# CHAPTER 1 INTRODUCTION

Blindness is a serious problem for all in the world. Blind person faces very problem in daily routine life. The main problem is digital world and it is developed Day by Day, so it's very difficult to survive in digital world by blind person. They can't see digital device like Smart phone, laptops, tablets etc. So, Project researches area is considered as a helping to blind person in anyway because of this they will live happy in wonderful world.

## Problem Statement

## causes-of-blindness-in-india.jpg

## Fig 1.1: Blindness ratio

In today's world blind person can faces several problems, one of problem is to detection of object, and identifying a person and find out an expression of that person when they are walking. they can develop alternative approaches to deal with daily routines, they suffer from certain Digital World like they can't operate smartphone, laptop, tablet easily. So, we are developing a system to identify an object in the way of blind person and notifying a person about that object. they also find person identification and expression of that person.

## Motivation

In today’s World, the blindness is a one of the most serious concern. Anyone have don't time, mainly for a blind person can get injured by any object this is a serious problem of day to day life. So we thought about this and coming up with the blind assistance which help the blind to identify object and notify to blind person. So they can interact with that object and not get injured by using our device, they can take care of them self.

## Aim

Our aim here is to help blind person that use our device to identify the person and using this device they know the expression of the person and also we try to help they can't injured by obstacles and live happy in a daily life.

## Objectives

* To provide a user friendly environment for blind person
* To provide a Face identification
* To detect Face Expression of person
* To provide a detection Of obstacles
* To provide a Assistance System(Future Work)

## Scope

* Our system will be useful as Assistant tool for blind person
* Our Algorithm will also useful for identifying a Facial Expression for Human in Robotics.
* This system can be upgraded for other Functions Like as Facial Gesture System.

# CHAPTER 2

# LITERATURE REVIEW

In this chapter, I have given my critical evaluation & summary of all research papers that I read related to my project. For existing systems advantages and disadvantages are mentioned below.

## CRITICAL EVALUATION OF JOURNALPAPERS

**Paper 1: Local Gaussian Difference Extrema Pattern: A New Feature Extractor for Face Recognition [1]**

In this paper, a contemporary method for face recognition i.e. local Gaussian difference extrema pattern (LGDEP) is proposed. The proposed method collects the most prominent directional edges present in the image, which in turn extracts the most prominent edge information. The basic local binary pattern (LBP) encodes the central pixel with reference to its surrounding pixels in an image while the directional local extrema pattern (DLEP) encodes the directional edge information featured by local extrema in 0°,45°,90° and 135° in an image. Whereas the proposed method encodes the most prominent directional edge information by integrating the local Concept with the multi-resolution (three resolutions) Gaussian filter banks. The Gaussian filter banks make the method more robust as it extracts only the most prominent edges and ignores (smoothens) the minor variations due to noise. Finally, k-nearest neighbors (KNN) classifier is used for the classification. The performance of the proposed method is evaluated on three different sets of FERET Database and compared with the standard block-based LBP (BLBP). After thorough analysis, it has been found that the proposed method significantly improves the results from 95% (BLBP)

**Paper 2: A Fast and Accurate System for Face Detection, Identiﬁcation, and Veriﬁcation [2]**

In this paper, the availability of large annotated datasets and affordable computational power has led to impressive improvements in the performance of convolutional Neural Networks (CNNs) on various face analysis tasks. In this paper, author describes a deep learning pipeline for unconstrained face identification and verification which achieves state-of-the-art performance on several benchmark datasets. They provide the design details of the various modules involved in automatic face recognition: face detection, landmark localization and alignment, and face identification/verification. They propose a novel face detector, Deep Pyramid Single Shot Face Detector (DPSSD), which is fast and detects faces with large scale variations (especially tiny faces). Facial key point detection methods can be divided into two types: model-based method and regression-based method: The model-based approaches create a representation of shape during training and use this to fit faces during testing. Model-based methods include PIFA, and 3DDFA.The Cascade regression-based methods directly map image appearance to the target output. This approach refines the coarse locations obtained from the first few stacked auto-encoder networks using subsequent networks. By studying this paper, we can tall that DPSSD is give good performance for various face analysis tasks.

