VOTERS FACE RECOGNITION AND FAKE REJECTION USING DIGITAL IMAGE PROCESSING

[1]Roopa Shankar, [2]Reju R Nath, [3]Sneha T B, [4]Sreejith K, [5]SreeSabari N, [6]Kala L, [7]Prasad R Menon
[1,2,3,4,5]Student, Department of ECE, NSS college of Engineering, Palakkad, India
[6]Associate Professor, Department of ECE,N.S.S. College of Engineering , Palakkad, India
[7]Assistant Professor, Department of ECE, NSS college of Engineering, Palakkad, India

Abstract— A face recognition technology is defined as the process of identifying one or more people in images or videos by analyzing and compairing various features.In this paper we propose a system to eliminate fake voters and repeated voting.In this work different facial expressions and poses of individual person faces are detected and stored in voter database.If a person comes for a vote then his or her faces are detected and this detected face image is compared with images in voter database.If the face image is recognized then person is allowed to cast the vote.If it is not recognized then person is allowed to vote.After successful voting number of votes to the particular party will be counted.

Index Terms—Face recognition, Viola jones detector, matlab.

I. INTRODUCTION

In the development of any country democracy plays a vital role. Democracy system runs by a leader of the country who is selected by citizen of a country. Citizens have right to choose leader through election. Process of election consumes lots of manpower as well as resources and preparation is started many days before commencement of the election. During this preparation it may happen that involved people make an illegal arrangement with each other and in the existing system there are certain drawbacks such as damage of machines, dummy voting and problem of proper monitoring.

Human face recognition plays an important role in applications such as video surveillance, human computer interface, and face image database management. The algorithm constructs eye, mouth, and boundary maps for verifying each face candidate. Face recognition also refers to the psychological process by which humans locate and attend to faces in a visual scene.. 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.

Through this paper we are aiming that voters do not need to wait for longer period of time as they do not have to wait in a queue and there is no time constraint; this system provides mobility for voters. The advantages of this proposed system is that,it is less time consuming compared to existing system. With this system man power can be reduced and there is no need to apply ink on the fingers. The proposed system is highly secure and no chances of data lost and also unlimited number of candidate information is being stored. A voter can vote only once, so voting multiple times or dummy voting shall be prohibited.

II.EXISTING VOTING SYSTEM

Current voting system is based on ballot machine where when we press the button with the symbol the voting is done. Here there is a security risk, the person who votes may be a fake person. The people there might not know that a person is using fake voting card, this may cause problem. Also the person who has to vote should travel from faraway places to his constituency to cast his vote. So, effective method is to use face detection while voting online and enabling the right person to vote.

III. PROPOSED VOTING SYSTEM

Face Detection and Recognition system is proposed and it is used an authentication technique in voting. The voter's image is captured and passed to a face detection algorithm like Haar like feature which is used to detect human face from the image and save it as the first matching point. We implement Eigen face algorithm to recognize the trained images stored in the database. The goal is to implement the system model for a particular face and distinguish it from a large number of stored faces with some real-time variations as well. Eigen face gives us efficient way to find the lower dimensional space. Choosing the threshold value is a very significant factor for performance of face identification in Eigen face approach. Besides that, the dimensional reduction of face space relies upon number of Eigen faces taken. In this paper, an enhanced solution for face recognition is given by taking the enhanced value of threshold value and number of Eigen faces.

IV. FACE DETECTION TECHNIQUE

A. Viola jones algorithm

The basic principle of the Viola-Jones algorithm is to scan a sub-window capable of detecting faces across a given input image. The standard image processing approach would be to rescale the input image to different sizes and then run the fixed size detector through these images. This approach turns out to be rather time consuming due to the calculation of the different size images. Contrary to the standard approach Viola-Jones rescale the detector instead of the input image and run the detector many times through the image – each time with a different size. At first one might suspect both approaches to be equally time consuming, but Viola-Jones have devised a scale invariant detector that requires the same number of calculations whatever the size. This detector is constructed using a so-called integral image and some simple rectangular features reminiscent of Haar wavelets..

(i) The Integral Image

Integral image, also known as a summed area table, is an algorithm for quickly and efficiently computing the sum of values in a rectangle subset of a grid. It was first introduced to the computer graphics field by Crow for use in mipmaps. Viola and Jones applied the integral image for rapid computation of Haar-like features. Illustration is shown in Figure 1.

