Pak. J. Biotechnol. Vol. 13 (special issue on Innovations in information Embedded and Communication Systems) Pp. 155 - 159 (2016)

DEVELOPMENT OF FACE RECOGNITION USING THE FEATURES OF LIP

S.Nirai Selvi1, M.Carmel Sobia2 and K. Shankar3

Department of Electronics and Instrumentation Engineering,, National Engineering College,National Engineering College, Kovilpatti, Tamilnadu

ABSTRACT

At present Lip is used as an identifier from person to person. The unique parameters are experimented to differentiate individuals and their uniqueness is also verified. The main advantages in the bio-metric system based on lip recognition are data acquisition and handlings remain simple. Herethe first stage of work face detection is donebyViola and Jone's algorithm. Face detection used for capturing the features of the lips four various mouth corners are detected through the proposed system. These detected four points are used for further recognition purpose. In the proposed system, is done by FBF (fast box filtering) used to generate a noise-free source with high processing efficiency. In this work Cohn–Kanade database and Indian face data base of neutral expression have been used for lip identification.

*Keywords:*Bio-metric, Face Detection, *Lip*cornerdetection, Lip recognition.

I INTRODUCTION

Several measurements and signals have been proposed and investigated for use in biometric recognition systems.A biometric can be based on each a person's physical or behavioral characteristics the most trendy measurements are fingerprint, face and voice. Both of these biometric traits have their own pros and cons with respect to accuracy and operation. Among these features, face recognition is able to work at a greater distance between the forthcoming users and the camera than other types of features so far; one critical issue of the face recognition system is that the system cannot work well if the goal face is partially covered. Thus, considering a smaller part of a face for further recognition can be anhelpful way to solve this problem [1].

Lip is the physical sensory organ constituting the visible portion of the mouth. Since the lip data can be capture at a distance, it represents a passive biometric as it requires no active user membership. The challenge of using the lip as a biometric mendacity in the area of uniqueness and circumvention. The use of the lip region as a means of human identification was first planned through the concept of lip-prints. In fact it is a difficult issue. Here an algorithm is planned to extract features from the can be designed for recognition of persons by use support vector machine [2].

The process of scanning and similar can occur through confirmation or classification. In verification a one-to-one match takes place in which the user must state an identity, and the biometric is then scanned and checked against the database. In identification, a user is not obligated to say an identity; instead, the biometric is scanned and then coordinated against the entire template in the database. If a equivalent is found, the person has been "recognized.".Early face-detection algorithms listening carefully on the detection of frontal human faces, whereas newer algorithms attempt to solve the more general and complicated problem of multi-view face detection. That is, the detection of faces those are either rotated along the axis from the face to the spectator or rotated along the vertical or left-right axis or both. The newer algorithms take into account variation in the image or video by factor such as face appearance, lighting, and pose.This method is not efficient.

The proposed method is developed to overcome the limitation of previous paper. Viola and jone's algorithm [3] is the best known and most trendy feature extraction and this feature has been used in this paper. It is capable of processing images very quickly. This technique uses a new image representation known as integral image and by using this features can be calculated simply. Then the professional classification is done by Adaboost learning algorithm.

The rest of the paper can be planned as follows in section II; we discuss the preprocessing steps of the proposed approach. Section III mainly focus on the description of mouth corner detection, and in section IV deals with the lip recognition, section v presents the experimental results will be described in detail to demonstrate the effectiveness of the proposed approach. At last the section VI, presents our conclusion.

II METHODOLOGY

Nowadays, many biometrics systems are present. Each of the biometrics has its own advantages and disadvantages. An overall diagram for the proposed method is given in figure1.

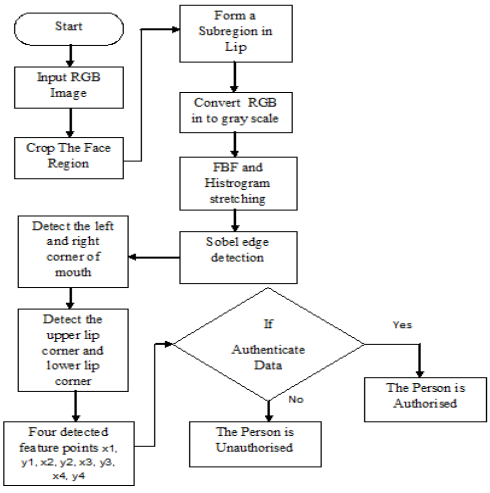

Figure 1. Flowchartfor Proposed Method

Processing stage include Face detection, Fast Box Filtering& Histogram Stretching [5] to find mouth corner points. The images are refined from Cohn–Kanade database of netural expresion which contains several face images. Selected face images are taken for the lip extraction purpose. The detailed explanation of the flowchart is given as below.

