A PROJECT REPORT ON

AUTOMATIC ATTENDANCE SYSTEM

Submitted in Fulfillment Of Summer Internship

In

Computer Engineering and Information Technology

By

DEEPLAXMI LAMBTURE

DHANASHREE BHANDARE

HUZAIFA SHAIKH

KUNJAL SHAH

Under The Guidance of

DR. S. G. BHIRUD

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

MATUNGA, MUMBAI 400019

2018-2019

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

(An Autonomous Institute)

H R Mahajani Rd, Matunga, Mumbai, Maharashtra 400019

CERTIFICATE

This is to certify that the project entitled **Automatic Attendance System** is being submitted by **Deeplaxmi Lambture**, **Dhanashree Bhandare**, **Huzaifa Shaikh** and **Kunjal Shah** to the department of Computer Engineering and Information Technology, Veermata Jijabai Technological Institute for the Summer Internship in the academic year 2018-19.

Project Mentor	**Head of Department**
(Dr. S. G .Bhirud)	**(Dr. M. M. Chandane)**

Date:

Place:

Acknowledgement

I would like to express my deep gratitude to Dr. S. G. Bhirud, my project mentor for his patient guidance, valuable and constructive suggestions during the design and implementation of this project. His willingness to give his time so generously has been much appreciated. My grateful thanks are also extended to the staff at the department of Computer Engineering and Information Engineering for their help in offering me the resources in running the program. I would also like to extend my thanks to my teammates and friends for their contribution, useful critiques of this work and offering me the test data.Finally, I wish to thank my family for their support and encouragement throughout my study and the Almighty God for his grace.

Date:

DHANASHREE BHANDARE
DEEPLAXMI LAMBTURE
KUNJAL SHAH
HUZAIFA SHAIKH

Contents

List of Figures

List of Tables

Chapter 1

INTRODUCTION

In many institutes and organization the attendance is a very important factor to maintain the record of lectures, salary and work hours etc. Most of them follow the manual method using old paper and file method, and some of them have shifted to bio-metric technique. The current method that colleges use is that the professor passes a sheet or makes roll calls and marks the attendance of the students and this sheet further goes to the admin department with updates to the final excel sheet. This process is quite hectic and time consuming. Also, for professors or employees at institutes or organizations the bio-metric system accepts one person at a time. So, why not shift to an automated attendance system which works on face recognition technique? Be it a class room or entry gates it will mark the attendance of the students, professors, employees, etc.

1.1 Current Attendance System

At present attendance marking involves manual attendance on paper sheet by professors and teachers but it is a very time consuming process and chances of fake signatures is also one problem that arises in such type of attendance marking. Also there are attendance marking system such as RFID (Radio Frequency Identification), Bio-metrics etc. but these systems are currently not very popular in schools and classrooms for students.

1.2 Issues in Current Attendance System

The problem with this approach in which manually taking and maintains the attendance record is that it is very inconvenient task. Traditionally, student attendances are taken manually by using attendance sheet given by the faculty members in class, which is a time consuming event. Moreover, it is very difficult to verify roll calls in a large classroom environment with distributed branches. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. This method could easily allow for impersonation and the attendance sheet could be stolen or lost.

1.3 Problem Statement

The traditional manual methods of monitoring student attendance in lectures are tedious as the signed attendance sheets have to be manually logged in to a computer system for analysis. This is tedious, time consuming and prone to inaccuracies as some students in the department often sign for their absent colleagues, rendering this method ineffective in tracking the studentsâ class attendance. Use of the face detection and recognition system in lieu of the traditional methods will provide a fast and effective method of capturing student attendance accurately while offering a secure, stable and robust storage of the system records , where upon authorization; one can access them for purposes like administration, parents or even the students themselves

1.4 Objective

The overall objective is to develop an automated class attendance management system Sign In ng of a desktop application working in conjunction with a mobile application to perform the following tasks:
1) To detect faces in real time.
2) To recognize the detected faces by the use of a suitable algorithm.
3) To update the class attendance register after a successful match.
4) To design an architecture that constitutes the various components working harmoniously.

1.5 Scope of the project

We are setting up to design a system where the students are registered at first.After registration particular subject attendance is marked by facial recognition and stored in excel sheet.This face detection and recognition is done with the web-cam and later the attendance is stored in excel sheet.

Chapter 2

LITERATURE SURVEY

2.1 Automated Attendance System Using Face Recognition

For our project we got motivation by the research carried out by the following people and their published papers:

Eigenfaces for recognition (Mathew Turk and Alex Pentland)

Here they have developed a near-real time computer system that can locate and track a subjects head, and then recognize the person by comparing characteristics of the face to those of known individuals. The computational approach taken in this system is motivated by both physiology and information theory, as well as by the practical requirements of near-real time performance and accuracy. This approach treats the face recognition problem as an intrinsically two-dimensional recognition problem rather than requiring recovery of three- dimensional geometry, taking advantage of the fact that these faces are normally upright and thus may be described by a small set of two-dimensional characteristic views.

Fast face recognition using eigenfaces (Arun Vyas and Rajbala Tokas)

their approach signifies face recognition as a two-dimensional problem. In this approach, face reorganization is done by Principal Component Analysis (PCA). Face images are faced onto a space that encodes best difference among known face images. The face space is created by eigenface methods which are eigenvectors of the set of faces, which may not link to general facial features such as eyes, nose, and lips. The eigenface method uses the PCA for recognition of the images. The system performs by facing pre-extracted face image onto a set of face space that shows significant difference among known face images.

Face recognition using eigenface approach (Vinay Hiremath and Ashwini Mayakar)

This paper is a step towards developing a face recognition system which can recognize static images. It can be modified to work with dynamic images. In that case the dynamic images received from the camera can first be converted in to the static ones and then the same procedure can be applied on them. The scheme is based on an information theory approach that decomposes face images into a small set of characteristic feature images called âEigenfacesâ, which are actually the principal components of the initial training set of face images. Recognition is performed by projecting a new image into the subspace spanned by the Eigenfaces (âface spaceâ) and then classifying the face by comparing its position in the face space with the positions of the known individuals. The Eigenface approach gives us efficient way to find this lower dimensional space. Eigenfaces are the Eigenvectors which are representative of each of the dimensions of this face space and they can be considered as various face features.

