International Research Journal of Computer Science (IRJCS)
Volume 1 Issue 1 (September 2014)
ISSN: Applied
www.irjcs.com

Efficient Attendance Management: A Face Recognition Approach

Badal J. Deshmukh, Sudhir M. Kharad

Abstract — Taking student attendance in a classroom has always been a tedious task faultfinders. It is completely a waste of precarious study time. There are many attendance taking devices in market namely bio-metrics scanner which take thumb impression of the student and marks attendance accordingly. But various skin problems affect the bio-metric scanner performance student may also have to make a long line queue in order to make mark there attendance .the method which we are proposing mark there attendance of hole class and generate result accordingly .our paper explains the method which is be followed in order to organized multiple faces at once

Index Terms— ***Histogram, normalization, PCA, Face Detection, Face Recognition***

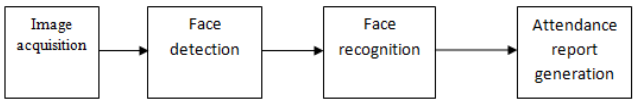
1. INTRODUCTION

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 bio-metric techniques. But in these methods students have to wait for long time in making a queue at time they enter the classroom. Many bio-metric systems are available but the key authentications are same is all the techniques. Every bio-metric system consists of enrollment process in which unique features of a person is stored in the database and then there are processes of identification and verification. These two processes compare the bio-metric feature of a person with previously stored template captured at the time of enrollment. Bio-metric templates can be of many types like Fingerprints, Eye Iris, Face, Hand Geometry, Signature, Gait and voice. Our system uses the face recognition approach for the automatic attendance of students in the classroom environment without students intervention. Face recognition consists of two steps, in first step faces are detected in the image and then these detected faces are compared with the database for verification. A number of methods have been proposed for face detection i.e.AdaBoost algorithm , the Float Boost algorithm, Support Vector Machines (SVM), and the Bayes classifier. The efficiency of face recognition algorithm can be increased with the fast face detection algorithm. Our system utilized this algorithm for the detection of faces in the classroom image. Face recognition techniques can be divided into two types Appearance based which use texture features that is applied to whole face or some specific regions, other is Feature based which uses geometric features like mouth, nose, eyes, eye brows, cheeks and relation between them. Statistical tools such as Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), Kernel Methods, and Neural Networks, Eigen-faces have been used for construction of face templates.in the above methods PCA is very efficient method for face recognition.

2. SYSTEM DESCRIPTION

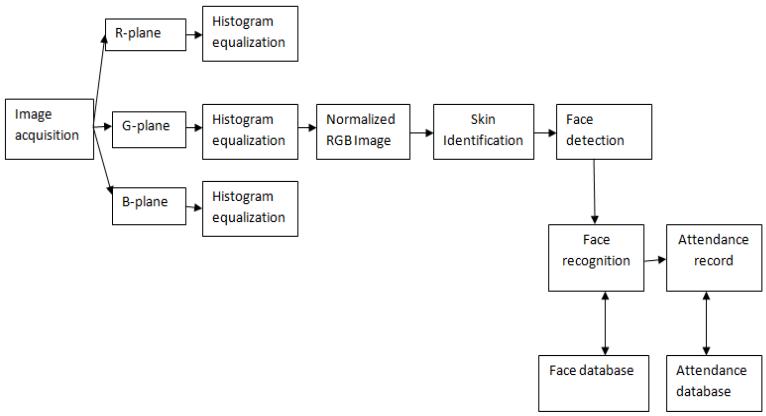
It generates report in spreadsheet format with mark 1 for present student and 0 for absent student.

