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Research Article

Detection and Recognition of Face

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Abstract: The main objective of this work is to construct an automated human facial measurements systems from the acquired images and to obtain the various parts of facial features which is frequently used for facial image analysis tasks. Required part of the face is detected by identifying face by using pattern recognition algorithm. The various parts of geometric and symmetric information of the face is used to develop an algorithm. An MATLAB R2018b tool is used for the implementation of the work.

Keywords: Face detection, Interclass variations, Data base, template matching, Face recognition.

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1. Introduction (Times New Roman 10 Bold)

Face detection detects faces from an acquired image by evaluating the dimensions of various parts of face. In the field of computer vision Face detection has been considered as the challenging and thought-provoking problem. The features that are used for detection of face is affected by several parameters like facial presence, illumination and appearance leads to the large intra-class variations. Such deviations makes the face feature distribution is nonlinear and detection process becomes complicated in real time system, whereas this features are linear in the original image space. The anterior face is acquired through the camera restrictions and posture differences build the spreading of human faces in feature space more distributed and intricate than that of anterior faces. It further elaborates the developing of robust face detection system.

In Face reorganization process for an arbitrary given image, through the face detection process decides the presence and absence of the image in the data base, if the image is existing then it returns the image location and extent of each face.

The face recognition and detection system are complicated procedure since it is depend on flexible features and complex background [1–3]. The Past work is based on semi supervised learning method the detection is based on different features of an image namely grayscale, Histogram of Oriented Gradients and shape features, the orientation of an image plays major role in evaluation of these features, and which in turn increases the complexity of the system it reduces the generalization ability. All together, the object blocking will lead to the unnoticed recognition, thereby decreasing the overall precision of the system. Hence it is necessary to make an effort to improve accuracy of the system [4]. In the field of computer vision, machine learning model is used for face detection and recognition [5]. Machine learning algorithms were used to classify and to recognize face. The recognition accuracy of the system is improved by extracting features from the detection area. [6]. The hierarchical strategy is used to acquire the needed feature representation in the data set like convolutional neural networks, decision trees through weight updating process [7]. Face detection and face recognition constructed by two-stage network structure. In Convolutional neural networks were used to measure the dissimilarity among the projected value and the real value is obtained by using a classification loss function. Through the training method distance among various forms of images are used to expand and then complete the classification of the image. An algorithm strength and precision is improved with large quantity of data set, 3-dimensional face information is used as a feature for training Wang et al. [8] .Corrow et al. [9] used complex operations on the features is accomplished by using Bayes algorithm. Abbad et al. [10] decrease the distance between the classes by using the feedback of the loss function during the training process, the system relies on the number of samples.

The work is carried out to detect and recognise the face based on Viola-Jones algorithm. This algorithm also works efficiently in an unconstrained environment meaning that it identity's very visible faces in any conceivable image. The face detection is carried out to match the features which are stored in data base against the extracted features along with that Viola-Jones algorithm is used to improve the performance of the system.

2. Methodology

The standard face recognition system mainly consists of 3 sections
1. Face detection is used to detect the required face from the acquired images using Viola-Jones algorithm.
2. Feature extraction the various features of face such as eyes, nose and mouth are extracted from the face image.
3. Recognizing faces is carried out by matching input image against the stored faces in database.

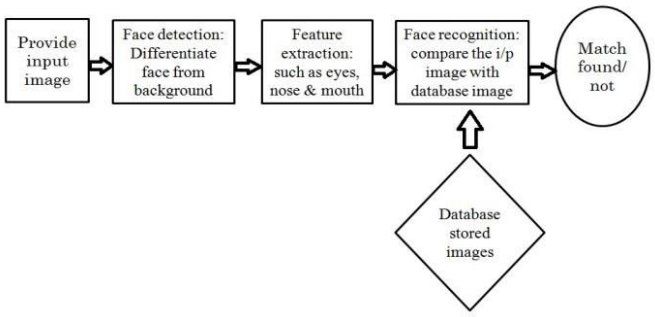

Figure 1: Block diagram of overall system

To find an object of an unknown size Viola-Jones face object detector is used. The detection process time can be reduced by splitting up the entire Viola-Jones algorithm in to three subsection are as follows: 1. Integral image 2. Haar like features 3. Adaboost algorithm

