

FACIAL EXPRESSION RECOGNITION **USING DEEP LEARNING**

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

In

Computer Science and Engineering

By

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Under the supervision of

Dr. Hemraj Saini

To



Department of Computer Science & Engineering and Information
Technology

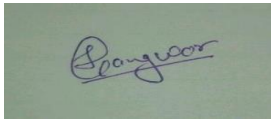
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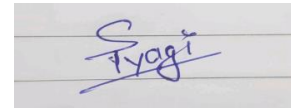
Candidate's Declaration

I hereby declare that the work presented in this report entitled “ **Facial expression recognition using deep learning** ” 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 & Engineering and Information Technology, Jaypee University of Information Technology Waknaghat is an authentic record of my own work carried out over a period from January 2021 to May 2021 under the supervision of **Dr. Hemraj Saini**(Associate Professor).

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



Jai Gangwar, 171206



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



Dr. Hemraj Saini

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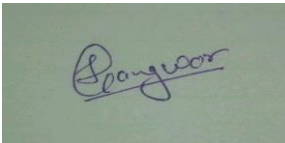
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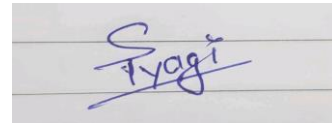
Besides the hard work of a group, the success of a project also depends highly on the encouragement and guidelines of many others. I take this opportunity to express my sincere and heartfelt gratitude to the people who have been instrumental in the successful completion of this project.

Our first and foremost acknowledgement goes to our supervisor and mentor, **Dr. Hemraj Saini**, without whose help the completion of this project wouldn't have been possible. It is because of his guidance and efforts that I was able to implement a practical idea based on my field of interest. I would also like to thank my panel for giving me an opportunity to present my project and for judging my work and providing me feedback which would certainly help me in the future.

Last but not the least I would like to acknowledge my institution **Jaypee University of Information Technology** for giving me a platform to give me life and implementation, to the various fields I have studied till date.



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Chapter-1 INTRODUCTION

Facial expressions play an important role to understand and police work feeling. Term "interface" also states this thing but the communication is very vital with face plays between 2 things. Some studies state that facial reading of expression will considerably change or vary the interpretation of things which are spoken yet the management of the status of oral communication. Here is flexibility to acknowledge the human feelings which are incredibly vital for communicating effectively ; and up to ninety three of accounting for communicating the employed among standard oral communication of AN entity depends on an emotion.

The human computer interaction also known as HCI in ideal terms , also we might want that to browse human feeling the machine should have its own aptitude. Here by this analysis will be concerning however computer will discover feeling Accurately by its varied sensors. To do this experiment we actually here we use image of the facial expression to browse feelings on the human face as a medium. Then we have the analysis on feeling is copied to the pioneer of the Darwin operating therefore it has heap for attraction by the research makers for the current space. The square measure some emotion that are basic and are seven of them that square measure masses in universal terms. specifically normal, anger, frightening, disgusted, joyful, bad mood, and surprised, and the emotion that is basic of a human is recognized countenance. during the analysis we will say a good thanks for discovering normal, anger, frightening, disgusted, joyful, bad mood, and surprised and also by discovering normal, joyful, unhappy and surprised these four feelings from frontal facial emotion.

While the recent past decade, varied strategies are planned for feeling recognition. several algorithms were advised to develop systems/applications which will discover emotions on laptop applications may higher communicate by ever-changing responses in step with the spirit of human users in varied interactions. feeling of an individual is considered by his facial or speech or perhaps is one of the traits. While the things to do work given are exploring the popularity from facial expression during this paper.



The expressions shown are of normal, anger, frightening, disgusted, joyful, bad mood, and surprised.

1.1 Facial Expression

Facial exploration by seeing or detecting or recognizing is one which is in this field that is mostly worked in the field of computer science. As we all know that each and every individual's face is the identity to distinguish them from another individual. Facial detection and recognition describes the way each individual's identification system works with the use of facial characteristics which vary from person to person.

Under this report, two major steps involved are: face detection, this process includes the detection of human faces and is a very fast process for human faces as well as the objects that are placed close to the camera lens, secondly the faces are categorized as per the facial attributes as they are different for each individual. Facial recognition is the future of one of the much-studied biometrics technology. The main motive of our project is to detect faces in a given video/image frame which has to be done using the HAAR-Cascades and then use facial recognition algorithm to validate the detected face.

The Eigenface method works on the algorithm called PCA which stands for Principal Component Analysis and this algorithm reduces the dimensions of the face expression to extract the facial characteristics. In this project, python is required as it consists on all the suitable modules and libraries that we require i.e Opencv and opencv-contrib-python libraries.



Fig. - Eigenfaces used for recognition

1.2 Problem Statement

Facial recognition methods, such as eyes, nose and other features are the basic conditions for image structure analysis. The face uses LFA detection method. Compared with other basic facial imaging technologies, the system is more robust in finding matches. But there is a certain real purpose. In order to win in practice, the number of cases must be large enough to discuss model fitting methods for facial recognition. For each person who trains the model, prepare a model and choose the best coordination model. The model is essential to achieve good results, and eye-catching responsive operator displays are essential to achieve good results.

The method that was talk about earlier consisted of the training set that used a sample database and that database consisted of 500 images to the count. The accuracy is a game changer in eyes and locating its position came out to be nearby 98% and nearby 94% respectively.

One of the conclusion that could be made from the initial experimental results that was conducted on this training set provided that the method or approach was displaying good

robustness and improvement in accuracy could be noticed

The purpose of the project is to build a system that not only detects faces but also recognises them, and this was done using face detection and face recognition algorithms

1.3 Objective

Recent times have shown results which earlier seemed impossible. In deep learning, M.L.

model that studies itself so as accomplish at hand tasks which involves classification directly from text, maybe images or sound too. The term state of the art in case of accuracy can be achieved via Deep learning models and the performance may even tend to exceed humans. The training of models is done via using of large dataset which includes labelled data and also includes neural network which contain n-number of layers.

Defining the term deep learning has been one challenge for many people because it has noticeably changed several forms slowly over the past decade. One closest and he most useful definition that can be used to specify the concept of deep learning applies with the neural network atleast having two layers to work with the algorithms.

The different technologies mentioned in the above are meant to suggest that with their help we aim to identify genders with help of different facial features and using different algorithms the task we wish to achieve is quicker than the humans and also further the future scope of this is implementing the neural networks in the real time to identify the genders. The scope is not only limited to this as monitoring or using in surveillances Face biometrics are just one kind of biometric while there are several other biometrics out in the society but still the face based biometric becomes undoubtedly best when the task at hand is to identify or provide help with an ongoing investigation against the criminals or culprits. The design of the system is such that it could recognize anyone just by the image of the persons face effectively from the dataset that has been provided in all robust conditions with best accuracy and least time possible.

Chapter -2 LITERATURE SURVEY

Facial recognition methods, such as eyes, nose and other features are the basic conditions for image structure analysis. The face uses LFA detection method. Compared with other basic facial imaging technologies, the system is more robust in finding matches. But there is a certain real purpose. In order to win in practice, the number of cases must be large enough to discuss model fitting methods for facial recognition. For each person who trains the model, prepare a model and choose the best coordination model. The model is essential to achieve good results, and eye-catching responsive operator displays are essential to achieve good results.

There are lot of approach that we can look on to one is 3d have been suggested as an to have problems but with different different types of solutions going by . The lighting and the posing had a fair amount of advantage on the data of the 3d, that have improved the consistent behaviour of recognition systems. But there is a chance that the 3d data is very delicate with the changes happen in the expressions of the face. Therefore this present an over look of the technology with recognition of facial expression in the history, there is very good methods of ongoing types of projects, also giving the direction to the near future. So here we will light our focus basically with the database which the newest in the game, facial method of recognition with the features of two-d and three-d. In addition, here have a special light which is focused with the strategy of deep learn where it represents current affairs on the area. New topics were researched also the directions which are possible for recognition of the facial feature that are suggested for the readers to have an full amount of knowledge through the reference on the points that should be considered for the deserving category.

