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Autonomous Institute Affiliated to

Visvesvaraya Technological University, Belagavi

A report on

PUNCTUALITY BASED AUTOMATED ATTENDANCE SYSTEM

Submitted in partial fulfillment of the curriculum prescribed for the award of degree of Bachelor of Engineering in Electronics and Communication Engineering

BY:

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DECLARATION

We, Amrutha H.A.(USN: 4JC11EC011), Bhavana C.P. (USN: 4JC09EC022), Chaithra B. (USN: 4JC11EC023), Priyanka M.V. (USN: 4JC11EC088) the students of final semester B.E, Electronics & Communication Engineering, Sri Jayachamarajendra College of Engineering, Mysuru, hereby declare that the project work entitled "PUNTUALITY BASED AUTOMATIC ATTENDANCE SYSTEM" has been carried out by us under the guidance of Mr. Shreekanth T., Assistant Professor, Department of E&C, SJCE for the partial fulfillment of the curriculum prescribed for the award of the degree of Bachelor of Engineering in Electronics & Communication Engineering by the Visvesvaraya Technological University, Belagavi, during the 2014-2015 term.

We also declare that, to the best of our knowledge and belief, the matter embodied in this project report has not been submitted previously for the award of any degree to any other institution or university.

Place : Mysuru

Date :

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Abstract

The face is the identity of a person. The methods to exploit this physical feature have seen a great challenge since the advent of image processing techniques. The accurate recognition of a person is the sole aim of a face recognition system and this identification maybe used for further processing. Face recognition techniques are considered to be the best and fastest method for the identification. Our project aims at designing an automated attendance system which can effectively manage attendance in various institutions. The system takes care of punctuality of students as well as faculty by considering timing parameters. Exact validation of attendance is possible by practically incorporating our system where attendance is marked only after face identification at the beginning of the class. Also, methodically attendance is deducted if the candidate moves out before the scheduled time. Proper threshold conditions are set so that there is a provision for marginal flexibility. Various time efficient algorithms used, constraints and practical difficulties are considered, solution models are proposed to overcome the same.

Chapter 1

Preamble

Punctuality is very important in daily life. To incorporate puntuality and to reduce the manual work, ”Punctuality based automated attendance system” makes all necessary attempts. The system basically makes use of face recognition and provides attendance to the student according to the timetable. There is a flexibility to feed the timetable accordingly. The timetable software can access the student database and henceforth maintain a record of perfect student attendance.

1.1 Motivation for the project

Every organization whether it be an educational institution or business organization, it has to maintain a proper record of attendance of students or employees for effective functioning of organization.The time consumed to take attendance in the class wastes the valuable time of both students and professors. Also, punctuality is not a sure thing in conventional attendance system. In order to maintain punctuality, also to make the job of lecturers easy, we have planned this project.

1.2 Problem Definition

To incorporate punctuality among students and to build an automatic attendance system that will decrease the difficulty of the college management. Also, this helps in saving teacher's time.

1.3 Approach to Solution

As soon as the student enters the class, there is a camera which captures the image of the student. The face of the student is detected using the face detector unit. The student is identified through the face recognition system. As soon as the student is recognized, the name is verified in the database, the date and time is checked and the attendance is incremented accordingly. Face detection is done using Viola Jones algorithm. Face recognition is done using Principal Component Analysis.

1.4 Objectives

The objectives to be achieved through this project are:

- To detect the face from the entire image
- To achieve efficient face recognition
- A generic timetable software to provide flexibility of entering the timetable
- To build a massive database consisting of various faces and to match it accordingly with the help of face recognition unit
- Attendance report generation

1.5 Literature Survey

Many algorithms and methods are being used for the face detection and feature extractions. Face Detection Methods: The different techniques used for face detection are classified as shown below:

- Knowledge Based Method
- Feature Invariant Method
- Template Matching Method
- Appearance Based Method

Face Feature Extraction Methods: The techniques used for Face Recognition can be divided into two main categories:

- Holistic Approach
- Feature-based Approach

In the holistic approach, the whole face is taken as input for recognition purpose. PCA (Principal Component Analysis) is used for reducing the dimension of the data by projecting it onto a lower dimensional sub- space. We can go for LDA (Linear Discriminate Analysis), where the dimension reduction takes place such that the within class variance is reduced and between class variance is maximized. In Featurebased Approach, local features on face such as eyes and nose are detected and based upon which recognition is performed [3].

