SCITECH
RESEARCH ORGANISATION|
Volume 5, Issue 2
January 16, 2016
Journal of Information Sciences and Computing Technologies
www.scitecresearch.com/journals

An Enhanced Technique for Face Recognition and Retrieval with Feature Extraction Using Euclidean Distance Classifier

Dr.S.Prasath
Assistant Professor, Department of Computer Science,
Erode Arts and Science College (Autonomous), Erode, Tamil Nadu, India.
softprasaths@gmail.com

Abstract

Today, image processing enters into various fields, but still it is struggling in recognition issues. Face detection and recognition developed into a very active research area specializing on how to extract and recognize faces within images. Face recognition and retrieval is a widely used biometric application for security and identification concern. The various methods have been proposed for face recognition and each method has advantages and drawbacks. The complexity in process and other issues affects performance of existing system makes insufficient. In this paper presents face recognition and retrieval with geometrical feature vector to calculate the threshold value separately and stored in feature database. The feature is generated and matching is done by Euclidean distance classifier is used to measures a distance between two images. The experimental result shows that block truncation coding method provides better recognition rate when compared with the existing methods such as Local Binary Pattern, Multi-Block Local Binary Pattern Method.

Keywords: LBP; MBLBP; BTC; Biometric; Chi-square Distance; Manhattan Distance; Euclidean Distance.

1. Introduction

In the era a rapid increase inside the discipline of records technology however the safety system becomes stricken by various problems. These days, intruders were entered into the sphere of records generation called cyber crime. Lot of safety systems has emerged to resolve the diverse protection troubles together with password, username, secret codes, however all are failed due to cyber attacks. In order to overcome such safety troubles the biometric machine has been advised with various capabilities including face popularity, fingerprints reputation, gait, palm print, voice, signatures etc.

Every human being can identify a faces in a scene without an effort, with an automatic device such targets are the very difficult one due to various factors which impacts the first-rate of the picture. As a result, face popularity device has been used to verify the identity of an individual. It may be completed by way of matching procedure using diverse techniques and features such as geometric, statistical, low-stage capabilities which are derived from face images.

2. Related Work

BTC [1] proposed approach for image classification strategies with diverse shade areas. Average color areas had been explored which incorporates RGB coloration space for making use of BTC to the feature vector in content material based image type strategies. The common success fee of sophistication dedication for every of the shade areas has been computed.

Young H. Kwon et al. [2] presented visualized classification from facial photos and the number one capabilities of the face are computed the usage of ratios to pick out young adults, and many others. The secondary function evaluation the wrinkle index computation is used to differentiate seniors from teens and babies.

The multiresolution approach [3] are gray-scale and rotation invariant texture classification based on local binary patterns and nonparametric discrimination of sample and prototype distributions. The method is based on recognizing that certain local binary patterns, termed uniform.

An efficient method [4] for a Multi-scale Block local Binary pattern (MB-LBP) is primarily based operator for robust picture illustration. The local Binary pattern (LBP) has been proved to be effective for picture illustration, but it's far too local to be sturdy. The Multi-scale Block nearby Binary styles (MB-LBP) uses sub-location common grey-values for contrast rather than unmarried pixels.

3. Methodology

The image processing includes several image-processing techniques such as filtering, feature extraction and classification of image.

3.1 Local Binary Pattern (LBP)

Texture is a term that characterizes the contextual belongings of an image. A texture descriptor can symbolize an image as an entire as an alternative it is able to additionally signify a image regionally on the micro degree and via worldwide texture description at the macro level. LBP method is used to label each pixel in the photo by thresholding the 8 associates of the pixel with the center pixel cost. If a neighbor pixel price is much less than the edge then a cost of zero is assigned in any other case it's 1.

3.2 Multi Block Local Binary Pattern (MBLBP)

Multi Block Local Binary Pattern is used to obtain texture pattern for every pixel by considering a local region of size 3 × 3, 9 × 9, 15 × 15 etc. with center pixel. Computation of MBLBP for 3 × 3 local region is equivalent to the original LBP. Nearby place of other sizes may be decomposed into equally sized areas. Consequently, the average sum of pixel depth for each sub regions is calculated that's then threshold with the center vicinity common price. MBLBP values are computed in a similar manner as in LBP.

