FACE DETECTION AND RECOGNITION

Project report submitted in partial fulfilment of the requirement for the degree of Bachelor of Technology

In

Computer Science and Engineering/Information Technology

By

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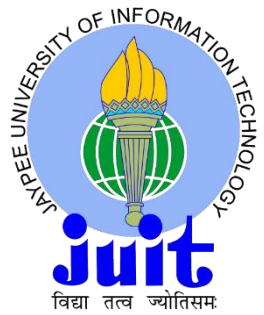
Under the supervision of

Ms. Ruchi Verma

To



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CANDIDATES' DECLARATION

We hereby declare that the work presented in this report entitled **"Face Detection and Recognition"** in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering** submitted in the department of Computer Science and Engineering**,** Jaypee University of Information Technology, Waknaghat, is an authentic record of our own work carried out over a period from January 2018 to May 2018 under the supervision of **Ms. Ruchi Verma**, Assistant Professor, Department of Computer Science and Engineering.

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

Karandeep Singh (141412)

This is to certify that the above statement made by the candidate is true to the best of my knowledge.

Ms. Ruchi Verma
Assistant Professor
Computer Science & Engineering
Dated:

ACKNOWLEDGEMENT

We are grateful and indebted to Ms. Ruchi Verma, Department of Computer Science for her help and advice in the completion of this project report.

We also express our deep sense of gratitude and appreciation to our guide for his constant supervision, inspiration and encouragement right from the beginning of this project.

We also want to thank our parents and friends for their immense support and confidence upon us. We deem it a pleasant duty to place on record our sincere and heartfelt gratitude to our project guide for his long sightedness, wisdom and co-operation which helped us in tackling crucial aspects of the project in a very logical and practical way.

Karandeep Singh (141412)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

S No.	Abbreviations	Description
1	IDE	Integrated Development Environment
2	HMM	Hidden Markov Model
3	RGB	Red Green Blue
4	YCbCr	Luma component, blue difference, red Difference

ABSTRACT

Face recognition is an important application of Image processing owing to its use in many fields. The project presented here will be developed after studies of various face recognition methods and their efficiencies. An effective and real time face recognition system based on OpenCV and C++ (and/or MATLAB) will be developed in this project (Many other techniques are available to apply face recognition one of them is Principle Component Analysis (PCA)).

This report describes our fourth year project “Face Detection and Recognition “. It discusses the various approaches and techniques that have been used for detection and recognition of faces. Furthermore, it mentions the various methods used for development and their detailed description. It showcases the results obtained and the testing performed to test the developed software artefact. This report also mentions the various tools and APIs that can be used to implement various methods and techniques in these fields.

CHAPTER -1

INTRODUCTION

1.1 INTRODUCTION

Pictures expect an imperative part in the present information in light of the way that a lone picture addresses a thousand words. “Face Detection” is said to be recognition of the input inquiry as a face and figure out information in the data picture. “Face Recognition” is basically whether the found face exists in the data as in whether or not it matches with the face of a person or not.”Face Recognition” system ascends from the minute that machine began to end up increasingly "keen" and had the progress of fill in, right or help the absence of human capacities and faculties.

Face affirmation is one of just a modest bunch few biometric procedures that have the advantages of both high exactness and low intruding. It has the exactness of a physiological approach without being meddling. Over late years, various experts have proposed differing face affirmation procedures, impelled by the extended number of bona fide applications that require the acknowledgment of human countenances. There are a couple of issues that make modified stand up to affirmation a to a great degree troublesome task. The centrality of customized stand up to affirmation is much to adjust to different assortments of photos of a comparable face in light of changes in the going with parameters, for instance, act, light, appearance, movement, facial hair, glasses, and foundation. Face affirmation advancement is well impel that can interface for some business applications, for instance, individual recognizing confirmation, security, picture film taking care of, cerebrum science, PC correspondence, incitement system, clever card, law approval, observation et cetera.

A general issue of face affirmation ought to be conceivable in 2 detail both a still image and clip photo of a scenario. They have been classified into 2 basic applications: Identification and confirmation. In the distinguishing proof issue, the face to be perceived

is obscure and coordinated against a face of a database containing known people.In the confirmation issue, the framework either affirms or rejects the asserted personality of the information confront. Essentially, before acknowledgment is played out the framework should make sense of whether there is a face in a given picture or given video or not. This procedure is called confront identification. When identification is done, the face locale ought to be removed or secluded from the foundation scene for the last advance i.e.face acknowledgment.

The idea of facial acknowledgment is as old as the vision of PC and in light of the useful significance of the subject and hypothetical enthusiasm from intellectual science. Face acknowledgment isn't the main technique for perceiving other individuals. Indeed, even people between each other utilize faculties all together perceive each other.

Since the beginning of this field of innovation there were two principle approaches for confront acknowledgment:

- Geometrical approach
- Pictorial approach

The geometrical approach utilizes the spatial arrangement of facial highlights while on the opposite side the other approach i.e. the pictorial approach utilizes formats for facial highlights. Aside from these two methodologies, there are numerous different methodologies that have been utilized and that will be utilized as a part of this undertaking which we will talk about in later sections.

1.2 PROBLEM STATEMENT

Face recognition in itself is an especially complex work which includes area, identification, and acknowledgment of countenances in any foundation took after by standardization and acknowledgment. The human face in itself is an extremely muddled example to identify and perceive, on the grounds that while its life structures is sufficiently unbending so all countenances have a similar structure, in the meantime there

are a great deal of natural and individual variables influencing facial appearance. The rule issue of face affirmation is broad variability of the recorded pictures as a result of stance, light conditions, outward appearances, usage of beautifiers, changed haircut, the proximity of glasses, .Images of a comparative individual taken at different conditions may now and again indicate more prominent capriciousness because of the already said factors (intrapersonal vacillation) than pictures of different individuals on account of sex introduction, race, age and individual assortments (extra individual irregularity)." One technique for adjusting to intrapersonal assortments is joining into the planning set pictures with such assortments." And while this is an average practice for assortments, for instance, outward appearances, use of improving operators and closeness of glasses or facial hair, it may not be productive if there ought to emerge an event of lighting up or position assortments. Another critical parameter in stand up to affirmation is developing. A capable affirmation structure should have the ability to see an individual even following a couple of years, especially in mug-shot planning quantifiable applications. This is a to a great degree troublesome endeavor, which has not been viably tended to yet.