1.5.1 Advantages of PCA

- Smaller representation of database because we always store the trained images in the form of their projections on the reduced basis.

- Noise is reduced because we choose the maximum variation basis and hence features like background with small variations are automatically ignored.

1.5.2 Referred papers and contents

1.REAL TIME FACE RECOGNITION SYSTEM FOR TIME AND ATTENDANCE APPLICATIONS by APARNA BEHARA, M.V. RAGHUNADH, Department of E and CE, NIT Warangal [1] Abstract— In this paper, we have proposed an automated Face Recognition System for Time and Attendance application. The model is developed with the help of real time OpenCV library The proposed system comprised of using the Viola Jones algorithm for detecting the human faces and then the detected face is resized to the required size, this resized face is further processed by using linear stretch contrast enhancement and Finally it is recognized using a simple PCA / LDA. Once recognition is done, automatically attendance will be updated in an Excel Sheet along with his name, date and time. An html file is automatically updated by our system so that a remote authenticated user can access the attendance file .Our system is integrated to an Automatic Attendance Management System, with the help of which some post attendance works like stipend amount calculation, viewing attendance report for the required date, calculating the number of hours a person is present in the class, searching for a required person in the classroom etc. Spoofing ng which is a major threat for our system can be avoided using Eye Blink Detector algorithm. Our system can automatically update the Database for the newly enrolled persons.

2. INDEPENDENT COMPONENT ANALYSIS ALGORITHM US-

ING IMAGE PROCESSING BASED HUMAN FACE DETECTION AND TRACKING AUTOMATIC ATTENDANCE SYSTEM by M.Deepak P. Anu Agalya [2] Abstract: The daily attendance management is a big task in any organization. The image processing based attendance marking system takes the daily attendance of people in industries and educational in- situations automatically. The work presented in this paper proposes a method to automatically take the attendance of students in a university. The system makes use of face recognition technology for identifying the students who are present in each class. It is an e client way to record and manage the attendance activity in a university. The system stores the details of each student as well as their facial features in the database and it compares the new patterns with the previously stored patterns as per the requirement. The system is technologically very simple, easily installable and maintainable. In this paper, one application of the automatic face recognition, such as attendance marking is discussed in detail. The same system with some modi cations, can be used in a wide range of applications such as to prove the identity of a person to log in to a computer; to draw cash from an ATM; to identify the presence of known criminals in airports, railway stations, LOC areas in country border etc; to enter a protected site and so on.

Chapter 2

Theory and Analysis

This chapter gives the theoretical concepts that are necessary to build a background support for the practical implementation of our project. This mainly aims at discussing all the algorithms incorporated in the project in detail.

2.1 Face detection algorithm - Viola Jones

Algorithm mainly has four stages.

1. Haar Features Selection - All human faces share some similar properties. This knowledge is used to construct certain features known as Haar Features. [4]

   The properties that are similar for a human face are:

   - The eye region is darker than the upper-cheeks.
   - The nose bridge region is brighter than the eyes.
   - Location and Size of eyes and nose bridge region

   The 4 features applied in this algorithm are applied onto a face.