## Paper 3: Robust Face Detection Using Hybrid Skin Color Matching under Different Illuminations [3]

Study and observed about proposed face detection technique is suitable for detecting face form almost all kind of color and illumination intensity. Human skin color property incorporation is considered a way to improve face detection. There are different skin color matching techniques and each individual one is found suitable for a specific illumination condition. In this study, robust face detection is developed considering a hybrid skin color detection method which combines complementary strength of different color detection methods. The proposed hybrid skin color detection method is tested with the most popular Haar Feature Based Face Detection (HFFD) method and identified performance on a large number of images from a benchmark face data set. From the experimental results and analysis, it is revealed that proposed face detection system improves the performance of HFFD significantly. The standard HFFD will be considered for applying human skin color filter. Human skin color matching formulas will be applied on those regions which are detected as face by standard HFFD. It is observed that proposed face detection technique is suitable for detecting face from almost all kind of skin colour and illumination intensity.

## Paper 4: Face Detection with the Faster R-CNN [4]

In this paper, author have look-over on the Faster RCNN, which has recently demonstrated impressive results on various object detection benchmarks, to face detection. In this experiment first author use Regional Proposal Network (RPN) and then author use RPN’s output as input of the Fast R-CNN. We must take care of both the RPN and Fast R-CNN modules since they share convolutional layers if we use both. Fast R-CNN is depended on RPNs output. Most approaches to face detection are still based on the R-CNN framework, leading to limited accuracy and processing speed. By training a Faster R-CNN model on the large-scale WIDER face dataset. By studying this paper, we can tall that face detection using faster R-CNN on large scale WIDER face dataset gives good performance.

## Paper 5: Detection of Accurate Facial Detection Using Hybrid Deep Convolutional Recurrent Neural Network [5]

In this paper, Author proposed a technique which uses RNN and Deep Neural Network (DNN) to take in the face shape. RNNs input not just the current input example, but also what they have perceived previously in time. Recurrent networks have two sources of input, the present and the recent past, which combine to determine how they respond to new data, much as we do in life. RNN method is mostly used for text detection. RNN is not restricted to video sequence management. The pattern along the time axis is missing for a single face image. By studying this paper, we can tall that hybrid deep convolutional recurrent neural network is gives accurate answer face detection.

**Paper 6: A Static Hand Gesture and Face Recognition System for Blind People [6]**

In this paper, System acts as an intelligent virtual assistant which helps in bringing the world closer and helps in meeting different ends together. System uses the facial recognition and hand gesture to assist and work with the environment to make it a better for the blind person.

There are different ways in algorithm for hand gesture recognition like KNN (K Nearest Neighbor), artificial neural network but most of the algorithm require large amount of samples for training and recognition to overcome this problem convex hull and convexity hull defects are used for static gesture recognition. Face Recognition using Linear Binary Pattern (LBP).In gesture recognition there are used a Hand region detection after that it will pull out the features of hand and find out the point of fingers and compute a finger area using convex hull algorithm.

In Face Recognition LBP is the measure of fixed grey scale texture obtained by thresholding the nearby area of each pixel and the result obtained is considered as a binary number. Gestured were recognized under dynamic video. A successful recognition of gesture with an accuracy of 95.2% was done within 0.1 to 0.4 seconds and facial recognition was done with an accuracy of 92%.

## Paper 7: Facial Expression Recognition in Image Sequences Using 1D Transform and Gabor Wavelet Transform [7]

In this paper, facial expression is highly demanded in several applications domains such as security, education, psychology, medical diagnosis, marketing and business negotiations. For the growth and productivity of these domains, researchers are keenly involved in improving the effectiveness of facial expression recognition systems. However, they still lack potency in terms of recognition accuracy, inter-subject facial variations and appearance complexity. This paper attempts to improve recognition accuracy by employing Radon transform and Gabor wavelet transform along with robust classifiers. Facial detection is examined by oval parameters approach and facial tracking is achieved using vertex mask generation.

Radon transforms and Gabor transform filters have been applied to extract variable features. Finally, self-organized maps and neural network are used as recognizer engine to measure six basic facial expressions. Unlike conventional results that were evaluated using a single dataset. This research experimental results have shown state-of-the-art accuracy of 86 and 83.7 percent over two public datasets as Cohn-Kanade and AT&T datasets respectively.