STEP 1: RGB IMAGE

Input is RGB image. In color image processing, there are various color models in use today. In the RGB model, images are represented by three components, one for each primary color – red, green and blue.The input image can be seen in figure 2.

Figure 2. Input Image

STEP 2: CROPPING OF FACE REGION

The RGB facial image is cropped based on the two eyes location. For automatic cropping Viola Jones algorithm is used. This uses vision, cascade Object Detector [3] detect object for cropping purpose. It uses Bounding box for cropping the face portion of the person for further processing. The Bounding Box can be seen in yellow line colored box as shown in figure 3.

Figure 3. Bounding Box for cropping the image

STEP 3: FORM A SUBREGION IN LIP

For further refining the possible region of the lips, a subregion [4] is roughly extracted by the following estimation:

(1) $(i_2, j_2) = (i_0, j_0 + 0.25 \times M)$

(2) $(i_3, j_3) = (i_1 - N \times 0.6, j_1 - M \times 0.25)$

Where (i0, j0) and (i1, j1) denote the origin and the top-right position of the face's bounding box of size M×N; positions (i2, j2) and (i3, j3) denote the origin and the top-right position of the estimated lip region of size W×L. It uses nBounding box for cropping the lip portion of the person for further processing. The nBounding Box can be seen in pink line colored box as shown in figure 4.

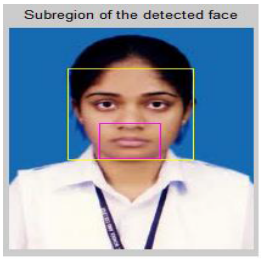

Figure 4. n Bounding Box for cropping lip

STEP 4: CONVERT RGB IN TO GRAY SCALE

In order to extract gray level features from color information, the proposed method utilized the RGB OR GRAY image. The subregion of lip image is checked for RGB to Gray. If the images is in RGB form it is converted to Gray image .The converted RGB Image of Subregion Lip in to Gray can be seen in figure 5.

Figure 5. RGB image of subregion lip in to grayscale image

STEP 5: FBF AND HISTROGRAM STRETCHING

For easing the influences from the camera noise and various lighting changes, and achieving a lower computation complexity simultaneously, the proposed fast box filtering (FBF) and the well-known histogram stretching [5] method are used to obtain a contrast enhanced and smoothed result.Fast Box Filtering is to obtain an integral image which gives the summation of the gray scale values in the lip region. It is used to generate a noise free source with high processing efficiency. Histogram stretching means the histogram equalisation. Histogram stretching indicates the extension of gray scale values. The above steps are included in the pre-processing steps. Next step will be the mouth corner detection. FBF [4] method is to obtain an integral image as derived by (3)

$$r(i,j) = (g(i,j) + g(i,j+1) + g(i+1,j) + g(i+1,j+1)) \div 4$$

Wherer (i, j) and g (i, j) denote the integral value and the original grayscale value, respectively. The Fast Box Filter Image and Histogram Stretched Image can be seen in figure 6.

Figure 6. Fast Box Filtered ImageHistogram Stretched Image

STEP 6: SOBEL EDGE DETECTION

The Sobel operator, sometimes called the Sobel-Feldman operator or Sobel filter, is used in

image processing and computer vision, particularly within edge detection algorithms [4] where it creates an image emphasising edges. The Sobel Operator Image can be seen in figure 7.

Figure 7. Sobel Edge Detection

STEP 7: DETECT THE LEFT AND RIGHT CORNER OF MOUTH

The unwanted pixel can be removed before finding the mouth corner. The Unwanted Pixel Image can be seen in figure 8.Scanning each row of imager_ed of sizeed_sobel , the isolate edge points (no neighbours at its left and right sides) are removed. Afterward, for each row, calculating the distance (in pixel) between the left- and rightmost and the amount of the remainingr_ed (i, j) between them, the left- and right most r_ed (i, j) are labeled when the maximum distance and its amount is also higher than one third of its distance. In an ideal condition, the two labeled locations are very close to the exact left and right mouth corners [4].