   Value = (Sum of all pixels in black area) - (Sum of all pixels in white area) The Viola-Jones face detector analyzes a given sub-window using features consisting of 2 or more rectangles. The different types of features are shown in figure 2.1 [4]

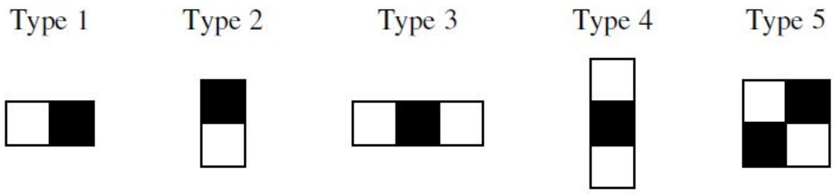


Figure 2.1: Different types of features

2. Creating Integral Image

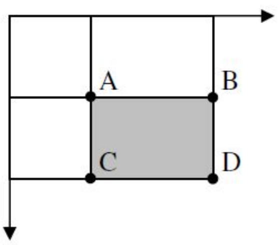
   Here, the input image is converted into integral image. this is done by making each pixel equal to the entire sum of all pixels above and to the left of the concerned pixel.this allows for the calculation of the sum of all pixels inside any given rectangle using only four values. these values are the pixels in the integral image that coincide with corners of the rectangle input image [4].

1	1	1
1	1	1
1	1	1

Input image

1	2	3
2	4	6
3	6	9

Integral image



Sum of grey rectangle = D - (B + C) + A

3. Adaboost Training algorithm

   AdaBoost is a machine learning boosting algorithm capable of constructing a strong classifier through a weighted combination of weak classifiers.

A week classifier is mathematically described as

$$h(x, f, p, \theta) = \begin{cases} 1 & \text{if } pf(x) > p\theta \\ 0 & \text{otherwise} \end{cases} \tag{2.1}$$

4. Cascaded Classifiers

   The cascaded classifier is composed of stages each containing a strong classifier. The job of each stage is to determine whether a given sub-window is definitely not a face or maybe a face. When a sub-window is classified to be a non-face by a given stage it is immediately discarded. Conversely a sub-window classified as a maybe-face is passed on to the next stage in the cascade. It follows that the more stages a given sub-window passes, the higher the chance the sub-window actually contains a face as shown in figure 2.2 [4]

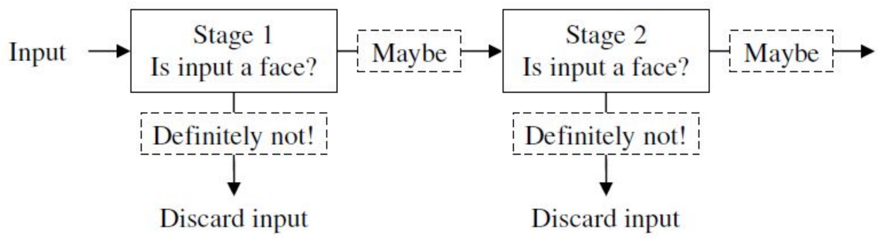


Figure 2.2: Cascaded classifiers

2.2 Face recognition using PCA

Face Recognition has always been a popular subject for image processing. PCA is an ideal method for recognizing statistical patterns in data. The popularity of face recognition is the fact a user can apply a method easily and see if it is working without needing to know to much about how the process is working.Facial recognition is a computer application composes for complex algorithms that use mathematical and matricial techniques, these get the image in raster mode(digital format) and then process and compare pixel by pixel using different methods for obtain a faster and reliable results, obviously these results depend of the machine use to process this due to the huge computational power that these algorithms, functions and routines requires, these are the most popular techniques used for solve this modern problem. There are various traditional methods of face recognition among which these are few [5].

2.2.1 Eigen faces

Some facial recognition algorithms identify faces by extracting landmarks, or features, from an image of the subject's face. For example, an algorithm may analyze the relative position, size, and/or shape of the eyes, nose, cheekbones, and jaw. These features are then used to search for other images with matching features. Other algorithms normalize a gallery of face images and then compress the face data, only saving the data in the image that is useful for face detection. A probe image is then compared with the face data. One of the earliest successful systems is based on template matching techniques applied to a set of salient facial features, providing a sort of compressed face representation. Recognition algorithms can be divided into two main approaches, geometric, which looks at distinguishing features, or photometric, which is a statistical approach that distill an image into values and comparing the values with templates to eliminate variances. Popular recognition algorithms include Principal Component Analysis with eigenface, Linear Discriminate Analysis, Elastic Bunch Graph Matching fisherface, the Hidden Markov model, and the neuronal motivated dynamic link matching [5].