1.3 OBJECTIVES

The main motto of our project is to build a software artifact which can detect faces from the input pictures and then can recognize the face from the picture by matching it with the database.

The implementation of face recognition technology includes the following three stages:

1. Acquiring data
2. Processing the input
3. Classifying the image and then making a decision

Acquiring data:

A simple recorded video of the speaker or any still picture can be considered as input data. Gathering a 25 outline video gathering requires a case of 1 sec length. To get a 3D depection of the face one or more than one cameras can be utilized.

Processing the input:

Lighting and changes in shading conditions are taken care by an already existing module which basically finds the eye position. A face as in input must be perceived to start with the closeness of appearances. Institutionalization process may be required to bring the estimations of the live facial case once the face is recognized.

Classification of face images and decision making

Some facial affirmation approaches use the whole face while others center around facial sections and also regions. The nearness of the face can change on account of outward appearances.

1.4 METHODOLOGY

There are two major approaches that are used for face detection and recognition, namely pictorial and geometric based approaches**.** Apart from these two approaches, there are many other approaches that have been used and that will be used in this project which we will discuss in later.

1.5 ORGANISATION

The organization of the report has been made such that the project report has been segmented into 5 parts: Details about the introduction part are provided in Part 1.The various methodologies used has been discussed in Part 2 .The various stages that have been used for the development has been discussed in Part 3.The main final codes that have been used are placed accordingly in Part 4.The drawbacks , the outcomes the conclusion etc along with the future scope has been discussed in Part 5.

CHAPTER -2
LITERATURE SURVEY

This project of ours on facial recognition has helped us to have a complete detailed survey of a number of facial recognition algos along with their pros and cons Some of the important methods taken into consideration and referred are listed below. The system basically consists of the following tasks:

1. Acquiring the face
2. Feature extraction
3. Recognition.

2.1 Face Detection Approaches

A still image or a video sequence can be used for “Face recognition”. Discussed below are some basic “face detection” methods :

1) Methods based on knowledge are basically dependent on the researcher’s know how of human facial features.

2) Methods based on features include the Invariant features of faces that are used for detecting texture, skin color etc.

3) Template matching: The image used as an Input is compared with predefined face templates already present.The disadvantage is the change is pose, color and shape.

4) Appearance-based strategy: In format coordinating strategies, the layouts are predefined by specialists. Measurable investigation and machine learning methods can be utilized to locate the significant attributes of face and non-confront pictures.

2.2 Face Recognition Approaches

Various features such as eyes, nose etc are the basic terms on which the analysis of the structure of the face is done using LFA method of recognition. This system offers better strength against other fundamental techniques on the facial picture in doing a match. Nevertheless, with a particular true objective to win in a practical set-up, the cases ought to be satisfactorily tremendous in number to speak to assortments. Model Matching

techniques for face recognition prepare a model for each individual amid model learning and pick the best coordinating model .Here additionally a major sensible agent model is vital for good outcomes. Here furthermore a noteworthy sensible operator show is crucial for good results. An affirmation system in perspective of meager depiction enlisted by minimization works with the basic idea of giving the affirmation a part as an insufficient depiction issue. The presence of a large number of features result to the main primary disadvantage of this technique. It is an energetic and versatile count for confront affirmation in perspective of straight or arched programming.

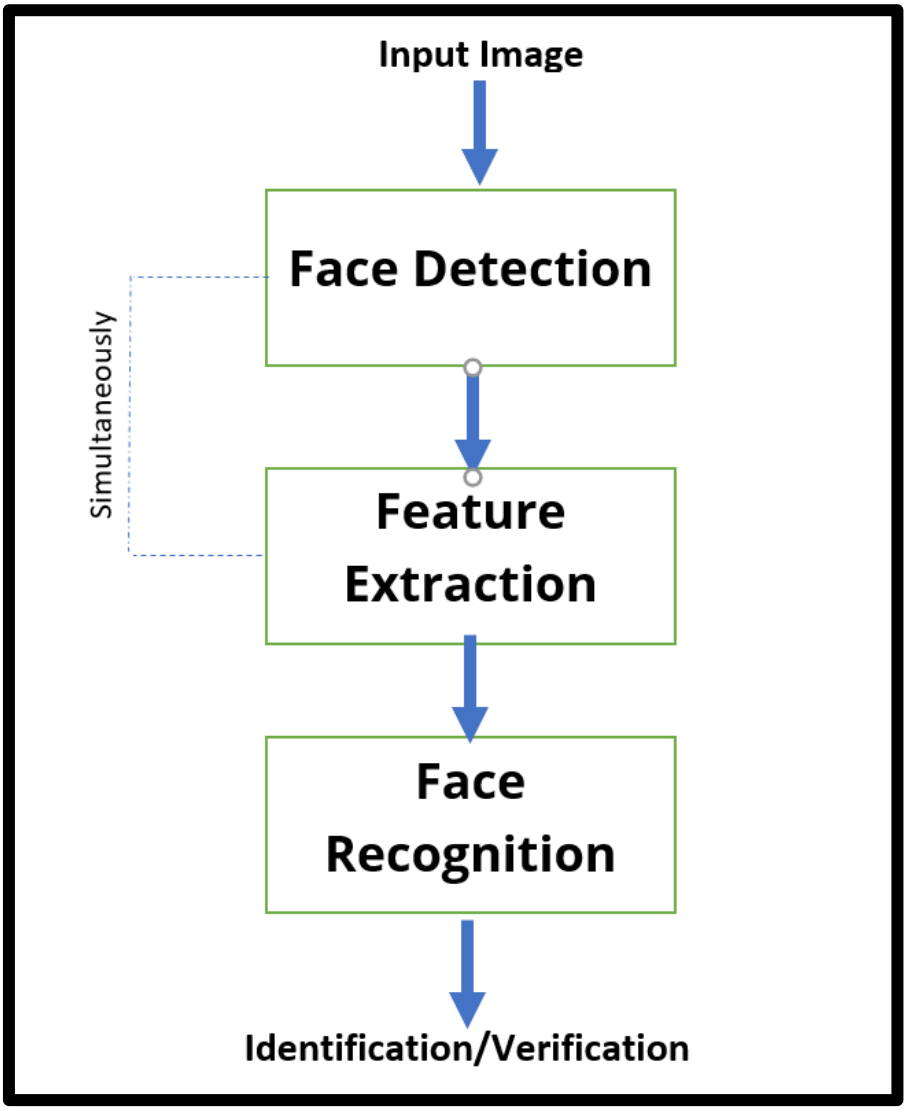


Figure 2.1 Generic face recognition configuration

Some more “face recognition” techniques are discussed below:

1. Holistic Approach

The complete face region is considered as input to the system in “Holistic approach” for face detection framework. Examples of comprehensive strategies are “**Eigenfaces”, “Probabilistic eigenfaces”, “Fisherfaces”** are the supporters of NFL i.e. (Nearest feature lines).

