THOMSON REUTERS ENDNOTE

[Sharma*, 5(3): March, 2016] ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

IMPLEMENTATION OF FACE RECOGNITION SYSTEM BASED ON ELASTIC BUNCH GRAPH MATCHING

Himanshu Sharma*, Anand Pawar, Chandhrvardan Chourasia, Sushma Khatri
.

DOI: 10.5281/zenodo.48386

ABSTRACT

The face is regarded as the primary means of identifying the person of a written document based on the implicit assumption that a person's face changes slowly and is very difficult to erase, alter or forge without detection. As face is now a days the primary mechanism both for authentication and authorization in legal transactions, the need for efficient automated solutions for face reorganization has increased. This Project offers algorithm for the offline image reorganization system in which artificial neural network is used to confirm the genuineness of faces. We approach the problem in two steps. Initially a set of face images are obtained from the subject and fed to the system. These face images are preprocessed Then the preprocessed images are used to extract relevant geometric parameters that can identify faces of different persons. These are used to train the system. The mean value of these features is obtained. In the next step the face image to be verified is fed to the system. It is preprocessed to be suitable for extracting features. It is fed to the system and various features are extracted from them. These values are then compared with the mean features that were used to train the system. The distance is calculated and a suitable threshold per user is chosen. Depending on whether the input face image satisfies the threshold condition the system either accepts or rejects the face image. Perform pattern matching with the test data set present in the hidden layer of neural network. Using outcome produced by the output layer of the neural network announces that image is match or not.

KEYWORDS: Face Recognition, cost, security, implementation time.

INTRODUCTION

The aim of this project is the growing need for a face reorganization scheme which can guarantee maximum possible security from fake faces. It ensures that the proposed scheme can provide comparable and if possible better performance than already established offline face reorganization schemes. The prospect of minimizing the memory required for storing the extracted feature points has also been a driving force in the commencement of this project.

This project is aimed to identify a face. Here the technique is we already store some images of the person in our database along with his details and that images are segmented into many slices say eyes, hairs, lips, nose, etc. If any image is matched up to 99% then we identified a particular person. Thus using this project it provides automatically identifying or verifying a person from a digital image. For Reorganization of faces some features needs to be extracted. The extracted features are used to train a neural network using error back propagation training algorithm. Our recognition system exhibited 100% success rate by recognizing correctly all the faces that it was trained for.

HISTORY

Pioneers of automated facial recognition include Woody Bledsoe, Helen Chan Wolf, and Charles Bisson.During 1964 and 1965, Bledsoe, along with Helen Chan and Charles Bisson, worked on using the computer to recognize human faces (Bledsoe 1966a, 1966b; Bledsoe and Chan 1965). He was proud of this work, but because the Funding was provided by an unnamed intelligence agency that did not allow much publicity, little of the work was published. Given a large database of images (in effect, a book of mug shots) and a photograph, the problem was to select from the database a small set of records such that one of the image records matched the photograph.This project was labeled man-machine because the human extracted the coordinates of a set of features from the photographs, which were then used by the computer for recognition. Using a graphics tablet (GRAFACON or RAND TABLET), the operator would extract the coordinates of features such as the center of pupils, the inside corner of eyes, the outside corner of eyes, point of widows peak, and so on. From these coordinates, a list of 20 distances, such as width of mouth and width of eyes, pupil to pupil, were computed. These operators could process about 40 pictures an hour. When building the database, the name of the person in the photograph was associated with the list of computed distances and stored in the computer. In the recognition phase, the set of distances was compared with the corresponding distance for each photograph, yielding a distance between the photograph and the database record. The closest records are returned. Because it is unlikely that any two pictures would match in head rotation, lean, tilt, and scale (distance from the camera), each set of distances is normalized to represent the face in a frontal orientation. To accomplish this normalization, the program first tries to determine the tilt, the lean, and the rotation. Then, using these angles, the computer undoes the effect of these transformations on the computed distances. To compute these angles, the computer must know the three-dimensional geometry of the head. Because the actual heads were unavailable, Bledsoe (1964) used a standard head derived from measurements on seven heads.

PRINCIPAL COMPONENT ANALYSIS (PCA)

PCA, commonly referred to as the use of eigenfaces, is the technique pioneered by Kirby and Sirivich in 1988. With PCA, the probe and gallery images must be the same size and must first be normalized to line up the eyes and mouth of the subjects within the images. The PCA approach is then used to reduce the dimension of the data by means of data compression basics2 and reveals the most effective low dimensional structure of facial patterns. This reduction in dimensions removes information that is not useful and precisely decomposes the face structure into orthogonal (uncorrelated) components known as eigenfaces.

