Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 3, Issue. 2, February 2014, pg.633 – 636

RESEARCH ARTICLE

Attendance Monitoring Using Face Recognition

Divya Singh[1], Ruhi Sunil Hadke[2], Shruti Sanjay Khonde[3], Valhavi Diwakar Patil[4], Monica Kamnani[5], Mitali R. Ingle[6]

[1,2,3,4,5,6] Computer Science & Engineering, Dr.Babasaheb Ambedkar College of Engineering & Research, India

[1] divya.singh379@gmail.com; [2] ruhihadke@gmail.com; [3] shrutikhonde93@gmail.com, [4] valhavid.patil@gmail.com, [5] monakamnani@gmail.com, [6] inglemitali@gmail.com

Abstract—Students attendance in the classroom is very important task and if taken manually wastes a lot of time. There are many automatic methods available for this purpose i.e. biometric attendance. All these methods also waste time because students have to make a queue to touch their thumb on the scanning device. This work describes the efficient algorithm that automatically marks the attendance without human intervention. This attendance is recorded by using a camera attached in the classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the database and mark the attendance.

Keywords— Attendance; detection; feature extraction; image conversion; recognition

I. INTRODUCTION

Maintaining the attendance is very important in all the institutes for checking the performance of students. Every institute has its own method in this regard. Some are taking attendance manually using the old paper or file based approach and some have adopted methods of automatic attendance using some biometric techniques. There are many automatic methods available for this purpose i.e. biometric attendance. All these methods also waste time because students have to make a queue to touch their thumb on the scanning device. This system uses the face recognition approach for the automatic attendance of students in the classroom environment without student's intervention. This attendance is recorded by using a camera attached in the classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the database and mark the attendance.

II. Literature Review

The old method for taking attendance is manual work. But this method takes a lot of time and there are chances that the attendance is not marked properly. The second method is finger print recognition. But for some people it is intrusive, because it is still related to criminal identification. Another disadvantage of finger print recognition is that it can make mistakes with the dryness or dirt of the finger's skin. The another method for taking attendance is iris recognition.The disadvantage of this method is that it is also intrusive and a lot of memory is required for data storage. There are various methods for facial recognition like eigenface method. Various extensions have been made to the eigenface method such eigenfeatures. This method combines facial metrics

(measuring distance between facial features) with the eigenface representation. Another method similar to the eigenface technique is 'fisherfaces' which uses Linear discriminant analysis[1] .This method for facial recognition is less sensitive to variation in lighting and pose of the face than using eigenfaces. Fisherface[2] utilies labelled data to retain more of the class specific information during the dimension reduction stage.A further alternative to eigenfaces and fisherfaces is the active appearance model[3]. This approach use an Active Shape Model to describe the outline of a face. By collecting many face outlines,Principal Component Analysis[4] can be used to form a basis set of models which, encapsulate the variation of different faces.Many modern approaches still use Principal Component Analysis as a means of dimension reduction or to form basis images for different modes of variation.

Fisherfaces

A key problem in computer vision, pattern recognition and machine learning is to define an appropriate data representation for the task at hand. One way to represent the input data is by finding a subspace which represents most of the data variance. This can be obtained with the use of Principal Components Analysis (PCA). When applied to face images, PCA yields a set of eigenfaces. These eigenfaces are the eigenvectors associated to the largest eigenvalues of the covariance matrix of the training data. The eigenvectors thus found correspond to the least-squares (LS) solution. This is indeed a powerful way to represent the data because it ensures the data variance is maintained while eliminating unnecessary existing correlations among the original features (dimensions) in the sample vectors. When the goal is classification rather than representation, the LS solution may not yield the most desirable results. In such cases, one wishes to find a subspace that maps the sample vectors of the same class in a single spot of the feature representation and those of different classes as far apart from each other as possible. The techniques derived to achieve this goal are known as discriminant analysis (DA).The most known DA is Linear Discriminant Analysis (LDA), which can be derived from an idea suggested by R.A. Fisher in 1936. When LDA is used to find the subspace representation of a set of face images, the resulting basis vectors defining that space are known as Fisherfaces.