Face recognition using eigenfaces and artificial neural networks (Mayank Agarwal, Nikunj Jain, Mr. Manish Kumar and Himanshu Agrawal)

This paper presents a methodology for face recognition based on information theory approach of coding and decoding the face image. Proposed methodology is connection of two stages Feature extraction using principle component analysis and recognition using the feed forward back propagation Neural Network. The algorithm has been tested on 200 images (40 classes). A recognition score for test lot is calculated by considering almost all the variants of feature extraction. The proposed methods were tested on Olivetti and Oracle Research Laboratory (ORL) face database. Test results gave a recognition rate of 97.018Department of ECE, SMVITM, Bantakal

Face Recognition

One of the simplest and most effective PCA approaches used in face recognition systems is the so-called eigenface approach. This approach transforms faces into a small set of essential characteristics, eigenfaces, which are the main components of the initial set of learning images (training set). Recognition is done by projecting a new image in the eigenface subspace, after which the person is classified by comparing its position in eigenface space with the position of known individuals. The advantage of this approach over other face recognition systems is in its simplicity, speed and insensitivity to small or gradual changes on the face. The problem is limited to files that can be used to recognize the face. Namely, the images must be vertical frontal views of human faces. The objective of this system is to present an automated system for human face recognition in a real time background for an organization to mark the attendance of their student.. So automated attendance using real time face recognition is a real world solution which comes with day to day activities of handling employees or student. The task is very difficult as the real time background subtraction in an image is still a challenge. In the past two decades, face detection and recognition has proven to be very interesting research field of image processing. The work carried out describes an automated attendance system using video surveillance. The proposed algorithm is automatic and efficient in intelligent surveillance applications. Video surveillance is used to detect the object movement thereby the captured image undergoes face detection and recognition process and searches the student database and enters the attendance if it is valid in the list.

2.1.1 Proposed Algorithms

This system uses Viola and Jones algorithm for face detection and correlations formulas for face recognition. Viola and Jones algorithm is used for face detection. Where it is used in both creating database and face recognition process. Where in case creating database it takes input image through a web camera continuously. Captured image undergoes face detection. Detected face will be cropped and stored in database. Where in case of face recognition if there is any movement video surveillance will be used to detect the moving object. The captured image undergoes face detection and further processed later by face recognition Cross-Correlation and Normalized-Correlation are used to extract the Coordinates of peak with the RIO and target images.The peak of the cross-correlation matrix occurs where the sub im- ages are best correlated.Find the total offset between the images. The total offset or translation between images depends on the location of the peak in the cross correlation matrix, and on the size and position of the sub images.Check if the face is extracted from the target Image. Figure out where face exactly matches inside of target image.

This paper uses Viola and Jones algorithm for face detection and correlations formulas for face recognition. Viola and Jones algorithm is used for face detection. Where it is used in both creating database and face recognition process. Where in case creating database it takes input image through a web camera continuously. Captured image undergoes face detection. Detected face will be cropped and stored in database. Where in case of face recognition if there is any movement video surveillance

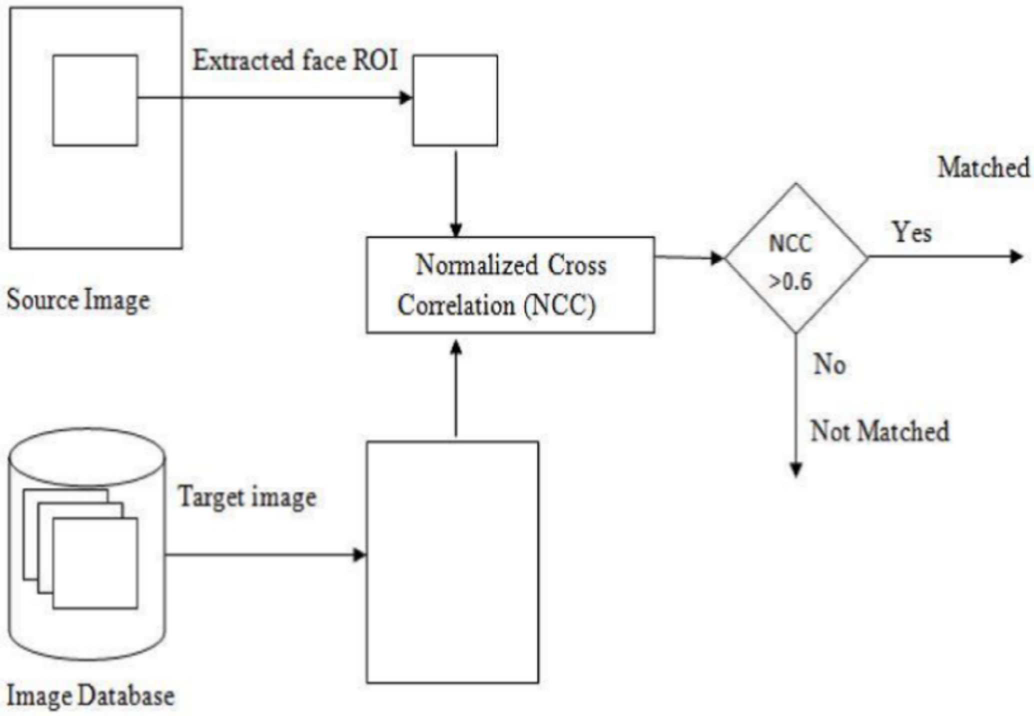

Figure 2.1: Stages of Face Recognition Algorithm

will be used to detect the moving object. The captured image undergoes face detection and further processed later by face recognition. PCA(Principle Component Analysis) technique for face recognition and im- age compression. The implementation of this project is done using OpenCV libraries for face detection and further processes.

PCA method has been widely used in applications such as face recognition and image com- pression. PCA is a common technique for finding patterns in data, and expressing the data as eigenvector to highlight the similarities and differences between different data. Then the system implementation is divided in three major part Face Detection and Extract, Learn and Train Face Images, Recognise and Identification. Implementation is done using OpenCV libraries which is open source and cross platform. In Viola and Jones the result depends on the data and weak classifiers. The quality of the final detection depends highly on the consistence of the training set. Both the size of the sets and the inter class variability are important factors to take in account.

The Viola-Jones algorithm works with a full view of frontal faces (Viola-Jones 2001). The difficulty comes when faces are tilted or on either side but can be adjusted as has been implemented with reference to MATLAB. The Viola-Jones Algorithm scans a sub-window in order to detect faces across an input image. The standard approach for image processing with this algorithm is to rescales the detector and run it many times through the image rather than rescaling the input image which results to more computational time. Each time the rescaled detector is run against an input image, the size of the image changes each time. The initial step of the Viola-Jones algorithm converts the input image into an integral image. By this, each pixel is equivalent to the entire sum pixels on top and to the left of the pixel in question.