A face detection algorithm is mainly depends on two key parameters namely accuracy and speed. Balance between this two parameter is needed. Through the use of an integral images representation rapidly calculate summations over sub regions of an image. It computes a value at each pixel (x,y) and quickly computed in one pass through the image. So that speeds up the classification task of the system with the fast feature evaluation process. Integral images are formed by taking the addition of the luminance values above and to the left of a pixel in an image.

The Haar-like feature is used in object recognition and is obtained by integral image. It is defined as the variance of the rundown of pixels of areas inside the rectangle, which can be at any position and scale within the original image. The certain characteristic of a particular area of the image and appearances in the image, such as edges or changes in texture is obtained by these values.

Adaboost Training is an iterative algorithm. In this process a weak learner is trained under several boosting rounds. It focuses on challenging data points. The data points that have been miscategorised by the previous weak classifier.

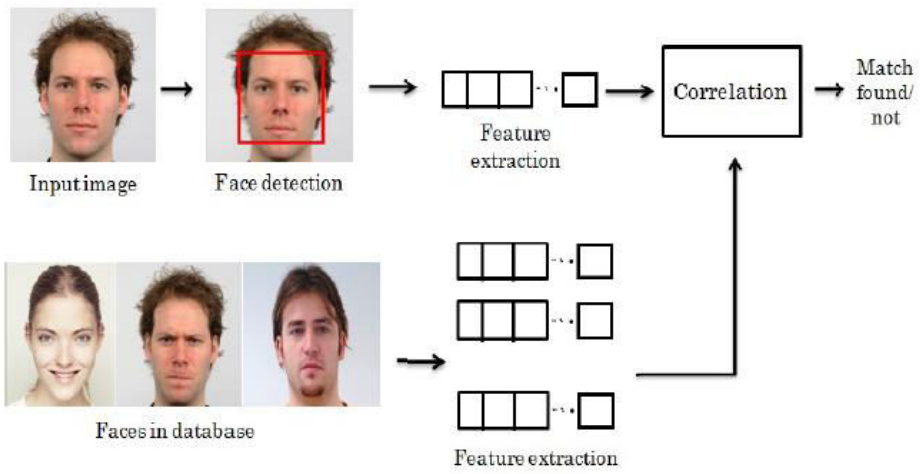

Figure 2: Work flow of the system

The work flow of the system using Viola-Jones algorithm is as shown in the above Figure. Initially data base has to be created by storing the several images and corresponding different features of face has to be extracted by using Haar like feature and stored it or reference purposes. The extraction of various features of face is as shown in the below figure.

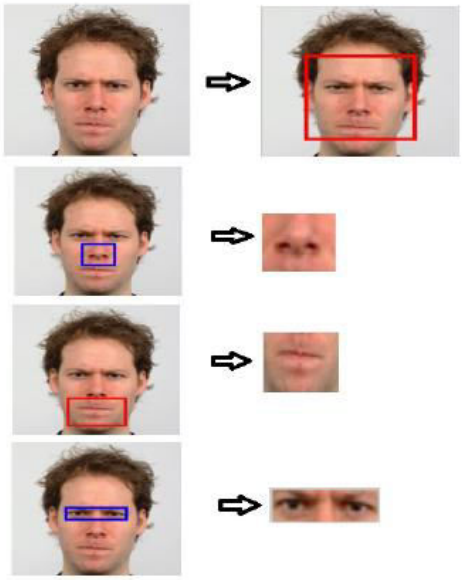

Figure 3: Stored Database image Features

Whenever the test image is applied to the input of the system, same steps as to follow that is used for extraction of reference features and. Is as shown in the below figure.