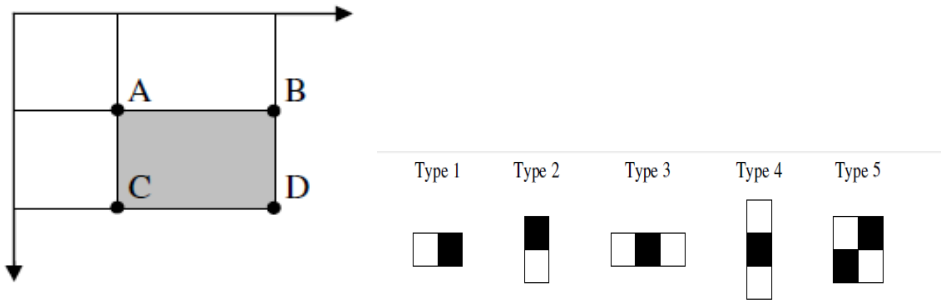

Fig 1: Illustration of integral image and haar like rectangle features (*A Survey on Face Recognition Technology - Viola Jones Algorithm, Anukar sahitya, Manjunath T N, Veena N)*

i (x; y) = ii(D)+ii(A)¡ii(B)¡ii(C) which only requires four array references. The integral image can be used to compute simple Haar like rectangular features. The features are defined as the (weighted) intensity difference between two to four rectangles. For instance, in feature (a), the feature value is the difference in average pixel value in the gray and white rectangles. Since the rectangles share corners, the computation of two rectangle features (a and b) requires six array references, the three rectangle features (c and d) requires eight array references, and the four rectangle features (e and f) requires nine array references.Viola Jones have empirically found that a detector with a base resolution of 24*24 pixels gives satisfactory results. When allowing for all possible sizes and positions of the features a total of approximately 160.000 different features can then be constructed. Thus, the amount of possible features vastly outnumbers the 576 pixels contained in the detector at base resolution. These features may seem overly simple to perform such an advanced task as face detection, but what the features lack in complexity they most certainly have in computational efficiency.

(ii) sAdaBoost Learning

AdaBoost is a machine learning boosting algorithm capable of constructing a strong classifier through a weighted combination of weak classifiers. (A weak classifier classifies correctly in only a little bit more than half the cases.) To match this terminology to the presented theory each feature is considered to be a potential weak classifier.Boosting is a method of finding a highly accurate hypothesis by combining many "weak" hypotheses, each with moderate accuracy. Boosting is a method of finding a highly accurate hypothesis by combining many "weak" hypotheses, each with moderate accuracy. Consider a set of training examples as S = f(xi; zi); i={1,……, N} where xi belongs to a domain or instance space X, and zi belongs to a finite label space Z. In binary classification problems, Z = {1,-1} where zi= 1 for positive examples and zi= -1 for negative examples. AdaBoost produces an additive model FT (x) = ∑ft(x), summation varies from t=1 to t=T, to predict the label of an input example x, where FT (x) is a real valued function in the form FT :X R. The predicted label is ^zi= sign(FT (xi)), where sign(.) is the sign function. From the statistical view of boosting, AdaBoost algorithm fits an additive logistic regression model by using adaptive Newton updates for minimizing the expected exponential criterion. The AdaBoost learning algorithm can be considered as to find the best additive base function ft+1(x) once Ft(x) is given. For this purpose, we assume the base function pool {f(x)}is in the form of confidence rated decision stumps. An important part of the modified AdaBoost algorithm is the determination of the best feature, polarity and threshold. There seems to be no smart solution to this problem and Viola-Jones suggest a simple brute force method. This means that the determination of each new weak classifier involves evaluating each feature on all the training examples in order to find the best performing feature. This is expected to be the most time consuming part of the training procedure. The best performing feature is chosen based on the weighted error it produces. This weighted error is a function of the weights belonging to the training examples.

(iii) Face Detection Using Ad boosted SVM-Based Component Classifier

The principle of Support Vector Machine (SVM) relies on a linear separation in a high dimension feature space where the data have been previously mapped, in order to take into account the eventual non- linearity of the problem. These are supervised learning models with associated learning algorithms that analyse data and recognize patterns, used for classification and regression analysis. It is a non - probabilistic binary linear classifier.

