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Feature Detection Using Dimensionality Reduction

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Abstract:
Extracting feature parts is one important central part of face detection. This paper deals with extraction of features of face such as eye, nose, lips using principal component analysis (PCA).PCA is one kind of dimensionality reduction technique for transforming the data into components of two dimensional space. The images are cropped from the actual size.

Key words: Face extraction, Biometric, risk, transform

I Introduction:

Passwords and pins are one way of secure mechanism used with a combination of numbers, symbols and alphabets. [1]To maintain a secure mechanism advantageous to change frequently the password. Biometric authentication require unique authentication for every person. The physiological characteristic are finger print, facial recognition, hand geometry, iris recognition, retina scan, hand scan. These physiological biometric uses information. The acquired information has to be compared and correctly stored as templates. Then enrollment and verification of the acquired information happens. Biometric is a kind of pattern recognition technologies which uses personal identification of a human and determines the authenticity. Face recognition is a grand challenge. Face Recognition is obtained by unsupervised methods.

Biometric is advantageous over other methods in the following ways:

i) No risk of being used by anyone
ii) Can't be stolen or lost
iii) Can't be forgotten
iv) Can't be copied

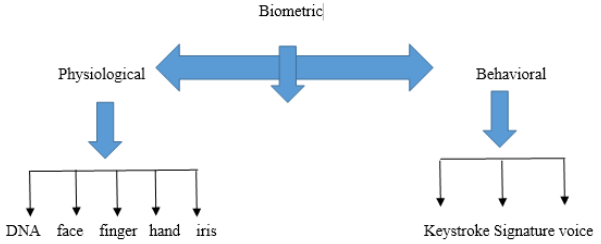

Fig 1 Hierarchy of various application of biometric

Based on surveillance sequences it's important to identify high quality images and to provide information on the same. Feature points are extracted from the images and a correspondence between two images is present. This paper deals with extracting face features with a subject of attempting to locate the position of significant facial features of eyes, lips, nose etc. The methodology performed is edge detection, detecting horizontal & vertical projection. In most cases, the empirical nature is that eyes produce the importance of edges within a face image.

The advantage of this paper is that the computation is intensively low and feasible. To identify automatically a person from digital image face recognition is mostly under research for several years in computer vision and pattern recognition.

II DIMENSIONALITY REDUCTION USING PCA

A numerical procedure is performed, to calculate the expression of the face. From a training set of R images the following is obtained. [7]

Let R= $[r_1, r2, r3 \ldots r_n] = [r^1\ r^2 \ldots r^n]$ be a matrix.

Each column r_i is a data sample.

Where n is the number of training images.

Principal component analysis comprises a numerical procedure involving a difference and similarity, thus identity pattern is taken as the input. Comparing of facial images is made by calculating the Euclidean distance between these feature vectors [1]. An image can be projected linear and non-linearly. Mathematically, PCA is a linear transformation. Transform the data into a two dimensional system by orthoginality.PCA makes use of Eigen faces and eigenvectors.Initally same size image must be taken and normalized to size within a scope decomposing the facial structures into orthogonally not correlated components of Eigen values[2][3].

It is based on input image & the dimensions of the feature space. In order to reduce the dimensionality PCA are used.

a. Demonstration of the proposed method:

PCA: An image can be projected linear and non-linear. In mathematics, PCA is a linear transformation, orthogonally transforming the data into a two dimensional system.PCA makes use of Eigen faces and Eigen vectors.Initally same size image was taken and normalized to size within a scope orthogonally not correlated components of Eigen faces.

It is based on input image and the dimensions of the feature space. In order to reduce the dimensionality PCA were used.

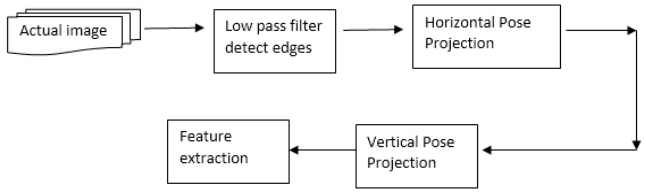

Fig2: Image Extraction overview

Applying filtering mechanism, on the frequency domain $f(x_1, y_1)$.
$f(x_1, y_1)$ $g(x_1, y_1)$ $F(jw_1, jw_2)$ $G(jw_1, jw_2)$

For a given set, large number of face feature vectors is computed. For an individual face image individual features are obtained.

