IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.6, Special Issue.10, Nov 2018 E-ISSN: 2347-2693

Face Recognition Based Security Scanner using PCA

Amrita Naik[1*], Amrita Nagekar[2], Michael Monte[3], Aditya Parab[4], Ronan Revadkar[5]

[1]Computer Engineering Dept, Don Bosco College of Engineering, Goa University, Margao, India
[2]Computer Engineering Dept Don Bosco College of Engineering, Goa University, Margao, India
[3]Computer Engineering Dept Don Bosco College of Engineering, Goa University, Margao, India
[4]Computer Engineering Dept Don Bosco College of Engineering, Goa University, Margao, India
[5]Computer Engineering Dept Don Bosco College of Engineering, Goa University, Margao, India

[*]*Corresponding Author:* amritanagekar@gmail.com, *Tel.: +91-9637197203*

Available online at: www.ijcseonline.org

Abstract— Immediately This paper proposes a novel Face Recognition based Security Scanner for keeping track of people moving in and out of a workplace using Haar Cascade and Principal Component Analysis. The proposed system trains the system using images and then detects and recognises the person and gives details about the person with the date and time.

Keywords— Face Detection, Face Extraction, Face Recognition, Principal Component Analysis, Haar Cascade

I. INTRODUCTION

Introduction Face recognition has become an exploring domain today due to increase in the security requirements and its law enforcement applications. Face recognition system makes it easier to automatically identify a person from an image or a video source.

Most of the face recognition techniques cannot deal with non-uniform blurring conditions that arise from tilts and rotations in cameras. Different factors such as exposure time, stability of the platform, user experience affects the degree of blurring. Here a method is proposed for face recognition across motion blur, variations in illuminations and phase. Here slight change in the pixels values denotes motion, which is captured through image processing. The recognition process is performed by obtaining facial features from an image of an individual. The main objective of video-based face recognition is to identify people using a large set of still face images, and keeping record of both known and unknown faces.

II. RELATED WORK

Face Detection is done using the Haar Cascade technique and once a face is detected, it is used to undergo pre-processing techniques such as Grayscaling.Various filters are applied before Face Recognition is performed using the Principal Component Analysis (PCA).

The General Face Recognition system block diagram is shown below.Two stages that are considered in the Face Recognition system are Training and Testing stages. The Training phase mainly consists of the Pre-Processing, Feature Extraction which is added to the xml file and the details of the person are added and stored into the database as shown in Fig. 1. Whereas the Testing phase consists of detection and tracking of faces in the live video frames, Pre-Processing, Feature extraction and Recognition using PCA and saving the details about the entry/exit date-time etc of the person in the database as shown in Fig. 2(a) and 2(b).

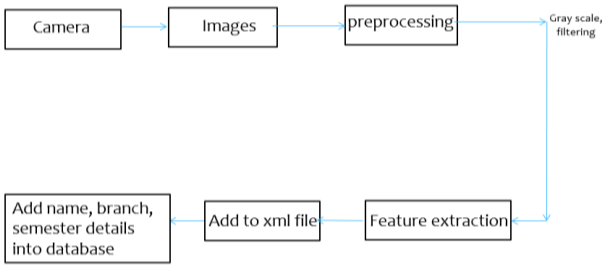

Fig. 1 : Training phase

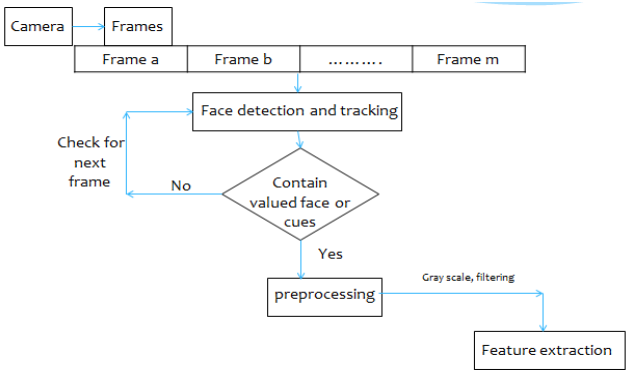

Fig. 2 (a): Testing phase.

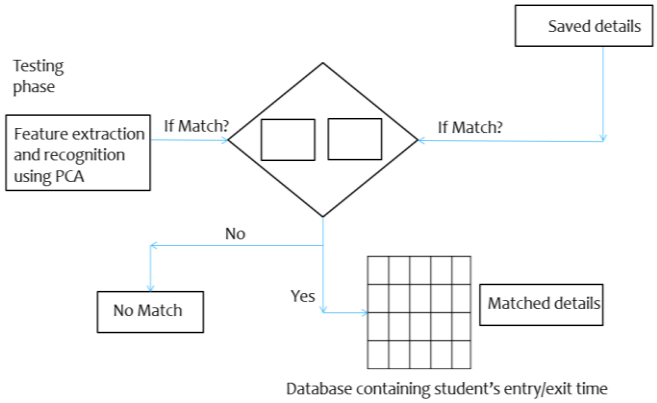

Fig. 2(b) : Testing phase.