2.1 Facial Detection approaches

Our facial recognition project helped us conduct a comprehensive and detailed study of many face recognition algorithms and their advantages and disadvantages. Some important technologies discussed and mentioned are listed below. Tasks:

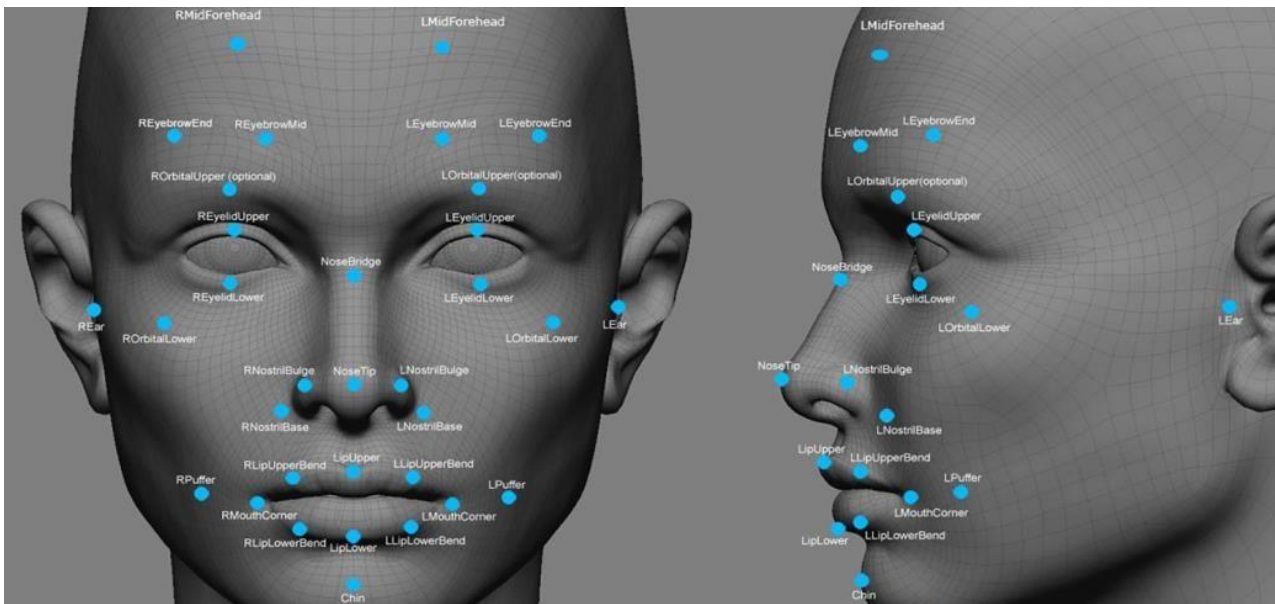
1. Obtain faces
2. Extract features
3. Recognition.

Face recognition method For "face recognition", you can use still images or video sequences. Here are some basic "face recognition" methods:

- 1) Knowledge-based methods mainly depend on the researchers' understanding of facial features.
- 2) Feature-based methods include invariant facial features used to determine texture and skin tone. And so on compared with the pre-defined face templates that are already available. There is a deformation or change in the posture, shapes and colors which have their own disadvantage.
- 3) Look-based method: For this type of thing alignment strategy, there is design is decided for the experts. This research method is also called the measurable and with the learning of the machine that we should use for determining and have a meaningful a non-confrontational images of attributes with facial images.

Facial recognition methods, such as eyes, nose and other features are the basic conditions for image structure analysis. The face uses LFA detection method. Compared with other basic facial imaging technologies, the system is more robust in finding matches. But there is a certain real purpose. In order to win in practice, the number of cases must be large enough to discuss model fitting methods for facial recognition. For each person who trains the model, prepare a model and choose the best coordination model. The model is essential to achieve good results, and eye-catching responsive operator displays are essential to achieve good results.

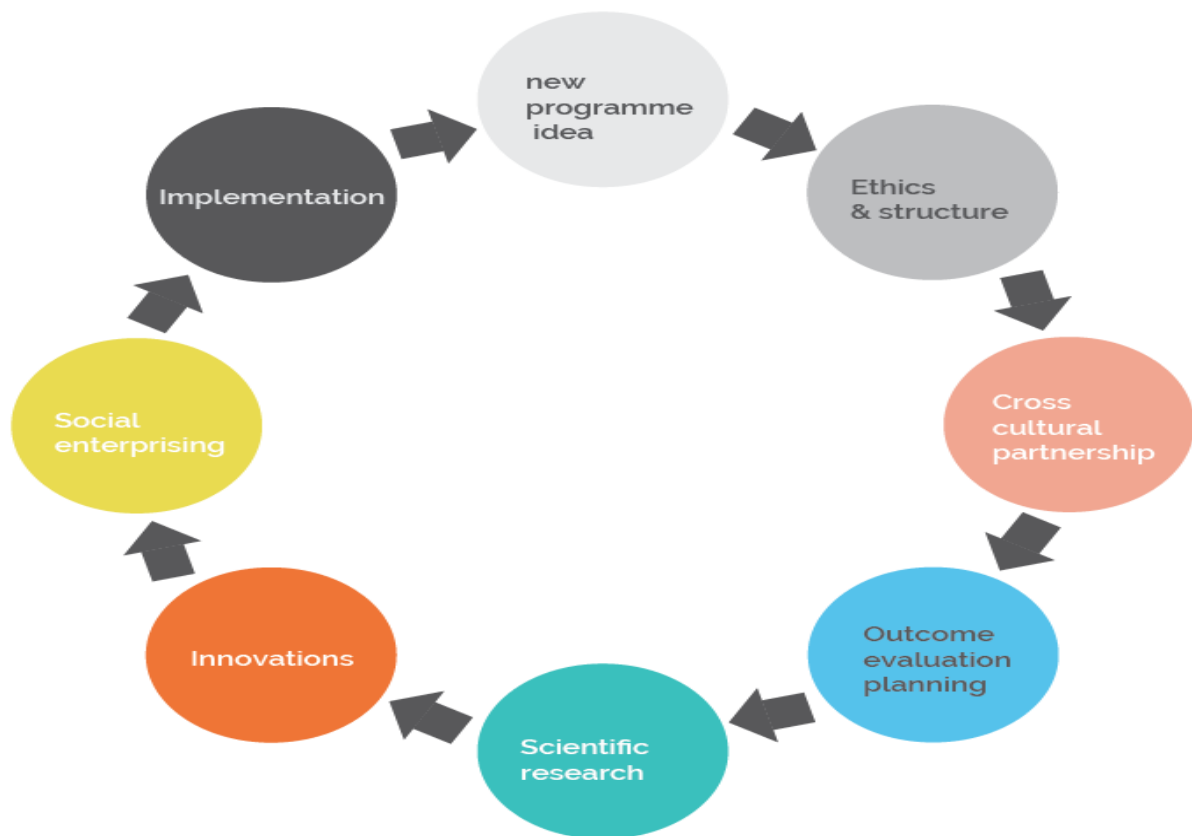
The main idea of enumerating the establishment system related to under-representation by minimizing work is to indicate some assertions as under-representation problems. There are huge amount of functions lead this technology with a different type of disadvantage. So we have a dynamic with also different representation that confronts statements from the perspective of linear or curved programming.