1. System overview



Camera is placed above the blackboard in order to get the image of the class and sends to the system. Now the system does some pr-processing in the form of histogram normalization. Faces are detected form the equalized /normalized image. This faces are then compared with database one by one and result is stored in ex-file. Once all the faces are recognized. The result can be generated and a print can be taken for future use

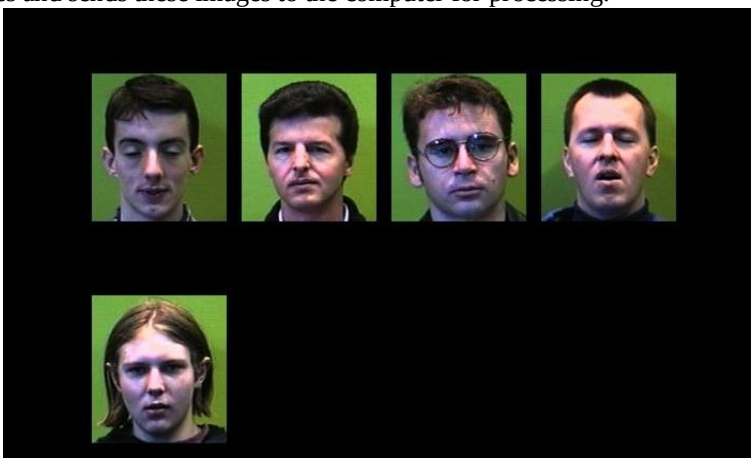
2. System description



3. SYSTEM ALGORITHM

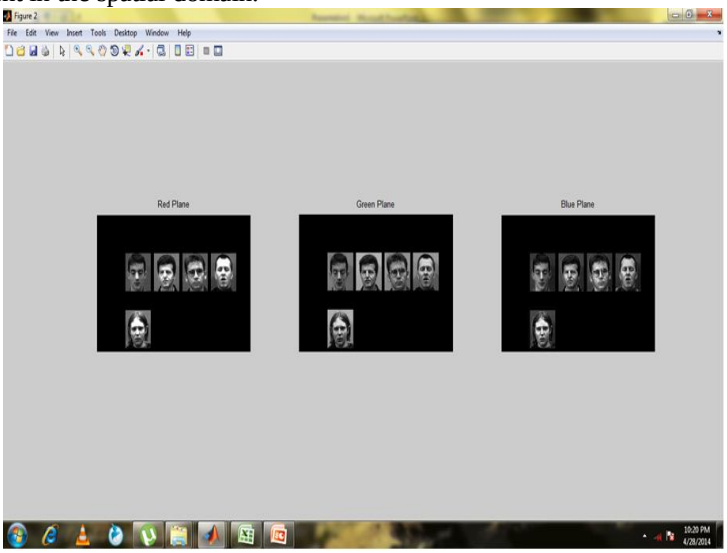
1 .Image Acquisition

Image is acquired from a high definition camera that is connected above the white board. This camera is connected to the computer. It captures images and sends these images to the computer for processing.

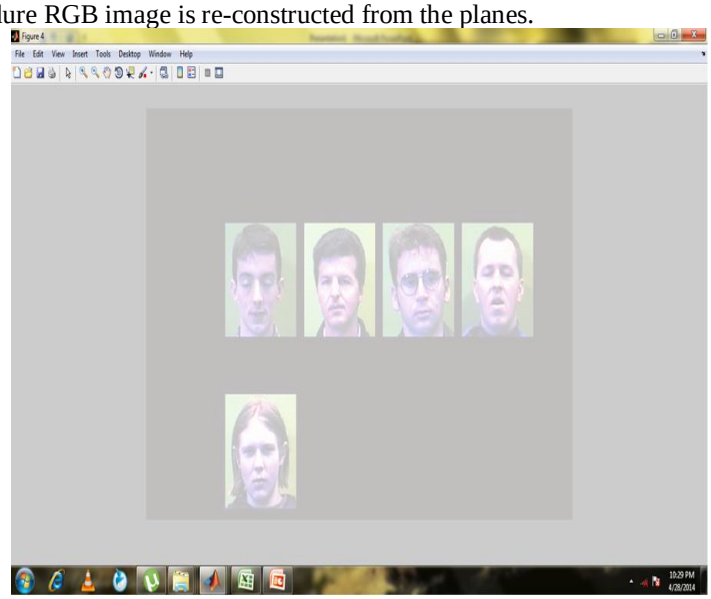


2. Histogram Normalization.

2. Captured image sometimes have brightness or darkness in it which should be removed for good results. First the RGB image is converted to the gray scale image for enhancement Histogram normalization is good technique for contrast enhancement in the spatial domain.

