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FACE DETECTION USING VIOLA JONES ALGORITHM AND MLP TECHNIQUE

Kiran Sanjay Katke[1]

Student, Computer Science and Engineering, CSMSS, Chh, Shahu College of Engineering, Aurangabad, India[1]

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Abstract:- Face detection could also be a way of detecting faces from pictures, video footages, etc. There are various face detection algorithms; one among the widely used algorithm is that the Viola Jones algorithm for object detection. The success rate of this algorithm for detecting faces was up to 78.4%. during this paper, we present a way , which is an improvisation on the prevailing Viola Jones algorithm. we've improvised the algorithm to obviously detect the eyes during a face of both people wearing glasses or not. And also other features of face, The detection of glasses on the face is completed by training a MLP technique. This algorithm primarily identifies a face with the presence of eyes, which has improved the detection rate and today our observations have yielded 97% success .Due to the large size of realistic galleries, not only the accuracy but also the scalability of a face identification system must be considered. the most scalability issues are the subsequent . First, the amount of subjects within the gallery are often quite large; hence, common search techniques like brute force nearest neighbor employed to match probe faces don't scale well.

Keywords:- *MLP, EPOCHS,LBP*

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I INTRODUCTION

This project aims to build a face detection using viola jones algorithm and MLP Technique that will not only detect the person but also identify the person by displaying its name, age, gender from dataset.

In general practice Faces play a crucial role in human interactions. Nowadays face is employed as a biometric identifier in many applications like access control for security, criminal identification, surveillance and lots of other commercial applications. Face detection is a procedure by which one can extract the facial region of humans from the images [5] with increasing terrorist activities and augmenting demand for video surveillance, it was the need of an hour to come up with an efficient and accuracy [6]

1. Techniques used

1.1 Viola jones algorithm

This is a learning based algorithm which is used for object detection. Here, we will be using it for face detection [5,6]. It uses Haar features and a cascade of classifiers to identify the objects. The Haar features are computed by using the integral image. The best features are chosen by using the Adaptive Boost (Adaboost) algorithm. This procedure takes place in every stage and there is a cascade of such stages. In every stage, the incorrectly detected faces are discarded. Thus higher the number of stages, better will be the accuracy of face detection.

The efficiency of the Viola-Jones algorithm can be significantly increased by first generating the integral image. [5]

The integral image allows integrals for the Haar extractors to be calculated by adding only four numbers. For example, the image integral of area ABCD (Fig.1) is calculated as II(yA,xA) – II(yB,xB) – II(yC,xC) + II(yD,xD).

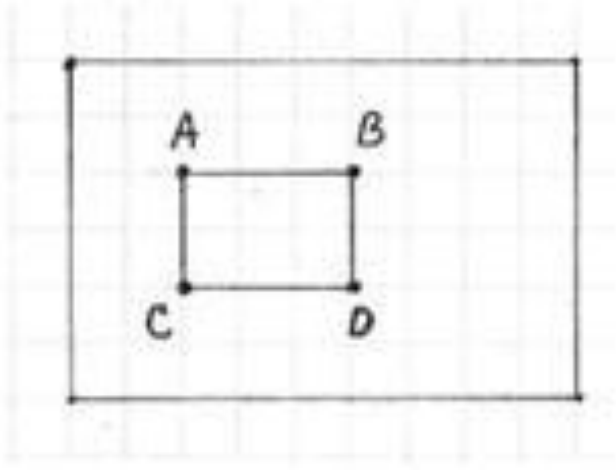

Fig.1 Image area integration using integral image

Haar Features

Rectangular Haar-like feature are often defined because the difference of the sum of pixels of areas inside the rectangle, which may be at any position and scale within the first image. This modified feature set is named 2-rectangle feature. [5] Viola and Jones also defined 3-rectangle features and 4-rectangle features. The values indicate certain characteristics of a specific area of the image. Each feature type can indicate the existence (or absence) of certain characteristics within the image, like edges or changes in texture. for instance , a 2-rectangle feature can indicate where the border lies between a dark region and a light-weight region [10]

1.2 Local binary patterns (LBP)

Local binary patterns (LBP) may be a sort of visual descriptor used for classification in computer vision. The LBP feature vector, in its simplest form, is made within the following manner:

• Divide the examined window into cells (e.g. 16x16 pixels for every cell).

• For each pixel during a cell, compare the pixel to every of its 8 neighbour's (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.

• Where the centre pixel's value is bigger than the neighbour's value, write "0". Otherwise, write "1". this provides an 8-digit binary number (which is typically converted to decimal for convenience).