2.2 Face Recognition approaches

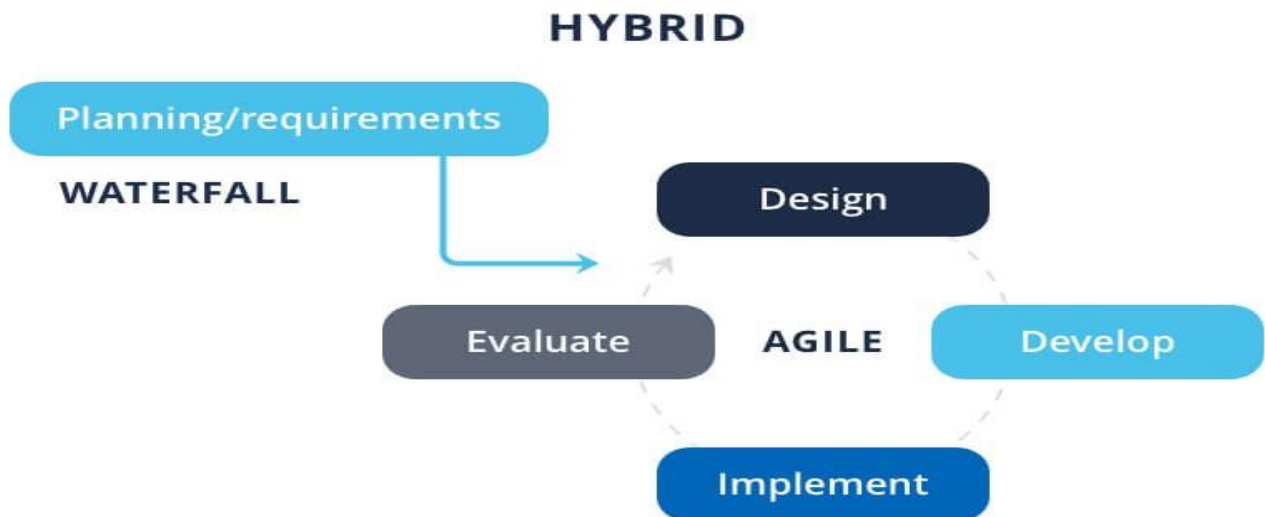
1. Approach Holistic

The system is considered with an input to the entire region of the facial expression gives us the “Approach Holistic” so that the will be a frame work for detecting the facial expression of the people. There is diffrent strategy that are very comprehension are “Eigenfaces”, “Probabilistic eigenfaces”, “Fisherfaces” have the NFL for the supporters.



2. Hybrid Approach

There are a lot of approaches that we can look on to one is 3D have been suggested as an to have problems but with different different types of solutions going by . The lighting and the posing had a fair amount of advantage on the data of the 3D, that have improved the consistent behaviour of recognition systems. But there is a chance that the 3D data is very delicate with the changes happen in the expressions of the face. Therefore this present an over look of the technology with recognition of facial expression in the history, there is very good methods of ongoing types of projects, also giving the direction to the near future.



Grey-scale transformation was a type of pre-processing that was done initially. The method that was applied was- Adaptive boosting algorithm [8] and this algorithm is ordinarily used to eradicate whatever features irrelevant could have been detected while trying to detect the face and they may not be that important, next step was using the 24 different connected components method and eyes were located with the best accuracy using this specific method and the status of eyes could be examined with its help.

The following stages depict what different stages were proposed:

- a) Input Image
- b) The Recognition and Detection of Face
 - Adaptive boosting Algorithm
 - Detecting human face
- c) Detection of eyes along with their position

The human face subjected to different testing conditions which were subjected to varying conditions. The images that have been shown below depict the conditions, the

thing that needs to be noticed here is that the result remained consistent even under different conditions.



Detecting faces in different conditions

“Variation Factors”	“Local Features”	“Holistic Features”
Small	<i>NS</i>	<i>S</i>
Large	<i>S</i>	<i>VS</i>
Illuminations	<i>VS</i>	<i>S</i>
Expressions	<i>NS</i>	<i>S</i>
Pose	<i>S</i>	<i>VS</i>
Noise	<i>VS</i>	<i>S</i>
Occlusion	<i>NS</i>	<i>VS</i>

2.3 Model Methods

2.3.1 Hidden Markov Model

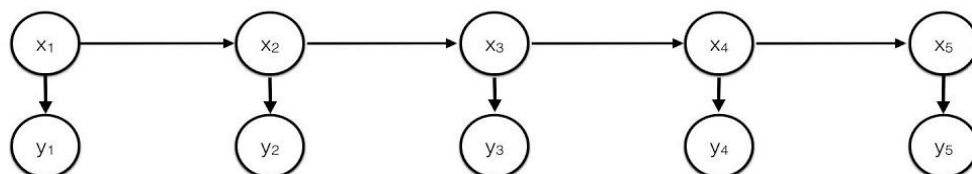
The face of the human front pics, critical face images and positions display with a pleasant this process includes the detection of human faces and is a very fast process for human faces as well as the objects that are placed close to the camera lens. Here we have "Hidden Markov fashions(HMM)" with another approach that work on the exceptional with the pics the usage of range in mild problems, also appearing to much outward and also having own intro. Here is an association that works on responsible fashions that allows and have signs of painting capabilities. The execution is very raw and almost super with the discourse where we also acknowledge the individual. Now there is the displaying of the framework notion to be a manner that shows signs of Markov which also has obstacles now no longer known & goal is to find out hid obstacles from the recognizable boundaries.

Each level in HMM has a conceivable probability flow over performance, while each level is observable also has a generalized proof which can be called as Markov. "The creator needs the help of a system called the DCT Compression Property to remove the lights." a partial image that is additionally connected to the perception vector. In HMM there is a Markov chain that with a small number of states cannot be observed currently in the model that is now probably worked on. Here we have a symbol with the matrix of probable outcomes which has a observation for the matrix B, which is the matrix for the probability for the change in state A., initial state π distribution which had group for the probability density function also called as pdf . Here we have some explanation of HMM: which can be stated as $\lambda = (A, B, \pi)$. Every face have a region which would be assigned for a 1-d state.

Hidden Markov Models

$p(y_t|x_t)$ observation probability SONAR noisiness
 $p(x_t|x_{t-1})$ transition probability submarine locomotion

$$p(X, Y) = p(x_1) \prod_{t=1}^{T-1} p(x_{t+1}|x_t) \prod_{t'=1}^T p(y_{t'}|x_{t'})$$



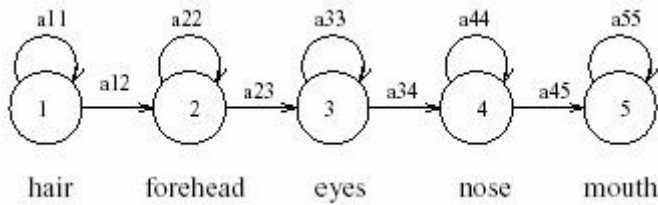


Fig - facial recognition

Every facial image that has a width "W" also having a height "H" that will be further divided by the deck that is being cut to piece with height "L" also having a width is also similar. So we have an amount through which the "P" coverage significantly changes and have some disturbance in the detection of the rates when the commencement are automatically figured out where the position was in the vertical. We have an estimate where "L" has the most urgency. Here the Markov Model that is hidden states that: "The small length" l "assigns insufficient information to separate the perceptual vector. This increases the likelihood of intersecting the feature. So get a decent estimate that is better than the The mean value of "L" is "is very important. The moment the pieces are ejected from the photograph, a mode of action of the" dct " variables is examined for every one of the variables.

When moment every square has to get changed "DCT", here basic and moments of low-frequency variables has to be satisfied also are collected where a small amount of area is being present "DCT" range. The vector which has a degree of recognizing actually becomes least significant, where in this sense improves the advantageous system and reminds that up to now there is the ability to maintain a good recognition rate. In the layout arrangement, the photo is isolated to the end where each piece is analyzed for a condition and the initial recognition probability grid "B" is obtained from recognition vectors relating to each condition. Once "B" is obtained, the basic estimate of "An" and " π " is determined from left to right in consideration of the structure of the face.