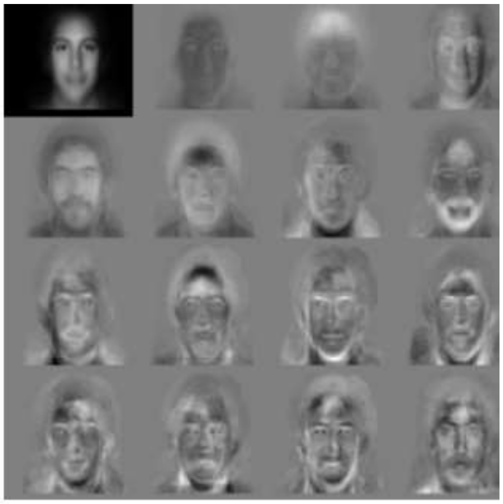


Figure 2.1: Standard eigen face using PCA Algorithm

Each face image may be represented as a weighted sum (feature vector) of the eigenfaces, which are stored in a 1D array. A probe image is compared against a gallery image by measuring the distance between their respective feature vectors. The PCA approach typically requires the full frontal face to be presented each time; otherwise the image results in poor performance.The primary advantage of this technique is that it can reduce the data needed to identify the individual to 1/1000th of the data presented.

LINEAR DISCRIMINENT ANALYSIS (LDA)

It is a statistical approach for classifying samples of unknown classes based on training samples with known classes.

Figure 2.2: Example of Six Classes Using LDA

This technique aims to maximize between-class (i.e., across users) variance and minimize within-class (i.e., within user) variance. In below Figure where each block represents a class, there are large variances between classes, but little variance within classes. When dealing with high dimensional face data, this technique faces the small sample size problem that arises where there are a small number of available training samples compared to the dimensionality of the sample space.This method is called LDA.

ELASTIC BUNCH GRAPH MATCHING (EBGM)

It relies on the concept that real face images have many nonlinear characteristics that are not addressed by the linear analysis methods discussed earlier, such as variations in illumination (outdoor lighting vs. indoor fluorescents), pose (standing straight vs. leaning over) and expression (smile vs. frown). A Gabor wavelet transform creates a dynamic link architecture that projects the face onto an elastic grid.The Gabor jet is a node on the elastic grid, notated by circles on the image below, which describes the image behavior around a given pixel. It is the result of a convolution of the image with a Gabor filter, which is used to detect shapes and to extract features using image processing. [A convolution expresses the amount of overlap from functions, blending the functions together.] Recognition is based on the similarity of the Gabor filter response at each Gabor node.4 This biologically-based method using Gabor filters is a process executed in the visual cortex of higher mammals. The difficulty with this method is the requirement of accurate landmark localization, which can sometimes be achieved by combining PCA and LDA methods.

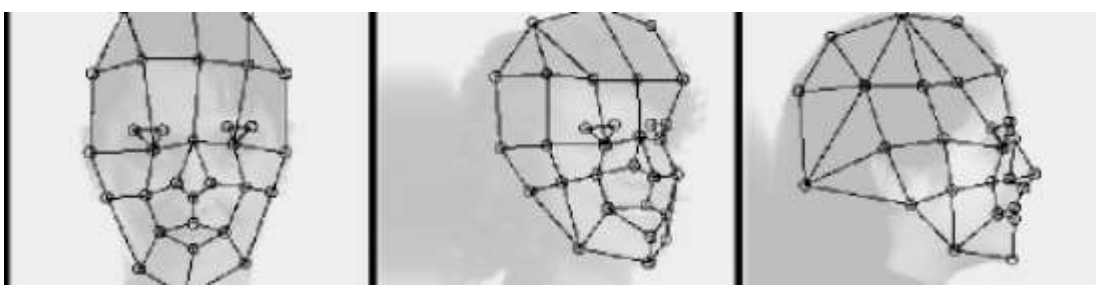


Figure 2.3: Elastic Bunch Graph Matching

PROBLEM DEFINITION

The face is regarded as the primary means of identifying the person of a written document based on the implicit assumption that a person's face changes slowly and is very difficult to erase, alter or forge without detection. As face is now a days the primary mechanism both for authentication and authorization in legal transactions, the need for efficient automated solutions for face recognization has increased. Unlike a password, PIN or key cards identification data that can be forgotten, lost, stolen or shared. The captured values of the face image are unique to an individual and virtually impossible to duplicate. Face recognition and verification involves two separate but strongly related tasks: one of them is identification of the face owner, and the other is the decision about whether the faces is genuine or forged. This project is intended to identify a person using the images previously taken. The identification will be done according the previous images of the same persons by using EBGM algorithm.

