

Human Face Recognition by Using Image Coding

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Abstract: This paper describes of convert front human face to image coding and histogram of pixel position to provide a measure for automatic face recognition. The edge of face image are detected by using canny algorithm, Then image code algorithm are used to transform the two- dimension black and white image to one dimension vector. The histogram is used to identify between faces. Results have demonstrated potential measure for face recognition while head movement, hair style and to small changes in illumination. The identify rate is 91.27%.

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1. Introduction

Though people are good at face identification recognizing human face automatically by computer is very difficult. Face recognition has been widely applied in security system. Credit-card verification, and criminal identifications, teleconferences and so on. Face recognition is influenced by many complications, such as the differences of facial expression, the light directions of imaging, and the variety of posture, size and angle. Even to the same people, the images taken in different surrounding may be unlike. The problem is so complicated that the achievement in the field of automatic face recognition by computer is not as satisfied as fingerprints. Facial feature extraction has become an important issue in automatic recognition of human faces. Detecting the basic feature as eyes, nose and mouth exactly is necessary for most face recognition methods [1].

Face recognition is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness. It has the accuracy of a physiological approach without being intrusive. For this reason, since the early 70's, face recognition has drawn the attention of researchers in field from security, psychology, and image processing, to computer vision [2].

In fact, detecting human faces and extracting the facial features in an unconstrained image is a challenging process. It is very difficult to locate the positions of face in an image accurately. There are several variables that affect the detection performance, including wearing of glasses, different skin coloring, gender, facial hair, and facial expressions. Furthermore, the human face is a 3D

object, and might be under a distorted perspective and uneven illumination [3].

In this paper is proposed approach based on image coding which can convert image with two dimension black and white after applied canny mask to one dimension vectors. Histogram is taken of one dimension vectors.

2. Edge detection

Firstly, the face image will be preprocessed by an Canny operator as shows in (Figure-1-) to extract the edge of face image, which will be used after that to return a binary image of the same size as the intensity image.

3. Image Coding Algorithm

The image has been scanned to get ones elements vector contains information about the coordinate of once elements. The following algorithm display the image coding stage [4].

SUPPOSE: BW is an $n \times m$ binary image,

COD is the coding vector

$K=0$

For $i=1$ to n

For $j=1$ to m

IF $BW(i,j)=1$ THEN

$k=k+1$

$COD(k) = j;$

End.

End.

End.

After, that histogram will take of image. This histogram is use to identified between faces.

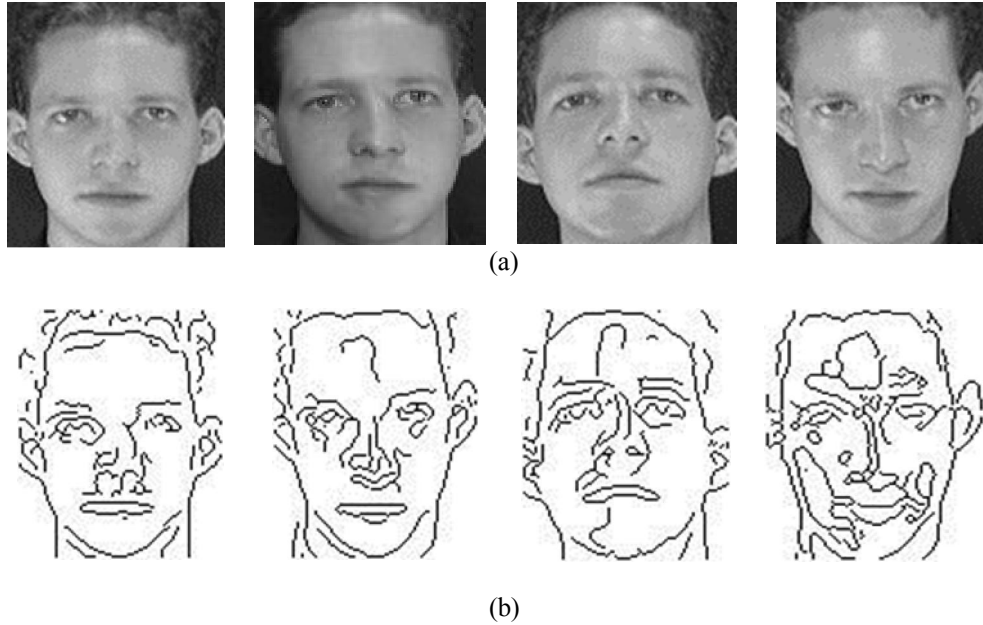


Figure-1-(a) Face images (b) after applied Canny mask.