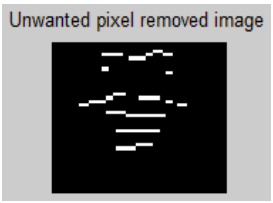

Figure 8. Unwanted Pixel Removed Image

STEP 8: DETECT THE UPPER LIP CORNER AND LOWER LIP CORNER

The upper lip corner has a strong variation around the philtrum and the upper lip boundary. Here the upper lip pixels are searching within a line region of one pixel width. These lines will be perpendicular to the distance between the left and right mouth corner [5]. The difference between the upper points should have a positive difference and smaller than an adjustable threshold. The upper gray scale point will also higher than the thresholdcalculated by isodata. The same concept is used for lower lip corner. Using this code the corner values can be calculated.

For an authentication purpose a set of data can be given and it will be checked with the input data if it matched with the result is authorized otherwise unauthorized. The person is authorized image and unauthorized image can be seen in figure 9.

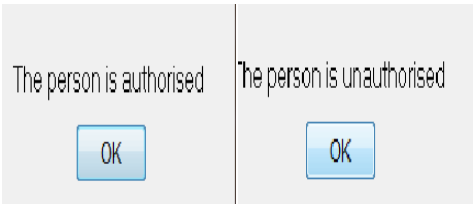

Figure 9. Authorized ImageUnauthorized Image

IIIEXPERIMENTAL RESULTS

In this paper we have used FBF & Histogram Stretching using Cohn–Kanade and Indian face database consider frontal view of facial images.The face iscropped into 251×603 pixels. We have used 19Cohn–Kanade data base and 121Indian face data base images totally 140 images.

The algorithm is developed based on proposed methodology and it is applied using the images representing each of the neutral expression used for testing the algorithm.The figure 10 shows the input image in the form of RGB image. The set of the input images considered for facial neutral expression.

Figure 10. Sample Results of Neutral Expression for Different Persons

The figure 11 shows the detected face and then cropping it based on two eye location. For face detection, Viola-Jones algorithm(3) is being used. Yellow rectangle box known Bounding Box is used to show the face portion being extracted. The original size of image is 480 × 720. After face detection of the lip can be cropped in pink rectangle nBounding Box size is used to show the lip portion being extracted. The size of lip portion is 130 × 163.The size of face and lip portion may vary based on the images.

Figure 11. Faces and Lip Detection

After lip detection FBF (5) and HISTOGRAM STRETCHING (5) is done for pre-processing.The figure 12 shows the Sobel edge detector is used for finding the left, right, upper corner and lower corner feature values.

Figure 12. Sobel Edge Detection

The extracted Features of lip corner are made in tabulation for effectively distinguishing the authentic-cation of person. The figure 13(a) , (b) shows the X1, Y1 - shows the left corner values of lip. X2, Y2 - shows the right corner values of lip. X3, Y3 - shows the upper corner values of lip. X4, Y4 -shows the lower corner values of lip. Here X, Y gives the Colum and row values of the lip detection area. The table I shows the values of featurepoints of authorised data. The table II shows the values of featurepoints ofunauthorised data.

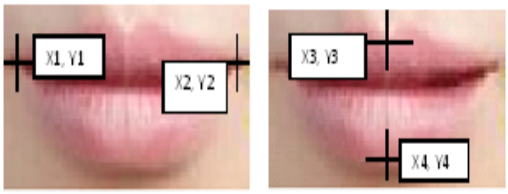

Figure 13. CornerPoints of Lip (a) Left and Right Corner Points of Lip (b) Upper and Lower Corner Points of Lip

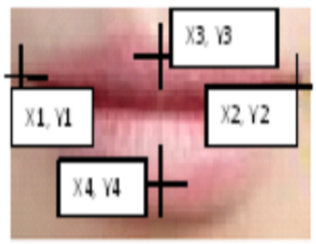

Figure 14. Four Corner Points of Lip

Table I Featurepoints for authorised persons

S.NO	IMAGE	X1	Y1	X2	Y2	X3	Y3	X4	Y4
1		62	33	62	117	59	42	66	42
2		51	44	51	101	48	28.5	55	28.5
3		63	29	63	129	60	50	67	50
4		72	52	72	128	69	38	76	38
5		85	21	85	137	82	58	89	58