• Compute the histogram, over the cell, of the frequency of every "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the centre). This histogram are often seen as a 256-dimensional feature vector.

• Optionally normalize the histogram.

• Concatenate (normalized) histograms of all cells. this provides a feature vector for the whole window.

1.3 MLP Technique :

MLP technique may be a machine learning prediction technique which is employed for image i:e(face) identification. it'll check whether the image which is in dataset matches with the person present within the dataset or not and identify the person with name , age , gender

In MLP technique with take the image of folder for training during which all the pictures are available, therein folder which ever files are it'll fetch them, all the files are read one at a time.

After reading the files we implement Local binary pattern(LBP) [1] on files, technique which we discussed in upper section ,LBP may be a simple efficient texture operator , it compares pixel values with neighboring pixels , LBP is essentially wont to identify the pixels and to spot the feature from pixels.

1.4 EPOCHS

Epochs is that the number of times a learning algorithm sees the entire dataset. Now, this might not be adequate to the amount of iterations, because the dataset also can be processed in mini-batches, in essence, one pass may process only a neighbourhood of the dataset. In such cases, the amount of iterations isn't adequate to the amount of epochs.

In the case of Batch gradient descent, the entire batch is processed on each training pass. Therefore, the gradient descent optimizer leads to smoother convergence than Mini-batch gradient descent, but it takes longer . The batch gradient descent is bound to find an optimum if it exists.

Stochastic gradient descent may be a special case of mini-batch gradient descent during which the mini-batch size is

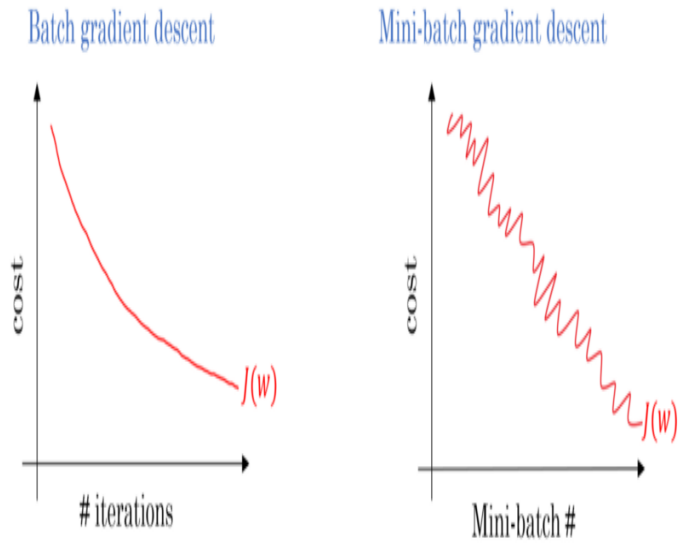

Fig 2: Batch gradient descent and mini batch gradient descent

1.5 Stochastic Gradient Descent

The word 'stochastic 'means a system or a process that's linked with a random probability. Hence, in Stochastic Gradient Descent, a couple of samples are selected randomly rather than the entire data set for every iteration. it's wont to determine the ultimate end in Gradient Descent, there's a term called "batch" which denotes the entire number of samples from a dataset that's used for calculating the gradient for every iteration.

In typical Gradient Descent optimization, like Batch Gradient Descent, the batch is taken to be the entire dataset. Although, using the entire dataset is basically useful for going to the minima during a less noisy and fewer random manner, but the matter arises when our dataset gets big

Suppose, you've got 1,000,000 samples in your dataset, so if you employ a typical Gradient Descent optimization technique, you'll need to use all of the a million samples for completing one iteration while performing the Gradient Descent, and it's to be finished every iteration until the minima is reached. Hence, it becomes computationally very expensive to perform.

This problem is solved by Stochastic Gradient Descent. In SGD, it uses only one sample, i.e., a batch size of 1 , to perform each iteration. The sample is randomly shuffled and selected for performing the iteration.

SGD formula:

$$for\ i\ in\ range\ (m):$$
$$\theta_j = \theta_j - \alpha\,(\hat{y}^i - y^i)\,x_j^i$$

So, in SGD, we discover out the gradient of the value function of one example at each iteration rather than the sum of the gradient of the value function of all the examples.

In SGD, since just one sample from the dataset is chosen randomly for every iteration, the trail taken by the algorithm to succeed in the minima is typically noisier than your typical Gradient Descent algorithm. But that doesn't matter all that much because the trail taken by the algorithm doesn't matter, as long as we reach the minima and with significantly shorter training time.

1.6 MIX BARNOULLI CLASSIFIER

A Bernoulli process may be a finite or infinite sequence of independent random variables X1, X2, X3, ..., such that

• for each i, the worth of Xi is either 0 or 1;

• for all values of i, the probability p that Xi = 1 is that the same.

