Image Segmentation For Multiple Face Detection Using CMY Color Model

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Abstract--- ***As constant research is being taken in the area of Biometrics; the construction of a face detection system is the one of the major practical application in strong development. Different aspects of human physiology are used to authenticate a person's identity. Face detection is an important topic in many applications. The person's face is an active entity and has a high quality of irregularity in its appearance, a difficult problem in computer vision is to makes face detection. In face recognition system, face detection is the initial step, with the performance of extracting and localizing the face portions from the background. The biometrics may perform a function called automated face recognition which is widely used because of the uniqueness of one human face to other human face. Color models is a system for measuring colors that can perceived by human, and a process of combining different values as a set of primary colors. In this work, the problem of face detection is addressed to overcome from this problem a new face detection method of CMY color model is introduced. This technique is used to avoid the non-faces and to detect the faces more accurately.***

Keywords: Biometrics; Image segmentation; Face detection technique;RGB and CMY color models.

I. INTRODUCTION

Human face detection is the first step of face processing method, computer vision and computational image analysis. The commonly used biometric characteristics for person recognition are face. The repeatedly using approach is to face recognition, such as eyes, eye brows, nose, lips, chin and the relationships of these attributes. The detection of the presence is the initial step in face processing system and subsequently the position of human faces in an image or video. The face detection has a challenge of cope with a wide variety of variations in human face such as face pose and skin color, scale, facial expression, face orientation and ethnicity. The block diagram for face detection is shown in figure 1.

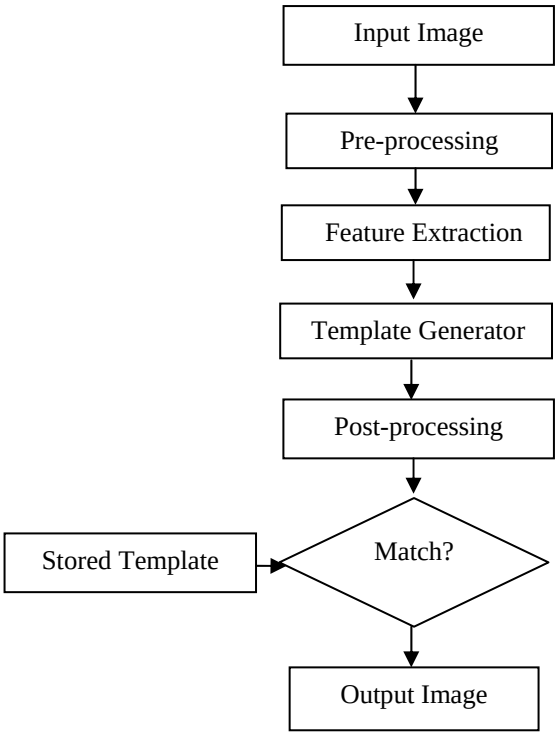

Figure 1: Block diagram of face detection

The extracted feature locations and topological relationships are used for faces detection. Both types have some limitations that are amplified by specifics of dissimilar application areas. It is a large search space, losing color information, inadequate face geometry features etc. Color is an efficient basic prompt that can be utilized as the initial step in the face detection performance. An RGB color space is an additive color space related on the RGB color model. In the RGB space, the three components of (R, G and B) show not only color but also luminance. Luminance may different across a human face due to the ambient lighting and is not a dependable measure in dividing skin from non-skin region. The RGB reflects the use of Cathode-Ray Tube (CRTs), since it is hardware oriented system. The CMY color model is based on complementary colors- cyan, magenta and yellow. The CMY color model is applied to the output devices, such as printers.

The rest of work is organized as follows. In Section II, describes the previous studies and affirm basic assumptions. In Section III, expands image segmentation using color models and studies the properties of the proposed CMY color model in biometric environments. In Section IV, provide numerical results to study the efficacy of the scheme. This research concludes in Section V.