2.2.2 3-D

A newly emerging trend, claimed to achieve previously unseen accuracies, is three-dimensional face recognition. This technique uses 3-D sensors to capture information about the shape of a face. This information is then used to identify distinctive features on the surface of a face, such as the contour of the eye sockets, nose, and chin. One advantage of 3-D facial recognition is that it is not affected by changes in lighting like other techniques. It can also identify a face from a range of viewing angles, including a profile view. Even a perfect 3D matching technique could be sensitive to expressions. For that goal a group at the Technion applied tools from metric geometry to treat expressions as isometries [5].

2.2.3 Skin texture analysis

Another emerging trend uses the visual details of the skin, as captured in standard digital or scanned images. This technique, called skin texture analysis, turns the unique lines, patterns, and spots apparent in a person's skin into a mathematical space Tests have shown that with the addition of skin texture analysis, performance in recognizing faces can increase 20 to 25 percent. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems.

2.3 Introduction to EmguCV

Emgu CV is a cross platform .Net wrapper to the Intel OpenCV image processing library. Allowing OpenCV functions to be called from .NET compatible languages such as C Sharp, VB, VC++, IronPython etc. The wrapper can be compiled in Mono and run on Linux / Mac OS X. EmguCV is used in the following applications [6]

- Optical Character Recognition(OCR)
- Face Detection
- 3D reconstruction
- SURF feature detector

2.4 Parameters used in multiple face detection

2.4.1 haarObj

Haar classifier cascade in internal representation scaleFactor: The factor by which the search window is scaled between the subsequent scans, for example, 1.1 means increasing window by 10

2.4.2 minNeighbors

Minimum number (minus 1) of neighbor rectangles that makes up an object. All the groups of a smaller number of rectangles than minimum neighbors minus 1 are rejected. If minimum neighbors is 0, the function does not do any grouping at all and returns all the detected candidate rectangles, which may be useful if the user wants to apply a customized grouping procedure [10]

2.4.3 flag

Mode of operation. Currently the only flag that may be specified is CV-HAAR-DO-CANNY-PRUNING. If it is set, the function uses Canny edge detector to reject some image regions that contain too few or too much edges and thus cannot contain the searched object. The particular threshold values are tuned for face detection and in this case the pruning speeds up the processing.

2.4.4 minSize

Minimum window size. By default, it is set to the size of samples the classifier has been trained on (20x20 for face detection).

2.5 Classifiers available

2.5.1 Eigen classifier

The Eigen recognizer takes two variables. The 1st, is the number of components kept for this Principal Component Analysis. There's no rule how many components that should be kept for good reconstruction capabilities. It is based on your input data, so experiment with the number. OpenCV documentation suggests keeping 80 components should almost always be sufficient. The 2nd variable is designed to be a prediction threshold; this variable contains the bug as any value above this is considered as an unknown. For the Fisher and LBHP this is how unknowns are classified however with the Eigen recogniser we must use the return distance to provide our own test for unknowns. In the Eigen recognizer the larger the value returned the closer to a match we have [10].

2.5.2 Fischer classifier

The Fisher recognizer takes two variables as with the Eigen constructor. The 1st, is the number of components kept Linear Discriminant Analysis with the Fisherfaces criterion. It's useful to keep all components, this means the number of your training inputs. If you leave this at the default (0), set it to a value less than 0, or greater than the number of your training inputs, it will be set to the correct number (your training inputs - 1) automatically. The 2nd Variable is the threshold value for unknowns, if the resultant Eigen distance is above this value the Predict() method will return a -1 value indicating an unknown. This method works and the threshold is set to a default of 3500, change this to constrain how accurate you want results. If you change the value in the constructor the recognizer will need retraining [10].