In other words, a Bernoulli process may be a sequence of independent identically distributed Bernoulli trials.

Independence of the trials implies that the method is memoryless. as long as the probability p is understood , past outcomes provide no information about future outcomes. (If p is unknown, however, the past informs about the longer term indirectly, through inferences about p)

If the process is infinite, then from any point the future trials constitute a Bernoulli process identical to the whole process, the fresh-start property

II LITERATURE REVIEW

1. Different Face Recognition Techniques: A Survey Mr. Rahul B. ATAL[12]

In this paper, face recognition has become one of the significant aspects in many applications of computer vision. Face recognition is image processing technique that include classification and recognition means to recognize Features of the face region are extracted using different techniques. Viola Jones is one of the universally accepted technique whose accuracy rate is higher compare to other techniques. Pre-processing of images to remove blur, features extractions in form of vectors and classification using reliable classifier like neural network, support vector machine, principal component analysis etc are done on images to classify them correctly. This survey is based on stating different techniques to identify images correctly taken from known standard databases using supervised learning methods. Keywords— Face Recognition, Image Processing, Viola Jones, Neural Network, Support Vector Machine, PCA

2. Face Recognition: A Literature Survey W. ZHAO University of Maryland National Institute of Standards and Technology [11]

As one of the most successful applications of image

analysis and understanding, face recognition has recently received significant attention, especially during the past several years. At least two reasons account for this trend: the first is the wide range of commercial and law enforcement applications, and the second is the availability of feasible technologies after 30 years of research. Even though current machine recognition systems have reached a certain level of maturity, their success is limited by the conditions imposed by many real applications. For example, recognition of face images acquired in an outdoor environment with changes in illumination and/or pose remains a largely unsolved problem. In other words, current systems are still far away from the capability of the human perception system

3. "Face Detection using Viola Jones Algorithm and Neural Networks" Mrs. Monali Nitin Chaudhari ATAL. [5]

Says that Face detection is a technique of detecting faces from pictures, video footages, etc. There are various face detection algorithms; one of the widely used algorithm is the Viola Jones algorithm for object detection. The success rate of this algorithm for detecting faces is about 78.4%. In this paper, we present a technique, which is an improvisation on the existing Viola Jones algorithm. We have improvised the algorithm to clearly detect the eyes in a face of both people wearing glasses or not. The detection of glasses on the face is done by training a neural network. This algorithm primarily identifies a face with the presence of eyes, which has improved the detection rate and today our observations have yielded 90% success. But in the proposed system the features from faces re detected as well as identify the person by his \ her name, age, gender. It also removes noise and light present on face or image and gives clear image with accuracy of 96%

4. Real time human face detection and tracking" Jatin Chatrath#1, Pankaj Gupta#2, [6]

This paper describes the technique for real time human face detection and tracking using a modified version of the algorithm suggested by Paul viola and Michael Jones. The paper starts with the introduction to human face detection and tracking, followed by apprehension of the Vila Jones algorithm and then discussing about the implementation in real video applications. Viola jones algorithm was based on object detection by extracting some specific features from the image. We used the same approach for real time human face detection and tracking. Simulation results of this developed algorithm shows the Real time human face detection and tracking supporting up to 50 human faces. This algorithm computes data and produce results in just a mere fraction of seconds. But in the proposed system the human faces or objects can be more than 500-1000 and can detect faces from the data set.

III RESEARCH GAP TABLE

Sr no	Precision	Accuracy	specificity	Types of person
1	93.2318%	97.7695%	95.6650%	Normal frontal face image of a girl
2	94.1155%	91.0078%	93.7868%	Image of a boy with dark white light on face
3	94.1155%	91.0078%	93.7868%	Image of a girl having side face
4	94.1155%	91.0078%	93.7868%	Face of a kid where tongue is out
5	94.1155%	91.0078%	93.7868%	Old man whose eyes re shrined and beard and moustaches on face
6	94.1155%	91.0078%	93.7868%	Man wearing a cap on his head
7	99.8621%	91.1868%	90.1279%	Boy having blur features on face

IV NECESSITY OF THE PROPOSED SYSTEM

The study of increasing the speed of searching images for the particular human face is one of the challenging domain in the research community. The goal of our project is to design and implement an application for features human face detection and reverse recognition using machine learning perdition technique by registering candidate, performing training, identify human face , image processing stages and then is exit . The result of a project is of great importance for broad area of applications like 'finding duplicate images in database', 'finding images from criminal records' etc. where time is important for

retrieving images. Also used in biometric process for Example: Adhar card.

