ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 3, Special Issue 8, March 2017

Attendance Monitoring System Using Face as Biometric

Iswarya[1], Jeevagapriya[2] Final IT
N.Suresh kumar[3], V.Vignesh[4] AP(Sl.Gr)/IT
Information Technology, Sri Ramakrishna Engineering College, Coimbatore.

***Abstract*:** *Anattendance monitoring system is a computer application capable of identifying or verifying a person from a digital image or video source. One of the ways to do this is by comparing selected facial features from the image and a facial database. Face Recognition begins with extracting the coordinates of features such as width of mouth, width of eyes, pupil, and compare the result with the measurements stored in the database and return the closest record(facial metrics). Nowadays, there are a lot of face recognition techniques and algorithms found and developed around the world. It is proven by numerous number of published papers related with facial recognition including facial feature extraction, facial algorithm improvements, and facial recognition implementations. Main purposes of this work are to get the best facial recognition algorithm by comparing the ROC(Receiver Operating Characteristics) curve and implement it in the attendance system.*
Keywords: *Image Training, Feature Selection, Feature Extraction, Attendance Monitoring, Performance Evaluvation.*

1 Introduction

Biometrics are referred as the metrics which are interrelated to human characteristics. Biometric verification is utilized in computer science for the development of recognition and access control. It is also utilized for classification of an individual among groups which are under supervision. Biometric identifiers are the exception, significant characteristics used for classification and relating an individual. Biometric identifiers are frequently categorized as physiological and behavioural characteristics.

Image processing is the processing of images by using mathematical operations based on any form of signal processing for which the input is an image, a series of images or a video and the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most of the image processing techniques involve two-dimensional signal and applying standard signal processing techniques. The image processing on digital images by using computer algorithms are defined as digital image processing. Digital image processing is used for classification, feature extraction, pattern recognition and multi-scale signal analysis.

Few facial recognition algorithms are used for identifying the facial features by extracting landmarks or

features from an image of an individual's face. An algorithm may analyse the relative position, size and shape of the eyes, nose, cheekbones and jaw. These features are used for searching the other images with matching features. Some algorithms are used for normalizing the gallery of face images and compressing the face data for face recognition. A probe image is then compared with the face data. One of the traditional systems is based on the template matching techniques which are applied to the group of salient facial features.

These recognition algorithms may be separated into two main approaches such as geometric and photometric. Geometric is an algorithm which looks at distinguishing features and photometric is a statistical approach which extracts an image into values and compares with templates for removing variances. Most recognition algorithms include principal component analysis using Eigen faces, linear discriminant analysis, hidden markov model and etc.

Nowadays three-dimensional face recognition technique is used to achieve improved accuracies. This technique utilizes 3D sensors for capturing information about the shape of the face. This information is then used for identifying the distinctive features on the surface of the face such as contour of the eye sockets, nose and chin. This technique is not affected by the changes in lighting and also identifying the face from a range of viewing angles including profile view. Three-dimensional data points from face are used for improve the precision of facial recognition. For face recognition, there are various software approaches are available.

Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection also refers to the psychological process by which humans locate and attend to faces in a visual scene. Face-detection algorithms focus on the detection of frontal human faces. It is analogous to image detection in which the image of a person is matched bit by bit. Image matches with the image stores in database. Any facial feature changes in the database will invalidate the matching process.

Facial recognition system is referred as the computer application which is capable of identifying or verifying a person from digital image or any video source. This verification is achieved by comparing selected facial features from the image and a facial database. This method is typically used in security systems such as commercial identification and marketing tool.

2 Proposed Work

In this approach a person is identified with face as a biometric feature using modified fisher face and fuzzy fisher face. This work introduce modified fisher face, fuzzy fisher face and include gradual level of assignment to class being regarded as a membership grade which helps to improve recognition results.

Image training: In order to train the classifier it need samples which means lot of images that show the object to detect the image (positive sample) and even more images without the object(negative sample). Here the haar-like features are used. It working with only image intensities (the RGB pixel value at each and every pixel of image) made the task of feature calculation. It considers adjacent rectangular regions at a specific location in a

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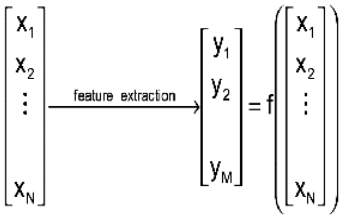
detection window, sums up the pixel intensities in each region and calculate the difference between these sums.