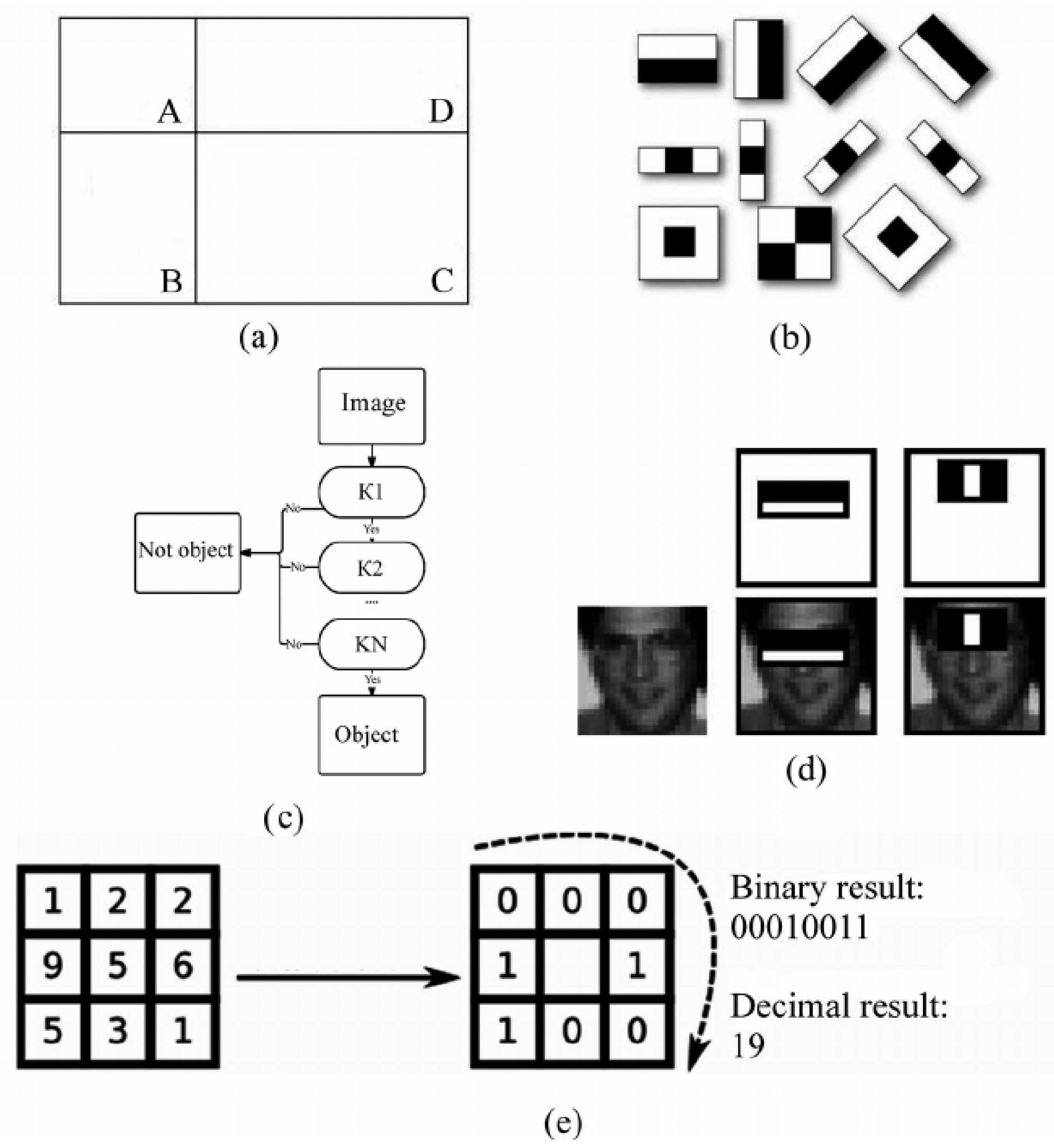

Figure 2.2: Viola Jones Agorithm

2.1.2 COMPARATIVE STUDY

The above tables show the different algorithms used to compare with our proposed algorithm and the accuracy between Viola-Jones and Kanade-Lucas Tomasi algorithm:

TABLE I. COMPARATIVE ANALYSIS

S.No	Face Detection Algorthims	Precision	Recall
1	Viola-Jones face detector	0.27321	0.27321
2	SMQT Features and SNOW Classifier	0.26792	0.26792
3	Neural Network-Based Face Detection	0.339450	0.037582
4	Support Vector Machines-Based face detection	0.01392850	0.00835708

Figure 2.3: Comparison between different algorithms

	Viola-Jones	Kanade-Lucas-Tomasi
Looking front	97%	90%
Looking left	90%	85%
Looking right	88%	83%
Looking up	80%	80%
Looking down	80%	80%
Total	87%	84%

Figure 2.4: Accuracy

Chapter 3

REQUIREMENT ANALYSIS

To be used efficiently, all computer software needs certain hardware components or other software resources to be present on a computer. These prerequisites are known as (computer) system requirements and are often used as a guideline as opposed to an absolute rule. Most software defines two sets of system requirements: minimum and recommended.

3.1 Platform Requirement

3.1.1 Supportive Operating Systems

The supported operating systems for client include:

- Windows XP/7/8/10
- Mac OS
- Linux Ubuntu/Mint etc

Software requirements deal with defining software resource requirements and prerequisites that need to be installed on a computer to provide optimal functioning of an application. These requirements or prerequisites are generally not included in the software installation package and need to be installed separately before the software is installed.

3.2 Software Requirement

The supported operating systems for client include:

- Open-CV
- python 3.3.0
- Tkinter
- tensor-flow

Open-CV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. Open-CV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, Open-CV makes it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. Open-CV has more than 47 thousand people of user community and estimated number of downloads exceeding 7 million. The library is used extensively in companies, research groups and by governmental bodies.

MySQL is the worldâs most popular open source database. With its proven performance, reliability and ease-of-use, MySQL has become the leading database choice for web-based applications , used by high profile web properties.

3.3 Hardware Requirement

The most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware, A hardware requirements list is often accompanied by a hardware compatibility list (HCL), especially in case of operating systems. An HCL lists tested, compatible, and sometimes incompatible hardware devices for a particular operating system or application.

Table 3.1: Requirements

Component	Minimum	Recommended
Processor	1.8 Ghz Dual Core Intel Pentium	i5 intel
RAM	4 GB	8 GB
DISK	512 GB	1 TB
Camera	8 Mega-Pixel	16 Mega-Pixel DSLR

Chapter 4

DATA ANALYSIS

This system uses Viola and Jones algorithm for face detection and correlations formulas for face-recognition.The problem to be solved is detection of faces in an image. A human can do this easily, but a computer needs precise instructions and constraints. To make the task more manageable, ViolaâJones requires full view frontal upright faces. Thus in order to be detected, the entire face must point towards the camera and should not be tilted to either side. While it seems these constraints could diminish the algorithm's utility somewhat, because the detection step is most often followed by a recognition step, in practice these limits on pose are quite acceptable.

4.1 Components of the Framework

4.1.1 Feature types and Evaluation

The characteristics of Viola Jones algorithm which make it a good detection algorithm are:

- Robust : very high detection rate (true-positive rate) and very low false-positive rate always.
- Real time : For practical applications at least 2 frames per second must be processed.
- Face detection only (not recognition) : The goal is to distinguish faces from non-faces (detection is the first step in the recognition process).