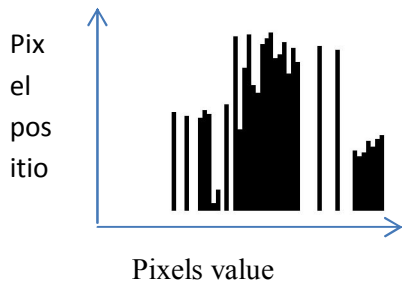


Figure-2- Histogram of figure-1-(b) of first image.
4.Data

The database which contains a set of faces taken between April 1992 & April 1994 at Olivetti

Research Laboratory in Cambridge (ORL) , U.K. are considered [5] There are different images of 40 (male and female) distinct subject. For some subjects, the images were taken at different times. There are variation in facial expression (open/close eyes, smiling/non-smiling), and facial details (glasses/no glasses).All the image were taken against a dark homogeneous background with subjects in an upright frontal position, with tolerance for some tilting and rotation. The images are 256 gray levels with resolution of 92x112 pixels. Example of these images are shown in Figure(3).





Figure-3-Samples of ORL database.

5. Experimental Results

The experimental results are demonstrated the image of the ORL database, a well-known free database of faces, to do the experiments. In this database, there are completely photographs of 40 persons, of which each one has 4 various views. The 4 views in different poses .All faces in this database

are presented by images in 256 gray-level with the size of 92x112 pixels.

From each face four frontal view images were taken with the face rotated from side to side and up and down as shown in Figure-4-.from these images histogram are extracted and stored the average value in database to compare with unknown faces.

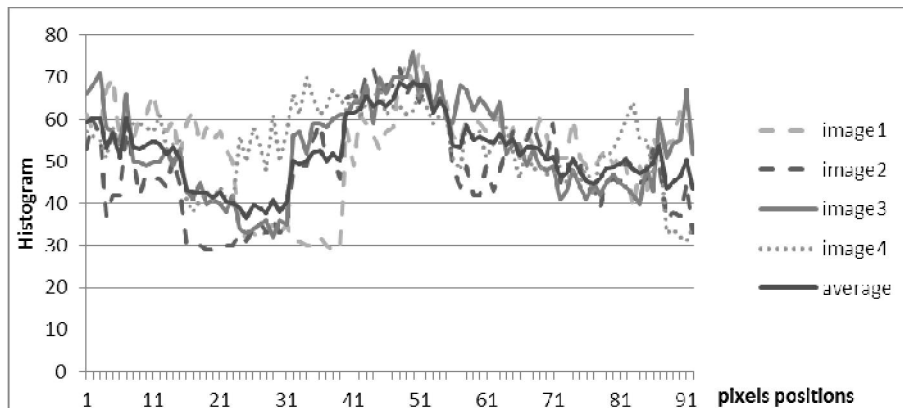


Figure-4- Histogram of four images and average of the same person.

The verities of histograms are used to identify between persons as shown in Figure-5-.

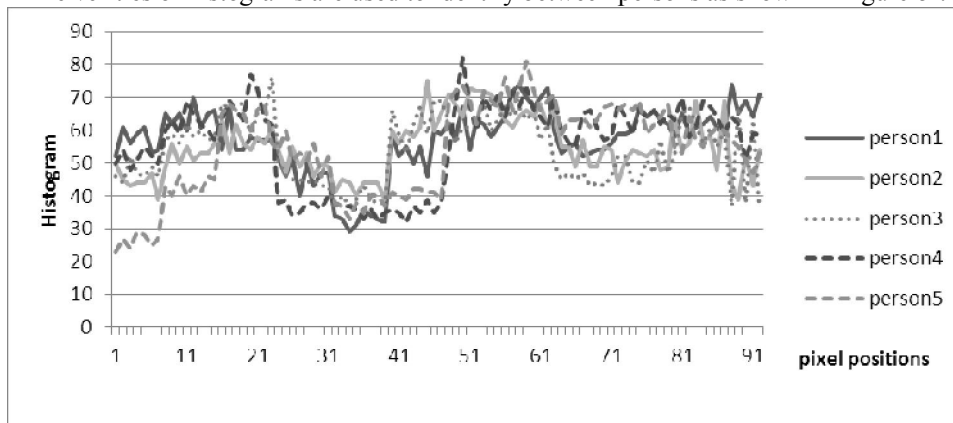


Figure-5- Histogram of five persons.