Dimensionality reduction: It is the process to reduce the feature dimension while preserving as much information as possible. It extract the real distribution of the population. It contains two methods:

1. Feature Selection is an approach for dimensionality reduction by selecting a subset of the existing feature without a transformation.

For implementing feature selection, it requires Feature Subset Selection. Feature Subset Selection requires a search strategy and an objective function. A search strategy is for to select the candidate subsets and an objective function is to evaluate the candidate.

2. Feature Extractionis also an approach for dimensionality reduction for transforming the existing features into lower dimensional space that is to project a set of m dimensional vectors to n dimensional space for visualization purposes.



The problem of feature extraction can be stated as given a feature space x_i belongs to R^N find a mapping $y=f(x):R^N \rightarrow R^M$ with M<N such that the transformed feature vector y_i belongs to R^M preserves the information in R^N. An optimal mapping y=f(x) will be a non-linear function that is there is no systematic way to generate nonlinear transforms. For this reason, feature extraction is commonly limited to linear transforms y=Wx.

Attendance Recognition: In Attendance Recognition task began with training the face recognizer against training set. It also allowed its user to set a countdown timer where students must present their face before the countdown ends in order to fill the attendance. Once the "Run" button is pressed, the countdown timer will start and the camera will be turned on. Student's face must be presented in front of the camera and pressed, in order to be marked as "present" during class. While presenting the face in front of the camera, students who inputted their face in the training set will be recognized, while students who did not input their face in the training set using will be labeled as "Unrecognized Person".

3 Algorithms

3.1 Modified Fisher Face Algorithm

1. Originate dataset and test set $\in R^D$.

2. For each Set_{org} (Ci) compute the mean of each class $\{\mu_i | i=1,2,\ldots, n_C\}$ as:

$$\mu_i = \frac{\sum_{i=1}^{n} x_i}{n}, n \geq 0$$

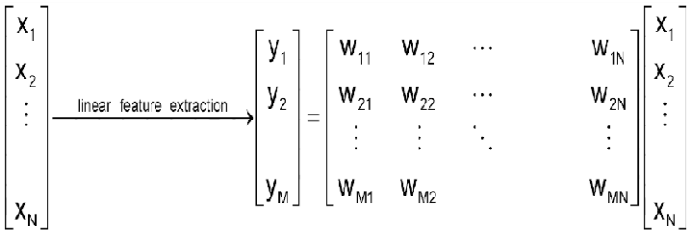
Where n is the total number of feature points in each class.

3. The overall mean denoted by μ_m depicts overall scatter of the data and shows the behavior of variance in specified direction which can be estimated by the formula as:

$$\mu_m = \sum_{i=1}^{n} C(p_i \mu_i)$$

Where p_i is the likelihood of entire data.

4. The size of the feature is given for selecting the features



face size=[128,128]

eye size=[32,128]

nose size=[32,32]

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5. For extracting the features, HOG(Histogram equalization) and gabor feature(consisting of column vector) is imported

functionfeatureVector = gaborFeatures(img,gaborArray,d1,d2)

gaborArray = gaborFilterBank(5,8,39,39);

6. Select first columns of the projected matrix which have largest mean values.

3.2 Fuzzy Fisher Face Alogrithm

1. Compute the Euclidean distance matrix between pairs of feature vectors in the training.
2. Set diagonal elements of this matrix to infinity (practically place large numeric values there).
3. Sort the distance matrix (treat each of its column separately) in an ascending order. Collect the class labels of the patterns located in the closest neighborhood of the pattern under consideration (as we are concerned with "k" neighbors, this returns a list of "k" integers)
4. Compute the membership grade to class "i" for j^{th} pattern.

$$\mu_{ij} = \begin{cases} 0.51 + 0.49\left(\frac{n_{ij}}{k}\right) & \text{if } i = \text{the same as the label of the } j\text{th pattern} \\ 0.49\left(\frac{n_{ij}}{k}\right) & \text{if } i \neq \text{the same as the label of the } j\text{th pattern} \end{cases}$$

Where n_{ij} stands for the number of the neighbors of the j^{th} data (pattern) that belong to the i^{th} class

4 Software Specification

MATLAB (Matrix Laboratory)

MATLAB is an interactive software package which was developed to perform numerical calculations on vectors and matrices. It is a high performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notations. It is an interactive system whose basic data element is an array that does not require dimensioning. This allows formulating solutions to many technical computing problems, especially those involving matrix representations, in a fraction of the time it would take to write a program in a scalar non-interactive language.