(iv)The attentional cascade structure

The basic principle of the Viola-Jones face detection algorithm is to scan the detector many times through the same image – each time with a new size. Even if an image should contain one or more faces it is obvious that an excessive large amount of the evaluated sub-windows would still be negatives (non-faces). This realization leads to a different formulation of the problem: Instead of finding faces, the algorithm should discard non-faces. The thought behind this statement is that it is faster to discard a non-face than to find a face. With this in mind a detector consisting of only one (strong) classifier suddenly seems inefficient since the evaluation time is constant no matter the input. Hence the need for a cascaded classifier arises. The cascaded classifier is composed of stages each containing a strong classifier. The job of each stage is to determine whether a given sub-window is definitely not a face or maybe a face. When a sub-window is classified to be a non-face by a given stage it is immediately discarded. Conversely a sub-window classified as a maybe-face is passed on to the next stage in the cascade. It follows that the more stages a given sub-window passes, the higher the chance the sub-window actually contains a face.Attentionalcascade is a critical component in the Viola-Jones detector. The key insight is that smaller and thus more efficient, boosted classifiers can be built which reject most of the negative sub-windows while keeping almost all the positive examples. The cascade structure also has an impact on the training process. Face detection is a rare event detection task. Consequently, there are usually billions of negative examples needed in order to train a high performance face detector.

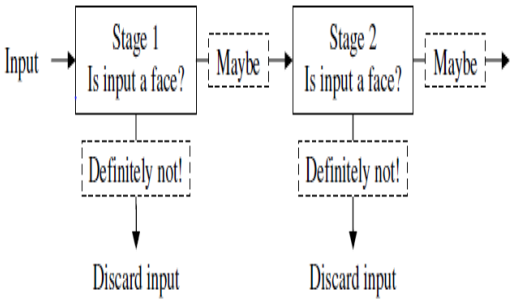

Fig 2:The attentional cascade(*A Survey on Face Recognition Technology - Viola Jones Algorithm, Anukar sahitya, Manjunath T N, Veena N)*

That is, at each node, a threshold was manually chosen, and the partial classifier was used to scan the negative example set to find more un rejected negative examples for the training of the next node. The attentional cascade is constructed manually and its illustration is shown in Figure 2. That is, the number of weak classifiers and the decision threshold for early rejection at each node are both specified manually. This is a non-trivial task. If the decision thresholds were set too aggressively, the final detector will be very fast, but the overall detection rate may be hurt. On the other hand, if the decision thresholds were set very conservatively, most sub windows will need to pass through many nodes, making the detector very slow. Viola-Jones also refer to the cascaded classifier as an attentional cascade. This name implies that more attention (computing power) is directed towards the regions of the image suspected to containfaces. It follows that when training a given stage, say *n*, the negative examples should of course be false negatives generated by stage *n*-1.

V. SOFTWARE DETAILS

A. MATLAB

MATLAB offers an easy interactive environment and fast mathematical algorithms. It allows matrix handling, plotting of functions and data, and algorithm implementations.

The MATLAB system consists of five main parts:

1. *The MATLAB language:*

This 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 complete large and complex application programs.

2. *The MATLAB working environment:*

This is the set of tools and facilities that you work with as the MATLAB user or programmer. It includes facilities for managing the variables in your workspace and importing and exporting data.

3. *Handle Graphics:*

This is the MATLAB graphics system. It includes high-level commands for two-dimensional and three-dimensional data visualization, image processing, animation, and presentation graphics MATLAB applications.

4. *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 eigenvalues, Bessel functions, and fast Fourier transforms.

VI. PROPOSED METHOD

The main purpose of this paper is to eliminate fake voting.Face recognition techniques can be classified as two main approaches: Geometric or Feature based approach where we analyse various features by means of their relationships and holistic approach such as Eigen faces etcAnd the fundamental steps involved in digital image processing are image acquisition, image enhancement, image restoration, colour image processing, wavelets and multi resolution processing, segmentation, representation and description, object recognition, and the knowledge base.

The block diagram of voters face recognition is shown in figure 3. Initial step is the collection of database that is details regarding voters are collected from a particular locality or panchayat. These details are then loaded to the system. Next step is the capture of image using webcam that is real time image of the voter is captured. Then features are extracted from captured image using feature extraction algorithm and compared with the image stored in the database. The most important step in this diagram is the decision making which is enclosed in the rhombus. If the captured image matches with the image stored in the database, the voter can cast his/her vote otherwise the voter will be recognise as fake voter. Finally current voter details will be eliminated and polling percentage was calculated.