## Paper 8: Real Time Facial Expression Recognition Based On Deep Convolutional Spatial Neural Networks [8]

In this paper, Facial Expression Recognition plays a great human first step is we want to detect the face and this can be significance in the field Artificial Intelligence. Authors Use a Viola Jones Face Detection Algorithm using haar- proposed deep convolution spatial neural network (DCSNN) for extracting the deep features of images after that trained and test system by using the datasets and then apply it in a live webcam. The Kaggle facial expression recognition combination and Jaffe face datasets are used. After, training and testing we will validate the accuracy and then applying the pre-trained model on a live webcam and find the expressions of the human. Adaboost eliminates the entire redundant feature, the feature that we don't need and it narrows it down to several thousands of features that are very useful.

DCSNN used for identifying the face of human first step is that to detect the face and this can be done by Viola Jones Face Detection Algorithm using haar-like features. After detecting the face, we are cropping our image into 48 x 48 and then applying into convolution layer of size[5x5] x 64 output will be 44 x 44. Future work will be to improve a accuracy of this using gesture, speech, etc.

## Paper 9: Enhancing Emotion Detection Using Metric Learning Approach [9]

In this paper, facial expression is one of the most prominent ways by which humans communicate their feelings to other humans. The task of detection of emotions in real time accurately has been a very arduous task as methods giving good results are generally computationally exhaustive, whereas the methods that has low computation time do not yield good results. System was maintained the highest accuracy possible while keeping the computational cost minimal. Various descriptors were tried to test the best trade-off between accuracy and time. We used Distance Metric Learning (DML) for significantly improving the results when the features were mapped to higher dimension. The dataset used is the extended Cohn–Kanade dataset. The system was also tested on subjects that were not available in the dataset and gives a comparable result with other real-time emotion detection system.

**Paper 10: Human Face Detection and Facial Expression Identiﬁcation [10]**

For interactive human and computer interface (HCI), it is important that the computer understand facial expressions of human. With HCI the gap between computers and humans will reduce. The computers can interact in more appropriate way with humans by judging their expressions. There are various techniques for facial expression recognition which focuses on getting good results of human expressions. Most of these works are done on standard databases of foreign origin with six (Neutral, Happy, fear, Anger, Surprise, Sad) basic expression identification. We propose Zernike moments based feature extraction method with support vector machine to identify 8 expressions (including Disgust, and Contempt) on JAFFE and Radboud faces database with discriminative multi-manifold analysis technique with Single Sample Per person (SSPP) and finally compared results of Zernike with Hu moments.

## Paper11: A comparative analysis on various Face Recognition Techniques. [11]

In this paper, one of the important tasks is in image processing is face recognition there many techniques and classifiers for face recognition. we have presented the comparative study of various techniques such as face recognition using PCA, DCT transform, LDA, neural networks, SVM etc. Author focus on keyword like Biometrics, Facial Land marking, Face recognition, Face detection, Humans, LDA, Neural networks, Principle Component Analysis. In techniques of face recognition, we recognize face but we focus on more accuracy then previous systems. And we provide better system. The six main techniques are knowledge -based methods, appearance- based methods, feature-invariant methods, geometry- based methods, template- based methods, and model- based methods. And classifiers are Hidden, Markov model, Support vector machines, Adaboost classifier, Genetic Algorithms. Algorithm was comparison among ICA, PCA, LDA and SVM. And highest performance is shown by SVM. If we further analyze SVM and make its comparison with Neural Network in detail it is concluded that former has certain disadvantages such as speed and size both in training and testing, discrete data, etc. Thus, the whole literature Survey, we can analyze Neural Network classifier as the most appropriate one as it provides following advantageous features i.e. Adaptive learning, Self- organization, Fault- tolerance.

**Paper12: SIFRS: Spoof Invariant Facial Recognition System. [12]**

The objective of this paper is to propose, build and validate an architecture based on facial Recognition and anti-spoofing system that can be integrated in both a video door entry and a mobile application. In this paper we proposed an approach which uses facial recognition methodologies to implement a computational efficient technique for facial biometric application to help visually impaired people. In this system we used LBP for feature extraction to classify image either valid or invalid person using SVM classification so that it helps visual impaired people in improving their lifestyle and safety.