MATLAB stands for Matrix Laboratory. It was written originally to provide easy access to matrix software developed by the linear system package, Eigen system package. It is complimented by a family of application-specific solutions called toolboxes. It contains a high-level programming language which makes it quite easy to code complicated algorithms involving vectors and matrices. It can do quite sophisticated graphics in two and three dimensions. Image processing toolbox is a collection of MATLAB functions that extend the capability of the MATLAB environment for the solution of Digital Image Processing.

Image Processing Toolbox is the standard computational tool for introductory and advanced courses in Math's, Engineering, and Science. It is a collection of MATLAB functions. This is called as M-functions or M-files. In MATLAB,Images can be conveniently represented as matrices. One can open an image as a matrix using 'imread' command. The matrix may simply be m x n form or it may be 3 dimensional arrays or it may be an indexed matrix, depending upon image type. The image processing may be done simply by matrix calculation or matrix manipulation. Image may be displayed with 'imshow' command.

The Image Processing Toolbox (IPT) is a collection of functions that extend the capability of the MATLAB numeric computing environment. It consists of more built-in functions. Image Processing Toolbox provides a comprehensive set of reference-standard algorithms and graphical tools for image processing, analysis, visualization, and algorithm development. You can perform image enhancement, image de blurring, feature detection, noise reduction, image segmentation, spatial transformations, and image registration. Many functions in the toolbox are multithreaded to take advantage of multi core and multiprocessor computers.

MATLAB System

MATLAB System consists of the following main parts. They are,

- Desktop tools and development environment
- The MATLAB Mathematical function library
- MATLAB Language
- Graphics
- MATLAB External Interface.

Desktop tools and Development Environment

MATLAB Desktop is the main MATLAB application window. It contains five sub components. This is the set of tools and facilities that help you use MATLAB functions and files. Many of these tools are graphical user interfaces. It includes the MATLAB desktop Command Window, a command history, an editor debugger, browsers for viewing help, the workspace, files and the search path.

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The MATLAB Mathematical Function Library

This is a vast collection of computational algorithms ranging from elementary functions, like sum, sine, cosine, and complex arithmetic, to more sophisticated functions like matrix inverse, matrix Eigen values, Bessel functions, and fast Fourier transforms.

The MATLAB Language

The matlab language is a high-level matrix/array language with control flow statements, functions, data structures, input/output, and object-oriented programming features. It allows both "programming in the small" to rapidly create quick and dirty throw-away programs and "programming in the large" to create large and complex application programs.

Graphics and graphical user interface programming

MATLAB has extensive facilities for displaying vectors and matrices as graphs as well as annotating and printing these graphs. It includes high-level functions for two-dimensional and three-dimensional data visualization, image processing, and animation and presentation graphics. It also includes low-level functions that allow you to fully customize the appearance of graphics as well as to build complete graphical user interfaces on your MATLAB applications.

For example the function plot can be used to produce a graph from two vectors x and y. The code:

```
x = 0: pi/100:2*pi;

y = sin(x);

Plot(x, y)
```

The MATLAB Application Program Interface (API)

This is a library that allows you to write C and FORTRAN programs that interact with MATLAB. It includes facilities for calling routines from MATLAB (dynamic linking), calling MATLAB as a computational engine for reading and writing MAT-files. Libraries written in Java, ActiveX or .NET can be directly called from MATLAB and many MATLAB libraries (for example XML or SQL support) are implemented as wrappers around Java or ActiveX libraries. Calling MATLAB from Java is more complicated, but can be done with MATLAB extension, which is sold separately by Math Works or using an undocumented mechanism called JMI (Java-to-MATLAB Interface), which should not be confused with the unrelated Java Metadata Interface that is also called JMI.

COMPONENTS OF MATLAB DESKTOP

MATLAB Desktop is the main MATLAB application window. It contains five sub components. They are as follows:

Command Window

Command window is where the use types MATLAB command and expressions at the prompt (>>) and where the outputs of those commands are displayed. MATLAB defines the workspace as the set of variables that the user creates in a work session.