4.1.2 The Algorithm has four stages:

- Haar Feature Selection
- Creating an Integral Image
- Adaboost Training
- Cascading Classifiers

The features sought by the detection framework universally involve the sums of image pixels within rectangular areas. As such, they bear some resemblance to Haar basis functions, which have been used previously in the realm of image-based object detection.[3] However, since the features used by Viola and Jones all rely on more than one rectangular area, they are generally more complex. The figure on the right illustrates the four different types of features used in the framework. The value of any given feature is the sum of the pixels within clear rectangles subtracted from the sum of the pixels within shaded rectangles. Rectangular features of this sort are primitive when compared to alternatives such as steerable filters. Although they are sensitive to vertical and horizontal features, their feedback is considerably coarser.

4.1.3 Haar Features

All human faces share some similar properties. These regularities may be matched using Haar Features.

A few properties common to human faces:

- The eye region is darker than the upper-cheeks.
- The nose bridge region is brighter than the eyes.

Composition of properties forming match-able facial features:

- Location and size: eyes, mouth, bridge of nose
- Value: oriented gradients of pixel intensities

Rectangle features:] The four features matched by this algorithm are then sought in the image of a face (shown at right).y

Rectangle features:

- Value = Î (pixels in black area) - Î (pixels in white area)
- Three types: two-, three-, four-rectangles, Viola Jones used two-rectangle features
- For example: the difference in brightness between the white black rectangles over a specific area
- Each feature is related to a special location in the sub-window

4.1.4 Summed Area Table

An image representation called the integral image evaluates rectangular features in constant time, which gives them a considerable speed advantage over more sophisticated alternative features. Because each feature's rectangular area is always adjacent to at least one other rectangle, it follows that any two-rectangle feature can be computed in six array references, any three-rectangle feature in eight, and any four-rectangle feature in nine.]

An image representation called the integral image evaluates rectangular features in constant time, which gives them a considerable speed advantage over more sophisticated alternative features. Because each feature's rectangular area is always adjacent to at least one other rectangle, it follows that any two-rectangle feature can be computed in six array references, any three-rectangle feature in eight, and any four-rectangle feature in nine.

4.2 Learning Algorithm

The speed with which features may be evaluated does not adequately compensate for their number, however. For example, in a standard 24x24 pixel sub-window, there are a total of M = 162,336[4] possible features, and it would be prohibitively expensive to evaluate them all when testing an image. Thus, the object detection framework employs a variant of the learning algorithm AdaBoost to both select the best features and to train classifiers that use them. This algorithm constructs a âstrongâ classifier as a linear combination of weighted simple âweakâ classifiers.

$$h(x) = sgn(\sum_{J-1}^{M} \alpha_J h_j(x)) \tag{4.1}$$

Each weak classifier is a threshold function based on the feature $f_j f_j$.

$$h(x) = \begin{cases} -s_j & \text{if } f_j < \theta_j \\ s_j & \text{otherwise} \end{cases} \tag{4.2}$$

Here is simplified version of the learning algorithm :

1. Initialize the weights
2. Normalize the weights
3. Select the best weak classifier (based on the weighted error)
4. Update the weights based on the chosen classifiers error
5. Repeat steps 2 to 4 T times where T is the desired number of weak classifiers

Method to train Viola Jones :

```
def train(self, training):
    training_data = []
    for x in range(len(training)):
        training_data.append
        ((integral_image(training[x][0]), training[x][1]))
```

4.3 Cascade Architecture

- On average only 0.01% of all sub-windows are positive (faces)
- Equal computation time is spent on all sub-windows
- Must spend most time only on potentially positive sub-windows.
- A simple 2-feature classifier can achieve almost 100% detection rate with 50% FP rate.
- That classifier can act as a 1st layer of a series to filter out most negative windows.
- A cascade of gradually more complex classifiers achieves even better detection rates. The evaluation of the strong classifiers generated by the learning process can be done quickly, but it isnât fast enough to run in real-time. For this reason, the strong classifiers are arranged in a cascade in order of complexity, where each successive classifier is trained only on those selected samples which pass through the preceding classifiers. If at any stage in the cascade a classifier rejects the sub-window under inspection, no further processing is performed and continue on searching the next sub-window. The cascade therefore has the form of a degenerate tree. In the case of faces, the first classifier in the cascade â called the attentional operator â uses only two features to achieve a false negative rate of approximately 0% and a false positive rate of 40%.[6] The effect of this single classifier is to reduce by roughly half the number of times the entire cascade is evaluated.

In cascading, each stage consists of a strong classifier. So all the features are grouped into several stages where each stage has certain number of features. The job of each stage is to determine whether a given sub-window is definitely not a face or may be a face. A given sub-window is immediately discarded as not a face if it fails in any of the stages. A simple framework for cascade training is given below:

- f = the maximum acceptable false positive rate per layer.
- d = the minimum acceptable detection rate per layer.
- d = the minimum acceptable detection rate per layer.
- P = set of positive examples.
- N = set of negative examples.

The cascade architecture has interesting implications for the performance of the individual classifiers. Because the activation of each classifier depends entirely on the behavior of its predecessor, the false positive rate for an entire cascade is:

```
F(0) = 1.0; D(0) = 1.0; i = 0

while F(i) > Ftarget
    increase i
    n(i) = 0; F(i)= F(i-1)

    while F(i) > f × F(i-1)
      increase n(i)
      use P and N to train a classifier with n(I) features using AdaBoost
      Evaluate current cascaded classifier on validation set to determine F(i) and D(i)
      decrease threshold for the ith classifier
        until the current cascaded classifier has a detection rate of at least d × D(i-1)
      N = ∅
      if F(i) > Ftarget then
        evaluate the current cascaded detector on the set of non-face images
        and put any false detections into the set N.
```

Chapter 5

SYSTEM

5.1 Proposed System

To overcome the problems in the existing attendance system we developed a face recognition based attendance system over simple attendance system. There are many solutions to automate the attendance management system like thumb based system, simple computerized attendance system, Iris scanner, but all these systems have limitations over work and security point of view. Our proposed system shall be a Face Recognition Attendance System which uses the basic idea of image processing which is used in many security applications like banks, airports, Intelligence agencies etc.

5.2 Proposed System Components

- Student Registration
- Face Detection
- Face Recognition:
  - Feature Extraction
  - Feature Classification
- Attendance management system: It will handle the following processes:
  - Automated Attendance marking
  - Manual Attendance marking
  - Attendance details of users

5.3 System Description

This is face recognition attendance system which consists of various phases throughout the completion of the process and is accessed by the administrator. Login permission is required for the system to be used. For the student to be recognized they need to be registered. For registration, a form must be filled up with the basic details of a student. Once the form is filled up, 100 images of a student are captured automatically after face being detected as a part of the registration process and are stored in the training set within the particular student folder. Encoding of the register images takes place. Followed by training of images inside the training set which creates .csv and .pkl file for images that are encoded and their labels.