2. Hybrid Approach

The technique is made conceivable from how human vision framework sees both comprehensive and neighbourhood component. The fundamental perspectives that effect the execution of mixture approach consolidate how to make sense of which highlights are to be joined and the way they are to join, with a specific end goal to ensure their points of interest and dismiss their negative marks meanwhile. These issues have cozy association with the different classifier framework.. In any case, even in such fields, such issues stay unresolved. Still various endeavours are being made in such field to give us a few experiences into taking care of these issues, and these lessons can be utilized as help lines in planning a cross breed face detection framework. The table portrays that neighbourhood highlights & the ones worldwide are freely fragile to various assortment factors.

"Variation Factors"	**"Local Features"**	**"Holistic Features"**
Small	*NS*	*S*
Large	*S*	*VS*
Illuminations	*VS*	*S*
Expressions	*NS*	*S*
Pose	*S*	*V S*
Noise	*VS*	*S*
Occlusion	*NS*	*VS*

Table 1: Difference between two types of feature

2.3 Review of Model Methods:

1. Hidden Markov Models Method

For frontal human face pictures, vital facial highlights show up in a best to howl path, for example, hair, brow, eyes, nose, mouth, and jaw. This"Hidden Markov models(HMM)" is someother technique which operates fine on pictures using variety in light changes, outward appearance & introduction. Gee, an arrangement of accountable models which portray features of signs. It has great execution in discourse & character acknowledgment. Framework being displayed is thought to be a Markov procedure with boundaries not known & objective is to discover concealed boundaries from the recognizable

boundaries. Every stage in HMM has a likelihood circulation over conceivable yield while every stage in a general Markov demonstrate is observable."The creator takes the assistance of a system called DCT compression property for removing highlight ."A picture is being isolated into parts of a sub-picture which is additionally connected with perception vector.

In HHM, there are Markov chain that cannot be observed using a small number of status in that model. The symbol for observation probability matrix **B**, a state changing probability matrix **A**, starting state distribution $\boldsymbol{\pi}$**,** and a group of probabilitydensity functions (PDF).Definition of HMM: $\boldsymbol{\lambda}$= (**A**, **B**, $\boldsymbol{\pi}$).

Allocation Of each facial region is done to one state in 1-D.

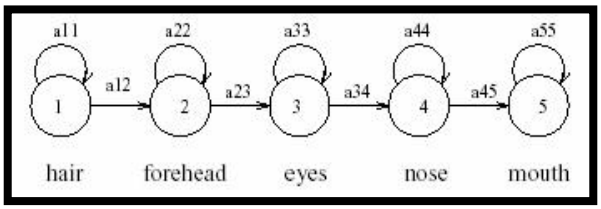


Figure 2.2: For face recognition

Each face picture with a with "W" and a stature "H" is additionally separated into covering pieces of tallness "L" and the width being the same.

The sum by which covering "P" importantly affects acknowledgment rate since highlights are captured autonomous of the vertical position. The estimation of "L" is likewise urgent.

According to the Hidden Markov model: "The little length "L" will appoint it data which isn't sufficient to separate to the perception vector. Then again, vast estimation of L will improve the likelihood of cutting over the feature. .Hence to get a decent better than average estimation of “L" is very imperative At the moment that the pieces are expelled from the photograph, a course of action of "DCT" coefficients are determined for each

and every one of them. At the point when each square is changed with "DCT", the most basic coefficients with low frequencies are met and gathered in a little area in the "DCT"domain. The degree of recognition vector is really made less of significance, which along these lines enhances the system beneficial and remembering that up 'til now having the ability to keep up a good acknowledgment rate. In the readiness arrange, the photo is isolated all the way where each piece analyzes to a state and starting discernment probability lattice “B” is gotten from recognition vectors related with each state. Once "B" is gained, the basic estimation of "An" and "π" are set given the left to right structure of the face."

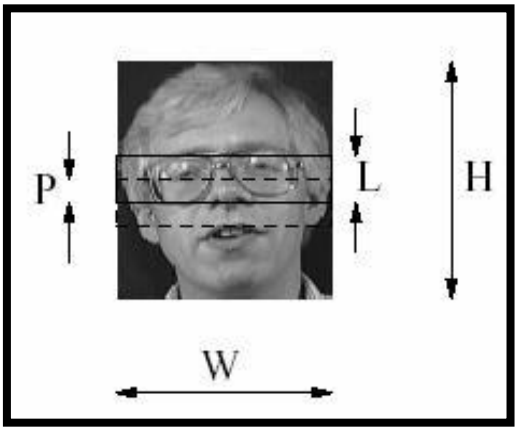


Figure 2.3 : Block extraction from image

2. **“Neural Network Method”**

The know-how of machine learning and various techniques from machine learning are the basis of “Neural networks:-based methodologies”. The networks can be prepared to catch more information about the variety of face designs is the basic advantage of utilizing NNM. The systems must be broadly tuned to get excellent performances the principal downside of this procedure. Back propagation algorithm has been for the most parts for this procedure while approaching “face recognition”. However, the meeting of the MLP systems is slow and the worldwide minima of the error space may not be always achieved. Quick learning ability and best approximation property are the main features of RBF neural system on the other side. Along these lines, as of late, numerous specialists have utilized RBF systems for confront acknowledgment and show in figure 4.

Considering all the cases their prosperity percentages are not all that promising as the blunder percentage which changes from {5 – 9}% under variety of stance, introduction, and lighting. So this might be because of the choice of the focuses of the hidden layer neurons that won't have been finished by catching the learning about the conveyance of preparing examples &varieties of face stance, introduction, and luminosity.