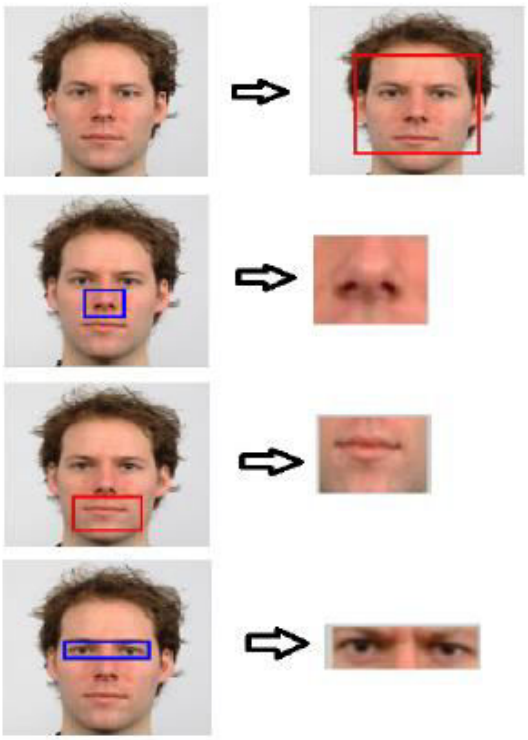

Figure 4: test image Features

3.Results and Discussion

MATLAB tool is used to implement the system. The created data base as shown in the below Figure.

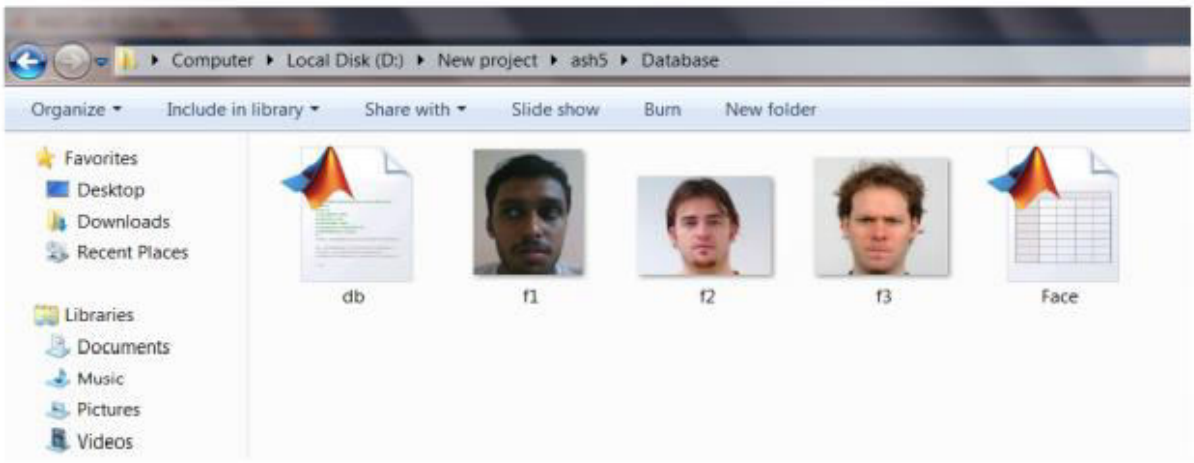

Figure 5: Database images

Using Viola-Jones algorithm various features are extracted for all data base images as shown in the below figures from Figure 6 to Figure 9.