Workspace Browser

Workspace window shows the variables and some information about them. Double-clicking on a variable in the workspace browser launches the Array Editor which can be used to obtain information and in some instances edit certain properties of the variable. The MATLAB workspace consists of the set of variables built up during a MATLAB session and stored in memory. You add variables to the workspace by using functions, running function, script files, and loading saved workspaces. This browser is used to view the workspace and information about each variable. The workspace does not persist after you end the MATLAB session. To save the workspace to a file that can be read during a later MATLAB session select File > Save or use the save function. Saving preserves the workspace in a binary file called a MAT-file, which has a .mat extension. You can use options to save to different formats. To read in a MAT-file, select File > Import Data or use the load function.

Current Directory Window

Current directory window is the content of current workspace, whose path is shown in this window. Clicking on the arrow in the Current Directory Window shows the list of recently used paths. Clicking on the button to the right of the window allows the user to change the current directory.

Command History Window

Command history window contains record of the commands that a user can enter in the command window including both current and previous MATLAB sessions. Previously entered MATLAB commands can be selected and re-executed from this window by right-clicking on a command or sequence of commands. This action launches a menu from which to select various options in addition to executing the commands. This is useful feature when experimenting with various commands in a work session. Statements you enter in the Command Window are logged with a timestamp in the Command History. From the Command History, you can view and search for previously run statements as well as copy and execute selected statements. You can also create a file from selected statements.

5 Conclusion

This application aims is to improve the performance. The performance evaluation of this work is done to prove the performance improvement over the proposed methodology than the existing system in terms of false match rate (FMR), false non match rate (FNMR) and receiver operating characteristics (ROC).FMR represents an acceptance over a non-legitimate user because the system finds biometric data similar enough to the master template of a legitimate user, and FNMR represents rejection over a legitimate user due to the system not finding the user's current biometric data similar enough to the master

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template. A visual characterization of the tradeoff between FMR and FNMR known as receiver operating characteristics or ROC will be created.

6 Applications

1. The system can be used for places that require security like bank, military etc.
2. It can also be used in houses and society to recognize the outsiders and save their identity.
3. It can used to mark attendance based on face recognition on organizations.

7 References

[1] Lienhart, R. and Maydt, J., "An extended set of Haar-like feature for rapid object detection", ICIP02, pp. l: 900-903,2002

[2] Messom, C.H. and Barczak, A.L.C., "Fast and Efficient Rotated Integral Images", Australian Conference on Robotics and Automation (ACRA2006), pp. 1-6, 2006

[3] Gareth James; Daniela Witten; Trevor Hastie; Robert Tibshirani (2013). An Introduction to Statistical Learning. Springer. p. 204

[4] Bermingham, Mairead L.; Pong-Wong, Ricardo; Spiliopoulou, Athina; Hayward, Caroline; Rudan, Igor; Campbell, Harry; Wright, Alan F.; Wilson, James F.; Agakov, Felix; Navarro, Pau; Haley, Chris S. (2015). "Application of highdimensional feature selection: evaluation for genomic prediction in man". Sci. Rep. 5

[5] Figueroa, Alejandro; Guenter Neumann (2014). "Category-specific models for ranking effective paraphrases in community Question Answering". Expert Systems with Applications. 41: 4730–4742. doi:10.1016/j.eswa.2014.02.004

[6] Keun-Chang Kwak, WitoldPedrycz : Face Recognition Using Fuzzy Fisherface Classifier, Science Direct Journal Of Pattern Recognition Socity 38(2005), 1717-1732

[7] VisarShehu, AgniDika, "Using Real Time Computer Vision Algorithm in Automatic Attendance Management System",Procedings of the ITI 2010 32nd Int. Conf. on Information Technology Interfaces , June 21-24,2010, Cavtat, Croatia

[8] ShireeshaChintalapati, M.V. Raghunadh, "Automated Attendance Management System Based On Face Recognition Algorithms", 2013 IEEE International Conference on Computational Intelligence and Computing Research

[9] SarathChanduGaddam and N.V.K. Ramesh, "Attendance Management and User Security System's based on Eigen Faces Algorithm Using Raspberry Pi2 and Ethernet", Vol 9 (17) May 2016 (www.indjst.org)

[10] Prof.TVenkat Narayana Rao, D Vishal Reddy, Rutwik V Jangam, "Face Detection E-Attendence system", International Journal of Computer Trends and Technology (IJCTT)- volume 27 Number 3-September 2015