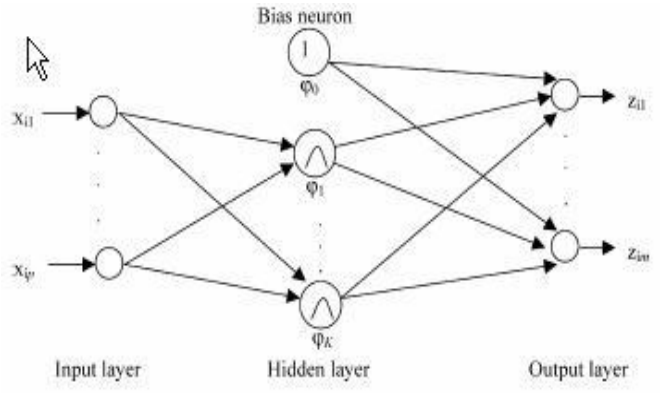


Figure 2.4: RBF Neural Network structure

3. The local binary pattern histogram

We know that “Eigen faces” and “Fisher faces” are both affected by light. In real world example it if quite tedious to get a constant perfect lighting all time.” LBPH”face recognizer is an improvement to overcome this drawback.

The main concept behind “LBPH”is not to consider the image as a complete image but instead, try to find the structure i.e. local by comparison of single pixel with neighbouring ones.

Consider a “3×3” window and make it move slowly throughout one image. At each movement, do comparison of the pixel at the center and with its surrounding pixels.

Once we are done reading these" 0/1" values of 3x3 matrix in a clockwise manner we will have a binary pattern like "11100011" which is unique to a specific area image and once we are done finishing this we will be left with a list of many local binary patterns.

The procedure explained above helps us to get a list of local binary patterns .Once we are able to fetch those patterns, a conversion takes place which converts each one of the local binary pattern to a decimal number. The value of the decimal numbers generated are then further used to make histograms of all the decimal values.

CHAPTER -3

SYSTEM DEVELOPMENTS

In this segment the various choices made during the development time and the implementation of the many methods used or that will be used during the project are included.

3.1 DESIGN

In process of development of software for the project various decisions regarding the nature, design etc of the project have to be made; these include the assumptions made, APIs used etc. This section discusses these aspects of the project.

3.1.1 ASSUMPTIONS

"PCA" (Principal Component Analysis) is the basis on which various "facial recognition" algorithms are based. The detected face is compared and analyzed with the trained image a large number of times by these algorithms, this is their basic principle. To further improve the accuracy of recognition we are supposed add several images of the same individual from different angles, varied positions and light conditions.

Method 2:

A study has uncovered that different methodologies and blend of these procedures can be associated being created of another face acknowledgment structure. Among the different possible philosophies, we have used a mix of learning based procedures for stand up to revelation part and neural framework approach for go up against affirmation part.

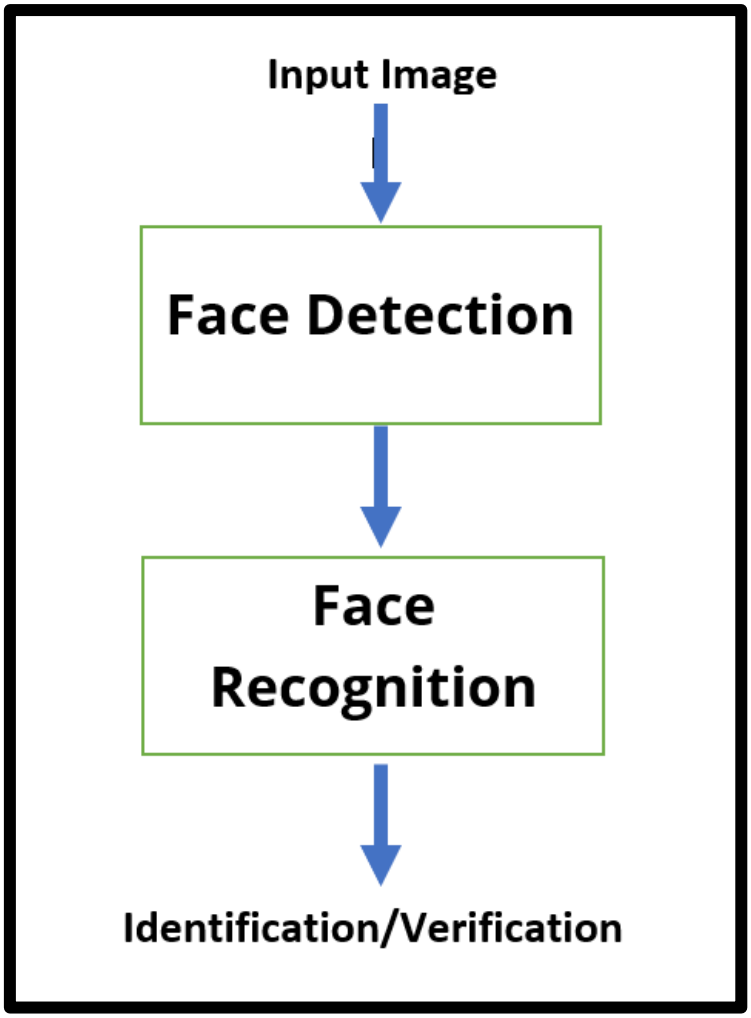


Figure 3.1: Flow of face detection and recognition

Input Part

For face acknowledgment framework the input of information part is quite essential. The main activity performed in this part is –"Picture procurement". For performing picture handling calculations the live caught pictures are transformed to advance information. Face identification calculator receives these caught picture information.

Face Detection Part

Face acknowledgment framework requires the removal of face picture task and this is performed by face identification. in Figure 3 portrays the face recognition part

calculation. This tests uncovers that skin division, as an initial step for face identification, lessens computational time for seeking entire picture.

The division of skin is basically an association, an acknowledgement of the part lying under that. Depiction of skin which can be used as "RGB" shading space .The picture as a result of extended light conditions are a result of white modification. Administration of the white part of the picture should be revised. Results of division:

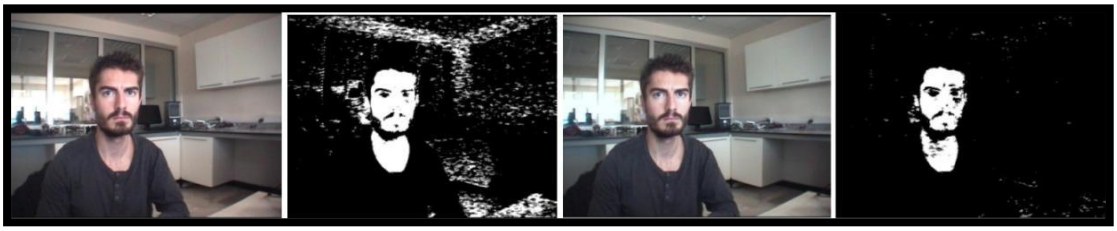


Figure 3.2: Example of taken/white balance corrected image and skin color segmentation

On the success of the connection of & operation the basic tasks linked with some kind of skin hopefully seek confront. Boisterous like little locales end, then applied face applications are selected with 2 conditions. Coverage of few spots and proportions of bouncing box etc should lie among "0.3"and "1.5".