3.3 Block Truncation Coding (BTC)

Block truncation coding (BTC) became first evolved in 1979 for grayscale image coding. This method first divides the image into small non overlapping image blocks. The small blocks are coded separately. For each block, the original pixels inside the block are coded the usage of a binary bit-map the same length as the original block and two imply pixel values. The approach first computes the suggest pixel value of the whole block after which each pixel in that block is in comparison to the block mean. If a pixel is greater than or identical to the block mean, the corresponding pixel role of the bitmap may have a fee of one in any other case it will have a value of 0.

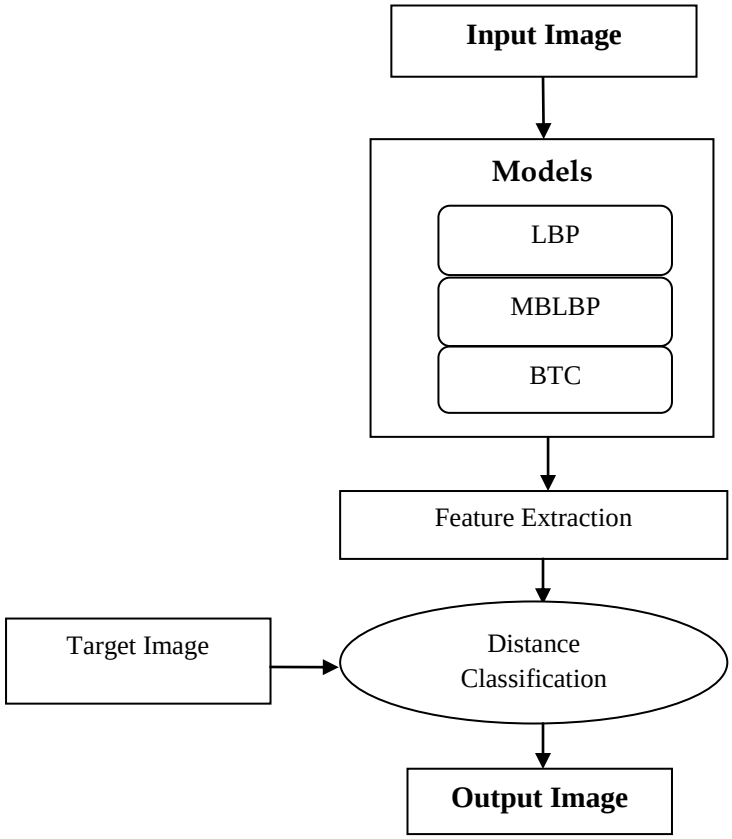
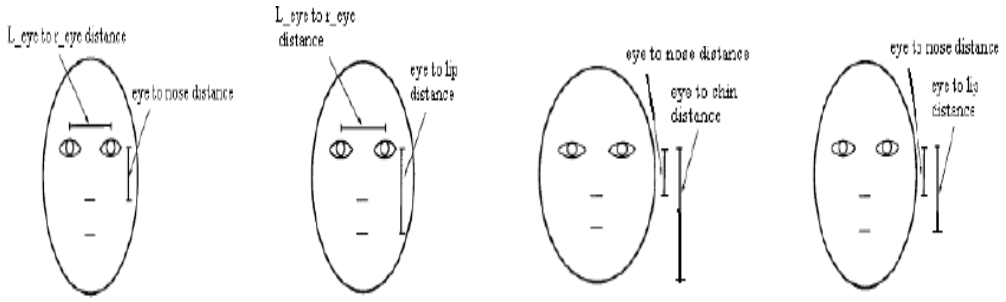


Fig.1 Face recognition process flow

4. Feature Extraction

The facial features are located to compute the feature sets for classification. Here four feature sets are calculated for geometrical facial feature extraction. The figure 2, a to d gives the feature set of left eye to right eye distance, eye to nose distance, eye to lip distance and eye to chin distance for feature extraction.



(a) Feature Set 1 **(b) Feature Set 2** **(c) Feature Set 3** **(d) Feature Set 4**

Fig.2 Feature Sets Computation

The feature set of the face is rotated in depth and measure needs to be adopted to compensate for rotation, before the feature sets are computed. Feature set 1, Feature set 2, Feature set 3 and Feature set 4 is computed.

$$\text{Feature set 1} = \frac{\text{Left eye to right eye distance}}{\text{eye to nose distance}} \quad \text{-- > (4.1)}$$

$$\text{Feature set 2} = \frac{\text{Left eye to right eye distance}}{\text{eye to lip distance}} \quad \text{-- > (4.2)}$$

$$\text{Feature set 3} = \frac{\text{eye to nose distance}}{\text{eye to chin distance}} \quad \text{-- > (4.3)}$$

$$\text{Feature set 4} = \frac{\text{eye to nose distance}}{\text{eye to lip distance}} \quad \text{-- > (4.4)}$$