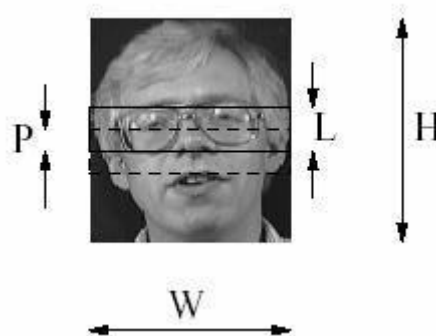
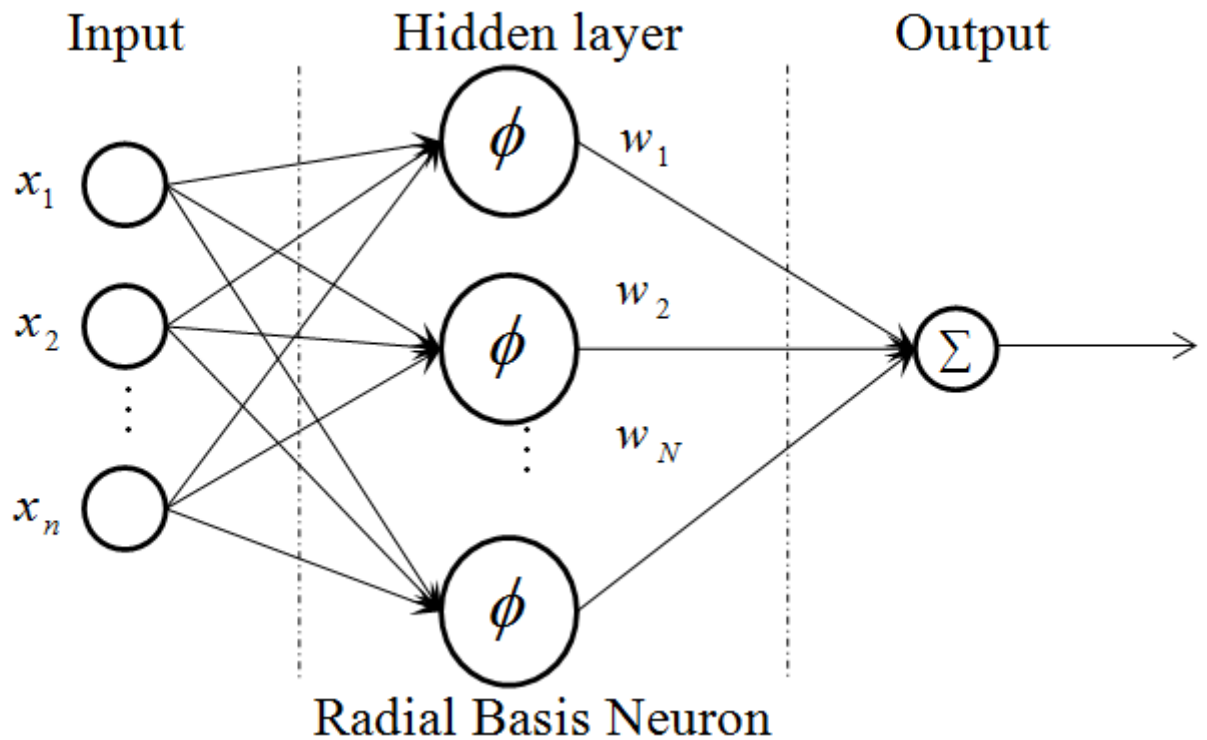


Fig - Block extraction image.

2.3.2 Neural Network Method

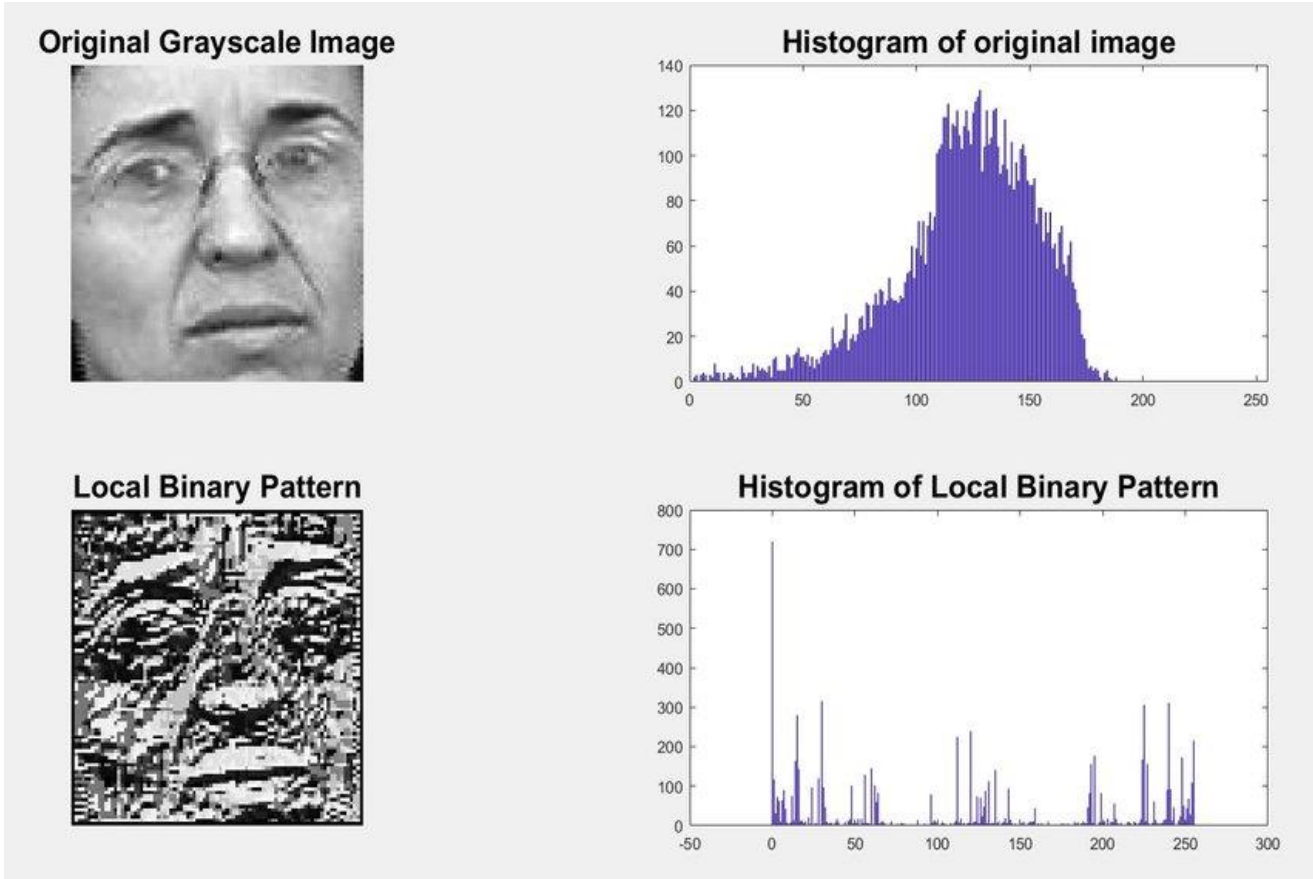
The knowledge of machine learning and the various machine learning techniques form the basis of the "methods based on neural networks". The preparation of networks needs to be done in a precise manner so that we can have an enormous amount of information about different different versatility I facial expression and its designs. So we have the nnm which gives us the benefit fundamentally. These system have to be extensively reincarnated for an amazing performance. This is where we have main disadvantage in the method. The backward algo which is the propagation algo has to be used in these parts that are mostly used in this method as it approaches "face recognition". Where else assembly is slow for the mlp that is being used in the systems with a minimum margin incorrectness will not be accomplished. On the other hand, the ability to learn quickly and the best approximation property are the main features of the neural RBF system. With this in mind, numerous specialists have recently used RBF systems for confrontation detection.

Considering all of the instances their prosperity chances aren't all that promising because the blunder percent which adjustments from % beneathneath form of stance, introduction, and lighting. So this is probably due to the selection of the focuses of the hidden layer neurons that wont were completed via way of means of catching the getting to know approximately the conveyance of getting ready examples &kinds of face stance, introduction, and luminosity.



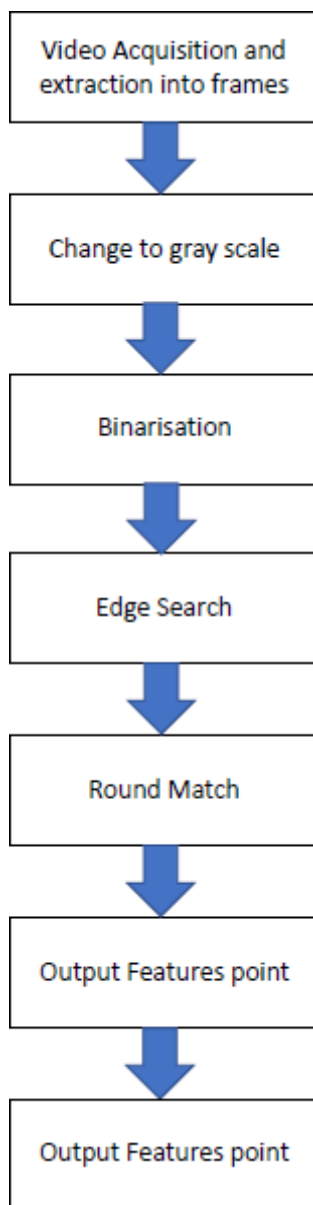
2.3.3 The Local binary pattern histogram

Here we have "Eigen-faces" with the "fishermen faces" which got influenced through light effects. While in the example it is quite obvious about troublesome which gives us the perfect and almost throughout light each and every time. "LBPH Face Recognition" has an disadvantage which needs to be improved to overcome the situation. We have the concept behind the bars "LBPH" which we should not think of a picture which normally should be a picture. However, we can see structure by comparing and trying to find the local outcome of a pixel with neighbors. Here "3 × 3" is slowly moving through the window and then through a picture. With each movement, do a simple compare for the center and for the pixel and then the nearby area through pixel.



