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Face Recognition by Separting Rgb of Facial Colour Images Database

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Abstract ***Face Recognition is performed on greyscale images. These images are actually converted from a color image to greyscale before the study takes place. A loss of information to converting color image to greyscale image. It would be interesting to see separting three color layers of the RGB image could give better recognition performance compared to the greyscale converted image. We conducted experiment on standard face 95 database, local database and pose variation database. We found that the red, green and blue layer of the RGB image gives the best recognition performance. The face recognition performance on face 95 database 100%. The experiment is also tested for locally created poor image quality database and pose variation database and its recognition performance is 100%.***

Keywords: Pattern Recognition, Face Recognition, Image Processing, Color Space, Color Image, RGB

I. Introduction

Face Recognition is widely used in biometric systems. Face Recognition by human being is very easy but it is very difficult to computer. The difficulties in face recognition are different poses, expressions, illuminations, orientations and presence of glasses. Face Recognition skill is quite robust, despite large changes in the visual stimulus due to viewing conditions, expression, aging and distractions such as glasses or changes in hair styles or facial hair. Face recognition is also useful in human computer interaction, virtual reality, database retrieval, multimedia, computer entertainment, information security e.g. operating system, medical records, online banking., biometric e.g. personal identification - passports, driver licenses , automated identity verification – border controls , law enforcement e.g. video surveillances , investigation , personal security – driver monitoring system, home video surveillance system. The first paper talking about face recognition can be traced back to the 1950's in psychology [1].The first work concerning automatic face recognition was done in 1970 by Kelly [2], during the 1980's work on face recognition had no progress, but the interest grew rapidly again from the beginning of the 1990's [3] gives some reasons why the research interest increased: real-time hardware became more available, and the importance of surveillance-related applications increased.colors play an important role for object detection, tracking and recognition, etc. [3]. Different color spaces have been proposed for face recognition such as RGB, HSV, and YCbCr. Generally HSV and YCbCr color spaces are helped to retrieve from the intensity variations. Some of the previous works are included like [4]. RGB color spaces are used in the application of face recognition and the accuracy of face recognition is affected by the color space.

1.1 Color Model A color model is an orderly system for creating a whole range of colors from a small set of primary colors. There are two types of color models, those that are subtractive and those that are additive. Additive color models use light to display color while subtractive models use printing inks. Colors perceived in additive models are the result of transmitted light. Colors perceived in subtractive models are the result of reflected light [11].

The Two Most Common Color Models

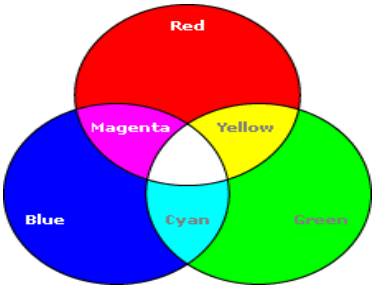
There are several established color models used in computer graphics, but the two most common are the RGB model (Red-Green-Blue) for computer display and the CMYK model (Cyan-Magenta-Yellow-black) for printing.

RGB Color Model

Additive color model for computer displays uses light to display color

Colors result from transmitted light

Red + Green + Blue = White

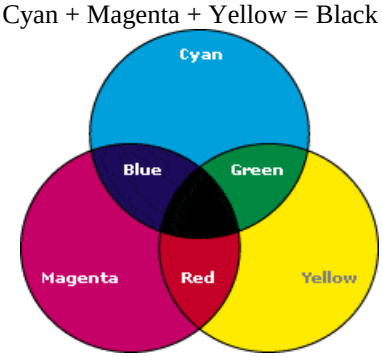


CMYK Color Model

Subtractive color model for printed material uses ink to display color

Colors result from reflected light

Cyan + Magenta + Yellow = Black



The centers of the two color charts. In the RGB model, the convergence of the three primary additive colors produces white. In the CMYK model, the convergence of the three primary subtractive colors produces black. In the RGB model the overlapping of additive colors (red, green and blue) results in subtractive colors (cyan, magenta and yellow). In the CMYK model the overlapping of subtractive colors (cyan, magenta and yellow) results in additive colors (red, green and blue).The colors in the RGB model are much brighter than the colors in the CMYK model [11].