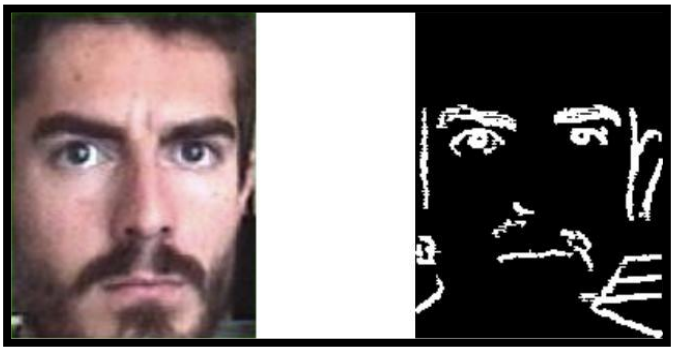


Figure 3.3: "Results of Segmentation on Uncorrected (Left) and Corrected Image (Right)"

With behaviour such as these the system goes up against contenders which are confined from an astounding jumping box input pictures with adjusted input pictures The tallness of ricocheting box adjusted as 1.28x more noticeable than the breadth of a bobbing box since parts of the torso will be shed if contender goes along with them These change more or likely have already been settled.

There is a relation between assertion of contender and the extraction of face picture. The most critical highlights of face places a special emphasis on the Facial section. eyebrows, eyes, mouth, nose etc constitute the facial highlights. Evacuation of the eyes and mouth, two eyes and mouth make isosceles triangle, and division between eye to eye and mid purpose behind eyes parcel to mouth is corresponding and makes use of this property. “Laplacian of Gaussian (LoG)” channel and some other segregating assignments are performed to evacuate facial part of face confident.

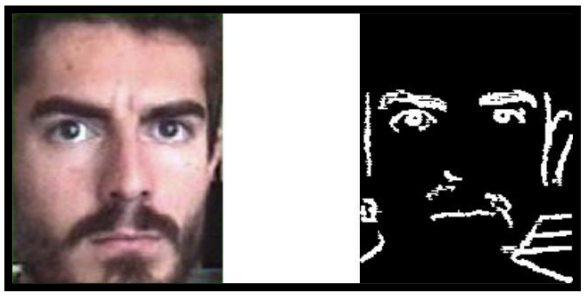


Figure 3.4: “Outcome of the option filtering

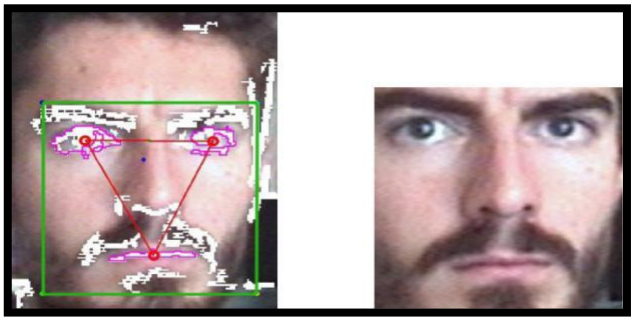


Figure 3.5: “Facial Feature Extractions (Left) and Face Image (Right) for the author”

The analysing segment is done, & pictures are seen in the obtained pictures. “MATLAB” software is used to execute calculation.(it should likewise be possible in c# which will be talked about later) and tried for in excess of hundred pictures. This calculation identifies one face as well as in excess of one face. Little measure of arranged face are satisfactory. Results are acceptable for general use**.**

Face Recognition Part

Altered face picture which is acquired in the Face acknowledgment framework, ought to be grouped to recognize the individual in the database. Face acknowledgment part is made out of pre-preparing face picture, vector punch picture network, database age, and after that characterization. The grouping is accomplished by utilizing Feed Forward Neural Network. .

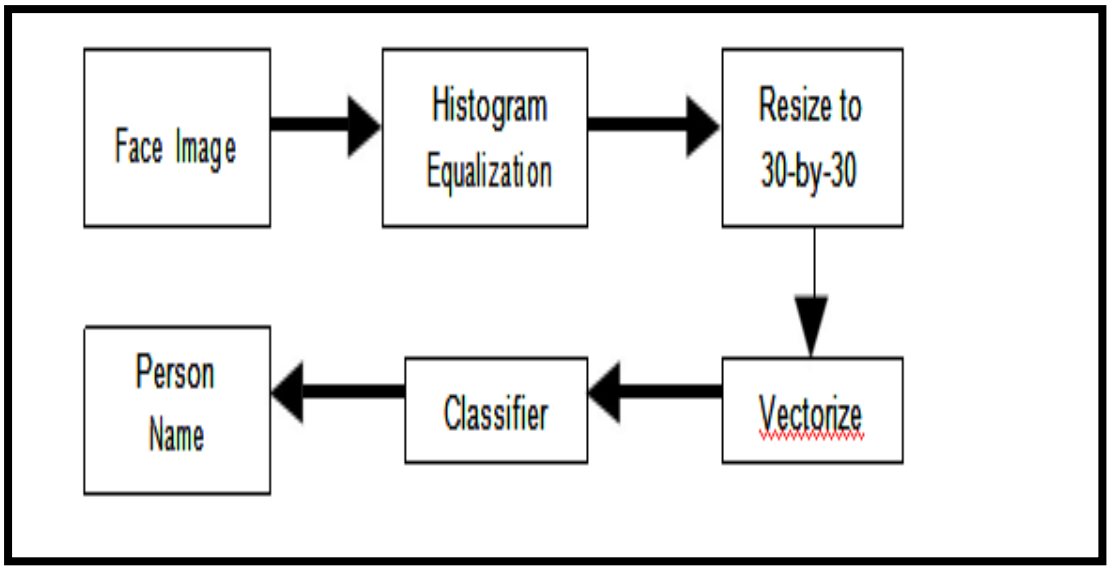


Figure 3.6 “Algorithm of Face Recognition Part”

In classifier, “**Feed Forward Neural Network (FFNN)”** is used. FFNN i.e. sustain forward neural framework is the most central segment of the neural network. Such kind

of framework structure is basically used for outline affirmation. Structure points of interest are: input layer has 900 wellsprings of information.