II. LITERATURE SURVEY

Automatic human face detection is a challenging problem which has received much attention during recent years. [1] propose a method that includes a denoising preprocessing step and a new face detection approach based on skin color fusion model and eye region detection. However, there is not a common opinion about which color space is the best choice to do this task is done by [2]. Human face detection plays an important role in applications such as video surveillance, human computer interface, face recognition, and face image database management. [3] proposed a face detection algorithm for color images in the presence of varying lighting conditions as well as complex backgrounds. Illumination preprocessing is an effective and efficient approach in handling lighting variations for face recognition are done by [4].

To automatically detect faces in real-world images presenting challenges such as complex background and multiple foregrounds, [5] proposed a new method which is based on parametric active contours and which does not require any supervision, model or training. [6] defining the respective face detection window includes setting the size of the face detection window according to an extent, in pixels of the image, of a standard face at the depth indicated by the depth map. A red- and green-based pseudo-color model could enable the adjustment of brightness of the entire area of color digital images are introduced by [7]. CMYK use the different color reproduction technologies and properties. A CMYK printer instead uses light-absorbing cyan, magenta and yellow ink. [8] discusses the conversion between RGB and CMKY color model. A novel approach to distinguishing computer graphics from photographic images is introduced by [9]. [15] shows the polynomial

regression method is used to determine the relationship between these two color spaces, in which the given CIELAB color's CMY value is calculated.

[10] purpose is to arrive at recognition of multicolored objects invariant to a substantial change in viewpoint, object geometry and illumination. [11] present a neural network-based upright frontal face detection system. Human face detection plays an important role in applications such as video surveillance, human computer interface, face recognition, and face image database management. [12] presented a face detection algorithm for color images in the presence of varying lighting conditions as well as complex backgrounds. Though numerous attempts have been made to detect and localize faces, these approaches have made assumptions that restrict their extension to more general cases in proposed by [13]. [15] focuses on the algorithms of identifying the tea flushes based on color image analysis. Firstly, several color indices, including y-c, y-m, (y-c)/(y+c) and (y-m)/(y+m) in CMY color space, S channel in HSI color space, and U channel in YUV color space, were studied and tested.

III. RESEARCH METHODOLOGY

The commonly used biometric uniqueness for human recognition is face. The most widely used approaches to face detection are based on shape of facial attributes, such as eyes, eye brows, nose, lips, chin and the relationships of all of these attributes.

A. RGB Color Model

An RGB color space is any preservative color space related on the RGB color model. It is quickly understood by thought of it as "all possible colors" that can be created from three colorants for red, green and blue. By using these three additive primary colors (red, green, and blue) the name of the model has been derived, and in a light spectrum they combined together as one color, and can be mixed to produce new spectrum colors. The RGB color space could be given as a cube by standardized RGB color values in the range [0,1] with gray values on the major diagonal of the black values (0,0,0) and on the another corner the white values (1,1,1). It is taken as the base color model for all image applications and further transformation for displaying in the screen is not used in acquired image. RGB color model is divided into two types: Linear RGB Color Space, and Nonlinear RGB Color Space.

1. Linear RGB Color Space

Linear RGB space achieves color reliability through different appliances using color management system. Linear RGB not suitable for numerical analysis and seldom used for image representation, it is used for computer graphics applications. The mapping to nonlinear completed using gamma correction factory of the camera or any input device, in the range [0,1] for both the models.

2. Non-linear RGB Color Space

The information input image taken by a camera or scanner are the R'G'B' values shown in the range from 0 to 255. These data is stored for using in image processing applications, JPEG, MPEJ standard. The conversion from linear to nonlinear values, and from nonlinear back to linear RGB values within the range [0, 1] is defined.

B. CMY Color Model

CMY model is a subtractive model based on complementary colors with respect to additive color in RGB color model. The color printing task may use CMY color spaces. CMY method to reconstitute the colors, exploits a group of three filters known as subtractive, well-known by photographers, a CMY color space utilizes cyan, magenta, and yellow (CMY) as its primary colors. Red, green, and blue are the secondary color. The representations of the CMY color space is shown in following figure. The CMY color space is normalized.