II. Algorithm

1. Get the dataset
2. Do following steps while not end of dataset
   i. Separate red, green and blue components of each image in the given dataset and stored into three separate arrays R1, G1 and B1.
   ii. Display the red, green and blue components of each image in the given dataset
3. Get the query image
4. Separate the Red , Green and Blue Component of query image
5. Stored red, green and blue components of query image into three separate arrays TR1, TG1 and TB1.
6. Display the Red, Green and Blue Component of the query image
7. Do the following steps while not end of dataset images

   i. Subtract red, green and blue components of query image from the red, green and blue components of the each image of dataset respectively and stored the result into three separate variables i.e. c1,c2 and c3

   c1 = R1(i,j)-TR1(i,j);

   c2 = G1(i,j)-TG1(i,j);

   c3 = B1(i,j)-TB1(i,j);

   ii. If the value of variables c1,c2 and c3 are zero then the query image is recognize and loop will break.

   iii. If the value of variables c1,c2 and c3 are not zero then the loop will continue

   iv. If the components of variables c1,c2 and c3 are not zero till the end of dataset then the image is not present in the dataset

In the above algorithm R1(i,j),G1(i,j) and B1(i,j) is array of the red, green and blue components of the images of the dataset respectively.TR1(i,j), TG1(i,j) and TB1(I,j) is red, green and blue components of the query image respectively.c1,c2 and c3 are the variables used to stored the result of subtraction.

III. Experiments and Results

The experiments were done using facial color images. The images were obtained from Libor Spacek Collection of facial images [10]. This database includes 7900 colored images of faces of 395 individuals. Each individual has 20 image samples in the database. The database consisits of male and female images of various racial origins. The images are mainly of first year under graduate students, so the majority of individuals are between 18-20 years old but some under individuals are also present. Some of the individuals has glasses and some of the male individuals have beards. The image format is 24-bit color jpeg in otherwords 200 x 180 array of pixels and each pixel is represented by 24 bits of RGB color values. The image were recorded with an S-VHS camcorder camera and the lighting is artificial, mixture of tungsten and fluorescent overhead.

Experiment were conducted standard face 95 database and local, pose variation database. The local and pose variation database is created by digital camera. There is no preprocessing of these images. The database is available on website **http://dsmcsresearch.info**. The 10 sample face images in the face 95 database were tested. The figure 1 shows the 10 sample images of face 95 database. The figure 2 shows the Red, Green and Blue components of 10 images of face 95 database. The figure 3 shows the query image and figure 4 shows the Red, Green and Blue component of query image. When the query image is present in the dataset then it is shown in the figure 5 and when the query image is not present in the dataset then it is shown in figure 6.

The figure 7 shows the 5 images of pose variation database. The figure 8 shows the Red, Green and Blue components of 5 images of pose variation database. The figure 9 shows the query image and figure 10 shows the Red, Green and Blue component of query image. When the query image is present in the dataset then it is shown in the figure 11 otherwise query image is not present in the dataset. The figure 12 shows the 10 images of local database. The figure 13 shows the Red, Green and Blue components of 10 images of local database. The figure 14 shows the query image and figure 15 shows the Red, Green and Blue component of query image. When the query image is present in the dataset then it is shown in the figure 16 otherwise query image is not present in the dataset. The Table 1 shows the performance of face 95, local and pose variation database.

Table 1 Performace of Face 95 , Local and Pose Variation Database

Database	Tested Image	Recognition Accuracy (Percentage)
FACE 95	10	100
POSE VARIATION DATABASE	5	100
LOCAL DATABASE	10	100