During attendance, web-cam is connected, and as students enter the class their faces are detected and recognized after which, an entry is marked in Excel sheet as a present. Unknown faces are shown as Unknown. Reports are generated on the basis of attendance sheet monthly and Email notification is sent to the students who are absent.

5.4 Module Specification

5.4.1 Student Registration

The student registration process can be summed up by the following diagram:

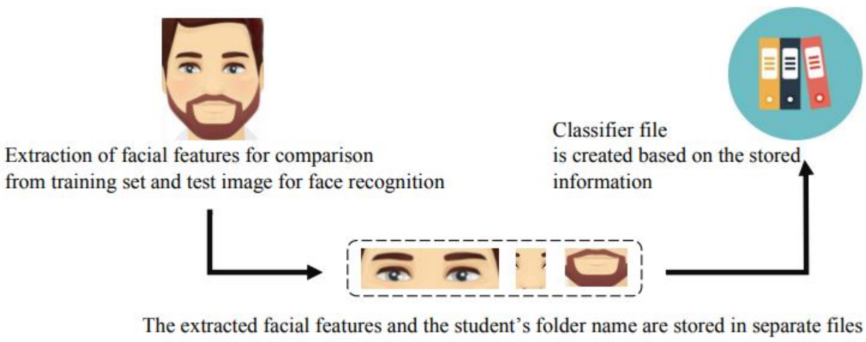

Figure 5.1: Registration

5.4.2 Face Detection

Detecting facial landmarks is a subset of the shape prediction problem. Facial landmarks such as eyes, eyebrows, nose, mouth, jaw line were used to localize and represent salient regions of the face. Given an input image, a shape predictor attempts to localize key points of interest along the shape.

Detecting facial landmarks is therefore involves localizing the face in the image and detecting the key facial structures on the face. Dlib and OpenCV were used to detect facial landmarks in an image.

Face detection has been achieved by us in two ways:

- Using OpenCVâs built-in particular Haar Cascades.
- Using a model for predicting facial landmarks.

Face detection using OpenCVâs Haar Cascades:

- Using the Haar feature-based cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001.
- It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

5.4.3 Face Recognition

For detecting key facial structures in the face region a pre-trained facial landmark detector is used which estimates the location of (x, y)-coordinates that map to facial structures on the face. There are other facial landmark detectors, but all of them try to localize and label the following facial regions: Mouth, Right eyebrow, Left eyebrow, Right eye, Left eye, Nose, Jaw, etc.

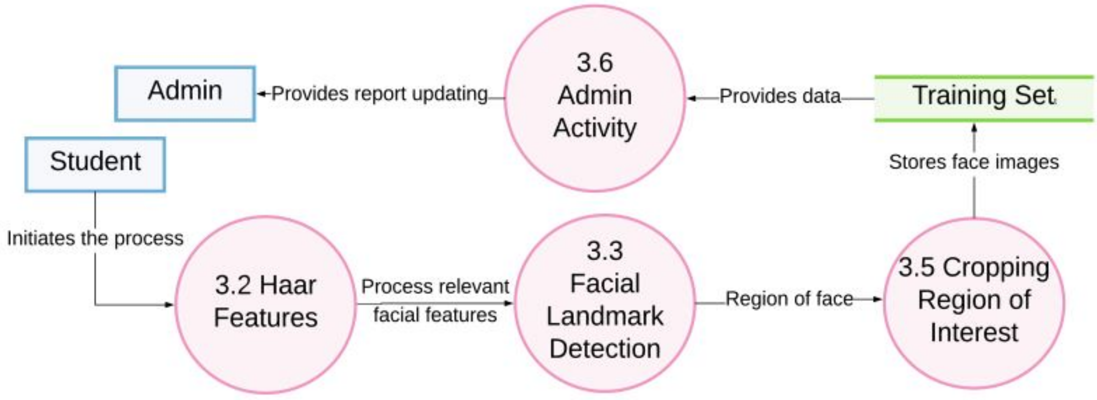

Figure 5.2: Face recognition

5.5 Architecture

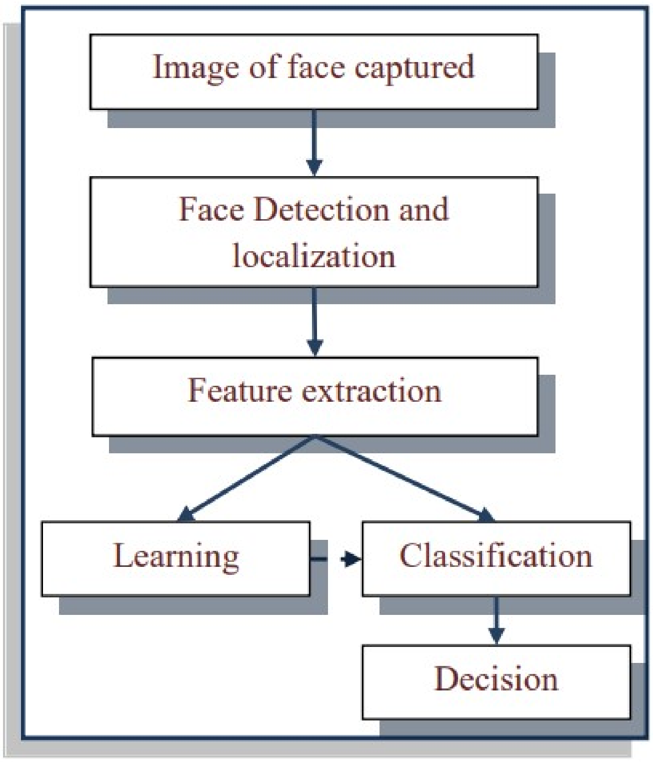

Figure 5.3: Architecture

The learning or enrollment process is the first module to be executed offline in a face recognition system. While the second module that addresses online, is that of recognition (authentication or identification). The first module allows extracting feature vectors (signatures) from the images of the base reference faces (Gallery); the database of face images of people assumed to be known by the system. These are the extracted feature vectors are learned or stored for use in the classification phase. While the recognition module extracts the feature vector of the query face image which is subjected to the input of the system for the first time. In these two modules, one must browse the processing steps illustrated in Figure 5.3 and described below:

Face detection and localization The captured image can contain both the face of the person to recognize and possibly a background. Hence, first of all one must detect the presence or absence of the face in the captured image. If the image contains a face, its location is localized to extract it. This step is performed in two modules (recruitment and recognition)

Feature extraction This is the key step of the process because the performance of the whole system depends on it. In this step also known as indexing or modeling, is extracted from the detected face image a characteristic vector (signature) that is sufficiently representative of a given face and which models the much more precise than the raw image departure. This new representation of the face must have both the uniqueness property for each person and the property of discrimination between different people.