Author focus on keyword like Facial Recognition, SVM, Local Binary Patterns, Mobile app, desktop application. Author also focuses on spoofing detection. In this we have block diagram of proposed system. And in this we have some methodology like, facial detection, Tracking and facial normalization, Extraction of characteristics through LBP, Feature extraction using the LBP operator for facial identification and spoofing detection, Information aggregator and audio generation. The architecture has been designed and developed with the aim of achieving a robust and computationally light result that could be embedded in elements with a moderate computing capacity, such as a video door phone or the device or the device mobile both of people with visual impairment satisfactory.

**Paper13:**  **Evaluation of Feature Extraction Techniques using Neural Network as a Classifier: A Comparative Review for face Recognition. [13]**

A pattern-recognition system is used for identification or authentication of users, based on their unique physical properties. Recognizing individuals through their faces is an important phenomenon and the task of recognizing peers through their faces effortlessly performs in our daily life. The different phases of typical face recognition systems are involved. The plenty of face recognition methods have been designed that are performing well in controlled environments. It includes some of the prevalent methods such as principal component analysis, linear discriminant analysis, Fisher face, independent component analysis. Among the most widely cited methods for face recognition based on feature extraction are Eigenfaces based on Principal Component Analysis (PCA), Fisher faces based on Linear Discriminant Analysis (LDA), and methods based on Independent Component Analysis. Methodologies of this paper are Local Binary Pattern (LBP), Gabor features, Principal component analysis (PCA), and Back Propagation neural network. In this paper, the various techniques of feature extraction and neural networks which include active shape, radial basis function, convolutional, gravity center template, has been discussed. The eight different types of feature recognition methods among which template-based method and active shape model looks more efficient compared to the rest other techniques where these techniques also have their own limitations. In the next four neural classification techniques which are discussed above are taken into consideration and it is observed that back propagation neural network and convolutional neural network are found to be more accurate than the rest but these two also have minor limitations.

**Paper 14: Overview of Biometric and Facial Recognition Techniques. [14]**

In this paperwe will analyze face recognition and face recognition theories and face detection and related works will analyse and different methods of face recognition. Security has become a major issue globally and in order to manage the security challenges and reduce the security risks in the world, biometric systems such as face detection and recognition systems have been built. These systems are capable of providing biometric security, crime prevention and video surveillance services because of their inbuilt verification and identification capabilities. Here author use variables like real-time capability, high accuracy, and availability as open-source software under the Open Computer Vision Library (OpenCV). We use this methodology,

- Biometric Systems:

Fingerprint recognition

Hand geometry

Retina scanning

Iris scanning

- Facial Recognition

- Facial Detection

We studied various types of biometric techniques (e.g. fingerprints, face, retina, iris and hand geometry, fingerprints, face, retina, iris and hand geometry) were reviewed, face recognition and face recognition theories were analyses, face detection and related works were analysed and different methods of face recognition were evaluated.

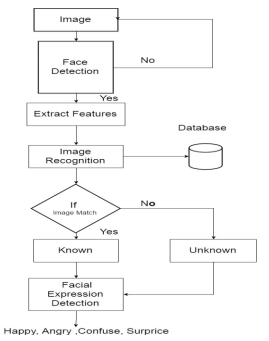
**Paper 15**: **Mobile CMOS Image Sensor Test System through Image Processing Technique. [15]**

In this paper, Authorsuse CMOS (complementary metal oxide semiconductor). There is explosive growth in the market of the solid-state image sensors because of the increased demand of the mobile imaging digital still and video cameras, surveillance, Internet-based video conferencing, and biometrics. CMOS has led to the adoption in the various high-volume products like optical mouse, mobile phones, PC cameras, and high-end digital cameras. Methodology is 1.Pixelation 2.Linear-filtering 3.Neural networks 4.Principle components analysis 5.Huffman encoding 6. Hidden Markov models 7.Image Restoration 8.Wavelets. The various architectures can be designed which would lead to the easy and cheap on-chip integration. There is also another important factor and i.e. the power consumption. Therefore, these are the points on which the further work can be done, so that the CMOS image sensing technology can be adopted over the CCD image sensors. In the literature survey, it can be seen that most of the researchers have focused on the design and architecture of the CMOS image sensors, like the on-chip integration, or the Smart CMOS image sensors, or focused on the compact design, so that, its performance can be increased, but no one has told about the using this technology for the various Purposes. The test systems help to identify the various issues that are happening in the CMOS image sensors like a loss in the analog signal and its quality, which may also need to change the structure of the CMOS image sensors.