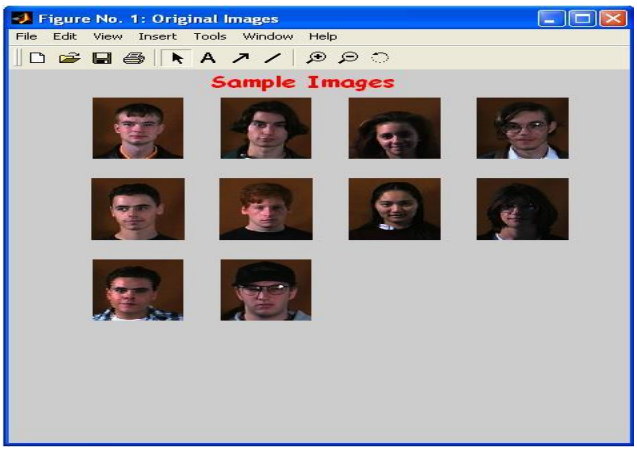


Figure 1 Sample 10 Images of face 95 database

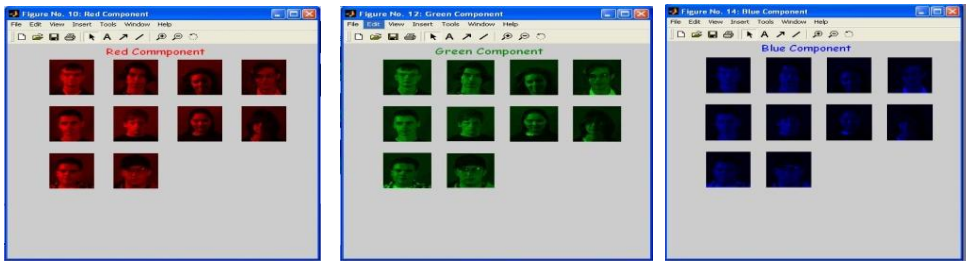


Figure 2 Separting Red, Green and Blue Component of Sample Images

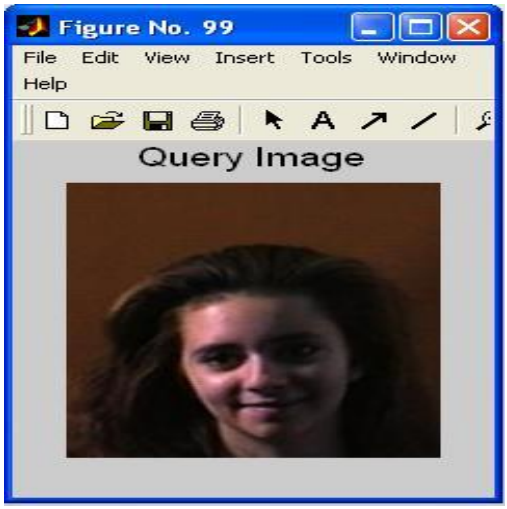


Figure 3 Query Image

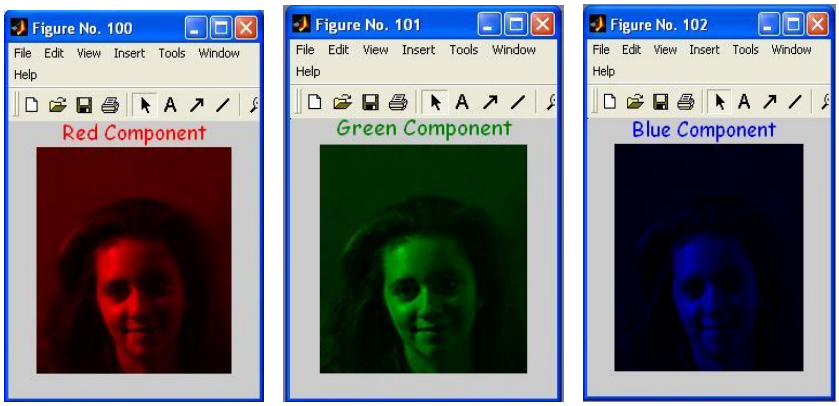


Figure 4 Separting Red, Green and Blue Component of Query Image

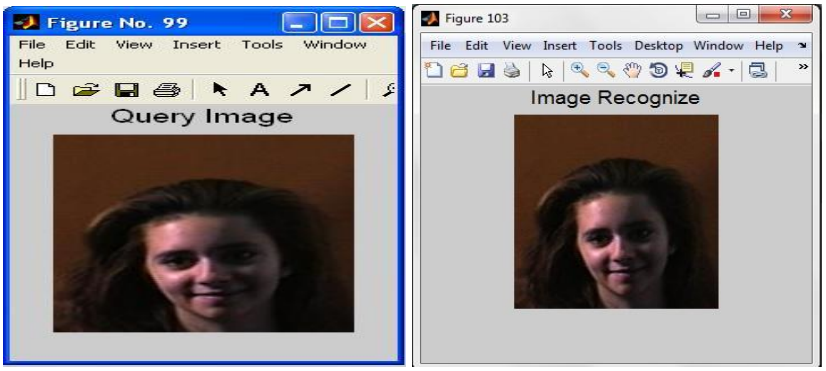


Figure 5 Query and Output Image

Figure 6 Query and Output Image

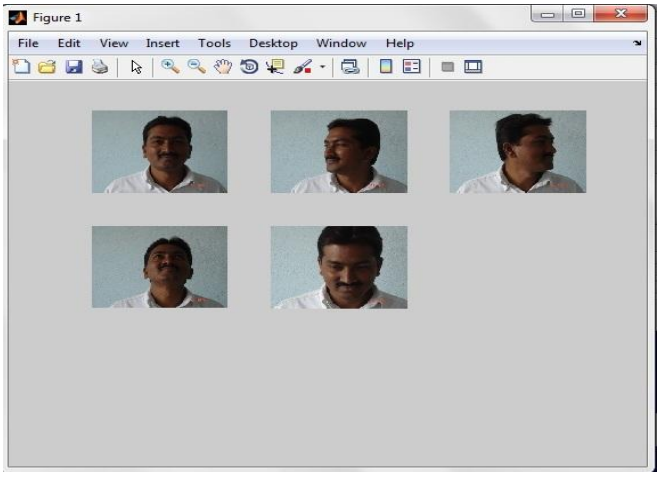


Figure 7 Sample Images of Pose Variation database

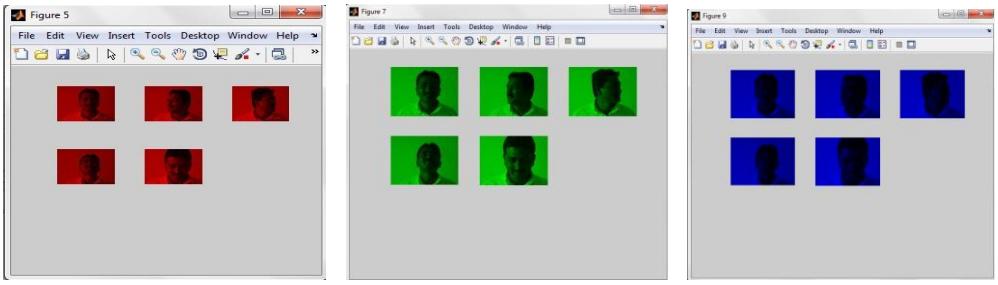


Figure 8 Separting Red, Green and Blue Component of Pose Variation database

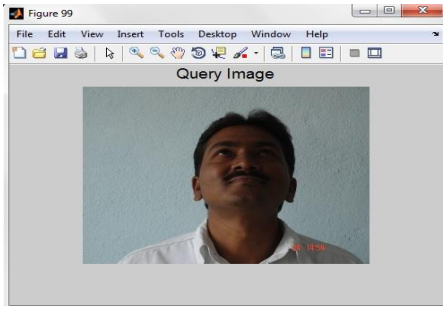