Fig

Another advantage of using this technique, which results in the precise definition of the eyes, is that the human eye becomes complete when observed as a pair, and this is because the human eye can see it in a very short time and therefore improves accuracy because it greatly reduces the likelihood that incorrect results will be detected. The use of this algorithm is related to it working very well and even marking during face detection on frontal faces, but this accuracy is enough when it comes to images that are obscured. After carefully reading the research article, we came to the conclusion that the algorithm used in the implementation was the same represented with the help of the stream chart given below:



In conclusion, these methods essentially included two traces or benefits, and they are important for improving range and accuracy. In summary, the first involved the use of a comprehensive projection feature aimed at achieving impolite or impolite positioning in relation to the eyes. People and then their integration. with Hough round Transform to know exactly where the eyes were on a person. The video created and recorded was processed beforehand. After completing the preprocessing, the next step should be to identify the facial area with the help of the neural network. Once the face has been identified, the important projection technique can be applied which will help determine the exact or exact location of the eyes of the person seen in the image below.



Fig

Chapter-3 SYSTEM DESIGN

In this the section tell us about the number of decisions that were processed when we had the implementation is going on for many methods that were taking place which can be utilized for different different future works and this also helps us for the development of the phases of neural network in future times.

This chapter explains the media that must be used when developing the framework. After experiencing distinctive research or study articles planned to find a non-intrusive way to develop my framework. We are all familiar and know that there are many, many different facial recognition and recognition strategies that can be accessed. However, you must opt for information-centric measures to design our structure, and this strategy is necessary because it is doing this to make it increasingly compact and appropriate in many environments.

A system dependent on following two stages is designed:

- (a) Face Detection
- (b) Face Recognition

A manner of distinguishing faces from listing of appearances and non-faces or different gadgets is referred to as face detection. The innovation of face detection has been applied in exceptional components and combination of practices that noticed a human face in automated images/pictures. While growing the face detection structure, get rid of the noteworthy highlights from the face of human and accumulate values in Pfunctions from human face exceptional type of strategies are to be had and had been indexed below.

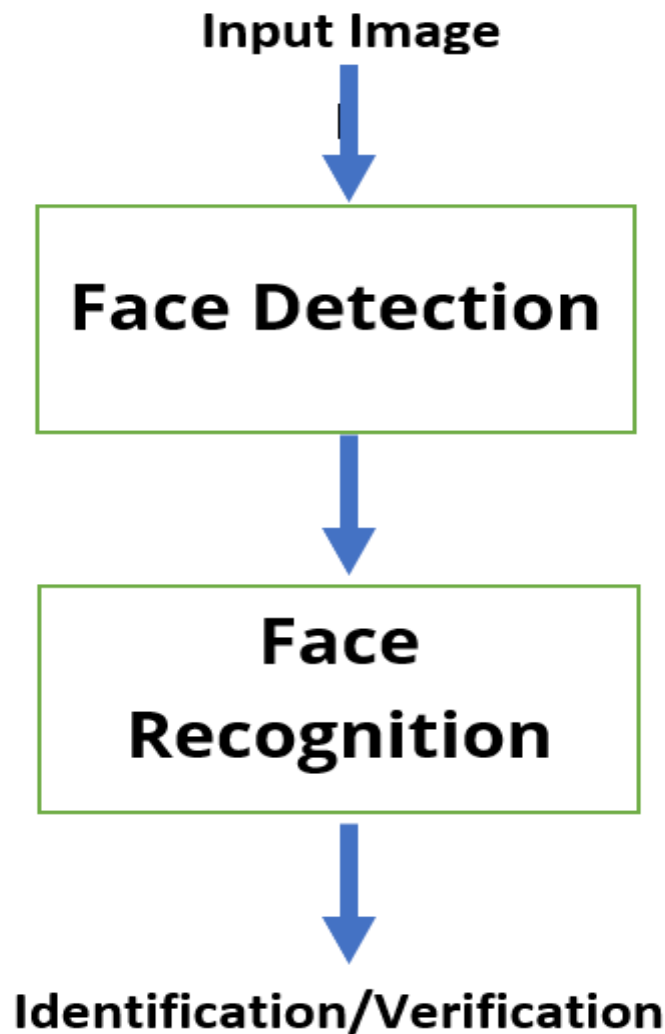
3.1 Design

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3.1.1 Algorithm of component

We have "PCA" which can be called as the analysis of the component of its principal through which we have the base by which we can perform "face recognition" algos that are completely relevant to use afterwards. With these algorithms, we use the recognizing of the facial expressions which further gives us the analysis and comparing the image that we used to train the model.

The main idea of enumerating the establishment system related to under-representation by minimizing work is to indicate some assertions as under-representation problems. There are huge amount of functions lead this technology with a different type of disadvantage. So we have a dynamic with also different representation that confronts statements from the perspective of linear or curved programming.



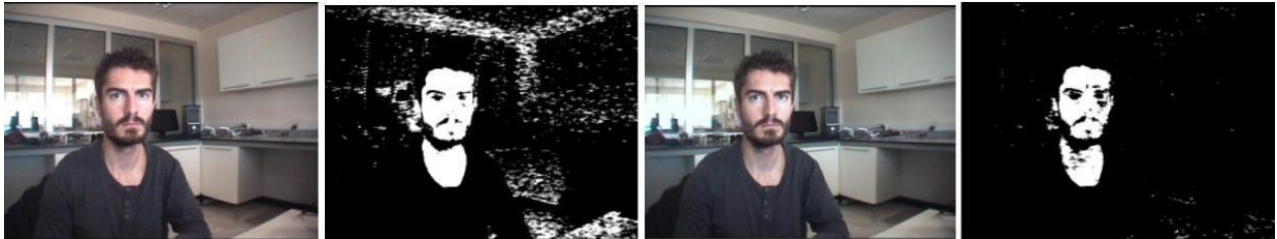
Here the facial recognition context is having an input to a certain part which is very important. So we have an activity going in this section which can be described as: "Image capture". In order to carry out image processing calculations, images recorded live are converted into extended information.

The face recognition scaffold of the face recognition part requires the removal of the face image task, and this is done by identifying the face. Figure 3 shows the calculation of the face recognition part. This test determines that dividing the skin as the first step to identify the face reduces the computation time to find a complete image.

There is the skin which we have to divide so that we can associate with it and get the acknowledgment that is underneath in that part. We will represent the skin for an "RGB shading space" which can be used efficiently. So we get the result for the image

as a prolonged lighting that results in a condition which provides us with the modification in white background. The management of the white part of the images that have to be seen as if it is correct or not.

Result:



Hopefully after the successful connection and surgery, the basic tasks associated with a skin type will be faced. In the end, when it comes to small places, the facial treatments that are applied under two conditions are selected. Covering some points and proportions bounce box, etc. between "0.3" and "1.5".



Grey-scale transformation was a type of pre-processing that was done initially. The method that was applied was- Adaptive boosting algorithm [8] and this algorithm is ordinarily used to eradicate whatever features irrelevant could have been detected while trying to detect the face and they may not be that important, next step was using the 24 different connected components method and eyes were located with the best accuracy using this specific method and the status of eyes could be examined with its help.