TableII FEATUREPOINTS FOR AUTHORISED PERSONS

S.NO	IMAGE	X1	Y1	X2	Y2	X3	Y3	X4	Y4
1		7	19	7	33	4	7	11	7
2		18	9	18	25	15	8	22	8
3		17	11	17	47	14	18	21	18
4		12	16	12	21	9	2.5	16	2.5
5		15	13	15	41	12	14	19	14

$$CAR = \frac{\sum CA}{\sum (CA + FR)}$$

$$CAR = 135 / (135+5)$$

$$= 96.42\%$$

$$FAR = \frac{\sum FA}{\sum (CR + FA)}$$

$$FAR = 5 / (5+135)$$

$$= 3.57\%$$

Where variables CA,FA, CR, and FR denote the numbers of correctly accepted, falsely accepted, correctly rejected, and falsely rejected samples of different subjects. The results demonstrate that, even the number of the subjects is as much as 140, the CAR is still higher than 97.85%, and the FAR is lower than 2.14%. Moreover, the processing efficiency of the whole lip recognition system, including FBF, mouth corner detection and recognition procedure, can achieve the real-time processing requirement.

IV CONCLUSION

This work present a methodology based extracting the features in lips are unique characteristics of an individual. This indicates that the distance between the lines, shape of lip and corner parameter varies from person to person. 1) The proposed FBF provides a faster processing speed than typical BF scheme when a greater filter size is required. 2) The mouth corners detection scheme demands fewer iteration compared with former schemes in the literature, and thus, the overall recognition system can operate in real-time fashion. 3) For authentication and security purpose lip recognition gives fast and better result.

REFERENCES

1. Piotr Dalka and Andrzej Czyzewski, Human-computer interface based on visual lip movement and gesture recognition' International Journal of Computer Science and Applications **7**(3): 124 – 139 (2010).
2. Sangeetha Devi, B. and V.J Arul Karthick, Lip recognition with support vector machine(svm)classifier. International Journal of Advanced Research Trends in Engineering and Technology (IJARTET) **2**(1): 513-519 (2015)
3. Duy Nguyen and David Halupka, Real-Time Face Detection and Lip Feature Extraction Using Field-Programmable Gate Arrays. IEEE transactions on systems, man, and cybernetics **36**(4): 902-912 (2006)
4. Thejaswi. N. S. and Somnath Sengupta, Lip Localization and Viseme Recognition from Video Sequences. Indian Institute of Technology, Kharagpur, Computer Vision(conference) PP. 1-5 (2009).
5. Reshmi M. P. and V. J Arul Karthick, Biometric Identification System using Lips. International Journal of Science and Research **2**(4): 3-4-307 (2013
6. Jyoti Malik and Dhiraj Girdhar, Reference Threshold Calculation for Biometric Authentication. I. J. Image, Graphics and Signal Processing **2**: 46-53 (2014).
7. Paulviola, Michael J. Jones, Robust Real-Time Face Detection' International Journal of Computer Vision **11**: 137–154. (2004)
8. Sunil Sangve and Nilakshi Mule, Lip Recognition for Authentication and Security. IOSR Journal of Computer Engineering . **16**(3): 156-158 (2014)
9. Sasikumar Gurumurthy and B.K.Tripathy, Design and implementtation of face recognition system in matlab using the features of lips. International Journal of. Intelligent Systems and Applications **8**: 30-36 (2012).
10. Samir K. Bandyopadhyay, .Lip contour detection techniques based on front view of face. Journal of Global Research in Computer Science **2**(5):.43-46 (2012)
11. Shrivakshan G. T., A comparison of various edge detection techniques used in imageprocessing. IJCSI International Journal of Computer Science 9(5): 269 - 276 (20912)
12. Yun-Fu Liu, Chao-Yu Lin and Jing-Ming Guo, Impact of the Lips for Biometrics. IEEE transactions on image processing **21** (6): 3092 -3101 (2012)