5. Algorithm

The process of the face images takes place in two phases and defined as algorithm I and II. The entire retrieval procedure with the proposed model is presented as simple algorithms hereunder using MATLAB7.0. In the algorithm-I, procedure to establish feature set is established for each of the images. In algorithm-II, the image retrieval procedure that retrieves top 'm' images from the IDB corresponding to the target image is presented.

Algorithm I

// generating feature sets //

Input: Input image of size (M x N) from IDB.

Output: Feature database.

Begin

Step 1: Read an image (Ii) from the image database (IDB) of size (M x N).

Step 2: Partitioning the input image into k non-overlapped blocks, each of size (n x n).

Step 3: Perform procedure threshold_feature ( )

Step 4: Repeat Step 2 to through step 3 for all blocks of the input image.

Step5: Generate feature set Fs={Fs1,Fs2,Fs3,Fs4} as mentioned in equation 4.1

to equation 4.4.

Step 6: Store the feature set into the feature database

Step 7: Repeat Step 1 through Step 6 for all the images in IDB.

End

Algorithm II

//Retrieving top m relevant images corresponding to the target image //

Input : Target Image (Ti) of size (M x N) and images from IDB

Output : List the top m relevant images corresponding to the target image.

Begin

Step 1: Read the Target image (Ti).

Step 2: Partitioning the Target image by k non-overlapped blocks of size (n × n)

*Step 3: Perform **procedure threshold_feature ( )***

Step 4: Repeat Step 2 through Step 3 for all blocks of the target image.

Step 5: Generate feature set Fs= {Fs1, Fs2, Fs3, Fs4} as mentioned in equation 4.1 to equation 4.4.

Step 6: Retrieve the top m relevant images from the image database.

End

Procedure threshold _ feature ( )

{

Step 1: input M, N //size of input image

Step 2: Read the image with even row and column

Step 3: Convert gray scale values into matrix format.

Step 4: Apply sorting method for an array by using step 3.

Step 5: Find out the middle gray scale values of lower range and upper range.

Step 6: Find out the average value of middle gray scale values and take whole number in sorted array and also known as threshold value.

Step 7: Convert binary matrix by using threshold value.

Step 8: Repeat step 3 to step 7 for all images in the database.

Step 9 : Return

}

6. Experimentation and Results

The proposed feature extraction is experimented with the images collected from the standard face database ORL DB (http://www.uk.research.att.com). The image of each size is considered for this experiment and of the original image has segmented to generate features sets. Some of the sample images considered in the experimental is presented in the Fig.3. The experimentation is carried out by MATLAB7.0. It stands for MATrix LABoratory. MATLAB® is a high-performance language for technical computing.