2.5.3 The Local Binary Pattern Histogram (LBPH) Classifier

The LBPH recogniser unlike the other two takes five variables:

- radius – The radius used for building the Circular Local Binary Pattern.
- neighbors – The number of sample points to build a Circular Local Binary Pattern from. An value suggested by OpenCV Documentations is '8' sample points. Keep in mind: the more sample points you include, the higher the computational cost.
- grid x – The number of cells in the horizontal direction, 8 is a common value used in publications. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector.

- grid y – The number of cells in the vertical direction, 8 is a common value used in publications. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector.

- threshold – The threshold applied in the prediction. If the distance to the nearest neighbour is larger than the threshold, this method returns -1 [10].

2.6 Introduction to Principal Component Analysis

The EigenFaceRecognizer applies PCA. The EigenFaceRecognizer allows easier application of the the FisherFaceRecognizer and the LBPHFaceRecognizer.

The FisherFaceRecognizer applies Linear Discriminant Analysis derived by R.A. Fisher. LDA finds the subspace representation of a set of face images, the resulting basis vectors defining that space are known as Fisherfaces. This can yield preferable results to PCA based analysis favouring classification rather than representation. See this ScholarPedia article for more information. [11]

The LBPH FaceRecognizer uses Local binary patterns (LBP) to create a feature vector for using in a support vector machine or some other machine-learning algorithm. LBP unifies traditionally divergent statistical and structural models of texture analysis. LBP is very robust in real-world applications due to the manner in which it is deals with monotonic grayscale changes caused by variations in illumination. See this ScholarPedia article for more information.

The EigenFaceRecognizer class applies PCA on each image, the results of which will be an array of Eigen values that a Neural Network can be trained to recognise. PCA is a commonly used method of object recognition as its results, when used properly can be fairly accurate and resilient to noise. The method of which PCA is applied can vary at different stages so what will be demonstrated is a clear method for PCA application that can be followed. It is up for individuals to experiment in finding the best method for producing accurate results from PCA [11].

To perform PCA several steps are undertaken:

- Stage 1: Subtract the Mean of the data from each variable (our adjusted data)
- Stage 2: Calculate and form a covariance Matrix
- Stage 3: Calculate Eigenvectors and Eigenvalues from the covariance Matrix
- Stage 4: Chose a Feature Vector (a fancy name for a matrix of vectors)
- Stage 5: Multiply the transposed Feature Vectors by the transposed adjusted data [11]

2.7 OleDB

OLE DB (Object Linking and Embedding, Database, sometimes written as OLEDB or OLE-DB), an API designed by Microsoft, allows accessing data from a variety of sources in a uniform manner. The API provides a set of interfaces implemented using the Component Object Model (COM); it is otherwise unrelated to OLE. Microsoft originally intended OLE DB as a higher-level replacement for, and successor to, ODBC, extending its feature set to support a wider variety of non- relational databases, such as object databases and spreadsheets that do not necessarily implement SQL [12].

2.7.1 Method

OLE DB separates the data store from the application that needs access to it through a set of abstractions that include the datasource, session, command, and rowsets. This was done because different applications need access to different types and sources of data, and do not necessarily want to know how to access functionality with technology-specific methods. OLE DB is conceptually divided into consumers and providers. The consumers are the applications that need access to the data, and the providers are the software components that implement the interface and thereby provide the data to the consumer. OLE DB is part of the Microsoft Data Access Components (MDAC) stack [12].

Chapter 3

Methodology

The project is implemented by taking the image of the student from image acquisition device like a camera and the face is detected using appropriate method and then the detected face is recognized by comparing with the available database. The time table software is created using visual basics. The entire methodology is depicted by the block diagram shown in figure 3.1