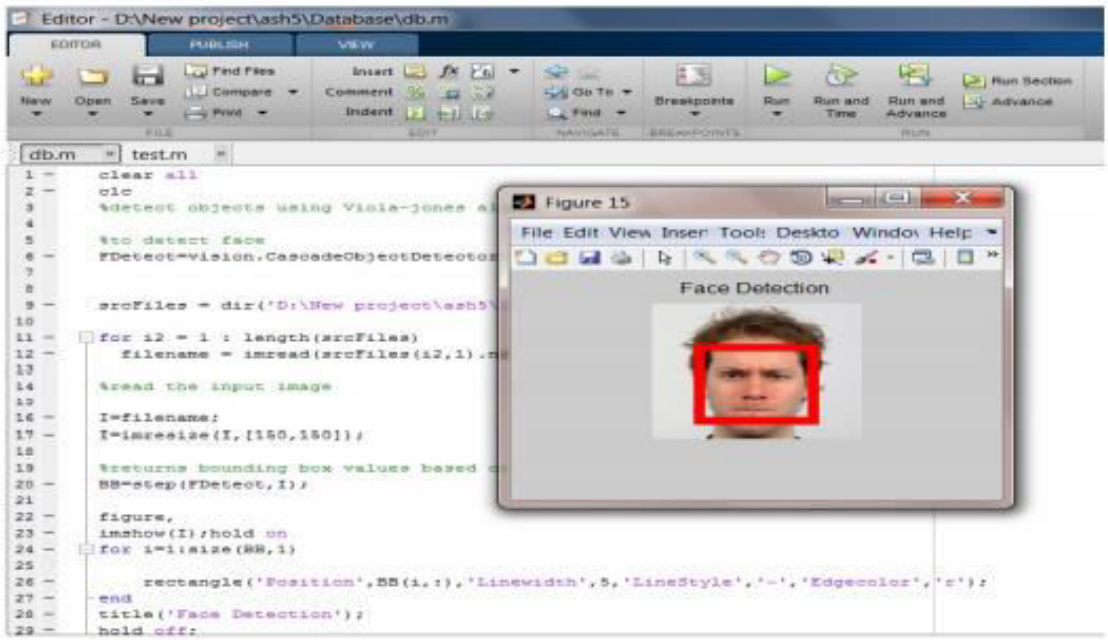

Figure 6: Face detection

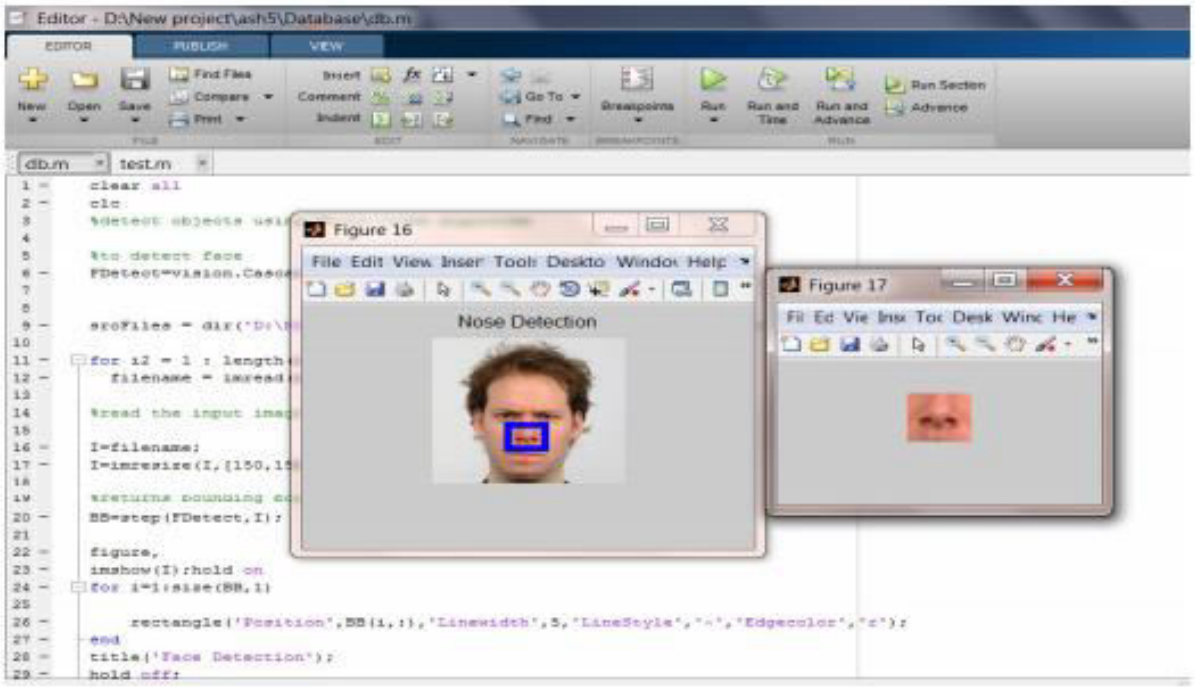

Figure 7: Nose detection