## Summary of Research Paper

## Table 2.1: Research Paper Summary

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Publication and Year | Author name | Approach (Methodology) | Advantages | Limitations |
| 1 | IEEE  2017 | K. M. Biradar,  Varun Kesana,  K. B. Rakhonde,  Ankita Sahu,  A. B. Gonde,  S. Murala | Pre-processing using Block based local binary pattern (BLBP),feature extraction using directional local extrema pattern (DLEP),  k-nearest neighbors (KNN) classifier,  face recognition. | Able to add prior knowledge and specifications about the shape of the model by selecting different kernel functions Able to add prior knowledge and specifications about the shape of the model by selecting different kernel functions. | Kernel Selection  Is very difficult in pre processing |
| 2 | IEEE  2015 | Rajeev Ranjan,  Ankan Bansal,  Hongyu Xu,  Boyu Lu,  Anirudh Nanduri,  Jun-ChengChen,  Rama Chellappa | Face detection using Deep Pyramid Single Shot Face Detector,  Pre-processing using Anchor pyramid with ﬁxed aspect-ratio | Fast and accurate method  Deep Pyramid  Single shot  Face detector | Object size should not be less than 5% of image |
| 3 | IEEE 2019 | Asif Anjum Akash, A. H. Akhand, N. Siddique | Feature extraction using  colour detection using RGB and skin detection  Haar feature based face detection (HAAF) | Object can easily identify because of colors | Some objects have same color that object cannot be identify |
| 4 | IEEE-2017 | Huaizu Jiang, Erik Learned | Face detection using  Faster R-CNN | Accurate, Any deep architecture can immediately be “plugged in” | Some loss of accuracy due to lower recall, poor localization |
| 5 | IEEE/  2017 | M. Sivaram, V. Porkodi,  Amin Salih Mohammed  V. Manikandan | Hybrid DCRNN:  CNN+RNN  (recurrent neural network) | RNN work well if we are dealing with huge amount of data | RNN require enough training data |
| 6 | Springer  (ICOSPIN),  2019 | Saransh Sharma,    Samyak Jain,  Khushboo | In this Hand gesture detection using Convex hull Used for extract fingers poin. Heron's formula used recognize hand point.and Face regonition using  LBP(Linear binary pattern) | High discriminative power, Computational simplify is easy to others. | The size of the features increases exponentially with the number of neighbors which leads to an increase of computational complexity in terms of time and space |
| 7 | IEEE,  2018 | Maria Mahmood,    Ahmad Jalal,  Hawke A. Evans | Extraction of feature using  Gabor wavelet transform and  Radon transforms,  Classifier used  Self-Organizing Map. | The data is easily interpreted and understood. Neural networks can be trained with any  number of inputs and layers. | Slow training, hard to train against slowly evolving data It is computationally very expensive  and time consuming to train with High Processor CPU. |
| 8 | International Conference on Emerging Trends and Innovations in Engineering and Technological Research  2018 | Subarna B ,  Daleesha M Viswanathan | Use a Viola Jones Face Detection Algorithm using haar- proposed deep convolution spatial neural network (DCSNN) | Accuracy properly measure because iteration graph are generated so it can will give perfect accuracy ratio. | High computational cost, they use to need a lot of training and testing dataset so that time complexity is low. |
| 9 | Innovations in Computer Science and Engineering  2018 | Ashutosh Vaish,    Sagar Gupta,  Neeru Rathee | Feature Extraction using Local binary pattern    Classifier used SVM | SVM are very good when we have no idea on the data | Choosing a “good” kernel function is not easy |
| 10 | IEEE  (International Conference on Computing Methodologies and Communication)  2018 | Sadaf A. H. Shaikh ,  Dipti jadhav | Zernike Moments are used for feature extraction,  HU Moments are used for comparison with zernike moment. | Microorganisms are used detection and Zernike algorithm advantage is it will resize the image in any format. | Zernike algorithm an HU algorithm comparison will take more time to predict expression. |
| 11 | IEEE /  2017 | Dr. Naveen Kumar Gondhi,  Er. Navleen Kour | PCA, LDA,  neural networks , SVM are used for implementing face recognition | Storing information on the entire network,  Ability to work with incomplete knowdge. | Need a larger dataset,  Training time is large |
| 12 | IEEE /9th ICCCNT 2018 | Aditya Dixit ,  VR Satpute | -facial detection, Tracking  -facial normalization, Extraction of characteristics through LBP  -SVM | -Small change to the data does not greatly affected.  -Stable | -Algorithm complexity is high.  -memory requirement is high. |
| 13 | IJSRST1841253 | Vinodpuri Rampuri Gosavi,  Dr. G. S. Sable  Dr. Anil K . Deshmane | Convolutional neural network(CNN)  RNN  Template based method, | RNN work well if we are dealing with huge amount of data. | RNN require enough training data |
| 14 | IOSR Journal of Computer Engineering (IOSR-JCE) | Omoyiola, Bayo Olushola | Biometric Systems  -Fingerprint recognition  -Hand geometry  -Retina scanning  -Iris scanning  Facial Recognition  Facial Detection | More accurate,  No need to thousands comparision | biometric are permanently associated with user. Not replaced. |
| 15 | International Journal of Trend in Scientific Research and Development (IJTSRD), 2019 | Rajesh Kumar,  Gargi Kalia | CMOS sensor use for image processing and also in detection of real  Time images. | CMOS have their own amplifier, data transfer rate is fast. | there is a limit on the  minimum pixel size . Because of the greater sensitivity |