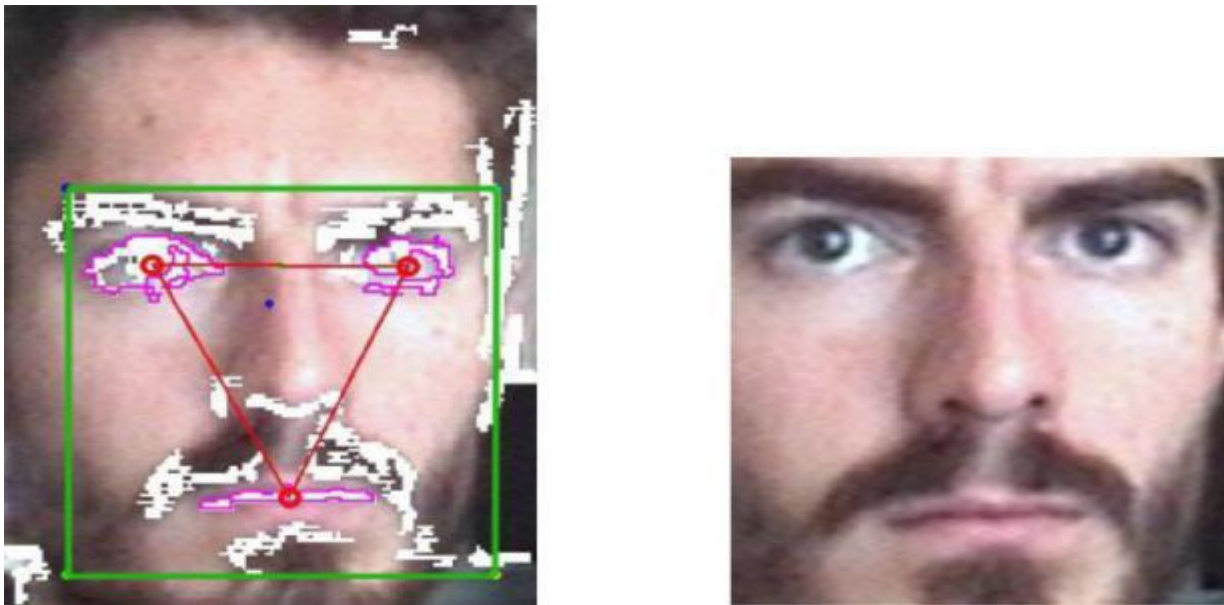


Fig - Facial feature extraction

Recognizing the face

Changed the facial photo that will be obtained withinside where we have the acceptance of the facial expression in the framework, have been in a position that we should group the framework that will give us the understanding in the person withinside data that we will collect from the database and check it effectively. Facial agreement in the component can be created from getting ready for the facial photo. There is certain amount of group which can be performed via way of means of utilising Forwarding of the neural network in the feed.

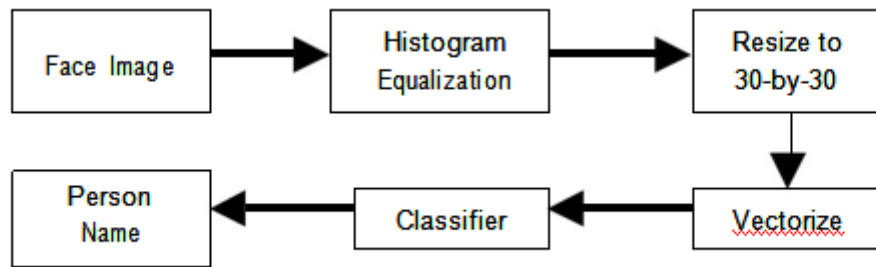


Fig -

Figure 3.6 “Algorithm of Face Recognition Part”

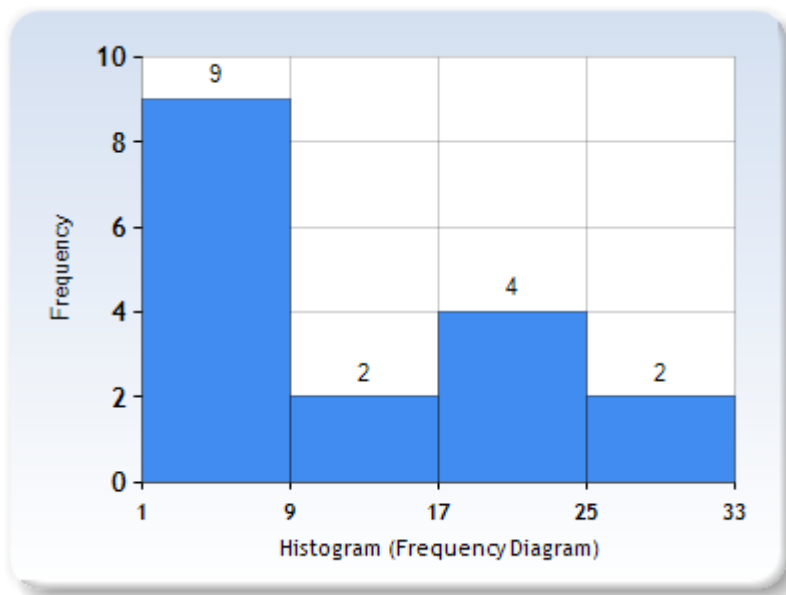
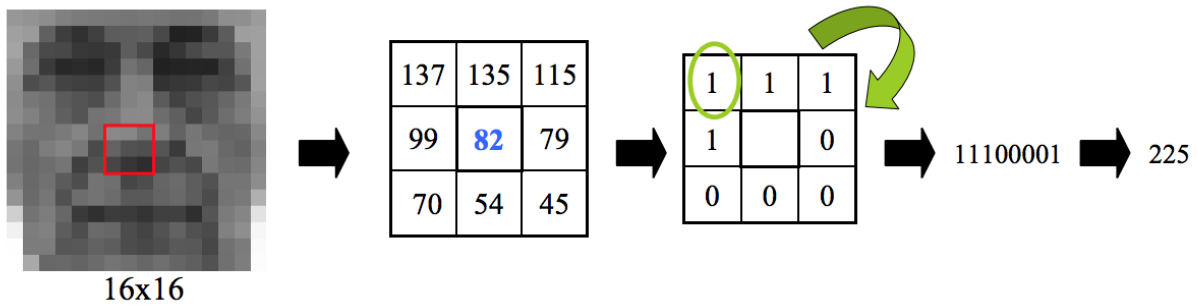
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Method 3 (Final method used)

The local binary pattern histogram

Here we have "Eigen-faces" with the "fishermen faces" which got influenced through light effects. While in the example it is quite obvious about troublesome which gives us the perfect and almost throughout light each and every time. "LBPH Face Recognition" has an disadvantage which needs to be improved to overcome the situation. We have the concept behind the bars "LBPH" which we should not think of a picture which normally should be a picture. However, we can see structure by comparing and trying to find the local outcome of a pixel with neighbors. Here "3 × 3" is slowly moving through the window and then through a picture. With each movement, do a simple compare for the center and for the pixel and then the nearby area through pixel.

Another advantage of using this technique, which results in the precise definition of the eyes, is that the human eye becomes complete when observed as a pair, and this is because the human eye can see it in a very short time and therefore improves accuracy because it greatly reduces the likelihood that incorrect results will be detected. The use of this algorithm is related to it working very well and even marking during face detection on frontal faces, but this acrae is enough when it comes to images that are obscured.

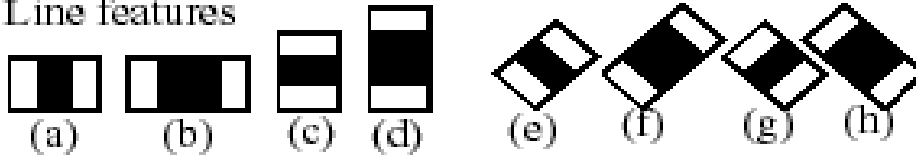


Here the facial recognition context is having an input to a certain part which is very important. So we have an activity going in this section which can be described as: "Image capture". In order to carry out image processing calculations, images recorded live are converted into extended information.