After the structure is created, by then network ought to be with respect to confronting database. .Therefore, 900-by-104 size network will get ready grid. Preparing structure vector part is sorted out with four social affairs in light of the quantity of tests for each person. Preparing system's portions are produced using a pre-taking care of picture and a short time later vectorizing to stand up to picture which creates a database.

Method 3 (Final method used)

The local binary pattern histogram

We know that “Eigenfaces” and “Fisherfaces” are bothaffected by light.In real world example it if quite tedious to get a constant perfect lighting all time.” LBPH”face recognizer is an improvement to overcome this drawback.The main concept behind “LBPH”is not to consider the image as a complete image but instead, try to find the structure ie local by comparison of single pixel with neighbouring ones.Consider a”3×3” window and make it move slowly throughout one image. At each movement, do comparison of the pixel at the center and with its surrounding pixels.

Give the neighbours the intensity value lesser than or equal to the main center pixel by 1 and the others 0.

Once we are done reading these” 0/1” values of 3x3 matrix in a clockwise manner we will have a binary pattern like “11100011” which is unique to a specific area image and once we are done finishing this we will be left with a list of many local binary patterns.

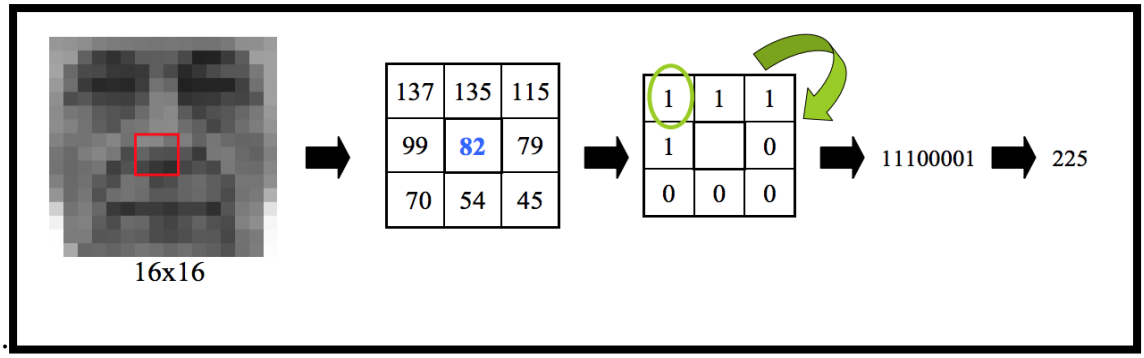


Figure 3.7 Binary to decimal

Once we get a list of local binary patterns that are generated from the above mentioned procedure, we convert each one of them into a decimal number and then make a histogram of all of those decimal values.

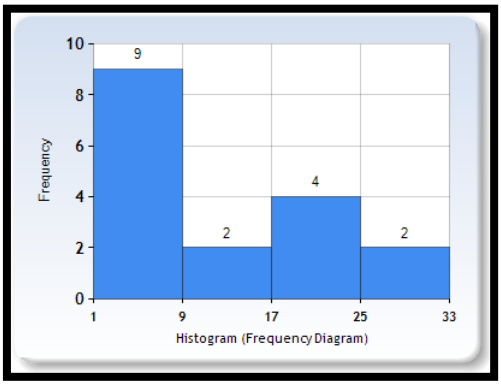


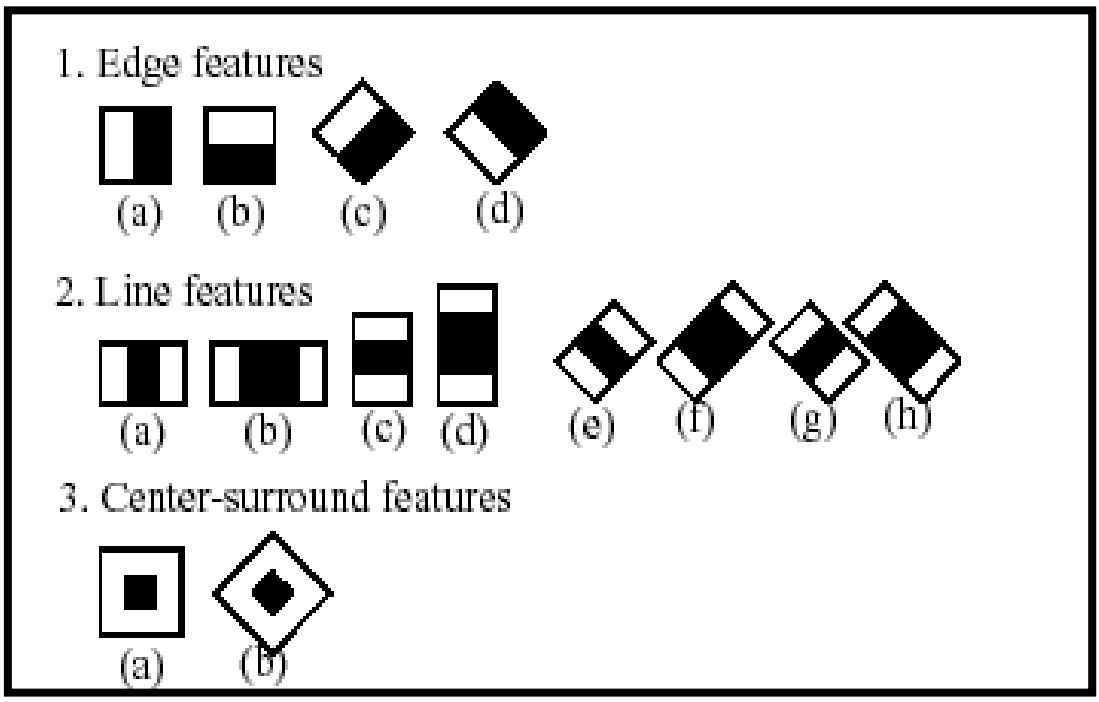
Figure 3.8: Histogram

In the training data set there will be one histogram as a result of this process for each face. Keeping a track of which histogram belongs to which individual? In the training data set is the job of this algorithm.