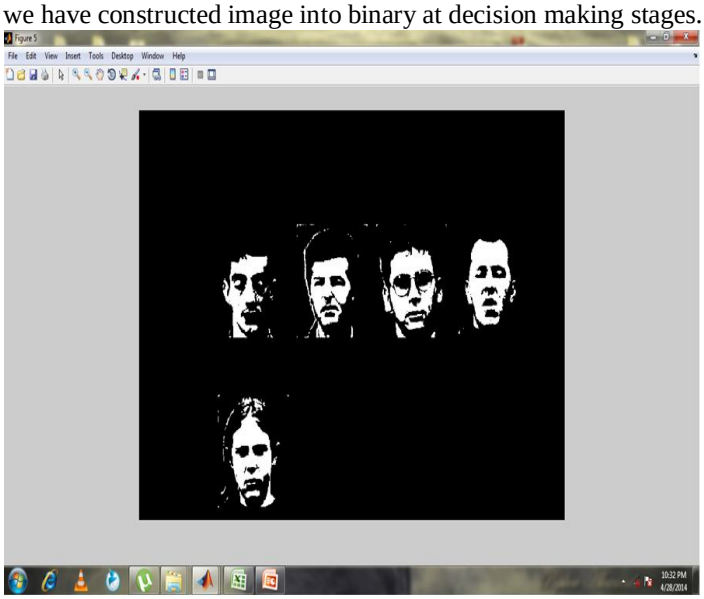


In order to bring the image and all its faces at same level we have to equalized it. Histogram equalization is the best technique for performing the task .since, thus begin RGB image we have to perform histogram equalization on RGB planes separately. After doing the above procedure RGB image is re-constructed from the planes.



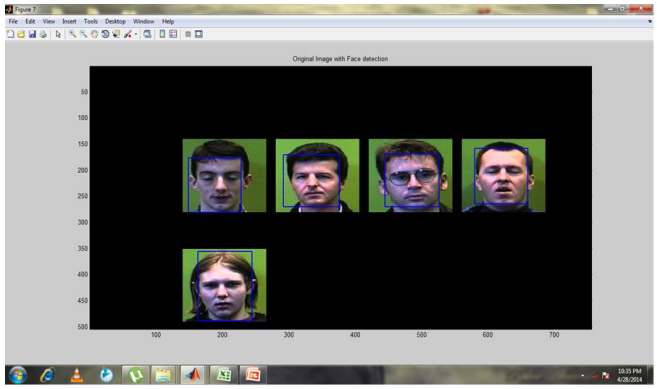
3. Skin identification

After gating the equalized image ,we will have to detect the faces .one of the method of face detection can be skin color identification. Depending on the average skin color of student of the institute we set threshold of skin identification.
Proper selection of the ranges help us in efficient detection of faces .in order to increase the processing speed of our algorithm we have constructed image into binary at decision making stages.



4 .Face detection

Depending on the identifying skin region and filling small vacancies left behind we can identify the region of interest and mark a centroid in that region. A square box can be marked with respected to the centroid with face lying inside the box. all the faces detected by the system needs to be cropped in a common dimension for the same the centroid is taken in the consideration and the square region is cropped from the centroid to each faces. This cropped faces will now be used for recognition propose.



5. Face Recognition

ALGORITHM

PRINCIPLE COMPONENT ANALYSIS

1. It tries to detect a face pattern as a whole unit.

2. Each image pattern of dimension I and J can be considered as a vector x in a N=IJ dimensional space.

3. The central idea of PCA is to find a low dimensional subspace (the feature space)which captures most of the variation within the dataset and therefore allows the best least-square approximation.