PROCESS FLOW OF EXISTING APPLICATIONS

This diagram shows how the whole system works from image acquisition till result whether signature is genuine or counterfeit.

- Input = Face Image
- Acquire image from the database.
- Enhanced the inputted Face image by preprocessing .
- Feature Extraction of various preprocessed image.
- Create a feature vector by combining extracted features from the preprocessed Face image
- Normalized the feature vector.
- Train neural network to test signature.
- Perform pattern matching.
- Output = Confirmation from system whether the face is recognized or not.

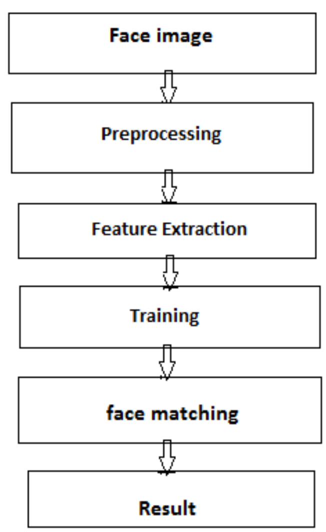


Figure 1.1: Project Flow

LIMITATIONS OF EXISTING APPLICATIONS

- The hardware component which is required for storing image, high RAM for better results and good processor.
- The input face images should be of required Format.

PROPOSED SOLUTION

Solutions depends on several factors which include :

- User acceptance
- Level of security required

[Sharma*, 5(3): March, 2016]
ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

- Accuracy
- Cost and implementation time

Theis Project offers algorithm for the offline image recognization system in which artificial neural network is used to confirm the genuineness of faces.

We approach the problem in two steps. Initially a set of face images are obtained from the subject and fed to the system. These face images are preprocessed Then the preprocessed images are used to extract relevant geometric parameters that can identify faces of different persons. These are used to train the system. The mean value of these features is obtained. In the next step the face image to be verified is fed to the system. It is preprocessed to be suitable for extracting features. It is fed to the system and various features are extracted from them. These values are then compared with the mean features that were used to train the system. The distance is calculated and a suitable threshold per user is chosen. Depending on whether the input face image satisfies the threshold condition the system either accepts or rejects the face image. Perform pattern matching with the test data set present in the hidden layer of neural network . Using outcome produced by the output layer of the neural network announce that image is match or not.

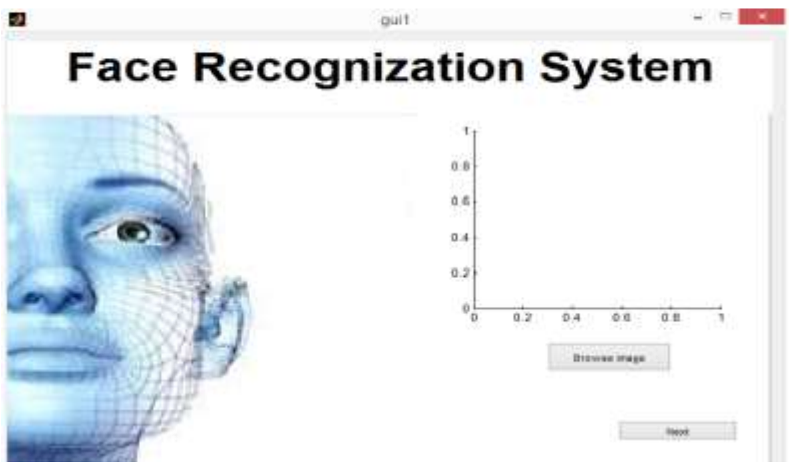
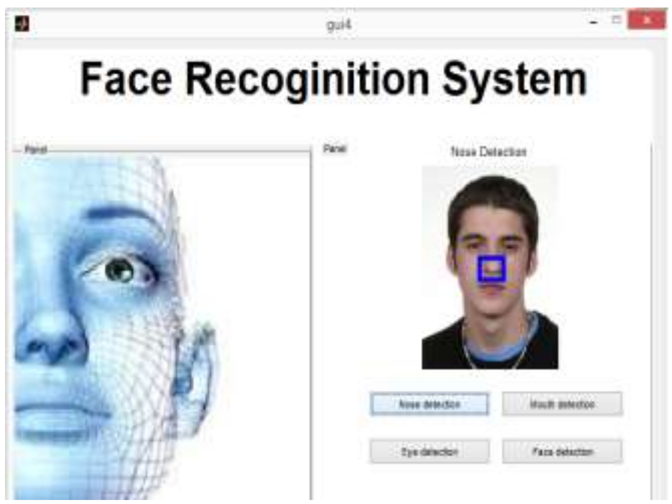
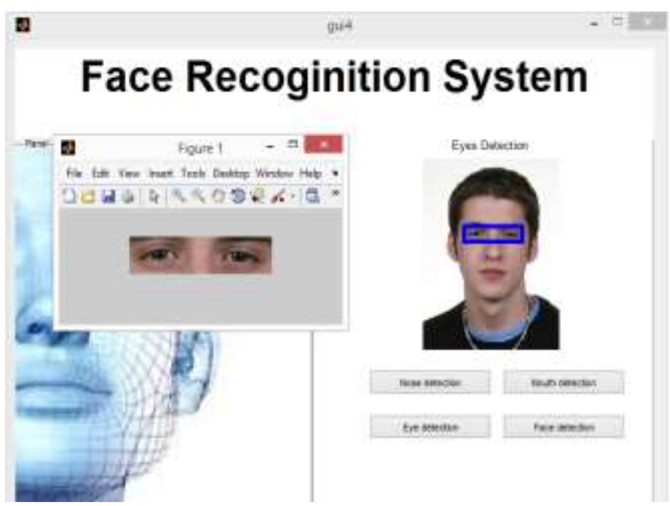


