The simple way of doing this has attracted many researchers in that field. It is clear that, the advantage of it is simple to specify the skin rules that will construct a very rapid classifying for skin pixels. Recently, there have been proposed a method that uses machine-learning algorithms to find both suitable color space and a simple decision rule that achieves high recognition rates [6] [7].

The Proposed System

In our proposed work we extract faces from the entire image by using extracting method

We are having a true color image pass throughout some steps to have an output image with a skin image as follows:

Step 1: reading any image size, but must be a true color image from a file under any extensions.

Step 2: We need to resize the image in equal rows and columns, and then have to separate each bond of it aside to have a three bonds of the same image.

Step 3: create a zero matrix of $(N \times M)$ that must equal to the image matrix size to have it ready to add the changes that happen on the original matrix to that one to get the skin image matrix .

Step 4: A threshold has to be there as we wrote above to test each pixel of the image to be a skin or not-skin area.

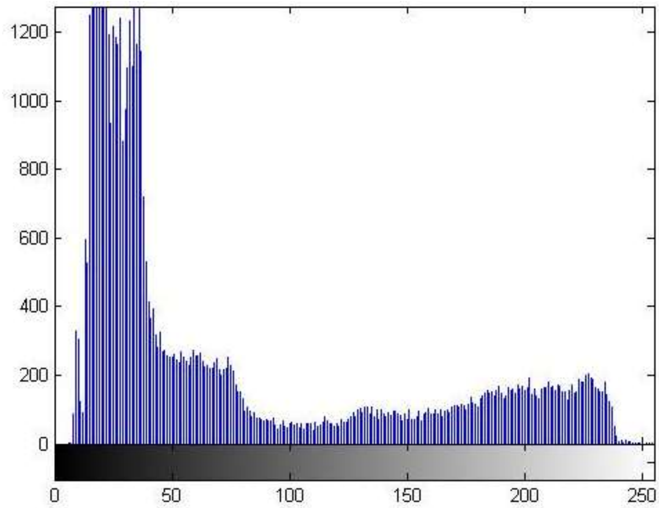
Step 5: the test will work now to check every pixel and when it passes the threshold, it will replace an element in the new matrix, if not will add 1 in the corresponding pixel

Step six: show the resulted image will be a skin image for the original one that we have at the bargain and it will be a skin image of the original one.

As shown in the Fig.3

Fig.3 the original image A   skin tone detected image B

Figure 4 Original image A **skin tone detected image B**



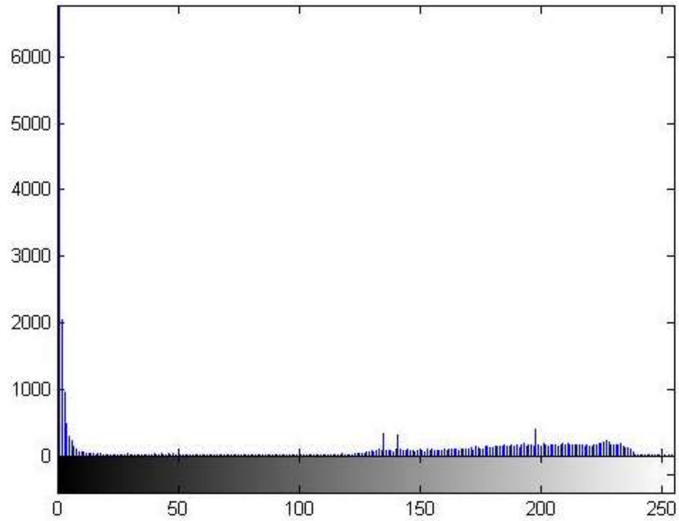
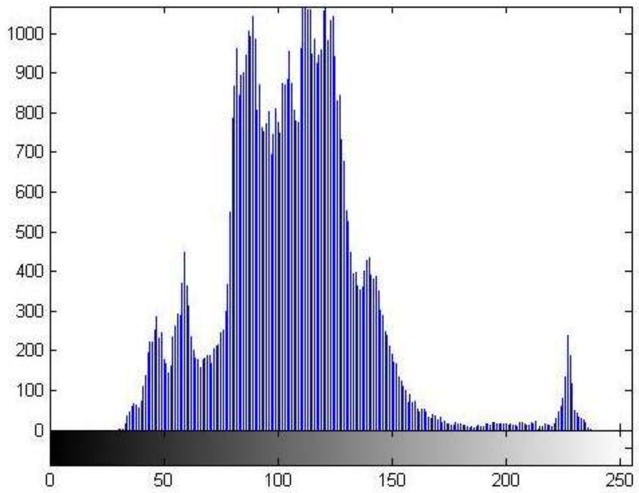


Fig. (6) show the histogram for image in Fig(4) A **show the histogram for image in Fig(4) B**

Figure 7 Original image A **skin tone detected image B**



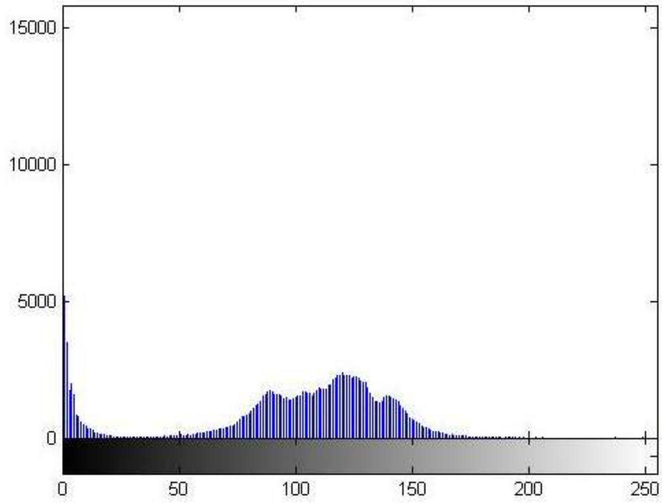


Fig. (8) show the histogram for image in Fig(7) A **show the histogram for image in Fig(7) B**

Image no	PSNR	SNR	RMES
Image 1	13.261	7.8686	55.39
Image2	16.033	7.1071	40.418
Image 3	6.005	2.0999	128.228

Table (1) show the mesuremnet for the used imges in the above figures

Conclusion

As we saw in the figures above, we notice that the images are true color and the algorithm for the skin detection seceded in getting the area of the skin regardless the color of the skin. In figure 1 we used an image with a brown sugar skin of a human, in figure 2 we used a brunette skin and as we see that the skin algorithm pass the skin and give as the resulted image. Figure 3 is a dark skin image that we saw the resulted image little different due to the different we of treating the color for darker skin. We can see how the algorithm treats the pixels for each image and give the output image the best result in the skin detection, where we can have the needed region of interest in that area to have them identify the person, by using a stander image and then find out what is the result under different situations of light and different way of view for the same face.

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