Learning In this step, stores the extracted feature vectors of individuals known to the system. During this learning process, each vector stored in the database is associated with a certain personal identity such as name, personal identification number which characterizes the user. This reference database is centralized to a central server or distributed on a smart card only has to recognize the person based on the intended application

Classification and decision In these two steps, the system must declare the identity of the person who appears before them without any a priori knowledge about it. To accomplish this task, we must affect the extracted feature of his face to a class from those learned. Each class is associated with an identity. These two steps are executed only in the recognition module.

Chapter 6

EXPERIMENT

6.1 Test Cases

6.1.1 Phases

The phases of Testing that were performed are as follows:

- Unit Testing : The main aim of this endeavor is to determine whether the application functions as designed. In this phase, each function was tested for its functionality.
- Integration Testing : Integration testing includes combining all of the functions within a program and test them as a group.
- System Testing : In System testing, the complete application was tested as a whole,and minor errors were fixed.

CASES	PRE-REQUISITES	EXPECTED OUTPUT	STATUS
Admin signup	Username and Password	Open attendance folder	Pass
Registration of faces	Camera	The face should be detected and camera should capture 200 images	Pass
Storage of faces in Training set	TrainingImg Folder	The folder should be checked and if exists the captured images to be stored in the folder	Pass
Live face Recognition	Students registered images in the TrainingImg folder	The registered students should be marked and others should be shown as unknown	Pass