III. Proposed Plan of Work

The system consists of a camera that captures the images of the students sitting in the classroom and sends it to the image enhancement module. In the image enhancement module, images are enhanced so that matching can be performed easily. After enhancement, the image comes in the Face Detection and Recognition modules and then the attendance is marked in the database. At the time of enrolment, templates of face images of individual students are stored in the Face database. Here all the faces are detected from the input image and the algorithm compares them one by one with the face database. If any face is recognized the attendance is marked in the database from where anyone can access and use it for different purposes. Teachers come in the class and just press a button to start the attendance process and the system automatically gets the attendance without even the intensions of students and teacher. In this way a lot of time is saved and this is highly secure process no one can mark the attendance of other. Camera takes the images continuously to detect and recognize all the students in the classroom. In order to avoid the false detection we are using the skin classification technique[5]. Using this technique enhance the efficiency and accuracy of the detection process. In this process first the skin is classified and then only skin pixels remains and all other pixels in the image are set to black, this greatly enhance the accuracy of face detection process.

For face recognition we have used PCA. Principle component analysis is an efficient method for face recognition. It not only reduces the dimensionality of the image, but also retains some of the variations in the image data. The system functions by projecting face image onto a feature space that spans the significant variations among known face images. The significant features are known as “Eigen faces”, because they are the eigenvectors (Principal Component) of the set of faces they do not necessarily correspond to the features such as eyes, ears, and noses. The projection operation characterize an individual face by a weighted sum of the Eigen faces features and so to recognize a particular face it is necessary only to compare these weights to those individuals.

Work Flow:

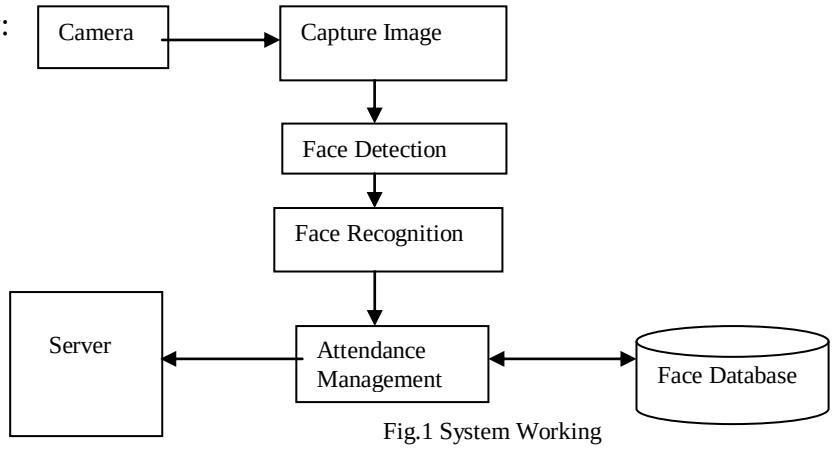

Fig.1 System Working

A. Enrolment of Student Faces

First step in every biometric system is the enrolment of a person using general data like their name and their unique biometric features as templates.

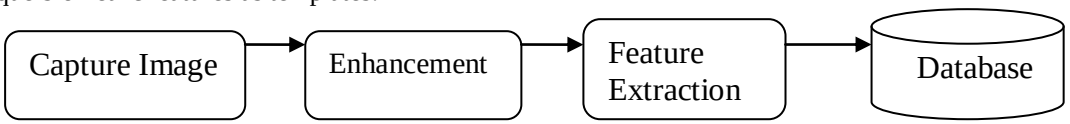

Fig.2.Enrollment Process

Image is captured from the camera and then student face is detected. After the face is detected, that face is cropped and then it is enhanced using histogram equalization and noise filtering so that exact features can be extracted. These unique features are then stored in the face database with certain id of that person.