HAAR CLASSIFIER

According to Paul Viola and Michael Jones, "The Haar classifier is a machine learning based approach."

It starts by extracting Haar features from each image as shown by the windows below:



A

Figure 3.9 Features

feature is basically calculated by the window i.e. a specific window allocated on the image. The difference between the sum of pixels under the white part and the sum of pixels under the black part gives a single value to the feature.

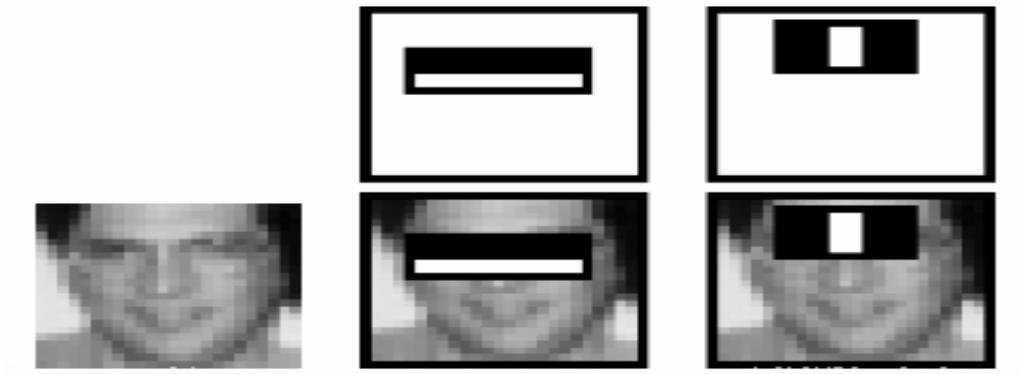


Figure 3.10: Classifiers

For the calculation of the features that are in plenty of number, all the sizes of windows which are possible are placed on all the locations that are possible.

Extraction of 2 features is done as in example in the image above. The area of the eyes is of a darker shade than the region of the nose and cheeks is the main focus of the first one. The eyes are of a darker shade than the bridge of the nose is the second property on which the features rely. Most of the region in an image is a non-face region. this is a consideration made by an algorithm.

3.2 EXPERIMENTS & RESULTS

A complete hardware and software system is designed and implemented in the Robot Vision Laboratory of the Department of Mechatronics Engineering at the Atılım University. The ultimate goal of the larger project (umbrella project) is to develop a humanoid robot with a narrower application like Guide robot, Guard robot, Office robot, etc. The developed system has been tested for many live acquired images and results are satisfactory for such a pioneering work in the department. Improvements are required for better performance. System description and possible improvements are discussed in this chapter.

3.2.1 System Hardware

System has three main hardware parts. They are computer, frame grabber, and camera. Sony EVI-D100P camera and Imagenation PXC 200A frame grabber from CyberOptics are used.

3.2.2 System Software

Algorithm of system is implemented on MATLAB R2011a software. Image Acquisition Toolbox, Image Processing Toolbox, and Neural Network Toolbox are used for algorithm development.

CHAPTER -4

PERFORMANCE ANALYSIS

4.1 METHODS UTILISED

After all the assumptions made in the earlier chapters for every stage, in this segment we include various methodologies that we used in each stage along with the final code.

4.1.1 Method 1: Code of capturing the dataset:

```
#enter username for which u want to train
path = input("enter new user:")
# if not os.path.exists(path):
#       os.mkdir(path)

c=1

while 1:

    #capture video frame
    ret, img = cap.read()

    #convert to greyscale
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

    #detect faces in image
    faces = face_cascade.detectMultiScale(gray, 1.3, 5)

    #store user in dataset folder
    for (x,y,w,h) in faces:
        roi_gray = gray[y:y+h, x:x+w]
        cv2.imwrite("dataset/"+path+"."+str(c)+".jpg",roi_gray)
        # cv2.rectangle(img,(x,y),(x+w,y+h),(255,0,0),2)
        # roi_color = img[y:y+h, x:x+w]
        c+=1
        # eyes = eye_cascade.detectMultiScale(roi_gray)
        # for (ex,ey,ew,eh) in eyes:
        #     cv2.rectangle(roi_color,(ex,ey),(ex+ew,ey+eh),(0,255,0),2)

    #display image
    cv2.imshow('img',img)

    #exit loop condition
    k = cv2.waitKey(300) & 0xff
    if k == 27:
        break

#close webcam and destroy all windows
cap.release()
cv2.destroyAllWindows()
```

capture_dataset.py - C:\Users\hp lapi\Desktop\facial recog\capture_dataset.py (3.6.4)

File Edit Format Run Options Window Help

```
# eye_cascade = cv2.CascadeClassifier('eye.xml')

#Start webcam
cap = cv2.VideoCapture(0)

#enter username for which u want to train
path = input("enter new user:")
# if not os.path.exists(path):
#       os.mkdir(path)

c=1

while 1:

    #capture video frame
    ret, img = cap.read()

    #convert to greyscale
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

    #detect faces in image
    faces = face_cascade.detectMultiScale(gray, 1.3, 5)

    #store user in dataset folder
    for (x,y,w,h) in faces:
        roi_gray = gray[y:y+h, x:x+w]
        cv2.imwrite("dataset/"+path+"."+str(c)+".jpg",roi_gray)
        # cv2.rectangle(img,(x,y),(x+w,y+h),(255,0,0),2)
        # roi_color = img[y:y+h, x:x+w]
        c+=1
```

4.1.2 Method 2: Code For Training Dataset

train_dataset.py - C:\Users\hp lapi\Desktop\facial recog\train_dataset.py (3.6.4)