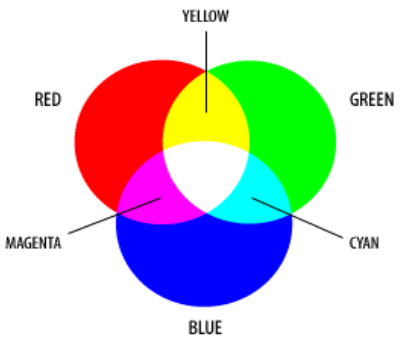

Figure 2: CMY color space cube at maximum and minimum value

Color model is to identify the colors in various standards. Some of the color models used is RGB for monitoring color, CMY model for color printing. The CMY color space is subtractive. Consequently, white is at (0.0, 0.0, 0.0) and black is at (1.0, 1.0, 1.0). Just as the primary colors of CMY are the secondary colors of RGB, the primary colors of RGB are the secondary colors of CMY. But as the example shows, the colors greated by the subtractive model of CMY do not look perfectly like the colors formed in the additive model of RGB. Particularly, CMY does not replicate the brightness of RGB colors. In addition, the CMY model range is much lesser than the RGB gamut. The CMY model used in printing lays down overlapping layers of varying percentages of transparent cyan, magenta, and yellow inks. The CMY colors spaces can be device independent, but in major frequent they are used in reference to a specific device.

IV. EXPERIMENTAL RESULTS

This study has been conducted using a set of portrait-like images (AR face database) with homogeneous back ground, containing human faces with different facial expressions, lighting conditions, objects occluding faces (like sunglasses and scarf) and several combinations of them.

Face detection was performed using every threshold obtained in the previous phase. Face segmentation was carried out first on the training set. The best results were achieved applying the segmentation using CMY color model. Considering these results, the same type of tests was carried out using images from the AR face database.

TABLE I. PERFORMANCE EVALUATION OF FACE DETECTION USING CMY COLOR MODEL

Image	Sizes	Face Detected	Time Taken	Accuracy
1	259*150	14	25	95
2	170*109	4	17	100