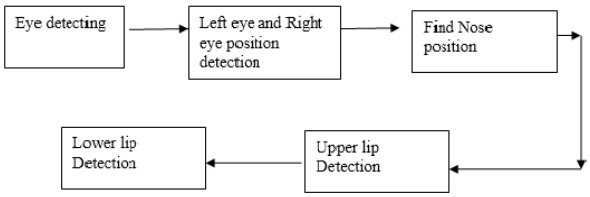

Fig3 Feature Detection Mechanism

Low pass filtering is applied to detect the eye position where left eye position and right eye position were obtained.[11] We focus on eye pixels and use histograms to calculate the formation of left eye pixel region and the right eye pixel region. The eye pixel is darker compared to skin color of facial region.[13]
For an face image the histogram is given by $s(y) = 1/w\varepsilon$ Eye(x, y)
W being the face width
The normality is given by the probability.
Probability (Eye(x, y)) = mid (face(x, y)) is max

b. Feature Extraction:
Over a plane consisting xy co-ordinate we define the faces and the facial features. Shape characters are traced detecting the salient points [3][14].
Images are loaded to the training set from AR database, MIT database, Yale face Database, FEI database
Training set is given by
$X = [x_1, x_2 \ldots x_n]$
and the components Y
$Y = [y_1, y_2 \ldots y_m]$
Locate eye area, detect the center points, we attempt to calculate the transformation matrix, T.
Size of T = DXd to map
$y_i = ZT_{xi, yi}$ and $R^{d,}$

Such that y_i, easier to be distinguished in image space. Then local structure is calculated with k nearest neighbors.
The linearity matrix L is defined by
$L_{i,, j} = \{1$, ixj
0, otherwise
The neighboring point's xi and x_j are mapped in local. Therefore, mapping x_i and x_j are y_i and y_j respectively
$\sum (y_{i,}-y_j)^2 L_{ij}$
The criterion function is feature extraction reasonably. The transformation matrix is obtained containing the Eigen vectors with Eigen values is small portion.[16][17][19]

c. Data base Used:
In order to evaluate the performance four databases are used. The AR database is the standard for evaluating the face recognition, which consists of more than 250 facial images. The AR database is related to gender. The images are of size 250X250 with 8 bit resolution. Images are collected from the internet.
In MIT database there are 160 images which are of 18 different subjects with 20 images per subject. The spatial resolution is of 250X246 with 8 bit resolution grey level. Normalization is done on various subjects. The eye centers are detected, then the image being cropped to 124X124 sizes and hence facial region is extracted. The experiments were performed with MATLAB simulation.

Data base:

Name	Image size	Color Images	No of pictures per person	No of unique people
AR Database	250X250	Yes	28	125;70, Male
MIT Database	250X246	Yes	8	158;84 Male72 Female
Yale face Database	228X246	No	18	20
FEI Database	240X280	Yes	18	200

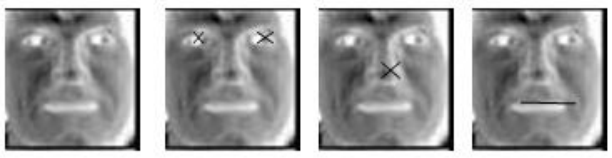

Fig 4: Features of the cropped face from image

III Conclusion:
Features of a facial recognition has come into existence over ten years. For secure transactions and to automate information concerned with identity machines are used. This is incorporated for surveillance attacks and security purpose involving in buildings. The focus is to incorporate both the features of various images and actual topological structure of the data. It is simple and efficient to reduce the memory as

this adopts a dimensionality reduction technique using principal component analysis.