V SYSTEM ARCHITECTURE

The overall architecture of Face Detection Using MLP Technique And Viola jones Algorithm Fig. 3, the number of operations and workflow of a proposed system is shown. The description for the Fig. 3 is given below. As well

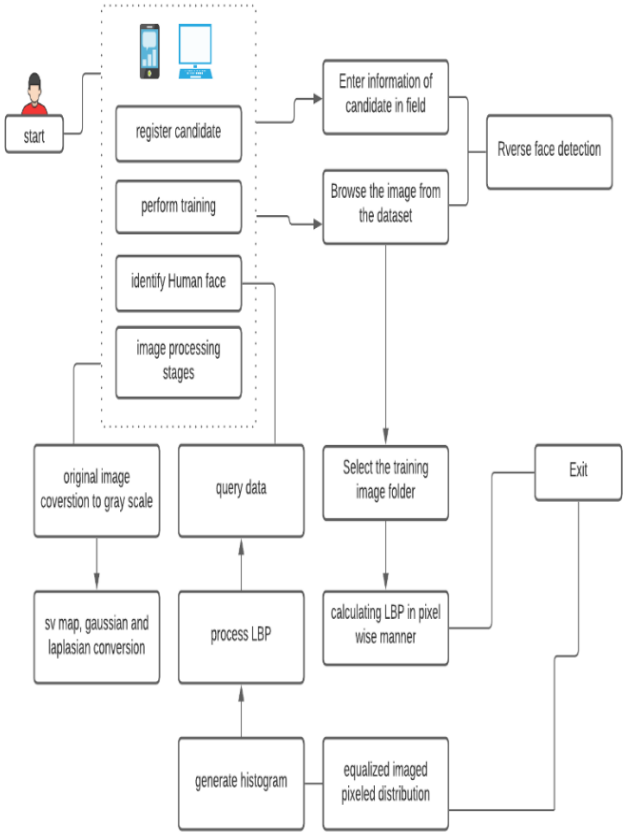

Figure 3: Overall Architecture of Face Detection Using MLP Technique And Viola jones Algorithm

In Fig. 3, it is shown that only authorized user can access the proposed system. After successful login, the user can search images, view database, perform operations on database such as add, update, delete and also perform operations on resulted images such as zoom, crop and Save As. Face detection using MPL techniques and viola jones algorithm uses adobe boost technique for feature selection, features are constituted as eyes, noise, lips, mouth, eyebrows and other features. Now based upon this features it will try to identify whether every feature when added up makes a face or not, if added features makes a face then it will detect it as a complete face, if there are partial features such as half sided face then it will not detect as a face. So this project is used for detecting full profile i:e complete face of a person.

There are two stages in voila jones one is training stage and the second is testing stages in this Haar process is used which is used for detectingeyebrows and noise one rectangular filter is used which is described in the introduction part, it calculates the feature though weight, in this adaboost is used to detect whether face is available or not. in this mix barnoliee classifier is also used. The new implementation is detecting reverse face as well.

So firstly we need to register candidate there we need to fill up the information f the candidate such as name , age and gender , set the image of the particular person ,here we need to give unique name at all the time, in this process the persons image should be already available in the data, browse and set the image . the base of the project is that we can only detect the single face there should be no multiple faces while detecting , it provides interface to view database contents, to add new record in that database, to update existing records and to delete existing records.

To add new record into the Human Frontal Face Image Database the user has to give an input image which contains at least one human frontal face. Then the system will detect the Human Frontal Face in an input image. With the input image user has to input the Full Name of the person whose frontal face is detected in an input image. After this when user will submit this information to the system, it will add this information into the face detection process Database in form of one record.

Face Detection Using MLP Technique and Viola jones Algorithm

Database contains the Original Colour Image which contains at least on Face detection, Cropped Gary Scale Image of Human Frontal Face detected in an input Original Image, Full Name of the person whose frontal face is detected in an input image in form of First Name, age, gender. Each record in Human Frontal Face Image Database is assigned unique identifier named as Image Id.

Image Search Interface provides interface to user for searching images. The proposed system In Searching

Images by Image, the user has to submit input image in which at least one human frontal face is present and set the accuracy percentage for searching images. After submitting this information, the proposed system will detect the Human Frontal Face Image in an input image. Then it calculates the histogram for the cropped Human Frontal Face Image. Then the proposed system compare histogram of cropped Human Frontal Face Image from input image with every Cropped Gary Scale Image of Human Frontal Face Image saved in Human Frontal Face Image Database by applying Voila jones algorithm and machine learning prediction technique For detection of Human Frontal Face in an input image, histogram calculation and histogram comparison of an image, the proposed system uses the Matlab. Then the proposed system retrieve and shows only those images from Human Frontal Face Image Database which histogram comparison result matches the user accuracy percentage to prevent unwanted result.