Table 6.1: Phases of Testing

6.2 System Screenshots

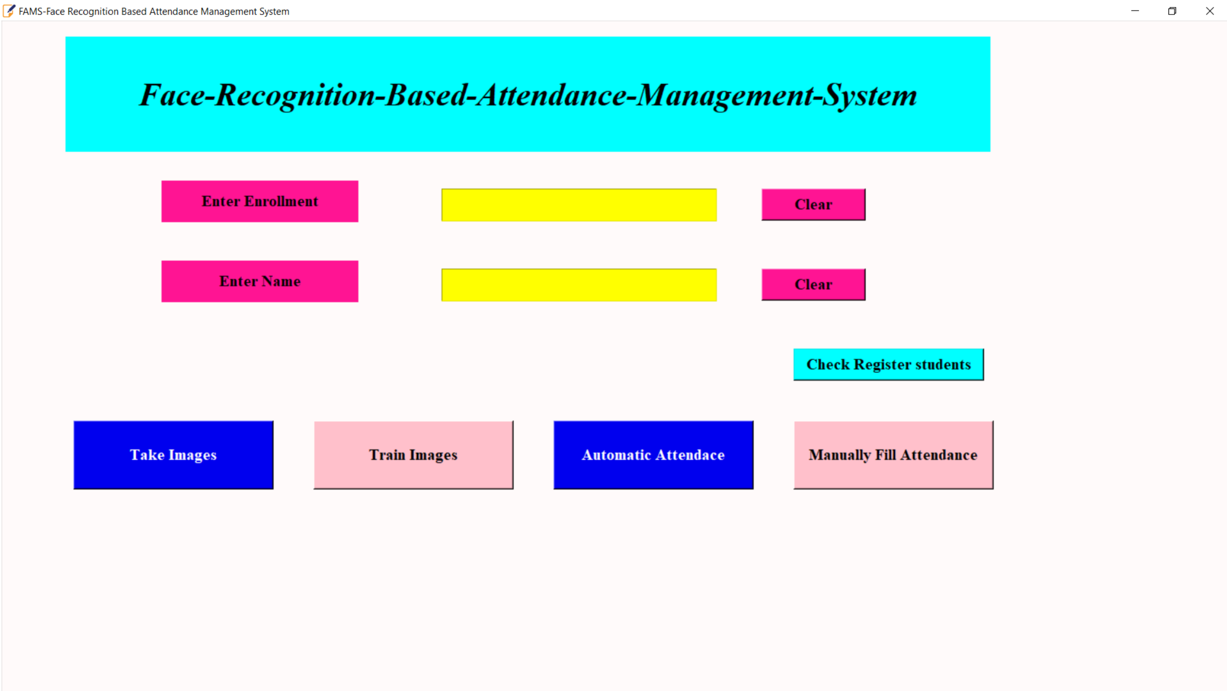

Figure 6.1: Main User Interface

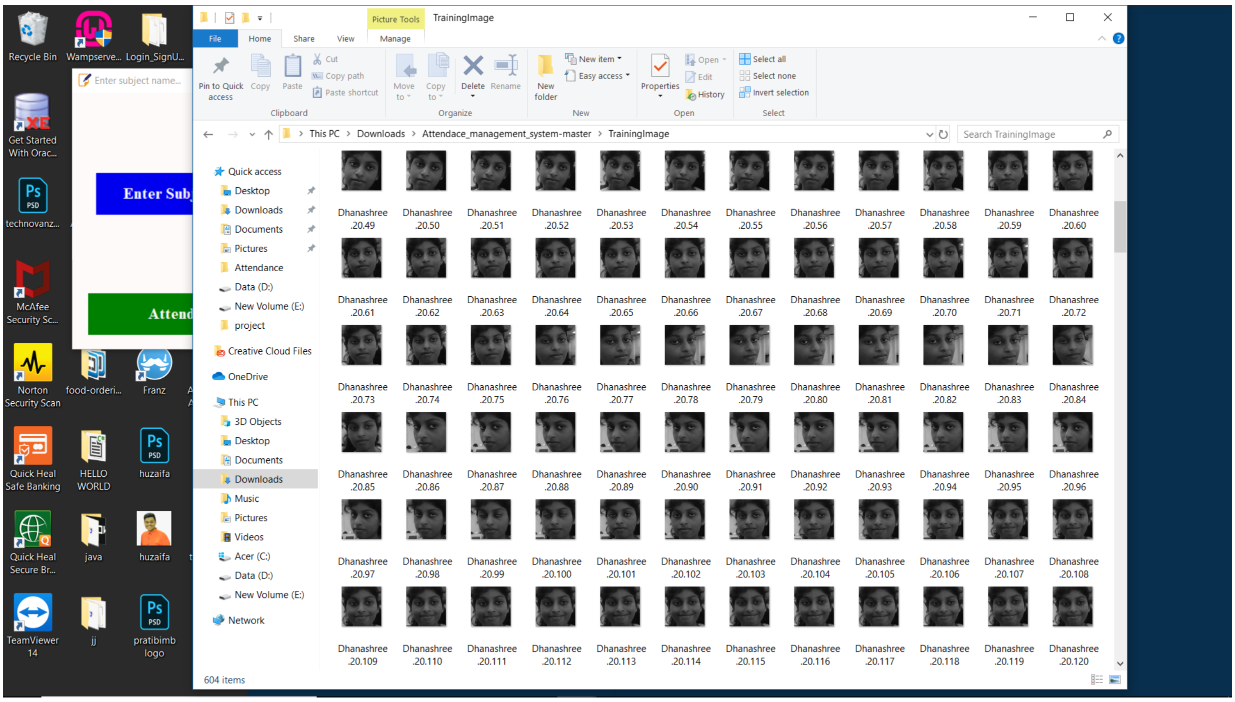

Figure 6.2: Training Data

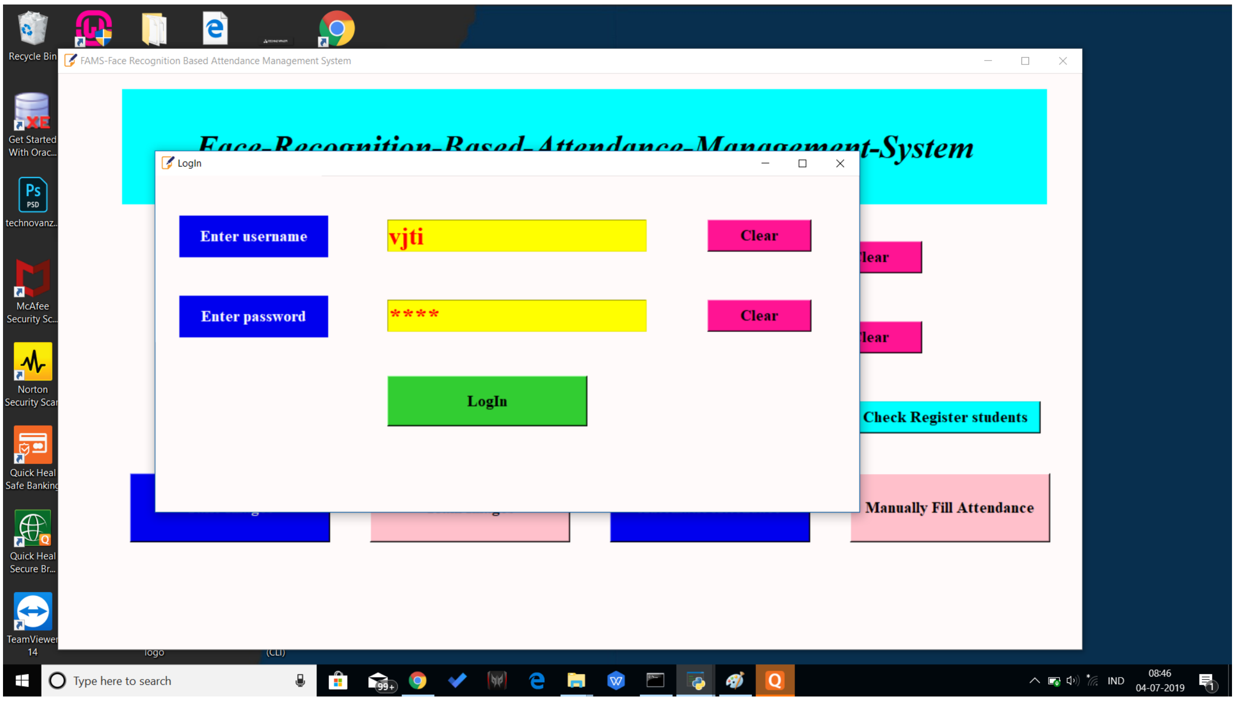

Figure 6.3: Admin Login

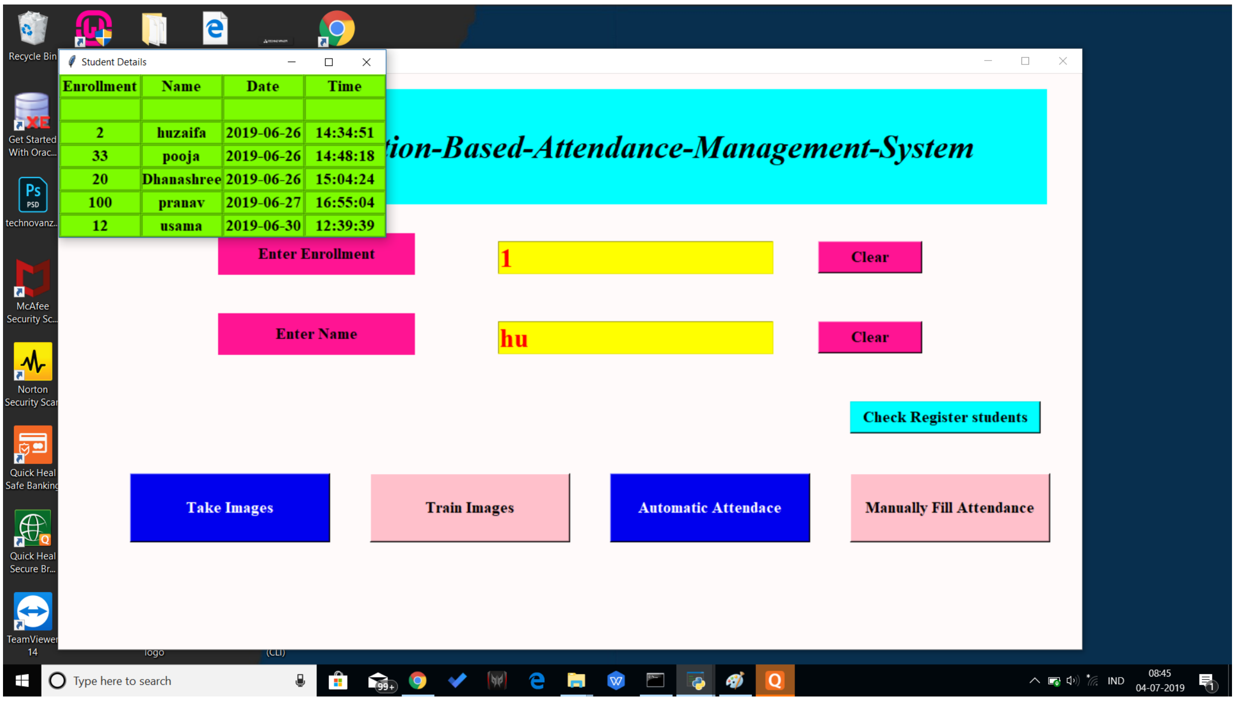

Figure 6.4: Registered Students

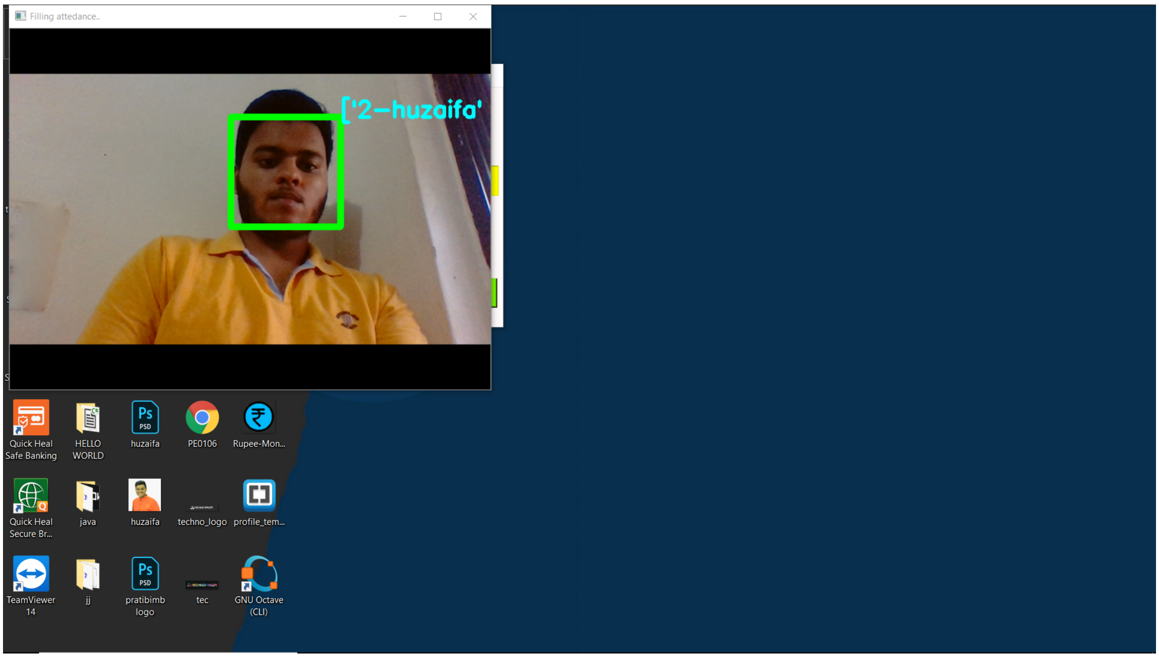

Figure 6.5: Automatic Attendance

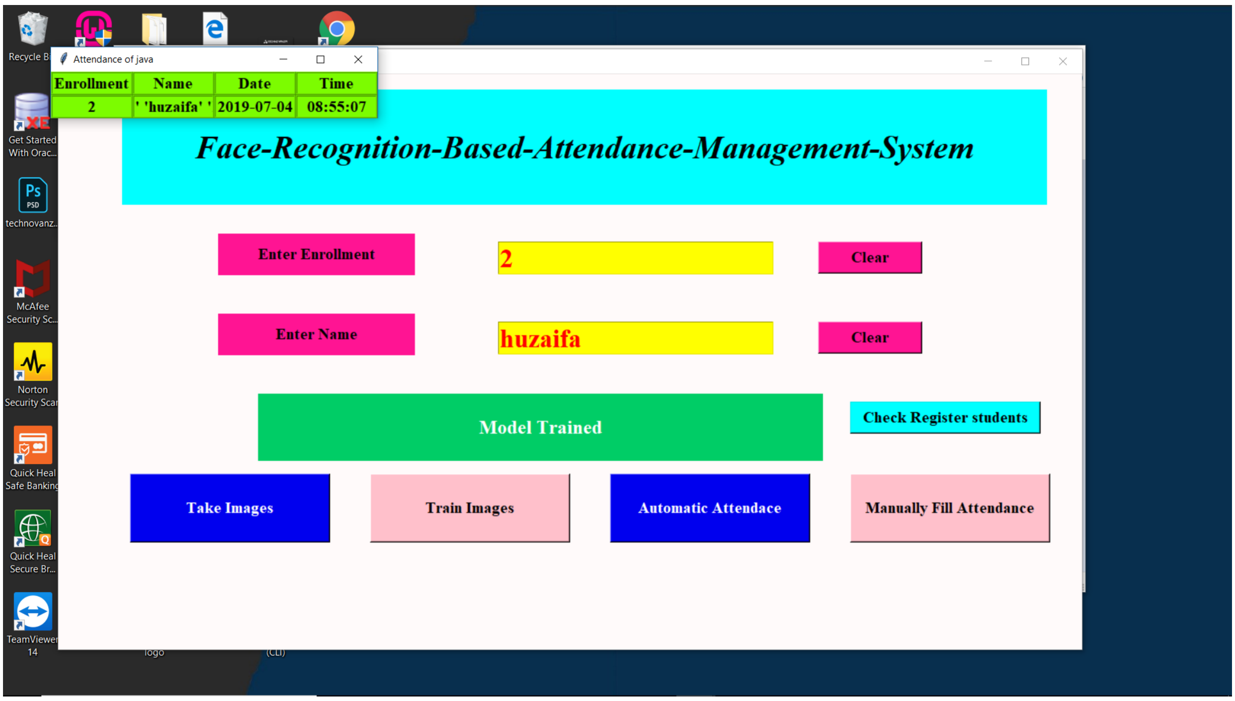

Figure 6.6: Results

Chapter 7

CONCLUSION

Automated attendance system, hence, is a modern technology suited to the needs of educational as well as commercial institutes for keeping a check on the registered personnel. It is an advanced machine learning based system which will make the process of attendance easier, and eliminate the fake proxy attempts by antisocial elements.

The facial expression recognition system presented in this research work contributes a resilient face recognition model based on the mapping of behavioural characteristics with the physiological biometric characteristics. The physiological characteristics of the human face with relevance to various expressions such as happiness, sadness, fear, anger, surprise and disgust are associated with geometrical structures which restored as base matching template for the recognition system.

Chapter 8

FUTURE SCOPE

We aim at implementing this system in college examination halls instead of manual admit card and many other sectors in the institute.

The use of spherical canonical images allows us to perform matching in the spherical harmonic transform domain, which does not require preliminary alignment of the images. The errors introduced by embedding into an expressional space with some predefined geometry are avoided. In this facial expression recognition setup, end-to-end processing comprises the face surface acquisition and reconstruction, smoothening, sub sampling to approximately 2500 points. Facial surface cropping measurement of large positions of distances between all the points using a parallelized parametric version is utilized.

Bibliography

[1] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The LaTeX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.

[2] Dr. Adrian Rosebrock *Computer Vision and Deep Learning Guide*. pyimagesearch

[3] Face Recognition with Python, in Under 25 Lines of Code
https://realpython.com/face-recognition-with-python/

[4] A Simple Introduction to Facial Recognition
https://www.analyticsvidhya.com/blog/2018/08/

[5] Python Face Recognition System
https://www.youtube.com/watch?v=QSTnwsZj2yc

[6] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *Python for Data Analysis: Data Wrangling with Pandas and NumPy*. McKinney, W.

[7] Getting Started with Face Recognition in Python
https://www.youtube.com/watch?v=IWoigw6-crg