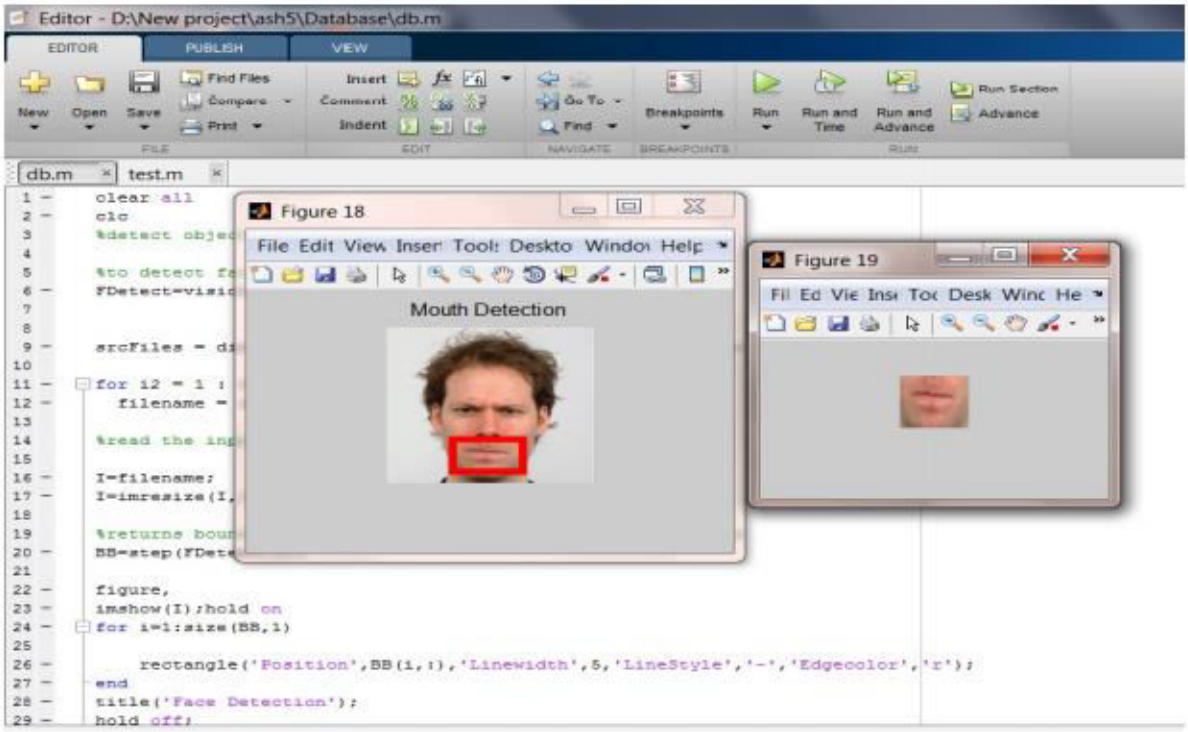

Figure 8: Mouths detection

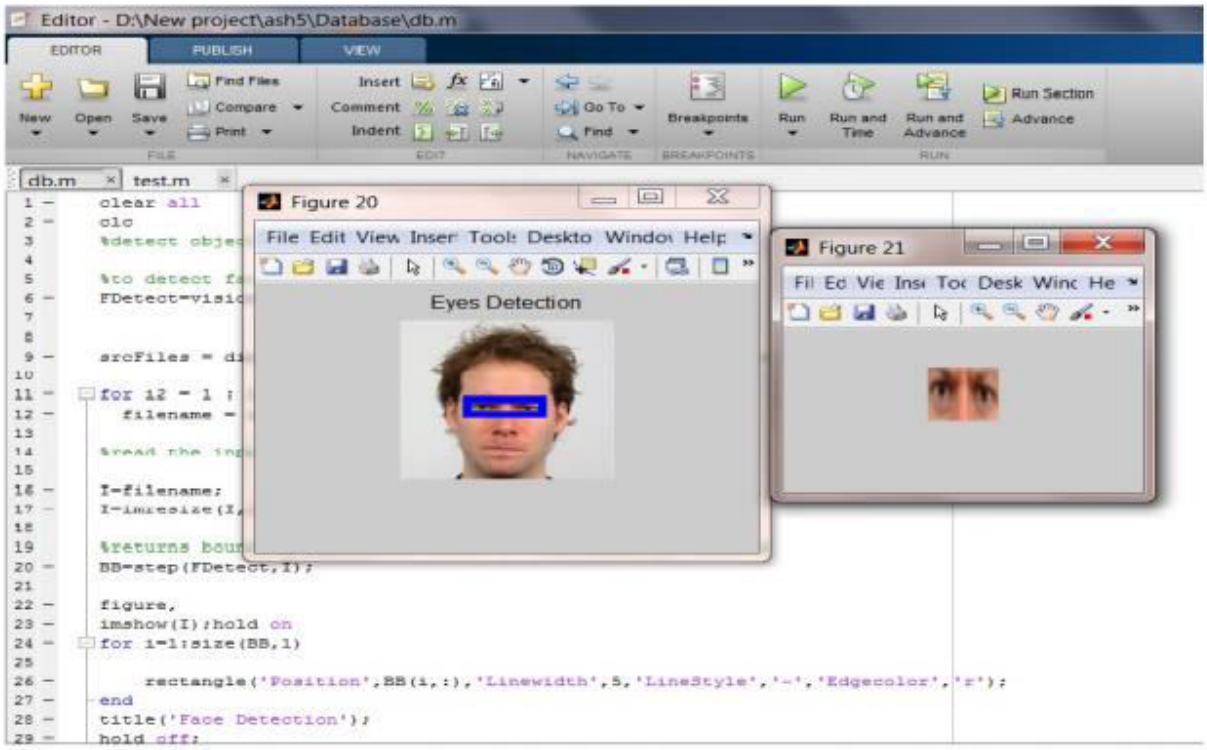

Figure 9: Eyes detection

Save the coefficient vectors such as eyes, nose and mouth in database using .matfile in MATLAB.

