# REAL TIME VOTING SYSTEM USING FACE RECOGNITION FOR DIFFERENT EXPRESSIONS AND POSE VARIATIONS

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## Abstract

*In this research work different facial expressions and poses of individual person faces are detected and stored in voter database by giving appropriate aadhar card id number. If a person comes for a vote then his or her face is detected and this detected face image is compared with images in voter database and aadhar card id number. If the face image and id number are recognized then person is allowed to cast the vote. If it is not recognized then person is not allowed to vote. After the successful voting process, number of votes to the particular candidate and the party will be counted. This paper illustrates the Haar like features for face detection and eigenface algorithm for face recognition. eigenface method is one of the most basic and efficient methods for face recognition. This paper also shows that if the minimum Euclidian distance from other images of the test image is zero, then the test image absolutely matches the existing image in the database.*

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## 1. INTRODUCTION

There are various significant applications of face feature extraction and recognition are face based electronic voting system, video indexing and browsing engines, biometric identity authentication, multimedia management, human-computer interaction, surveillance, image and film processing and criminal identification [11]. Different illumination, size and orientation of face image can be effected the face recognition results. An input image is captured by web camera at different illuminations with different contrast may consists of shadows and high darkness region. Human face have variety of emotions with different expressions are more sensitive to different conditions such as variation in illumination, noise, colors etc [18]. Facial expressions recognition is a challenging task. There is various subspace methods are defined such as PCA, LDA, SVD. LPP, ICA used for feature extraction [2].

## 2. 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 fake person voting. 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.

## 3. PROPOSED VOTING SYSTEM

In this study Face Detection and Recognition system is proposed and it used as an authentication technique in voting, application based voting allows the voter to vote from any place in state or out of state[ 15]. 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 eigenface 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. eigenface 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 eigenface approach. Besides that, the dimensional reduction of face space relies upon number of eigenfaces taken. In this research paper, an enhanced solution for face recognition is given by taking the enhanced value of threshold value and number of eigenfaces.

## 4. FACE DETECTION TECHNIQUE

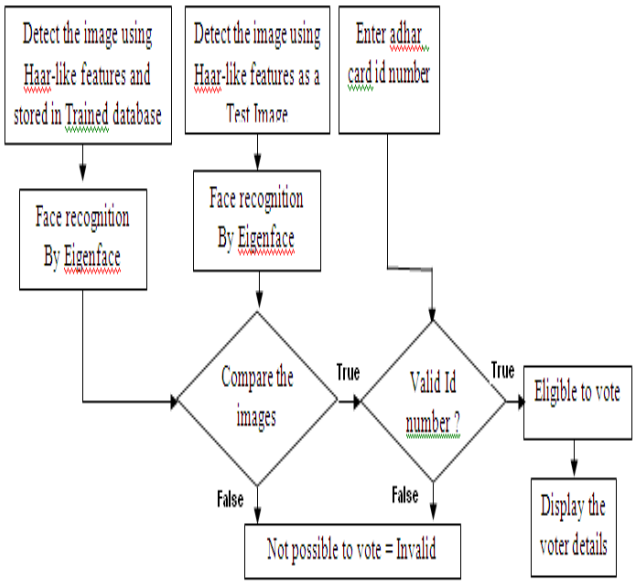


**Fig 1** Data Flow Diagram for the proposed voting system

In the above flow diagram the captured image will be detected using Haar-like feature algorithm and recognized using Eigen face algorithm. This test image and the trained image in the database will be compared. Simultaneously the ID(aadhar number) is entered. Once entered number is matched with the number in the Database and after the matching of the image the image in the Database is will be retrieved and the details of the voter will be displayed and the candidate form will be enabled. Then the voter will be allowed to vote. If the face is not matched or the ID is invalid the voter will not be able to cast his/her vote.