* 1. **Existing System**
  2. 
     1. Fig 2: Existing System Workflow

**Advantage:**

* Face detection
* Expression identification
* Easy to install

**Disadvantage:**

* Low accuracy for expression identification
* Time consuming
* Prediction can't accurate

# CHAPTER 3

**RESEARCH**

**METHODOLOGY**

This chapter deals with the research and methodology to do in the project work .It shows detailed and deep insights into the experimentation associated with the project. Project planning is represented in a Proposed System workflow. Also, future working of our project is presented.

## Introduction of Research Methodology

## As per the studied papers we came across various methodologies which shows data and methods in theoretical manner. The methods and process followed by us is as follows:

1. **Working**

Firstly user will register in Dataset which will create the user name and id in the database. Once data store is successfully done user need to enter various details like name, name of family member, family members photos etc.

1. **Advantage**

* Good Accuracy
* Identify all expression and detect all object
* Easy to use for blind people

1. **Disadvantage**

* Little bit time consuming
* Require internet necessary
* Can't detect small object

## Methodology

## Here we can describe methods that will use in Project:

## Haar Cascade Classifier:

## Haar Cascade classifier is based on the Haar Wavelet technique to analyse pixels in the image into squares by function training a classifier which identifies a face.

## Using this We can find Face Detection and Finding some Expression like Smile, Angry, etc.

## LBPH Classifier:

## Local Binary Pattern Histogram (LBPH) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number.

## Using this we can find Face recognition of a person.

## Proposed Work Flow

## P.PNG

## Fig 3: Proposed System Workflow

* After doing study on various technology, we have tried to implement a system using PI Camera, Raspberry PI, Haar cascades feature extraction, LBP classifier, Bluetooth/Headphone.
* The PI Camera Used for Capture Images and using Real-Time We can finding Face Expression using Haar cascades Classifier.
* after image is taken from Pi Camera or Start Video Stream Using OPENCV.
* The Face detection is applying that will predict the face or object. If it is face, then going for first Face Recognition using LBPH Classifier and After find face expression using Haar-cascade classifier method.
* If Person name and expression identify in text, convert text to audio using python library.

# CHAPTER4

# IMPLEMENTATION

## IMPLEMENTATTION SCREENSHORT:

## Hardware Requirement:

## Raspberry PI:

## 

## Figure 4.1:Raspberrt PI

## Raspberry PI is a minicomputer, it is a Single board circuit. It’s capable of doing everything you’d expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

## PI Camera:

## robu-3.jpg

## Figure 4.2: PI Camera

## The Pi camera module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol.

## 

## Face Detection and Face Recognition:

## Screenshot (12).png

## Figure 4.3: Face Recognition

## Screenshot (23).png

## Figure 4.4: Face Recognition

## Screenshot (44).png

## Figure 4.5:Face Recognition