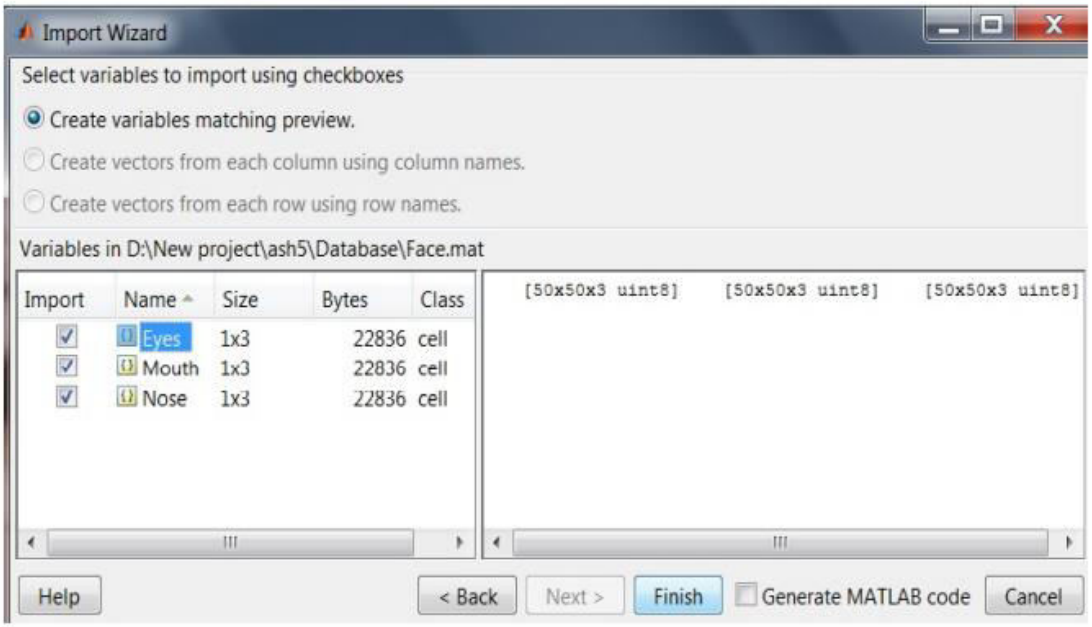

Figure 10: Import wizard

Run the test image for face recognition. To recognizing faces by matching input image against the faces in database. The result obtaining is as shown in the Figure 11 and Figure 12