Initially robust method was not obtained; this is one of the difficulties we faced during the topic selection. The second one is the lack of efficient database of voters. The third one is the limitation of PCA (principal component analysis) algorithm. PCA method is a useful mathematical technique that is used in face recognition and image compression. PCA can perform prediction, redundancy removal, feature extraction, data compression, etc. On the other hand using PCA method the covariance matrix is difficult to be evaluated in an accurate manner and even the simplest invariance could not be captured by PCA unless the training data explicitly provides the information. So we switch on to other efficient method called ICA (independent component analysis) algorithm. One of the factors that distinguish ICA from other methods is that, it looksfor components that are both statistically independent and nonGaussian. And finally we end up with VIOLA-JONES face detector with Adaboost Learning. The VIOLA-JONES face detector contains main three ideas: the integral image, classifier learning with Adaboost, and the attentional cascade structure.

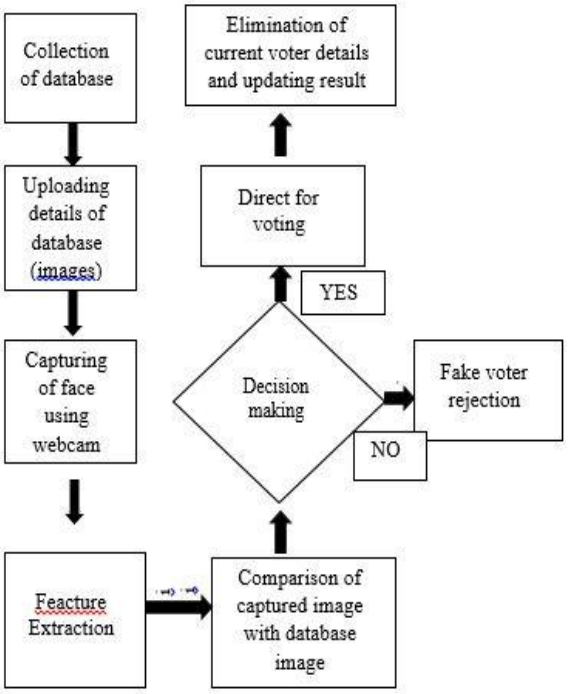

Fig 3: Block diagram

(i)STEPS INVOLVED

- Create a database-1
- Capture image using web cam of voter
- Face area extraction from the captured image of voter
- Different features of the voter face is compared
- Matching of the extracted image with the image stored in the database
- Display the details of the voter
- Rejection of fake voter if he/she not existing in the database.
- Allow voter to vote
- Create a database-2
- Eliminate the details of the voter who has done voting

The initial step involved in this paper is the creation of database-1 for adding the details of voter for voting that is, a database is created using the images of voters in that particular locality. Then the real time image is captured using a webcam during the voting process. The webcam used here is C170 webcam, it is a 5Mp camera which provides smoother video, sharper image and clearer colour under real word conditions. The face area of current voter is extracted and different features of the face were compared using feature extraction algorithm. Next is the matching process that is matching of the extracted image with the image stored in the database. From this we can obtain that whether the voter is eligible or not for voting. If the voter is existing in the database he/she will be allowed to vote if not they will detected as fake voter and rejected. After voting the details of the voter is stored in database-2 then the next step is comparison of the two databases resulting in the elimination of the voter who voted so that he/she can't vote more than once. Finally details of individual were displayed and voter can vote on his/her party and the details of votes for each party will be displayed in the excel sheet.

VII. RESULTS

A. Face area Detection and Feature extraction

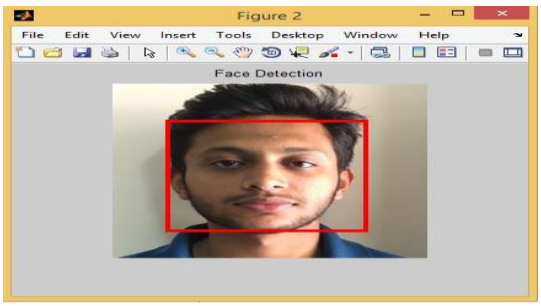

Fig 4:Face Area Detection

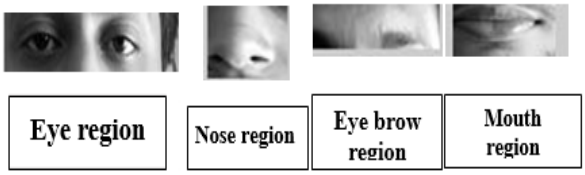

Fig 5: Feature Extraction

B. Matching process

The most important part of this project is the matching process. If the image stored in the database matches with the captured (extracted image) a dialogue box appears with the name of that person and suddenly another dialogue box appears with ‘ Do you wish to continue voting’ as shown in figure 6, and the voter can cast his/her vote.