File Edit Format Run Options Window Help

```
import numpy as np
import cv2
import os
from PIL import Image
from store_users import Users

#using Local Binary Pattern Histogram algorithm to recognize face
recognizer = cv2.face.createLBPHFaceRecognizer()

#using haarcascade for face detection
detector= cv2.CascadeClassifier('face.xml')

#folder where train data is present
path = "dataset"

#initialize database
users = Users()


def getImagesAndLabels(path):
    #get the path of all the files in the folder
    imagePaths=[os.path.join(path,f) for f in os.listdir(path)]
    # print(imagePaths)
    #create empth face list
    faceSamples=[]
    #create empty ID list
    Ids=[]
    #now looping through all the image paths and loading the Ids and the images
    for imagePath in imagePaths:
        #loading the image and converting it to gray scale
        pilImage=Image.open(imagePath).convert('L')
        #Now we are converting the PIL image into numpy array
        imageNp=np.array(pilImage,'uint8')
        #getting the Id from the image
```

```
        imageNp=np.array(pilImage,'uint8')
        #getting the Id from the image
        Id=os.path.split(imagePath)[-1].split(".")[0]
        user = users.checkMember(Id)
        if not user:
            user = users.newMember(Id)
        # print(Id)
        # extract the face from the training image sample
        # print
        faces=detector.detectMultiScale(imageNp)
        #If a face is there then append that in the list as well as Id of it
        for (x,y,w,h) in faces:
            faceSamples.append(imageNp[y:y+h,x:x+w])
            Ids.append(user)
    return faceSamples,Ids

faces,Ids = getImagesAndLabels(path)
# print(Ids)
recognizer.train(faces, np.array(Ids))
recognizer.save('trainer.yml')
#cv2.destroyAllWindows()
```

```
try
           {
               //Trained face counter
               ContTrain = ContTrain + 1;

               //Get a gray frame from capture device
               gray = grabber.QueryGrayFrame().Resize(320, 240,
Emgu.CV.CvEnum.INTER.CV_INTER_CUBIC);

               //Face Detector
               MCvAvgComp[][] facesDetected = gray.DetectHaarCascade(
               face,
               1.2,
               10,
               Emgu.CV.CvEnum.HAAR_DETECTION_TYPE.DO_CANNY_PRUNING,
               new Size(20, 20));

               //Action for each element detected
               foreach (MCvAvgComp f in facesDetected[0])
               {
                   TrainedFace = currentFrame.Copy(f.rect).Convert<gray,>();
                   break;
               }

               //resize face detected image for force to compare the same size with the
               //test image with cubic interpolation type method
               TrainedFace = result.Resize(100, 100, Emgu.CV.CvEnum.INTER.CV_INTER_CUBIC);
               trainingImages.Add(TrainedFace);
               labels.Add(textBox1.Text);


               //Show face added in gray scale
               imageBox1.Image = TrainedFace;

               //Write the number of triained faces in a file text for further load
               File.WriteAllText(Application.StartupPath + "/TrainedFaces/TrainedLabels.txt",
trainingImages.ToArray().Length.ToString() + "%");

               //Write the labels of triained faces in a file text for further load
               for (int i = 1; i < trainingImages.ToArray().Length + 1; i++)
               {
                   trainingImages.ToArray()[i - 1].Save(Application.StartupPath +
"/TrainedFaces/face" + i + ".bmp");
                   File.AppendAllText(Application.StartupPath +
"/TrainedFaces/TrainedLabels.txt", labels.ToArray()[i - 1] + "%");
               }

               MessageBox.Show(textBox1.Text + "´s face detected and added :)", "Training OK",
MessageBoxButtons.OK, MessageBoxIcon.Information);
           }
           catch
           {
               MessageBox.Show("Enable the face detection first", "Training Fail",
MessageBoxButtons.OK, MessageBoxIcon.Exclamation);
           }
       }
```

4.1.3 Method 3:

Code for recognizing:

recognize.py - C:\Users\hp lapi\Desktop\facial recog\recognize.py (3.6.4)

File Edit Format Run Options Window Help

```
import cv2
import numpy as np
from store_users import Users

#using local binary pattern histograms for face recognizion
recognizer = cv2.face.createLBPHFaceRecognizer()

#loading trained model
recognizer.load('trainer.yml')

#using haarcascade to detect faces in a image
cascadePath = "face.xml"
faceCascade = cv2.CascadeClassifier(cascadePath);

users = Users()

cam = cv2.VideoCapture(0)
font = cv2.FONT_HERSHEY_SIMPLEX

while True:
    ret, im =cam.read()
    gray=cv2.cvtColor(im,cv2.COLOR_BGR2GRAY)
    faces=faceCascade.detectMultiScale(gray, 1.3,5)
    for(x,y,w,h) in faces:
        cv2.rectangle(im,(x,y),(x+w,y+h),(225,0,0),2)
        Id, conf = recognizer.predict(gray[y:y+h,x:x+w])
        print(Id," ",conf)
        #if the confidence of face recognision is to certain threshold then find
        if(conf<=60):
            Id = users.getMember(Id)
        else:
            Id="Unknown"
        # cv2.PutText(cv2.fromarray(im),str(Id), (x,y+h),font, 255)
        cv2.putText(im,str(Id),(x,y+h), font, 1, (200,255,155), 2, cv2.LINE_AA)
```

CHAPTER -5

CONCLUSIONS

In this segment all the learning outcomes are discussed further carried forward by the plans and the management put into the project. The basic conclusion and the drawbacks are also discussed along with the scope and future work of the project.

5.1 REFLECTION

We mentioned above in the “context section” that we have considered various methods and “strategies” for “face detection and recognition”. Some assumptions were made initially and we stuck to them as they helped us in achieving our objective. We selected 3 methods for every stage while excluding the “recognition” one and in the expectation of result. We selected one of them or fusion of two. We actually learnt various strategies to remove essential data from the image. Adding to this we also learnt about difference in shading spaces and its different applications. In the end we learnt about “open CV” and the various opportunities it gives.

5.2 PROJECT CONCLUSION

The face detection and recognition calculations were altogether examined taking various test pictures and changing the conditions and factors. All the work specified above included continuous information. The PCA achievement rates were given while for confront discovery, the achievement rate was diverse for different pictures relying upon the outer elements. The general achievement rate was 95%.

5.2.1 LIMITATIONS

As discussed above, a few assumptions were made for the project, but the system has few limitations in spite of that. Even though HD video is quite low in resolution when compared with digital camera images, it still occupies significant amounts of disk

space. The limitations for HAAR is that it takes more time for training and is less accurate for black faces. It is computationally complex and slow.

5.3 FUTURE SCOPE

Further, we may likewise fabricate a GUI in view of python as well as Open CV. Face acknowledgment frameworks are a piece of facial picture preparing applications and their noteworthiness as an examination territory are expanding as of late. Usage of framework are wrongdoing avoidance, video observation, individual check, and comparable security exercises.

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