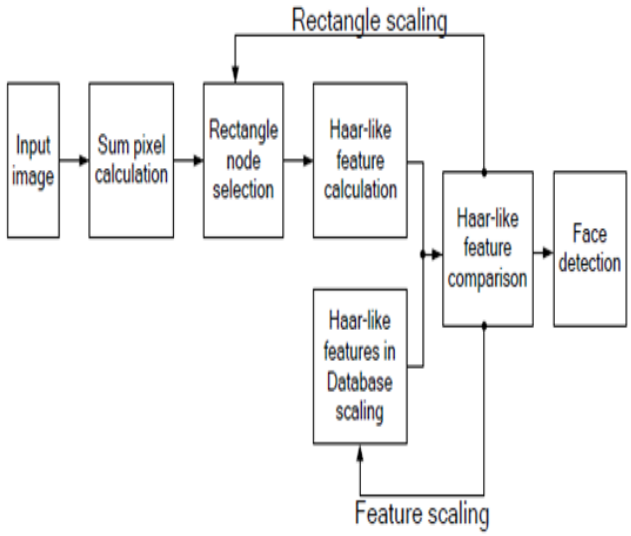


**Fig 2.** Data flow diagram for Haar-like features

In the above flow diagram the input image (captured image) is taken and sum of the pixels of the image is calculated. Then from the entire image, rectangular node is selected covering only the face. Each vertices of the rectangle is named as A, B, C, D. Then the Haar-like feature calculation is done by finding the difference of the sum of the adjacent points(vertices).

$$\text{i.e} \quad \text{Sum} = I(A) + I(C) - I(B) - I(D)$$

Then the trained image stored in the database using Haar-like feature is compared with the test image selected using Haar-like feature. If the comparison is true then the face is detected else we need to select the different rectangle node from the face of the captured image.

Object Detection using Haar feature-based cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" [6]. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, Haar features shown in below image are used. They are just like our convolution kernel. Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle.

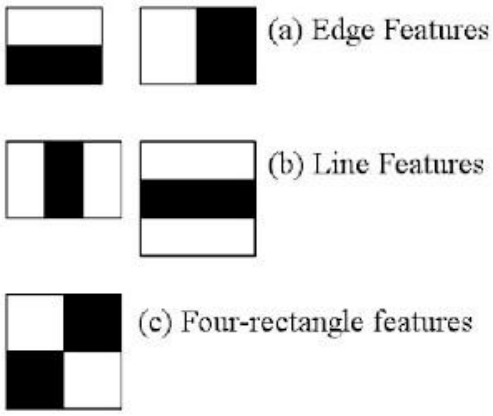


**Fig 3** Land marks of extraction of features

For each feature calculation, we need to find sum of pixels under white and black rectangles. To solve this, they introduced the integral images. It simplifies calculation of sum of pixels, how large may be the number of pixels, to an operation involving just four pixels. In an image, most of the image region is non-face region. So it is a better idea to have a simple method to check if a window is not a face region. If it is not, discard it in a single shot. Don't process it again. Instead focus on region where there can be a face. This way, we can find more time to check a possible face region.

## 5. FACE RECOGNITION TECHNIQUE

The scheme is based on an information theory method that decomposes face images become a minute set of characteristic feature images are called 'eigenfaces', which are in fact the principal components of the primary training set of face images. The eigenface method is one of the most efficient and simplest approaches in developing a system for Face Recognition. The recognition is performed by projecting new image into the subspace extended by the eigenfaces ('face space') and then organizing the face by contrasting its position into the face space with the positions of the identified individuals [2]. In eigenface method, the distance is measured between couples of images for recognition after the dimensional reduction of the face space. If the distance is less than a certain threshold value, then it is considered as an identified face else it is an unidentified face [5].

In the figure 4, we have two set of image blocks training set image block and test set image block. In training set image block, firstly the Eigenface of image in the database (trained image) is obtained. Then the weight W1 is calculated by using the Eigenface and the training set. In the testing set image block, input unknown image X which is the captured image is taken. The weight W2 is calculated using the input image and the Eigenface. Value of D is calculated by finding the average of distances between W1 and W2. If the

D value is less than 0, then the face is recognized. Then the input image X and W2 values are stored. If the D value is greater than 0, then the face is not recognized.