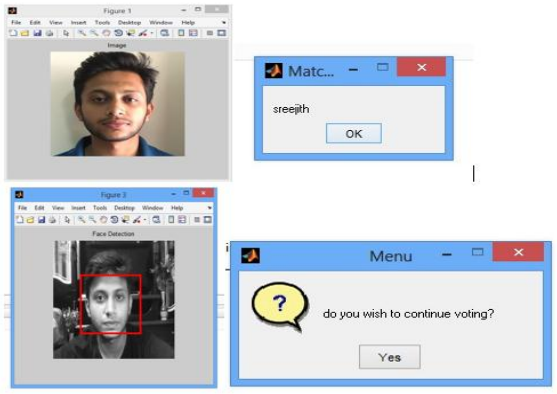

Fig 6:Matching case

If the captured image doesn’t matches with the image stored in the database, a dialogue box appears with ‘Not matched ’as shown in figure 7 and he/she will be rejected from the list.

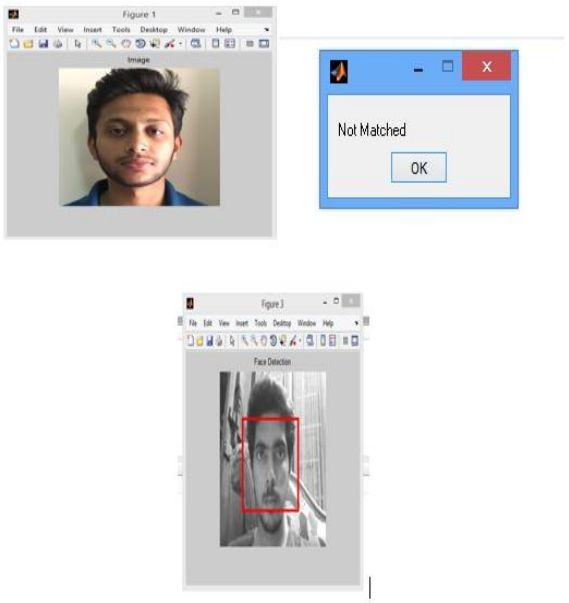

Fig 7. Not matching (invalid case)

C. Voting and polling percentage calculation

After the process of face recognition each voter can cast his/her vote to the specific political parties according to the number allotted to each party and the result will display on the excel sheet as shown in figure 8.

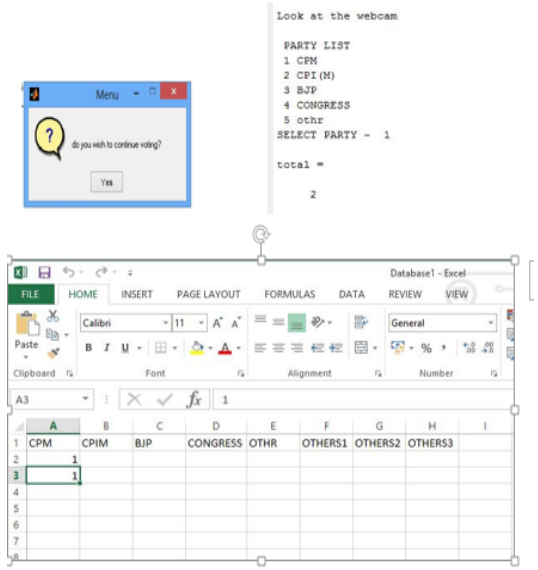

Fig 8.voting and polling percentage

VIII. ADVANTAGES AND DISADVANTAGES

- Can prevent card counters, etc. from entering casinos
- Can identify terrorists, criminals, etc.
- Can find missing children
- Prevents voter fraud
- Targets shoppers
- Isn't always accurate
- Hindered by glasses, masks, long hair etc.
- Must ask users to have a neutral face when pictures are being taken
- Considered an invasion of privacy to be watched