ADVANTAGES OF PCA

1. Smaller representation of database because we only store the training images in the form of their projections on the reduced basis.

2. Noise is reduced because we choose the maximum variation basis and hence features like background with small variation are automatically ignored

EIGEN FACE APPROACH

It is adequate method to be used in face recognition due to its simplicity, speed and learning capability. Eigen faces are a set of Eigen vectors used in the Computer Vision problem of human face recognition. Eigen Faces assume ghastly appearance. They refer to an appearance based approach to face recognition that seeks to capture the variation in a collection of face images and use this information to encode and compare images of individual faces in a holistic manner. The Eigen faces are Principal Components of a distribution of faces, or equivalently, the Eigen vectors of the covariance matrix of the set of the face images, where an image with N by N pixels is considered a point in N 2 dimensional space. Previous work on face recognition ignored the issue of face stimulus, assuming that predefined measurement were relevant and sufficient.

This suggests that coding and decoding of face images may give information of face images emphasizing the significance of features. These features may or may not be related to facial features such as eyes, nose, lips and hairs. We want to extract the relevant information in a face image, encode it efficiently and compare one face encoding with a database of faces encoded similarly.

A simple approach to extracting the information content in an image of a face is to somehow capture the variation in a collection of face images. We wish to find Principal Components of the distribution of faces, or the Eigen vectors of the covariance matrix of the set of face images. Each image location contributes to each Eigen vector, so that we can display the Eigen vector as a sort of face. Each face image can be represented exactly in terms of linear combination of the Eigen faces. The number of possible Eigen faces is equal to the number of face image in the training set. The faces can also be approximated by using best Eigen face, those that have the largest Eigen values, and which therefore account for most variance between the set of face images. The primary reason for using fewer Eigen faces is computational efficiency.

Eigen Values and Eigen Vectors

In linear algebra, the eigenvectors of a linear operator are non-zero vectors which, when operated by the operator, result in a scalar multiple of them. Scalar is then called Eigen value (λ) associated with the eigenvector (X). Eigen vector is a vector that is scaled by linear transformation. It is a property of matrix. When a matrix acts on it, only the vector magnitude is changed not the direction.

$AX = \lambda X$, ----------(1)

where A is a vector function.

$(A - \lambda I)X = 0$, ----------(2)

where I is the identity matrix.

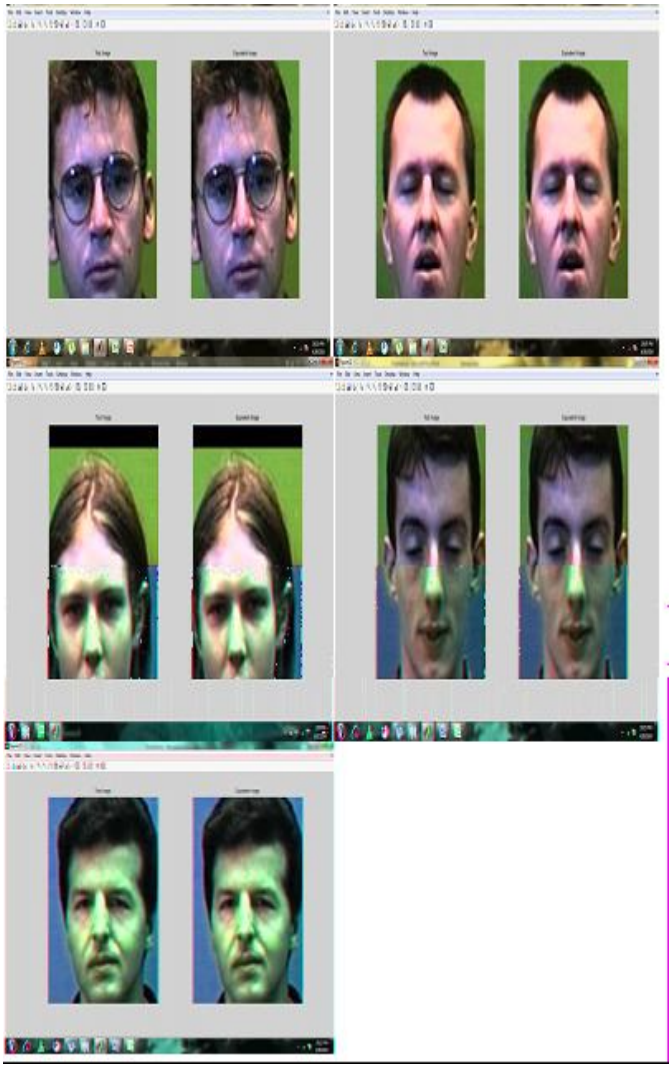
This is a homogeneous system of equations and form fundamental linear algebra. We know a non-trivial solution exists if and only if-