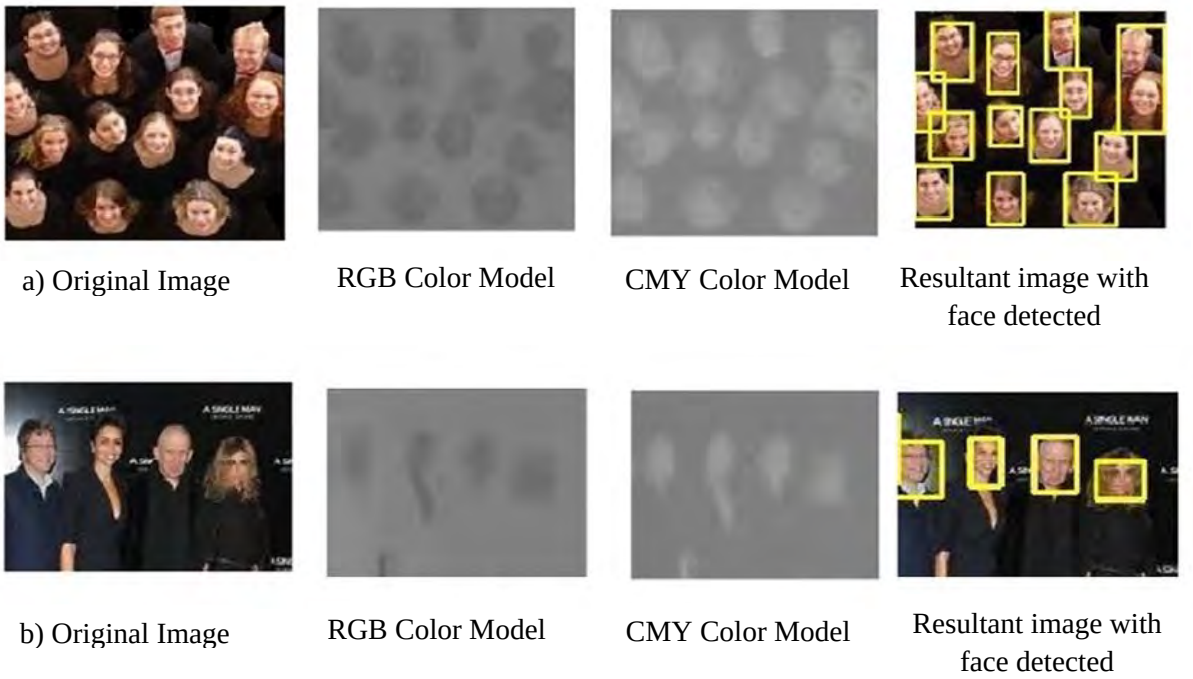

Figure 3: Resultant Image using CMY Color model

V. CONCLUSION

Face detection is an important field which can have great impact in generating security systems more reliable and making color applications. An efficient face detection method using the fusion of skin color modeling and the half face template matching method. This work offers various methods of face detection techniques. Typically, for Face detection this work has summarized several techniques that how face are detected with the help of those techniques such as for skin detection has two techniques like RGB, and CMY. This work implements these methods in real time application. Experimental result shows the face detection result by using the CMY color model.

REFERENCES

[1] Li, Yongmin. "Dynamic face models: construction and applications." PhD diss., 2013.

[2] Hsu, Rein-Lien, Mohamed Abdel-Mottaleb, and Anil K. Jain. "Face detection in color images." Pattern Analysis and Machine Intelligence, IEEE Transactions on 24, no. 5 (2002): 696-706.

[3] Chaves-González, Jose M., Miguel A. Vega-Rodríguez, Juan A. Gómez-Pulido, and Juan M. Sánchez-Pérez. "Detecting skin in face recognition systems: A colour spaces study." Digital Signal Processing 20, no. 3 (2010): 806-823.

[4] Han, Hu, Shiguang Shan, Xilin Chen, and Wen Gao. "A comparative study on illumination preprocessing in face recognition." Pattern Recognition 46, no. 6 (2013): 1691-1699.

[5] Olszewska, Joanna Isabelle. "Multi-Scale, Multi-Feature Vector Flow Active Contours for Automatic Multiple-Face Detection." (2013): 429-435.

[6] Shor, Yael, Tomer Yanir, and Yaniv Shaked. "Enhanced face detection using depth information." U.S. Patent Application 13/751,173, filed January 28, 2013.

[7] Doi, Ryoichi. "Red-and-green-based pseudo-RGB color models for the comparison of digital images acquired under different brightness levels." Journal of Modern Optics 61, no. 17 (2014): 1373-1380.

[8] Yin, Feng Ling, and Bing Quan Huo. "Image Transformation for Digital Printing Machine." Applied Mechanics and Materials 401 (2013): 180-183.

[9] Chen, Wen, Yun Q. Shi, and Guorong Xuan. "Identifying computer graphics using HSV color model and statistical moments of characteristic functions." InMultimedia and Expo, 2007 IEEE International Conference on, pp. 1123-1126. IEEE, 2007.

[10] Gevers, Theo, and Arnold WM Smeulders. "Color-based object recognition."Pattern recognition 32, no. 3 (1999): 453-464.

[11] Rowley, Henry A., Shumeet Baluja, and Takeo Kanade. "Neural network-based face detection." Pattern Analysis and Machine Intelligence, IEEE Transactions on 20, no. 1 (1998): 23-38.

[12] Hsu, Rein-Lien, Mohamed Abdel-Mottaleb, and Anil K. Jain. "Face detection in color images." Pattern Analysis and Machine Intelligence, IEEE Transactions on 24, no. 5 (2002): 696-706.

[13] Yow, Kin Choong, and Roberto Cipolla. "Feature-based human face detection."Image and vision computing 15, no. 9 (1997): 713-735.

[14] Bangyong, Sun, Liu Han, and Zhou Shisheng. "Calculating cyan-magenta-yellow-black (CMYK) printer gray component data based on polynomial modeling." Scientific Research and Essays 9, no. 9 (2014): 352-356.

[15] Jin, Xiao Jun, Yong Chen, Ying Qing Guo, Yan Xia Sun, and Jun Chen. "Tea Flushes Identification Based on Machine Vision for High-Quality Tea at Harvest." Applied Mechanics and Materials 288 (2013): 214-218.