III. METHODOLOGY

The Training phase includes the Gray scale processing as shown in fig 3.,
A gray scale image carries intensity information and are distinct from the black and white images, which in the context of computer imaging are images with only black and white color.

Fig. 3 Gray scaling

For conversion of any color image into gray scale image one must first obtain the red,green and blue(RGB) value primaries in linear intensity encoding by gamma expansion and add them together by 30%,59% and 11% respectively. The result is the desired luminance value regardless of the scale employed i.e 0.0 to 1.0, 0 to 255, 0% to 100%, etc. The result needs to be gamma compressed to get the gray scale representation.

Haar cascade classifiers is an effective object detection method used.Face detection based on videos consists of some of the main processes. First of all combination of detection and tracking,
says that detecting face in the first frame and then tracking it through the whole sequence.
Face detection using haar cascade is shown in fig. 4 below.

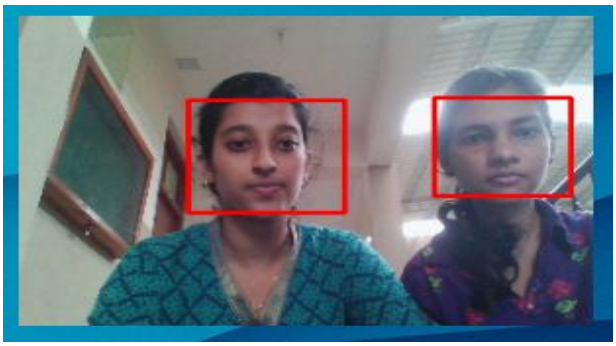

Fig. 4 : Face detection and tracking.

In face detection using haar cascade Haar like Classifiers are used which use haarcascade_eye for eye detection as well as haarcascade_frontalface_default for frontal face detection. A Haar cascade is a basically a classifier which is used to detect particular objects from the source.
Initially, the algorithm requires many positive images I.e images of face to train the classifier and extract features from it. Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle

The testing phase consists of using the live camera feed as input and the frames are used and the face is detected and recognized from it.But prior to recognition filters are applied for various smoothening purposes.. An example of filtering is shown below in fig. 5.

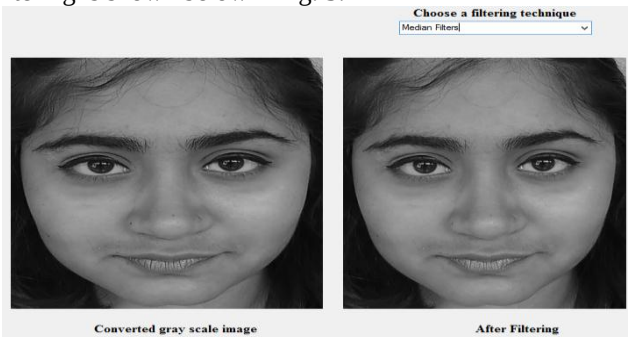

Fig. 5 : Filtering.

Eigenface is one of the simplest and most effective face PCA approach used in face recognition. In Eigenface approach it considers the main characteristics,eigenfaces and hence the main component of the image learning or training set.
Recognition is done by projecting a new image in the eigenface subspace, after which the person is classified by comparing its position in eigenface space with the position of known individuals. The advantage of this approach over other face recognition systems is in its simplicity, speed and insensitivity to small or gradual changes on the face. The problem is limited to files that can be used to recognize the face.
Face recognition performed is as shown in fig6. below

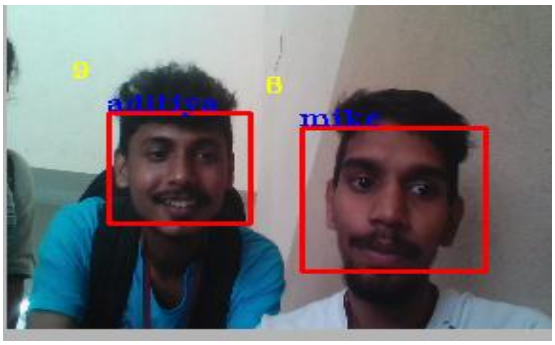

Fig.6 Face Recognition.

IV. RESULTS AND DISCUSSION

We will evaluate thresholds from 0.0 to 1.0 in increments of 0.1, at each step calculating the precision, recall, F-Measure. Following are the classification outcomes at each threshold:

Table 1: Accuracy level at each threshold value

Sl.No	Threshold	Precision (%)	Recall (%)	F-Measure (%)	Accuracy (%)
1	0.1	1	0.67	80	71
2	0.2	1	0.71	83	75
3	0.3	1	0.75	86	87.5
4	0.4	0.86	1	92	87.5
5	0.5	0.75	1	86	75
6	0.6	0.75	1	86	75
7	0.7	0.75	1	86	75
8	0.8	0.75	1	86	75
9	0.9	0.75	1	86	75
10	1	0.75	1	86	75

Based on the result obtained from testing the following evaluation parameters were calculated using the number of true positives(TP), true negatives(TN), false positive(FP), false negatives(FN).