The histogram extracted from image coding has been applied for assessment. By assessing the relative different d, between two histogram where :

$$d = \sum_{n=1}^k \frac{|x_i - y_i|}{\sqrt{x_i y_i}} \dots\dots\dots(1)$$

Where k are number of histogram points and n=1,2,3.....k.

x_i and y_i are elements of histogram of unknown face and histogram stored in database. The threshold is selected by trial and error. As shows in Table below, if (d) greater than Threshold(Th=13.36) the face will be recognized .

Table-1- (d) values of five persons in database.

	Person 1	Person 2	Person 3	Person 4	Person 5
Person 1	13.68	19.59	13.79	16.55	22.94
Person 2	11.03	4.88	12.39	12.5	12.33
Person 3	15.21	12.77	4.13	10.83	16.62
Person 4	14.18	12.25	9.39	5.23	15.92
Person 5	11.97	10.92	12.09	13.12	9.28

As, We can see from table-1.The minimum value of (d) represented threshold match between faces.

The experiment was done by using all faces with or without spectacles, changes in illumination and change hair style (Figure-6-)which concerns

35persons faces images for each one has taken three or four faces images. The success rate of proposed algorithm for all 126 faces is 91.27% .

Also, the algorithm succeeds to identify the variety of light intensity and change hair style as shown in Figure-6-.



Figure-6-Images with change hair style and illumination.



Figure-7-Sample of faces failed to identification.

6. Conclusion

Face recognition is a both challenging and important recognition technique .Among all biometric techniques, face recognition approach possesses one great advantage. The paper proposed a method to transform the black and white image to one-dimension vector by using canny mask. The histogram of pixels positions are made from One-dimension vectors, which can use later to identification between two faces. The algorithm is tested over 35 persons (160 images) with a small

angle left and right rotation of face, change illumination and hair style. The success identification rate is 91.27.5%. The identify rate can be increased by using statistics and moments of data.

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References

1. H. Gu, G. Su and C. Du, "Feature Points Extraction from Faces", Image and vision computing NZ, November 2003.
2. S.H. Lin, "An Introduction to Face Recognition Technology", Informing Science Special Issue on Multimedia Informing Technologies-Part 2, Vol. 3, No1, 2000.
3. K. W. Wong, K. M. Lam, W.C. Siu, "An efficient algorithm for human face detection and facial feature extraction under different conditions", Pattern recognition 34, 2001.
4. S. E. El-Khamy, O. A. Abdel-Alim and M. M. Saii, "Neural Network Face Recognition Using Statistical feature Extraction. Seventeen International radio science conference, Minufiya University, Egypt. Feb 22-24, 2000.
5. The ORL database is available free of charge, see <http://www.cam-ori.co.uk/facebase.html>.
6. K. A. Ghaffary, F. Akhlaghian Tab and H. Danyali, "Profile-based Face Recognition using the Outline Curve of the Profile Silhouette". IJCA special issue on :Artificial Intelligence Techniques-Novel Approaches & Practical Applications". AIT, 2011.
7. X. Jia, M. S. Nixon, "Analyzing front view face profiles for face recognition via the Walsh transform", Pattern Recognition Letters 15, P(551-558), 1994.
8. R. C. Gonzalez, Digital Image Processing, Third edition, Wesley publishing company, Reading MA, 1997.
9. K. Peng, L. Chen, Su Ruan, Georgy Kukharev, "A Robust Algorithm for Eye Detection on Gray Intensity Face without Spectacles, JCS & T Vol.5 No.3, P(128-132), October 2005.
10. Hassan, M.I. Osman, and M. Yakhia, "Walsh-Hadamard Transform for Facial Feature Extraction in Face Recognition", World Academy of Science, Engineering and Technology, Vol.23, P194, 2007.
11. R.C. Gonzalez, R. E Woods, Eddins, "Digital image processing using Matlab", Pearson Education, first printed edition.

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