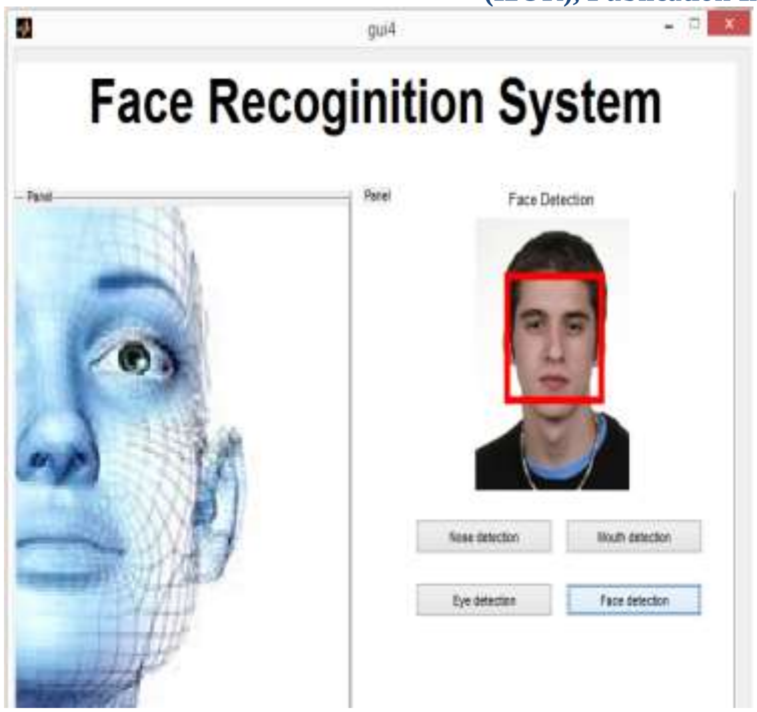
fig. 7.1: Initial interface


Face Recognization System


gui4
Face Recoginition System
Nose Detection


gui4
Face Recoginition System
Figure 1
File Edit View Insert Tools Desktop Window Help
Eyes Detection

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785



REFERENCES

[1] David S. Bolme "THESIS ON ELASTIC BUNCH GRAPH MATCHING" .In partial fulfillment of the requirements for the Degree of Master of Science Colorado State University Fort Collins, Colorado Summer 2003
[2] Patrick S. P. Wang , Springer Science "Pattern Recognition, Machine Intelligence and Biometrics" by Business Media Publication, on 13-Feb-2012
[3] By Rafael C. Gonzalez, Richard Eugene Woods, Steven L. Eddins," Digital Image Processing Using MATLAB ",Second Edition ,Tata McGraw Hill Education Private Limited Publication ,in 2010.
[4] Manan Tiwari "Gabor Based Face Recognition Using EBGM and PCA"(IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 3 (3) , 2012,4322 – 4326.
[5] Avalaible at- http://in.mathworks.com.
[6] Avalaible at- http://www.ece301.com/ml-doc/54-face-detect-matlab-1.html.
[7] Avalaible at -http://engineeringprojects101.blogspot.in/2012/07/face-detection-using-matlab.html.
[8] Avalaible at -http://in.mathworks.com/discovery/face-recognition.html.