References:

[1] A user authentication scheme using Physiological and Behavioral Biometrics for Multitouch Devices choring-Shiuh Koong, Tzu-1 yang and Chien-chaoTseng

[2] Facial Expression recognition Techniques, Database & classifiers, "Rupinder saini, Narinder Rana, "International Journal of Advances in Computer Science and Communication Engineering", Vol 2 Issue2, June 2014

[3] Design of face recognition system using Principal Component Analysis, Abin Abraham Oommen, C.senthil sing, M.Mani Kandan IJERT vol-3 special issue01, Mar 2014

[4] Illumination Invariant Face Recognition using discrete Cosine transform and principle component analysis.Shermina.J, "Proceedings of the ICETECT 2011

[5] http://vis-www.cs.umass.edu/lfw

[6] (2D) ²PCA-ICA: A new approach for Face representation and recognition Dongmin Jeong, Minho Lee, Sang-Woo Ban

[7] Thormaz and Giraldi, 2010 A new ranking method for Principal Components Analysis and its Application to face image Analysis, Image and Vision Computing, 28, 908-913

[8] Zhang et al., M.Yang, M., & Fang, X. (2011) sparse representation or collaborative Representation which helps Face recognition? In: IEEE International Conference in computer vision

[9] Robust Recovery of Subspace Structures by Low-Rank Representation Guangcan Liu, Zhouchen Lin, Shuicheng Yan, Ju Sun, Student Member, Yong Yu, Yi Ma

[10] Teja G P, Ravi S (2012) Face recognition using subspaces techniques. Recent Trends in Information Technology (ICRTIT). pp. 103-107.

[11] Prof Ujval Chaudhary, ChakoliMateen Mubarak, Abdul Rehman, Ansari Riyaz, Shaikh Mazhar Face Recognition Using PCA-BPNN Algorithm ijmer Vol.2, Issue.3, May-June 2012 pp-1366-1370 ISSN:2249-6645

[12] Zhou Y, Mayyas A, Mohammed A (2011) Principal Component Analysis-based image fusion routine with application to automotive stamping split detection, Research in Nondestructive Evaluation. pp. 76-91.

[13] Dandpat S K, Meher S (2013) Performance improvement for face recognition using PCA and two-dimensional PCA. International Conference Computer Communication and Informatics (ICCCI), ISBN 978-1-4673-2906-4. pp. 1-5.

[14] Jeemoni Kalita and Karen Das, "Recognition Of Facial Expression Using Eigenvector Based Distributed Features And Euclidean Distance Based Decision Making Technique"; International Journal of Advanced Computer Science and Applications, Vol. 4, No. 2, 2013.

[15] Mahesh Kumbhar, Manasi Patil and Ashish Jadhav, "Facial Expression Recognition using Gabor Wavelet" ; International Journal of Computer Applications (0975-8887) Volume 68-No.23, April 2013.

[16] Ajit P.Gosavi and S.R. Khot, "Facial Expression Recognition uses Principal Component Analysis with Singular Value Decomposition" ; International Journal of Advance Research in Computer Science and Management Studies Volume 1, Issue 6, November 2013.

[17] Xiang Xu, Wanquan Liu, Svetha Venkatesh, "An innovative face image enhancement based on principle component analysis", International Journal of Machine Learning and Cybernetics, December 2012, Volume 3, Issue 4, pp 259-267.

[18] Abhishek Bansal, Kapil Mehta, Sahil Arora, " Face Recognition using Incremental Principal Components Analysis", 2012 Second International Conference on Advanced Computing & Communication Technologies, IEEE, Year of Publication-2012.

[19] Kanokmom Rujirakul, Chakchai So, Banchar Arnonkijpanich, Khamrom Sunat and Sarayut Poolsanguan, "PFP-PCA: Parallel Fixed Point PCA Face Recognition", 2013 4th International Conference on Intelligent Systems, Modelling and Simulation, IEEE, Year of Publication-2013.

[20] Jeemoni Kalita and Karen Das, "Recognition Of Facial Expression Using Eigen Vector Based Distributed Features And Euclidean Distance Based Decision Making Technique"; International Journal of Advanced Computer Science and Applications, Vol. 4, No.2, 2013.

[21] Ajit P.Gosavi and S.R Khot, "Facial Expression Recognition uses Principal Component Analysis with Singular Value Decomposition"; International Journal of Advance Research in Computer Science and Management Studies Volume 1, Issue 6, November 2013