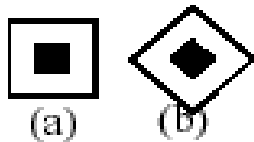
1. Edge features



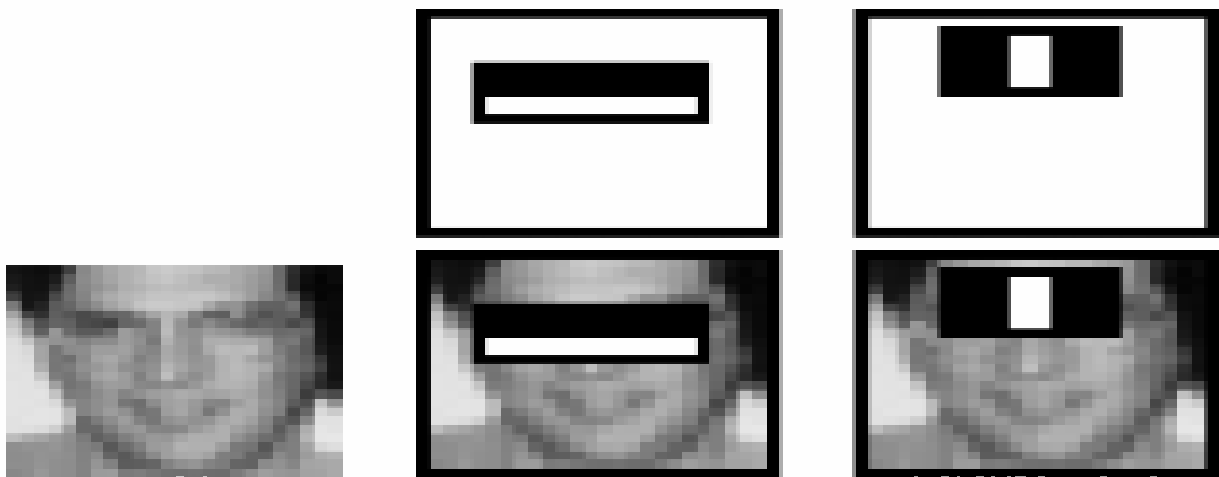
2. Line features



3. Center-surround features



characteristic is largely calculated with the aid of using the windows that can be selected windows allotted at an specific type of image. Where distinction among all the connected pixel should give us a summation beneathneath a clear component and also the smmation should give us the beneathneath all blacked out component offers the unmarried cost for each and every characteristic.



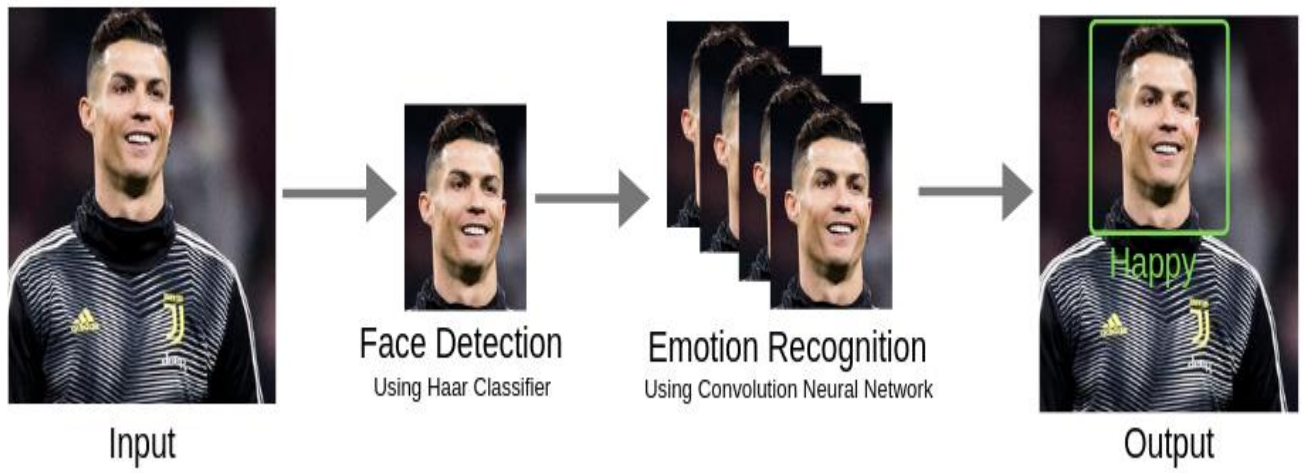
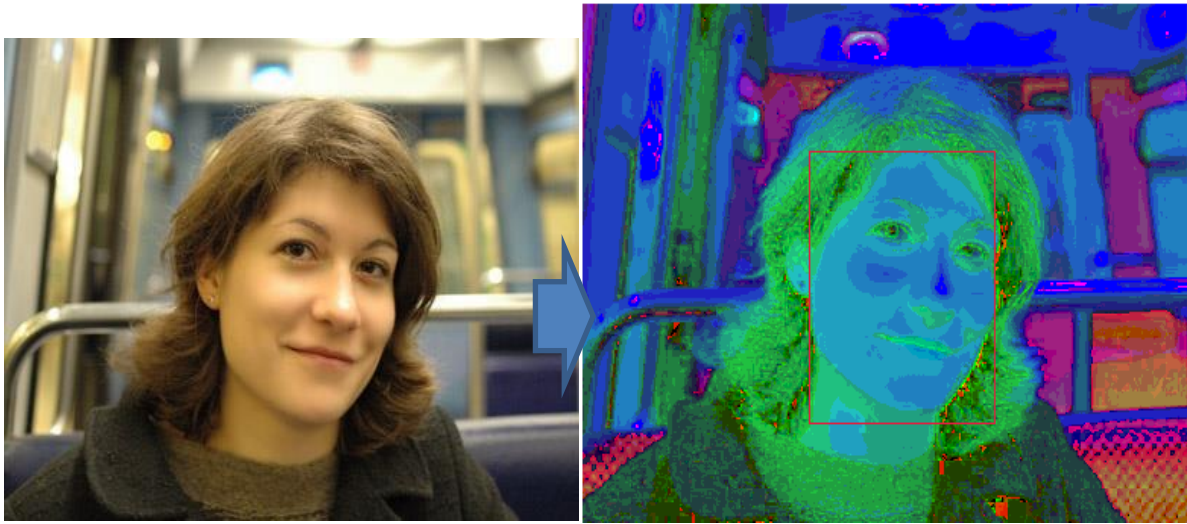
For the calculation of the capabilities which might be in masses of number, all of the sizes of home windows that are viable are positioned on all of the places which might be viable. Extraction of two capabilities is accomplished as in instance withinside the picture has to be extracted through the means of an algorithm.

3.2 Experiments and Results

A whole hardware and software program gadget is designed and carried out within the Robot Vision Laboratory of the Department of Mechatronics Engineering on the Atılım University. The final intention of the bigger project (umbrella project) is to increase a humanoid robotic with a narrower utility like Guide robotic, Guard robotic, Office robotic, etc. The advanced gadget has been examined for plenty stay received pix and outcomes are pleasant for this sort of pioneering paintings within the department. Improvements are required for higher performance. System description and feasible upgrades are mentioned on this chapter.



the successful connection and surgery, the basic tasks associated with a skin type will be faced. In the end, when it comes to small places, the facial treatments that are applied under two conditions are selected. Covering some points and proportions bounce box, etc. between "0.3" and "1.5".



Chapter-4 PERFORMANCE ANALYSIS

4.1 Methods step by step

Among all these algorithms, I have tried to work with methods based on neural networks, Gabor wave transforms, and Viola Jones algorithms to find the one that will allow the most accurate extraction of facial features and to implement the system that works when reading of these characteristics recognizes emotions. Here are some of the performance reviews of these feature extraction and emotion detection methods that they use.