IX. CONCLUSION AND FUTURE SCOPE

Use of cameras, closed circuit televisions and digital cam are common method used for surveillance, in view of the security aspects. But these systems possess several disadvantages, like, its viewing angle is restricted and there are numerous blind spots that make the detection process difficult. This project tries to overcome this by introducing Viola-Jones algorithm and using geometric and graph matching approaches for face detection and recognition. As every operation is performed through internet connectivity so, it is one time investment for government. Voters' location is not important but their voting is important. As data is stored in centralized repository so, data is accessible at any time as well as backup of the data is possible. Also requires less man power and resources. Person identification is to be done from a group of people and the result is stored in a defined destination .The plan of the project is to develop it as a face recognition for voting purpose so that fake voting can be eliminated. So far matching of captured images (folder) with data base images was done. In the future perspective there will be an introduction of central server system, were all units will be connected.

X. REFERENCES

[1] https://people.ece.cornell.edu/land/courses/ece4760/FinalProjects

[2] http://ieeexplore.ieee.org/xpl/login.jsp?tp=7105378&url=http%3A%2F%ieee.org%2Fxpls%2Fabs_all.jsp%3F arnumber%3D7105378

[3] https://people.ece.cornell.edu/land/courses/ece4760/FinalProjects/f2012/wl378_as889

[4] https://www.youtube.com/watch?v=-5GpqOzANQQ

[5] International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 3, Issue 3, March 2014, 'Voting System Support through Face Recognition',G.Rajeshbabu 2A.Ramu 3S.Suruliraj 4R.Chinnasamy

[6] Bhumika G. Bhatt , Zankhana H. Shah Face Feature Extraction Techniques: A Survey National Conference on Recent Trends in Engineering & Technology 2013

[7] A MATLAB based Face Recognition System using Image Processing and Neural Networks

[8] Noha E. El-Sayad, Rabab Farouk Abdel-Kader Face Recognition as an Authentication Technique in Electronic Voting, (IJACSA), Vol. 4 No. 6, 2013

[9] Nikita Sharma, D.S.Singh, A Survey on various Feature Extraction Techniques for Face Recognition, IJCA, ISSUE 2, Volume 4 (August 2012) ,ISSN: 2250-1797, Page 18

[10] Eric Hess „"Facial recognition: A valuable tool for Law Enforcement"", Forensic magazine, Vol.7/ No.5, November 2010. S.Ravi, S.Wilson, "Face detection with facial features and gender classification based on support vector machine", 2010 IEEE Internation al Conference on Computational Intelligence and computing Research, ISBN: 97881 8371 362 7

[11] S. Asadi, Dr. D. V. Subba R. V. Saikrishna, "A Comparative study of Face Recognition with PCA and Cross-Correlation Technique", IJCA(0975-8887), Volume 10- No.8, November 2010.

[12] R. Jafri, H. R. Arabnia, "A Survey of Face Recognition Techniques", Journal of Information Processing Systems, Vol.5, No.2, June 2009.

[13] Abate A. F., Nappi M., Riccio D. and Sabatino G. (2007) Pattern Recognition Letters, vol 28,no. 14, pp. 1885–1906

[14] Mohamed A. Berbar ,Hamdy M. Kelash, and Amany A. Kandeel, Faces and Facial Features Detection in Color Images, Proceedings of the Geometric Modeling and Imaging— New Trends (GMAI'06) 07695-2604-7/06 $20.00 © 2006 IEEE

[15] J. Lu, K. Plataniotis, A. Venetsanopoulos, and S. Li. Ensemble-based discriminant learning with boosting for face recognition. IEEE Trans-actions on Neural Networks, 17(1):166–178, January 2006

[16] R. Gross, J. Shi, and J. Cohn. Quo vadis face recognition? - the current state of the art in face recognition. Technical report, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, USA, June 2001.

[17] K. Sung and T. Poggio, Example-based Learning for View-based Human Face Detection, A.I. Memo 1521, MIT A.I. Laboratory, 1994.

[18] A Survey on Face Recognition Technology - Viola Jones Algorithm, Ankur Sahitya Dept of ISE BMSIT&M, Bangalore Karnataka, India, Manjunath T N Dept of ISE BMSIT&M, Bangalore Karnataka, India Veena N Dept of ISE BMSIT&M, Bangalore Karnataka, India