101_1 **102_1** **103_2**

Fig.3 Sample Images considered for experimentation

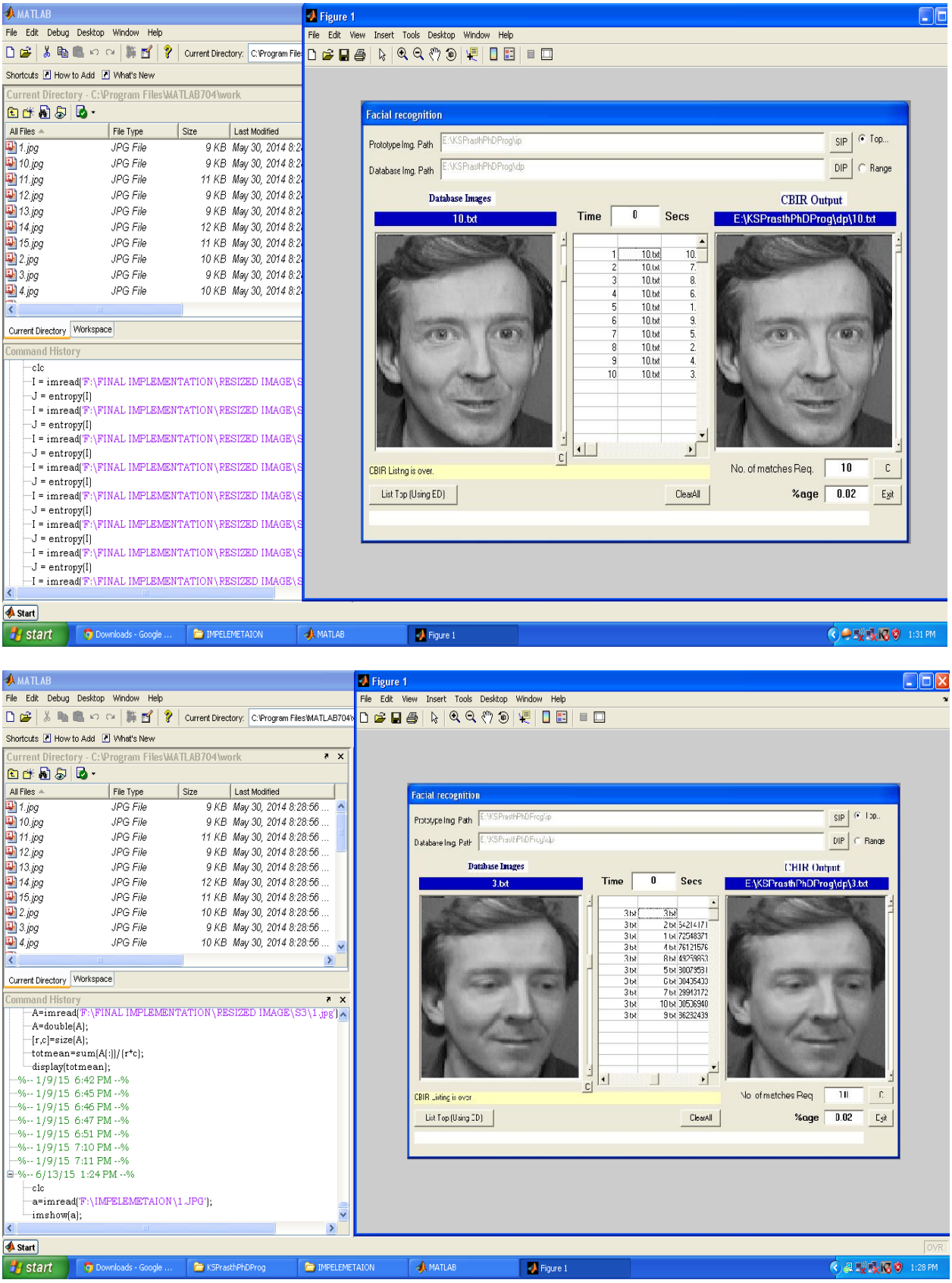


Fig.4 Retrieval results obtained for Proposed Model

From the above Fig.4 shows the experimental results of the proposed model. The image 103_2 is considered for the matching and it gets match with the 10 same face images and 1 face image with different face image has been matched. Similarly, in case of retrieval the same input image gets matched with image set of same face image and the considered input image is ranked in top 1 and the relevant images of the same face images are listed in top 10 among the top 8.

6.1 Euclidean Distance

The Euclidean Distance $d_E(x_1, x_2)$ is calculated as below

$$d_E(x_1, x_2) = \sqrt{\sum_{i=1}^{i=n} \left(x_1(i) - x_2(i)\right)^2} \quad \text{-- > (6.1)}$$

Where x1(i) is the feature vector of input image i, and x2(i) is the feature vector of the target image i in the image database.

6.2 Manhattan Distance

It is a distance between two points measured along axes at right angles. It is also known as rectilinear distance or city block distance. It requires less computation than many other distance metrics. The Manhattan distance $d_m(x_1, x_2)$ is calculated as below

$$d_m(x_1, x_2) = \sum_{i=1}^{i=n} \left[x_1(i) - x_2(i) \right] \quad \text{-- > (6.2)}$$

6.3 Chi-square Distance

Chi-square is a statistical test used to compare expected data with the collected data. There is a large difference between collected numbers and expected numbers. Statistically significant means the difference in the results did not occur by random chance.

$$x^2\ (I,T) = \sum \frac{(I_i - T_i)^2}{(I_i + T_i)^2} \quad \text{-- > (6.3)}$$

From the below Table.1 shows that recognition percentage of face images BTC gives the experimental results the BTC produces higher recognition accuracy of 87.25% for face recognition. The performance was evaluated using the chi-square classification by analysis of the values in the table the block truncation coding method is better for recognition of face images.