Det(A − λI) = 0,---------- (3)
Where det denotes determinant.
When evaluated becomes a polynomial of degree n. This is called characteristic polynomial of A. If A is N by N then there are n solutions or n roots of the characteristic polynomial. Thus there are n Eigen values of A satisfying the equation.
A Xi = λi Xi, (4)
Where i = 1,2,3,.....n
If the Eigen values are all distinct, there are n associated linearly independent eigenvectors, whose directions are unique, which span an n dimensional Euclidean space.

PRACTICAL IMPLEMENTATION

Prepare a training set of face images. The pictures constituting the training set should have been taken under the same lighting conditions, and must be normalized to have the eyes and mouths aligned across all images. They must also be all resample to the same pixel resolution. For this implementation, it is assumed that all images of the training set are stored in a single matrix T, where each row of the matrix is an image.
The cropped faces needs to be compared with the stored database for marking the attendance in order to perform face recognition. we have made use of PCA(principal component analysis)algorithm

.



6. Attendance report generation

The recognized faces are identifying from the database and a mark is made in the front of their name these by denoting

marking of their attendance. The marking is done in ex-cell file .once the attendance is mark a hard copy can be made by taking printout of the ex-cell file and it can be stored for further references.

4. RESULT

$$\text{Formula- } \% n = \frac{\text{No. of faces detected}}{\text{Total no. of faces in input image}} \times 100$$

Image no.	No. Of faces in input image	No. Of faces detected	percentage
1.	6	6	6/6*100=100%
2.	6	5	5/6*100=83.33%

5. CONCLUSION

It has been seen that we received 83.33 % n with PCA algorithm at faces recognition stage and skin color identification at face detection stage .the %n can be further be improved by introducing more efficient algorithm like voila Jones method.

6. REFERENCES

1 .Anil K. Jain, Arun Ross and Salil Prabhakar," An introduction To biometric recognition", Circuits and Systems for Video Technology IEEE Transactions on Volume 14, Issue 1, Jan.2004 Page(s):4 – 20.
2. Anil K. Jain, Brendan Klare and Unsang Park Michigan State University East Lansing, MI, U.S.ACRC Press, 2010"Face Recognition under Varying Illumination Using Gradient faces. In Image Processing", IEEE Transactions, Nov. 2009,
3. Naveed Khan Balcoh, M. Haroon Yousaf, Waqar Ahmad and M. Iram Baig," Algorithm for Efficient Attendance Management: Face Recognition based approach" International Journal of Computer Science Issues, Vol. 9, Issue 4, No 1, July 2012
4. A.J. Goldstein, L.D Harmon, and A.B Lesk, "Identification of human faces", Proc IEEE, May 1971 Vol. 59, No. 5, 748-760.
5. Nirmalya Kar, Mrinal Kanti Debbarma, Ashim Saha, and Dwijen Rudra Pal," Study of Implementing Automated Attendance SystemUsing Face Recognition Technique", International Journal of Computer and Communication Engineering, Vol. 1, No. 2, July 2012.
6. A. S. Tolba, A.H. El-Baz, and A.A. El-Harby." Face Recognition: A Literature Review", International Journal of Information and Communication Engineering 2:2 2006