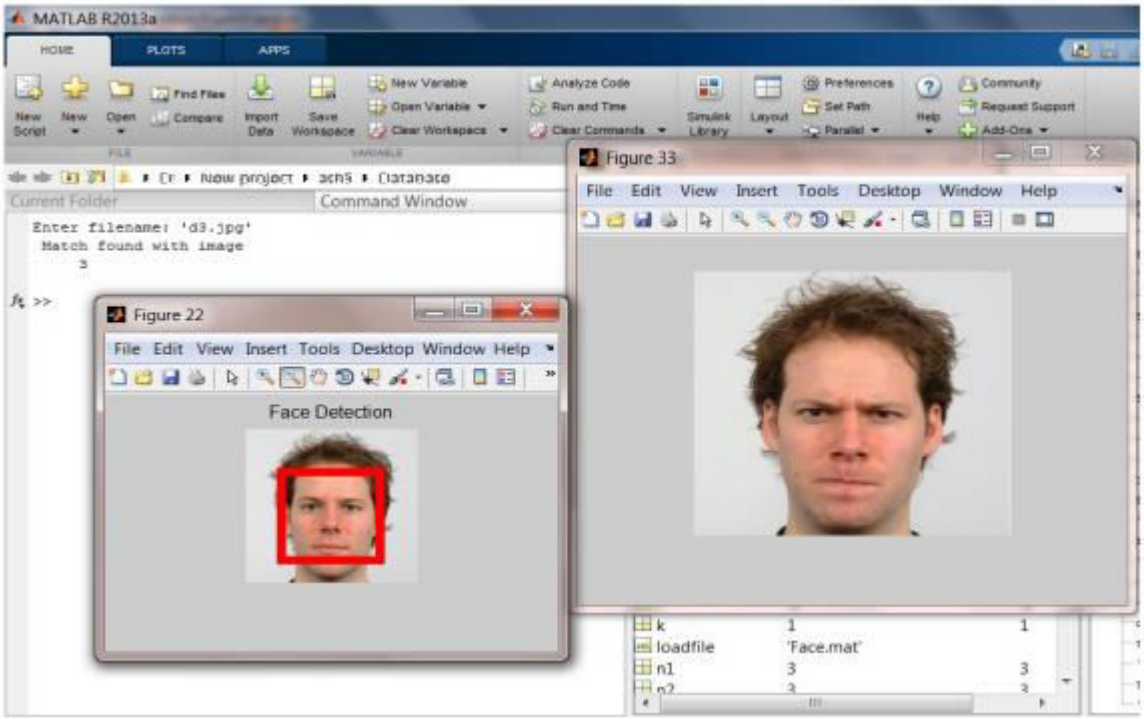

Figure 11: Test image matched with database image

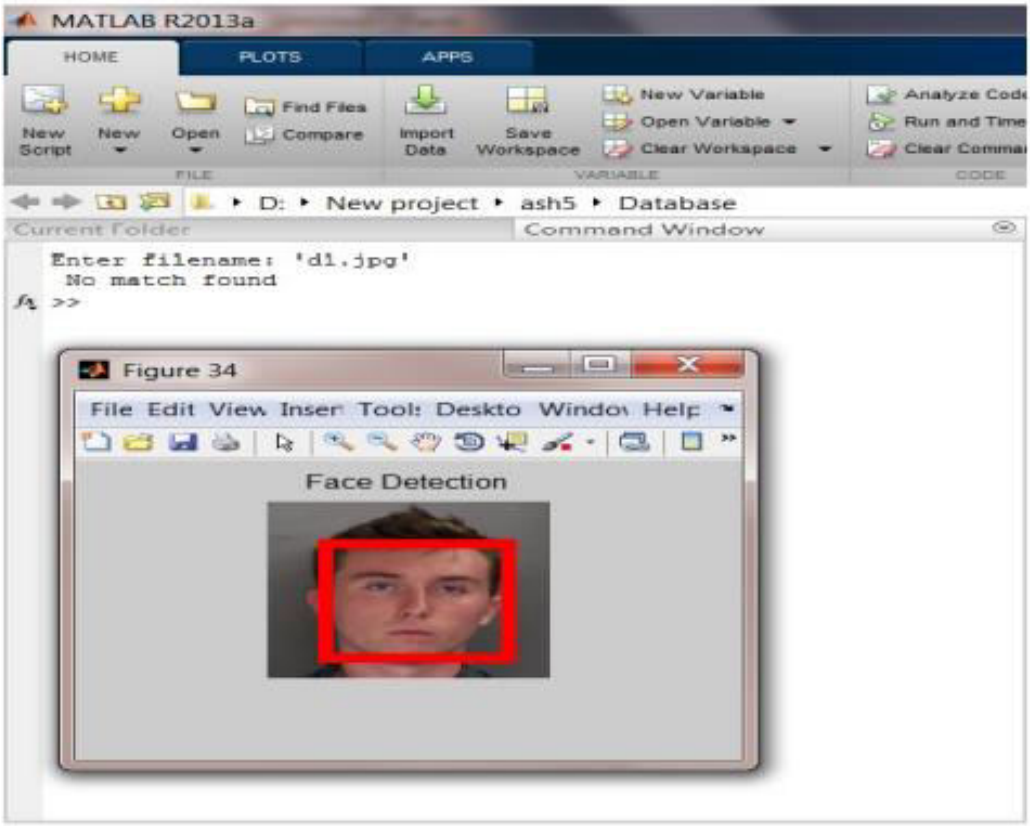

Figure 12: Test image does not matched with database image

The various colour images with different face expression, various posture and under various illumination intensities data base is created. In order to speed up the recognition process irrespective of original image size, each image is resized to 150X150 resolution and there features are resized to 50X50 resolution. This work was executed using a Viola-Jones face detection algorithm and system functions at an accuracy of 70-90%.

4.Conclusion

The Viola-Jones face algorithm is used for implementation of face detection and recognition has been effectively implemented. Where the system functions at an accuracy of 70-90% using MATLAB R2018a. The various features are detected by using object find detector.so that we can obtain good accuracy with reduce computation time. The constitutive image is used to obtain abundant set of image features, which eliminates need to compute multistage image pyramid, which decreases the initial image processing needed for object detection significantly. The AdaBoost training is used as effective tool for feature selection so that user can free from selection of features as input for effective learning process

In the future work further improvement can be done by making it more robust under various illumination conditions with different algorithms, also implementing it with group detection with algorithms and it possible to devise a distributed face detection algorithm in DSC(Desired state configuration) incorporates multi-view face detection in DSC networks.

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