Table.1 Comparison Values

Methods	Chi-Square Distance	Manhattan Distance	Euclidean Distance
LBP	73.08%	79.67%	82.29%
MBLBP	76.15%	65.90%	80.53%
BTC	75.83%	77.41%	87.25%

From the below figure shows the pictorial representation of the performance evaluated. By analysing the obtained results the BTC method produced the best results.

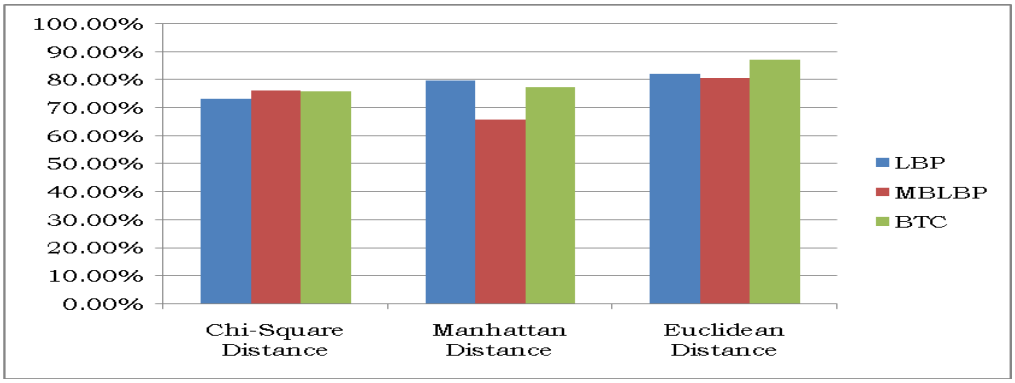


Fig. 4 Performance Evaluation

7. Conclusion

In this paper, the face recognition and distance based retrieval with geometrical feature extraction images based on LBP, MBLBP and BTC models has been presented. The experimental result proves the effectiveness of the BTC methods provides good recognition rate and Euclidean distance gives better for retrieval of face images when compared to existing methods. The performances of BTC method when compared to existing methods such as Local Binary Pattern and Multi-block Local Binary Pattern methods are investigated independently. The Block Truncation Coding method produces better results with 87.25% accuracy compared with existing methods Local Binary Pattern and Multi-block Local Binary Pattern. Moreover, the computational cost of the algorithm is very low also used for face recognition and retrieval.

References

[1] H.B.Kekre, Sudeep D. Thepade, Shrikant P. Sanas Improved CBIR using Multileveled Block Truncation Coding International Journal on Computer Science and Engineering Vol. 02, No. 08, 2010, 2535-2544.

[2] Young H. Kwon and Niels Da Vitoria Lobo, "Age Classification from Facial Images," Journal of Computer Vision and Image Understanding, vol. 74, no. 1, pp. 1-21, April 1999.

[3] T. Ojala, M. Pietikainen and T. Maenpaa, "Multiresolution gray-scale and rotation invariant texture classification with local binary patterns", IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 24, No. 7, pp. 971 – 987, 2002.

[4] Shengcai Liao, Xiangxin Zhu, Zhen Lei, Lun Zhang and Stan Z. Li., "Learning Multi-scale Block Local Binary Patterns for Face Recognition", Proceedings of International Conference ICB, Advances in Biometrics, Lecture Notes in Computer Science, Vol. 4642, pp. 828 – 837, 2007.

[5] T. Ojala, M. Pietikainen and D. Harwood, "A comparative study of Texture Measures with Classification based on Featured Distribution", Pattern Recognition, Vol. 29, No. 1, pp. 51 - 59, 1996.

[6] Rafael C. Gonzalez and Richard Eugene Woods "Digital Image Processing", 3rd edition, Prentice Hall, Upper Saddle River, NJ, 2008. ISBN 0-13-168728-X. pp. 407–413.

Author' Biography

Dr.S.Prasath is currently working as Assistant Professor at Department of Computer Science, Erode Arts & Science College (Autonomous), Erode, Tamilnadu, India. He has obtained his Masters degree in Software Engineering from M.Kumarasamy college of Engineering, Karur under Anna University, Chennai and M.Phil degree in Computer Science and he obtained Doctorate in Computer Science from Erode Arts & Science College (Autonomous), Erode under Bharathiar University, Coimbatore. His area of interests includes, Image Processing and Data Mining. He has presented 6 papers in National and 2 International level conferences. He has published 12 papers in International journals.