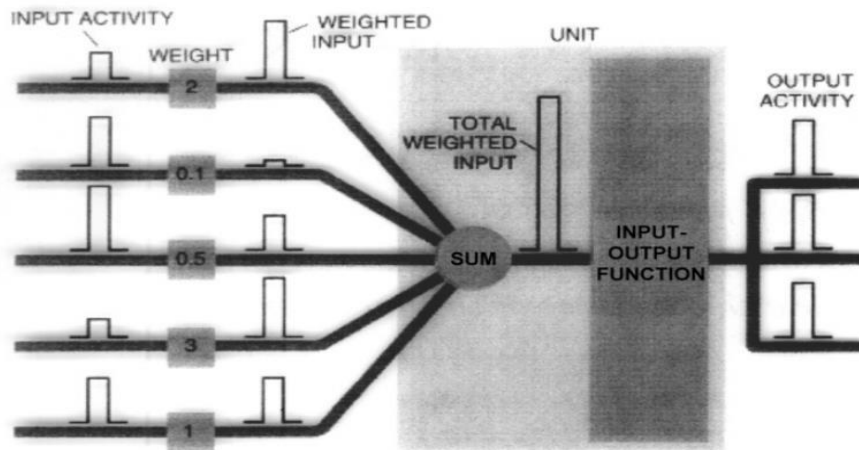
PERFORMANCE ANALYSIS				
No.	Type of Gesture	No. of Input Images	Recognized	Result (%)
1	Happy	13	12	92.3
2	Disgust	11	10	90.9
3	Anger	10	9	90
4	Neutral	7	7	100

Fig - performance analysis for PCA

Happy	79.7%
Sad	69.9%
Angry	72.3%
Disgust	69.9%
Surprise	78.5%

Facial recognition methods, such as eyes, nose and other features are the basic conditions for image structure analysis. The face uses LFA detection method. Compared with other basic facial imaging technologies, the system is more robust in finding matches. But there is a certain real purpose. In order to win in practice, the number of cases must be large enough to discuss model fitting methods for facial recognition. For each person who trains the model, prepare a model and choose the best coordination model. The model is essential to achieve good results, and eye-catching responsive operator displays are essential to achieve good results.

The main idea of enumerating the establishment system related to under-representation by minimizing work is to indicate some assertions as under-representation problems. There are huge amount of functions lead this technology with a different type of disadvantage. So we have a dynamic with also different representation that confronts statements from the perspective of linear or curved programming.



4.1.1 Data capturing

```
#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()
```

File Edit Format Run Options Window Help

```
#https://github.com/Itseez/opencv/blob/master/data/haarcascades/haarcascade_eye
```

```
# 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)
```

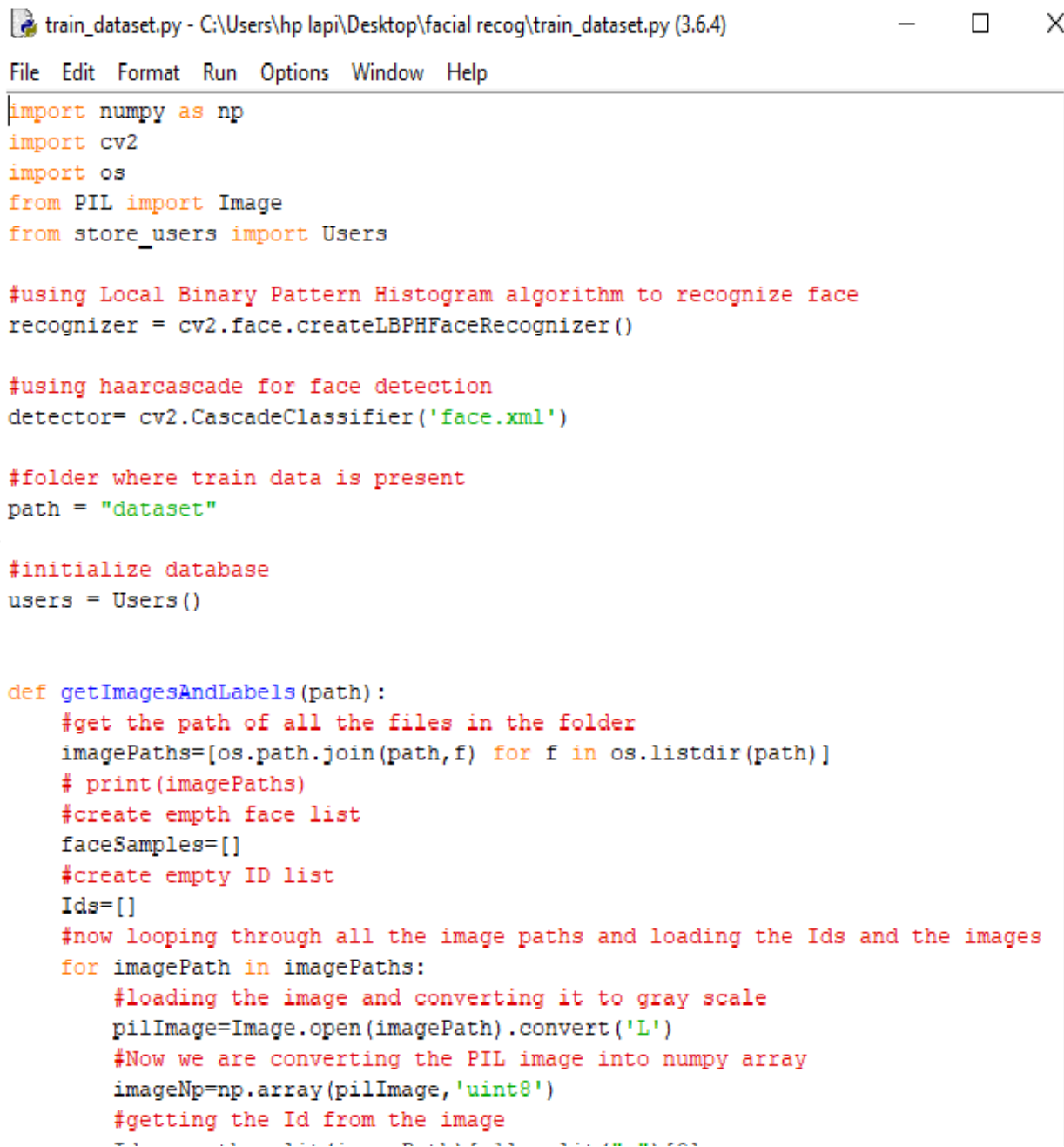
```
        # cv2.rectangle(img, (x,y), (x+w,y+h), (255,0,0),2)
```

```
        # roi_color = img[y:y+h, x:x+w]
```

```
        c+=1
```

```
    # face = cv2.CascadeClassifier('face.xml')
```

4.1.2 Dataset Training



```
train_dataset.py - C:\Users\hp lap\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
    imagePath=[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 imagePath:
        #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
        Id, confidence = recognizer.predict(imageNp)
```

```

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);
    }
}

```

4.1.3 Recognising code

```
recognize.py - C:\Users\hp lapl\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 recognition
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), (255,0,0),2)
        Id, conf = recognizer.predict(gray[y:y+h,x:x+w])
        print(Id," ",conf)
        #if the confidence of face recognition 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, (255,255,155), 2, cv2.LINE_AA)
```


Chapter-5 CONCLUSIONS

5.1 Conclusion

Face recognition and recognition calculations were studied together by taking multiple test images and changing conditions and factors. All of the above work contained continuous information. PCA success rates were reported, while for exposure detection the success rate was different for different images based on external elements. The overall performance rate was 95%.

In this project, the field of face recognition was presented and various approaches, methods, tools and algorithms for determining emotions from images were explained. Some are better, some are less precise, some are more versatile, and others are too computationally intensive. Face recognition is associated with a few issues related to problem definition, environmental conditions, and hardware limitations.

Some of the disadvantages of this system:

- This system cannot recognize the face of a dark person with a light background. □
- The side images do not recognize the emotions because they cannot extract characteristics from the face. I only used lips as a neuron to recognize emotions.
- Some of the mixed feelings will go undetected.

As explained above, some assumptions have been made for the project, but the system still has few limitations. Although HD video is quite low resolution compared to digital camera images, it still takes up a significant amount of 4disk29 space. HAIR is that the workout takes longer and is less accurate for black faces. It's computationally complex and slow.

5.2 Future work

In addition, we can also create a GUI for Python and Open CV. Face recognition frameworks are part of facial image preparation applications and their importance as a study area has recently increased. Observation, individual control and comparable safety exercises.

The system I implemented works reasonably well with the normal background, but if the background is too light or matches the skin color of the person or people with dark

skin, the system will not work properly so I'll work on how to make it makes the system. More efficient for work on light backgrounds or for people with darker skin. The eyes also help identify emotions. Therefore, I will use the eyes to identify emotions more precisely. Adding more emotions to detection is one of my future plans. Four emotions detected for this system. Another plan is to detect emotions from live video images as it can be helpful in many areas of daily use, e.g. B. in the fields of medicine, research or security and much more. I will try to develop a better system like emotion in the future. Screening can help us decide many of the problems we face in our daily life and help us make society a better place to live.

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