Precision (positive predictive value): is the fraction of relevant instance among the retrieved instances.

Precision = TP/ (TP+FP)

Recall(known as sensitivity): is the fraction of relevant instances that have been retrieved over the total amount of relevant instances.

Recall= TP/ (TP+FN)

Fmeasure: A measure that combines precision and recall is the harmonic mean is the harmonic mean of precision and recall, the traditional f-measure or the balanced fmeasure.

$$\text{Fmeasure} = 2 * \frac{Precision * Recall}{Precision + Recall}$$

Accuracy: Is a weighted arithmetic mean of precision and inverse precision as well as weighted arithmetic mean of recall and inverse recall(weighted by prevalence).

$$\text{Accuracy} = \frac{TP + TN}{TP + FP + FN + TN}$$

As per our observations, **Threshold of 0.4** was found to be better for recognition.

We also made a comparative study of 8 filters namely smooth median filter, smooth gaussian filter, bilateral filter ,smooth blur filter, dilate, erode, mul and pyramid down.

Table 2: Comparative study of different filters

Sl.No	Filter	Precision (%)	Recall (%)	F-Measure (%)	Accuracy (%)
1	Median	68.18	83.33	75	71
2	Guassian	70.59	92.31	79.91	70.1
3	Bilateral	73.33	91.67	81.4	74
4	Smooth Blur	71.43	66.67	69	72
5	Dilate	90	45	62	64
6	Erode	100	45	62	62
7	Mul	20	25	22	41
8	Pyramid Down	100	40	57	60

As per our observations,Bilateral filter was found to be better than other filters.For recognition we have used threshold of 0.4.

V. CONCLUSION AND FUTURE SCOPE

The aim of the project was to implement a face recognition method which considers all the factors necessary to givebetter recognition.Different techniques can be used for face detection like haar cascade, PCA. But haar cascade was found to be more efficient than others due to its calculation speed and due to the use of haar-like feature for face detection. Finally the application was successfully completed and an effective and usable interface was developed. In this study , Bilateral filter was found to be the most efficient of all with accuracy of 74%. Threshold of 0.4 was considered to be most beneficial in recognition of individual's face.

REFERENCES

[1] Santhosh Shetty, Paritosh Kelkar,K Manikantan, S Ramachandran, “Shift Invariance based Feature Extraction and Weighted BPSO based Feature Selection for Enhanced Face Recognition”, International Conference on Computational Intelligence: Modeling, Techniques and Applications(CIMTA) 2013 Procedia Technology 10(2013)822-830

[2] R. Jafri, H. R. Arabnia, "A Survey of Face Recognition Techniques", Journal of Information Processing Systems, Vol.5, No.2, June 2009
[3] Zhao , W. chellappa , R. Phillips, P.J Rosenfeld , "Face Recognition: A Literature Survey", ACM Computing Surverys (CSUR), V.35, Issue 4, pp.399-458 2003
[4] Chan A.B. Liang Z.S.J, Vaconcelos N.," Privacy preserving crowd monitoring: Counting people without people models or tracking //Computer Vision and Pattern Recognition", 2008. CVPR 2008. IEEE Conference on—IEEE,2008-C. 1-7
[5] T.Chandrasekhar, Dr.K GIRIBABU, Dr. Ch. Sumanth Kumar, "A Novel Approach of Face Recognition using Statistical Features and Neural Networks", GITAM University, Visakhapatnam V.V.I.T Nambur, International Jouranl of Engineering and Innovative Technology (IJEIT) Volume 4, Issue11, May 2015

Authors Profile

Ms. Amrita Nagekar pursed Bachelor of Engineering from Don Bosco College of Engineering,Fatorda in the year 2018. Is currently working as a Software Engineer in Helix Tech,Porvorim Goa.

Mr. Michael Monte pursed Bachelor of Engineering from Don Bosco College of Engineering,Fatorda in the year 2018.Is currently working as Technical Support at IBM,Bangalore.

Mr. Aditya Parab pursed Bachelor of Engineering from Don Bosco College of Engineering,Fatorda in the year 2018. Is currently working as a IT Engineer at Zuari Pvt Ltd Vasco.

Mrs. Amrita Naik pursed her B.E in Information technology from B.V Bhoomaraddi college of Engineering,VTU University in the year 2007.She has completed her M.E in Information Technology from Padre Conceicao College of Engineering,Goa University in the year 2012.She has 7 years of teaching experience in various Engineering colleges.Currently she is pursuing Ph.D from N.I.T,Goa.