B .Capturing the Images of Student

Camera attached in front of classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the database and mark the attendance. In order to avoid the false detection we are using the skin classification technique. Using this technique enhance the efficiency and accuracy of the detection process. In this process first the skin is classified and then only skin pixels remains and all other pixels in the image are set to black, this greatly enhance the accuracy of face detection process. How capture works:-

In the first step image is captured from the camera. There are illumination effects in the captured image because of different lighting conditions and some noise which is to be removed before going to the next steps. Histogram

Normalization is used for contrast enhancement in the spatial domain. Median filter is used for removal of noise in the image. There are other techniques like FFT and low pass filter for noise removal and smoothing of the images but Median filter gives good results.

C. Face Localization and Face Detection

Face localization aims to determine the image position of a single face. This is a simplified detection problem with the assumption than an input image consists only one face [6] . The procedure below explains the proposed face localization technique.

3.3.1) Image Conversion:

The input image is first converted into the gray-scale image. The gray-scale image is then converted into its binary form.

3.3.2) Dilation:

The dilation process removes the noise encountered in the binary image. Hence, the dilation operation is performed on the binary image obtained. The gray-scale image is then converted into its binary form. Then, the dilated image is mapped on to the gray scale image.

3.3.3) Image Cropping:

The mapped image is converted into binary image and the required face region is cropped from the binary image and is saved to the database. The execution sequence of image cropping is as follows:-

The Feature Extraction is carried out by taking the features such as eyes, mouth, nose, ears etc. In this paper, the two features, eyes and mouth are taken into consideration. The proposed feature extraction algorithm is explained below.

1. Divide the localized face column wise into two equal parts.

2. For each row 'r' do steps 3 and 4.
3. The first black pixels encountered on either side are taken as (x1, y1) and (x2, y2) respectively.
4. Calculate the distance between those points using the formula:

$$Distance = (\sqrt{(x2 - x1)^2 + (y2 - y1)^2} \quad (1)$$

5. From step 4, two sets of non-zero distance values corresponding to eyes and mouth are obtained.
6. Find the maximum of the distances for each non-zero set. They represent the distance between the eyeballs and the distance between the mouth end points.
7. Using the pixels corresponding to that maximum distance, calculate the following:
   i. Distance from the left eyeball to the right eyeball.
   ii. Distance from the left mouth end point to the right mouth end point.
   iii. Distance from the left eyeball to the left mouth end point.
   iv. Distance from the right eyeball to the right mouth end point.
   v. Distance from the left eyeball to the right mouth end point.
   vi. Distance from the right eyeball to the left mouth end point.
8. The six values calculated above are given as the inputs to the neural network recognizer.

D. Face Recognition & Marking Attendance

After extracting the features from the given face image, a recognizer is needed to recognize the face image from the stored database. After the face detection step the next is face recognition .This can be achieved by cropping the first detected face from the image and compare it with the database. This is called the selection of region of interest. In this way faces of students are verified one by one with the face database using the Eigen Face method and attendance is marked in the database.

IV. Conclusion

This paper introduces a system that helps in taking attendance using face recognition. Another application of this system is that it is capable of marking the presence of employees at any workplace and this attendance will be useful for calculating their monthly payment.

References

[1] "Face recognition by linear discriminant analysis suman kumar bhattacharyya1, kumar rahul2"

[2] "Eigenfaces vs. Fisherfaces: Recognition Using Class Specific Linear Projection Peter N. Belhumeur, Jo~ao P. Hespanha, and David J. Kriegman"

[3]"Active appearance model "T.F.Cootes","G.J.Edwards","C.J.Taylor"

[4]"An efficient method for face recognition using principal component analysis (PCA)".

[5] " Lijuan Duan, Guoqin Cui, Wen Gao and Hongming Zhang"Adult Image Detection Method Base-on Skin Color Model and SupportVector Machine" ACCV2002: The 5th Asian Conference on Computer Vision, 23--25 January 2002,Melbourne, Australia"

[6] " Anil K. Jain, Arun Ross and Salil Prabhakar," An introduction to biometric recognition", Circuits and Systems for VideoTechnology, IEEE Transactions on Volume 14, Issue 1, Jan.