Figure 9 Query Image

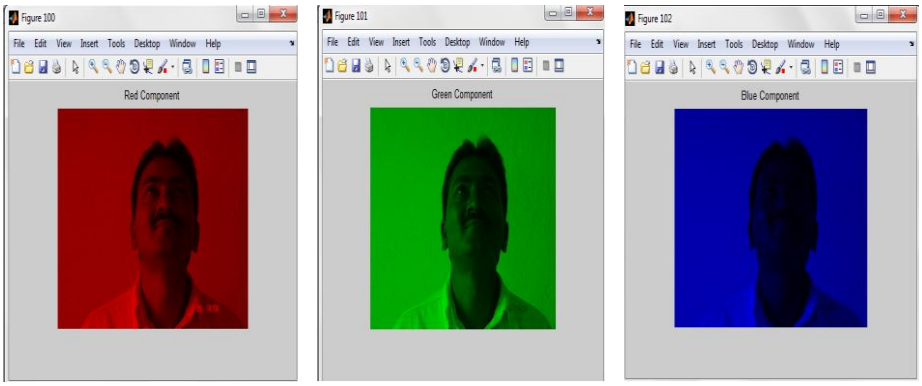


Figure 10 Separting Red, Green and Blue Component of Query Image

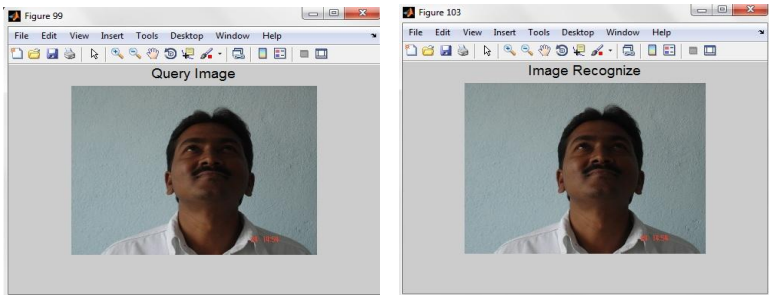


Figure 11 Query and Output Image

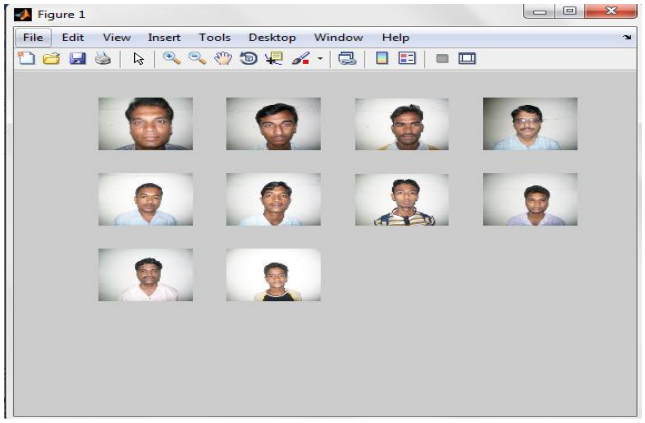


Figure 12 Sample 10 Images of local database

Figure 13 Separating Red, Green and Blue Component of local database

Figure 14 Query Image

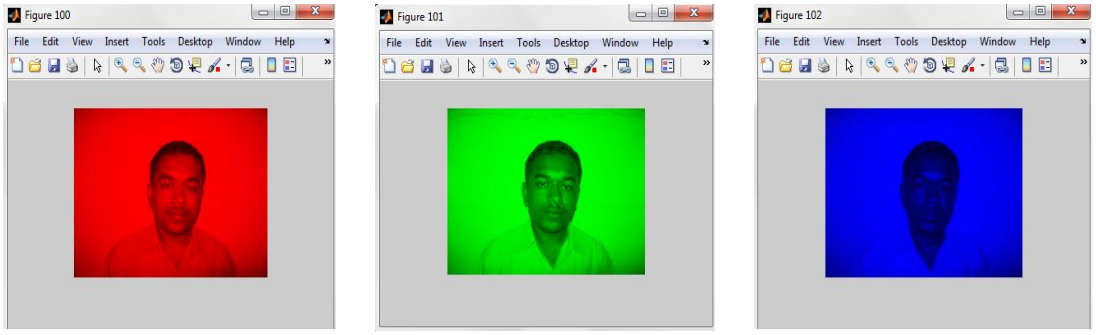


Figure 15 Separating Red, Green and Blue Component of Query Image

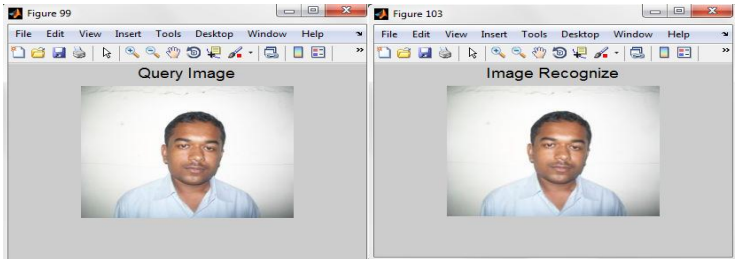


Figure 16 Query and Output Image

IV. Conclusion

Face recognition by separting RGB of facial color images database is implemented in MATLAB. Face recognition of still images is performed with grayscale images. These images are actually converted from a color image to grayscale before the study takes place. A consequence of such a conversion is obviously loss of information, which could influence the performance of the face recognition system. It would be interesting to see separating the three color layers of the RGB image could give better recognition performance compared to the grayscale converted image. We conducted experiment face 95, local and pose variation database and its recognition performance is 100%. We found that the red, green and blue layer of the RGB image gives the best recognition performance.

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