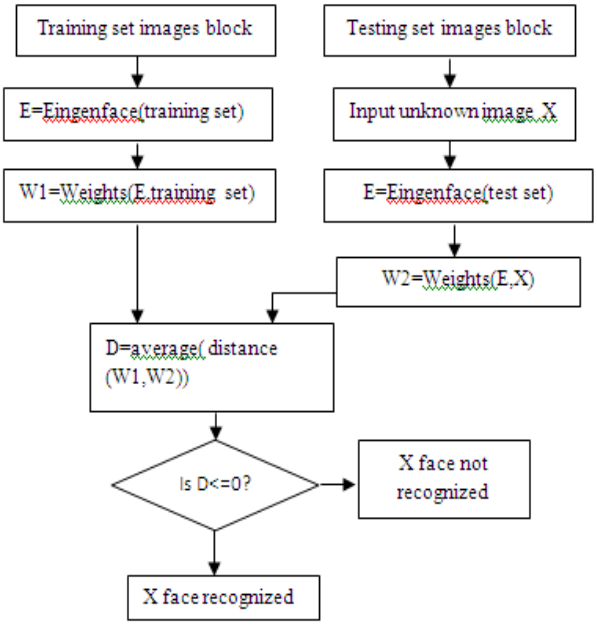


**Fig 4.** Data flow diagram for the Eigenface algorithm for face recognition

## 6. RESULTS AND DISCUSSIONS

The experimental results are demonstrated in this paper to verify the viability of the proposed face recognition method. Also only 15% of eigenfaces with the largest eigenvalues are adequate for the recognition of a person. The best optimized solution for face recognition is provided when both the features are combined i.e. 15% of eigenfaces with largest eigenvalues are chosen and threshold value is chosen 0.8 times maximum of minimum the Euclidean distances from all other images of each image, it will wholly improve the recognition performance of the human face up to 97%. Initially multi views of a voter/person face is captured with webcam and voter details are entered with an appropriate address, date of birth, aadhar card number then it is trained and stored in a database, A Person who wants to vote should correctly focus his/her face in front of webcam window then enter the aadhar card id number. After doing this if voter face and aadhar card id number match with the data base value then voter is successfully complete voting.

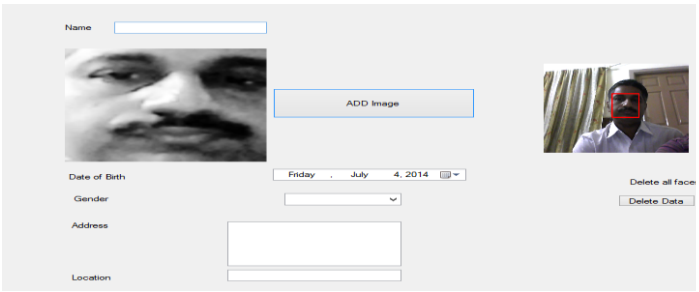


**Fig. 5** Training process under different views of a person

**Fig. 6** Trained database images (Detected face of My database)

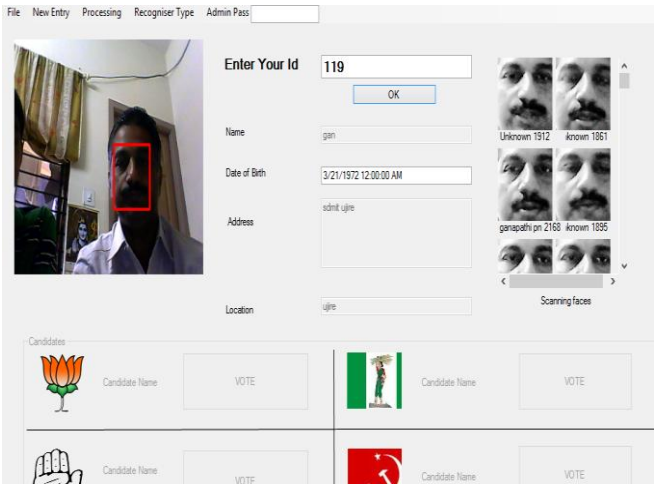


**Fig. 7** Testing process when person comes for voting.

**Fig 8** Matching images with different facial expressions

## 7. CONCLUSIONS

This voting system helps everybody to cast their votes without any problem. Voting application will increase the percentage of voting. Manual counting is not required. So by this we will get the very prominent, clear and fast result. By using this newly developed system we can overcome many problems of existing system. This system is more efficient than the existing one. Application voting allows the voter to vote from anywhere in his state or out of state.

We have used Face Detection and Recognition based on Haar-like features and Eigen face recognition as authentication in the application. This system detect the face from an image captured using a webcam and recognize face from AADHAR database and check if the two images match. If a match accrues, then verify that the law and roles of voting are not violated then allow him to vote.

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