VI ALGORITHM OF THE SYSTEM ARCHITECTURE

Step 1: In this application what we do is we take the image of folder for training in which all images are available

Step 2: In that folder which ever files are there we fetch them

Step 3: Then to all those files we need to read it one at a time.

Step 4: After reading the files we implement local binary pattern (LBP) technique on it. Which we have discussed in above section. Which is basically used to identify the pixels and to identify the features from pixels?

Step5: The second stage starts by perform training which calculates pixel wise LBP (which basically takes time to retrieve the images it is carried out in Matlab)

Step 6: In this perform training stage it will detect the face and features from the face with the help of voila jones algorithm

Step 7: The additional work done in this process is reverse face detection where it will detect the features from reverse face.

Step 8: Once the perform training is done it will give result as conversion from original image to efficient LBP image and pixel wise LBP image

Step 9: Then the three stage we need to perform which is identify human face in which result final _query resides where attributes such as query data, process LBP, result and generate histogram takes place..

Step 10: In query data the reverse features of face can be detected, which can gets converted to mono chrome (gray scale) Guassian-Laplacian fusion and finally resultant match

Step11: The histogram of detected image is generated in which it calculates the precision, accuracy, specificity in percentage, where it gives the best and original results up to 97%

Step 12: The further process generates another histogram which calculates the histogram of original image which converts into equalized image histogram, den it shows the calculation of total no of pixels n and equalizes image pixel distribution

Step 13: Hence the final results gets displayed.

VII APPLICATIONS

- In school
- College
- Crime bureau of investigation (C.B.I)
- Police Department

VIII RESULTS

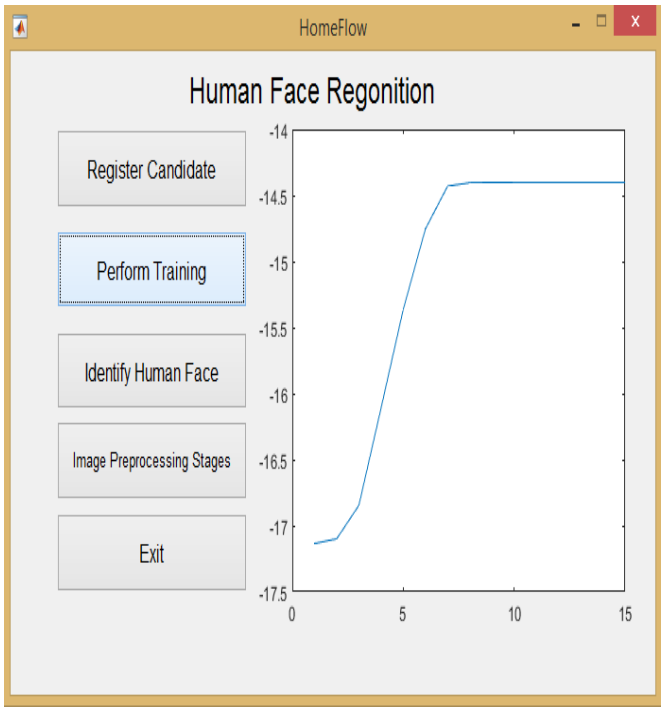

Fig 4 Human face detection

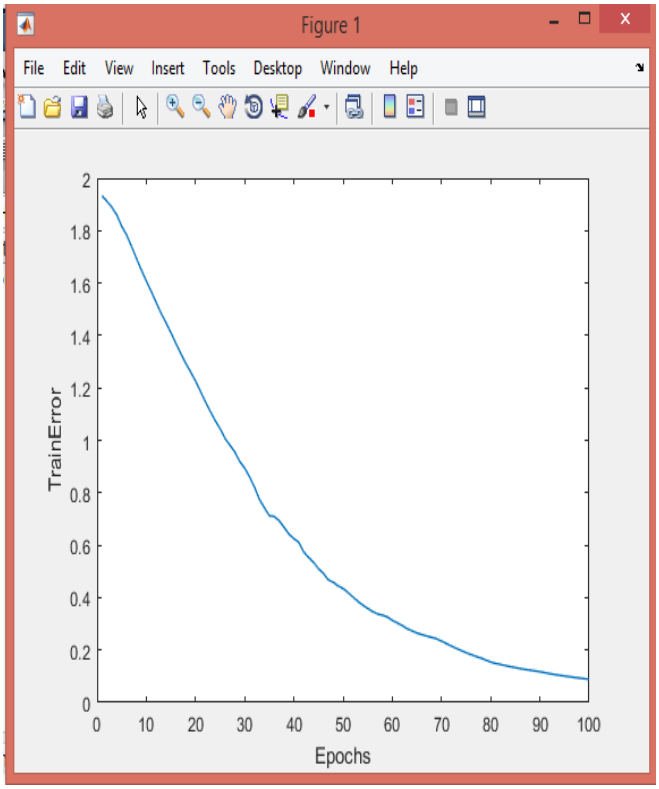

Fig 5 train the errors in iteration

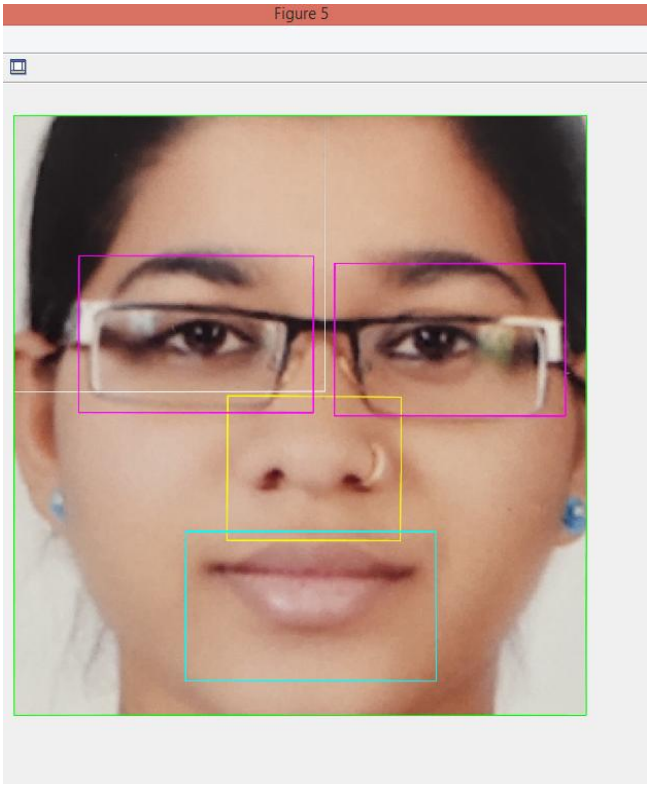

Fig 7 detecting feature

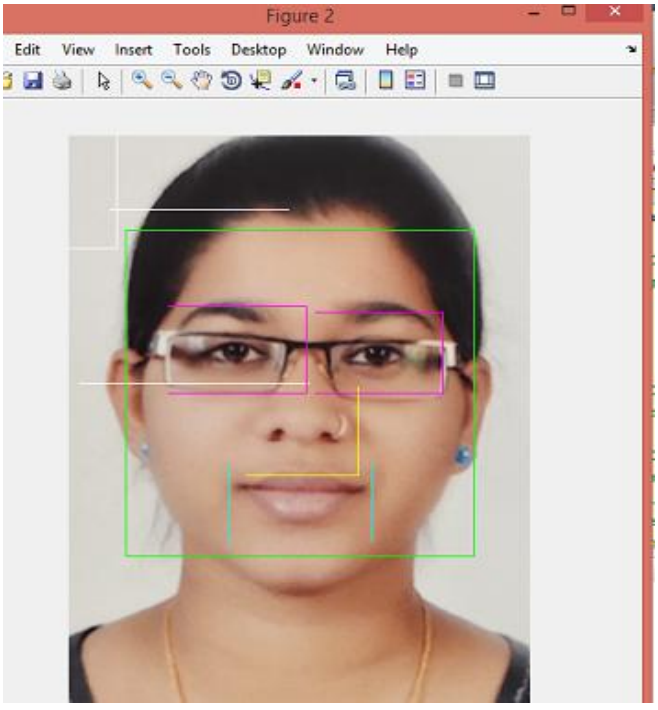

Fig 6 detecting face

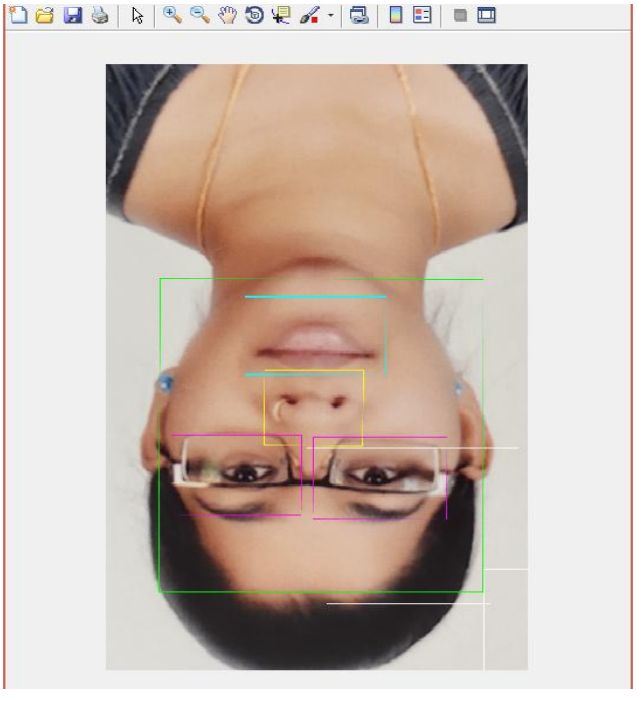

Fig 8 Reverse feature detection

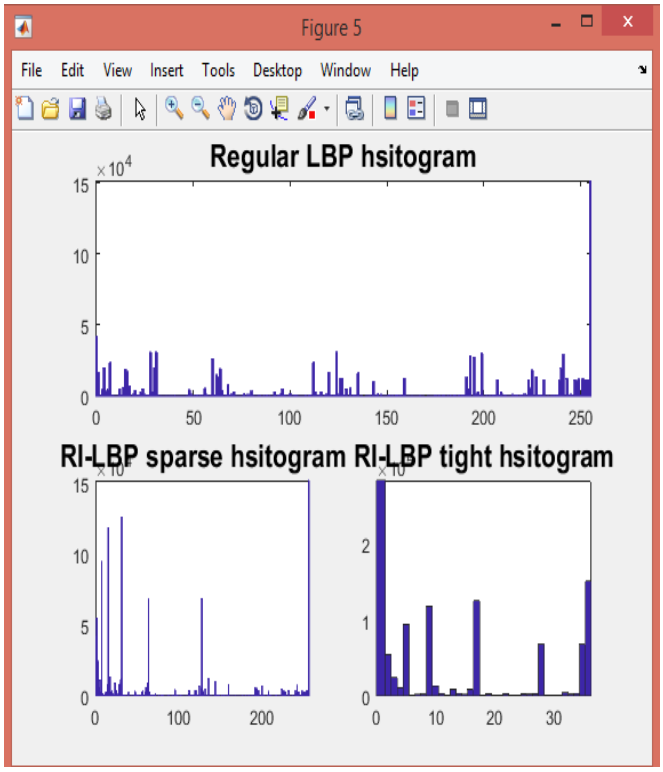

Fig 9 LBP Histogram

Fig 11 Result final query

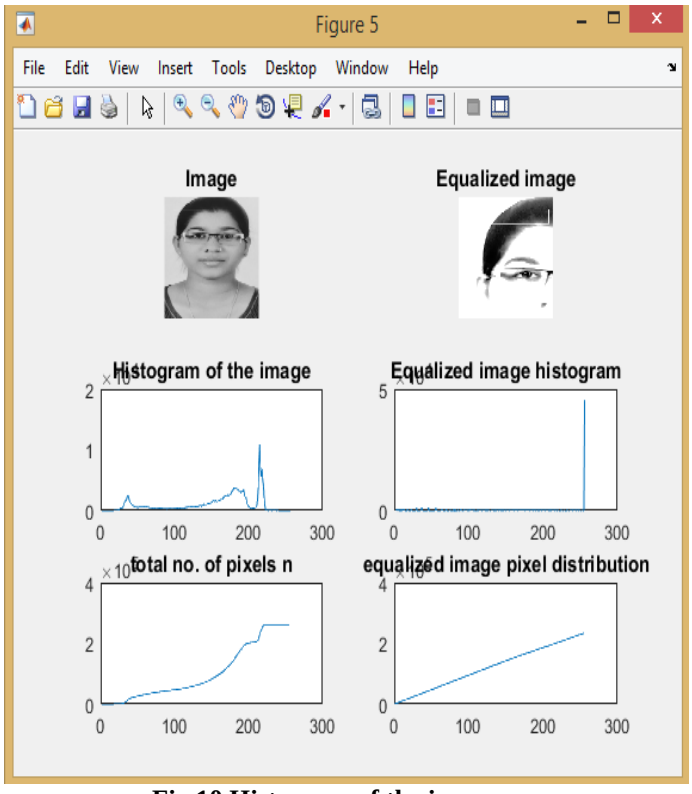

Fig 10 Histogram of the image

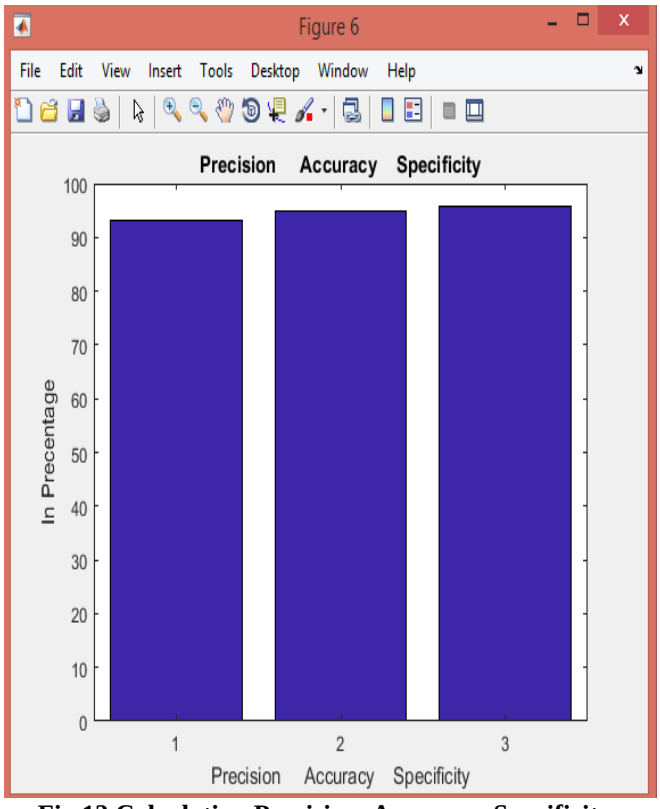

Fig 12 Calculating Precision, Accuracy, Specificity

Fig 13 Complete base of the project

IX CONCLUSION

We implemented face detection using MLP and viola Jonas algorithm which Add the user details which include name, age, gender and browse the image from data set add selected images , the input images which are added to detect will be used for training purpose , the system will not only detect but identify the person as well , the features are detected in this system reverse also The system provides authority to authorized user to make changes in the process and data Record .The user can Crop, Zoom In/Zoom Out, Save As operations on the retrieved images. The authorized user can add new human faces every time with the user can modify its information that is Name, age and gender and also can delete existing records from the records within system The result section shows some possible input and its output of the face detection using viola jones and MLP technique

REFERENCES

1)DC. He and L. Wang (1990), "Texture Unit, Texture Spectrum, And Texture Analysis", Geoscience and Remote Sensing, IEEE Transactions on, vol. 28, pp. 509 - 512.

2)L. Wang and DC. He (1990), "Texture Classification Using Texture Spectrum", Pattern Recognition, Vol. 23, No. 8, pp. 905 - 910.

3)Narayan T. Deshpande professor department of Electronics and communication BMS college of Engineering , Bangalore India

4)Dr .S.Ravishshankar professor Department of Electronics and communication RV college of Engineering , Bangalore India

5)Mrs. Monali Nitin Chaudhary Electronics & Telecommunication Dept. VESIT, University of Mumbai Mumbai, Ms. Mrinal Deshmukh Electronics & Telecommunication Dept. VESIT, University of Mumbai Mumbai, India" Face Detection using Viola Jones Algorithm and Neural Networks "

6)Jatin Chatrath#1, Pankaj Gupta#2, Puneet Ahuja#3, Aryan Goel#4, Shaifali Arora*5 # B.Tech, Electronics and Communication, MSIT (GGSIPU) C-4 Janak Puri NEW DELHI-58, INDIA M.Tech , Electronics and Communication, asst professor at MSIT (GGSIPU) C-4 Janak Puri NEW DELHI-58, INDIA . "Real time human face detection and tracking"

7)Kruti Goyal ASET, CSE Amity University Noida, India "face detection and tracking"

8)Talele Kiran Sardar Patel Institute of Technology, Mumbai talelesir Tuckley Kaushal AGV Systems Pvt. Ltd. Mumbai "Facial Expression Classification using Support Vector Machine Based on Bidirectional Local Binary Pattern Histogram Feature Descriptor"

9)IEEE 802.16a: Method for using non squared constellation and how to decode them with independent I and Q.

10)Face Detection and Recognition in Videos. S.V. Tathe Sinhgad College of Engineering Pune.

11)Face Recognition: A Literature Survey W. ZHAO University of Maryland National Institute of Standards and Technology

12)Different Face Recognition Techniques: A Survey Mr. Rahul B. ATAL