3.1 Block Diagram and description

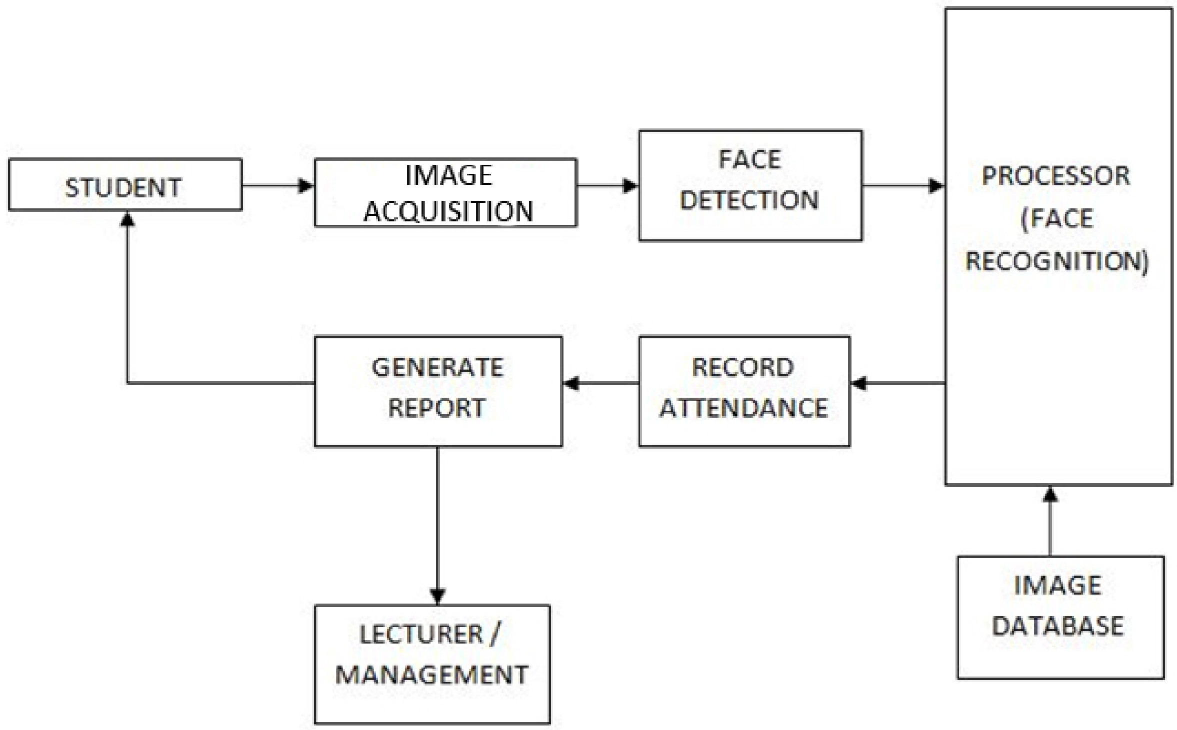


Figure 3.1: Block Diagram

The image of the student is captured using an image acquisition device like a camera. The faces in the captured image are detected using the face detection module. The detected faces are to be properly recognized. Various face recognition algorithms are available. Among them best algorithm is selected for the recognition. When the face of a student is recognized, attendance is incremented for that particular student. After a definite set of classes, attendance report is generated. This report is sent to the student as well as the management so that a strict attendance can be maintained and punctuality is achieved.

3.2 Face Detection

Face detection is a computer technology that determines the locations and sizes of human faces in digital images. It detects face and ignores anything else, such as buildings, trees and bodies. Face detection can be regarded as a more general case of face localization. In face localization, the task is to find the locations and sizes of a known number of faces (usually one). In face detection, face is processed and matched bitwise with the underlying face image in the database.

3.3 Face Recognition

A facial recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame from a video source. One of the ways to do this is by comparing selected facial features from the image and a facial database. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems. The algorithm which we used to accomplish detection and recognition is PCA (Principal Component Analysis).

3.4 Timetable feeding software

The timetable feeding mechanism implemented in our project is very flexible where initially the timings can be entered. This enables the user to have classes any flexible time. Later check for the suitable radio buttons of particular day and time to enter one subject in all required days, all at once. Hence, using this software, subjects can be assigned easily and in a faster manner. The logic is better explained by the flowchart shown in figure 3.2

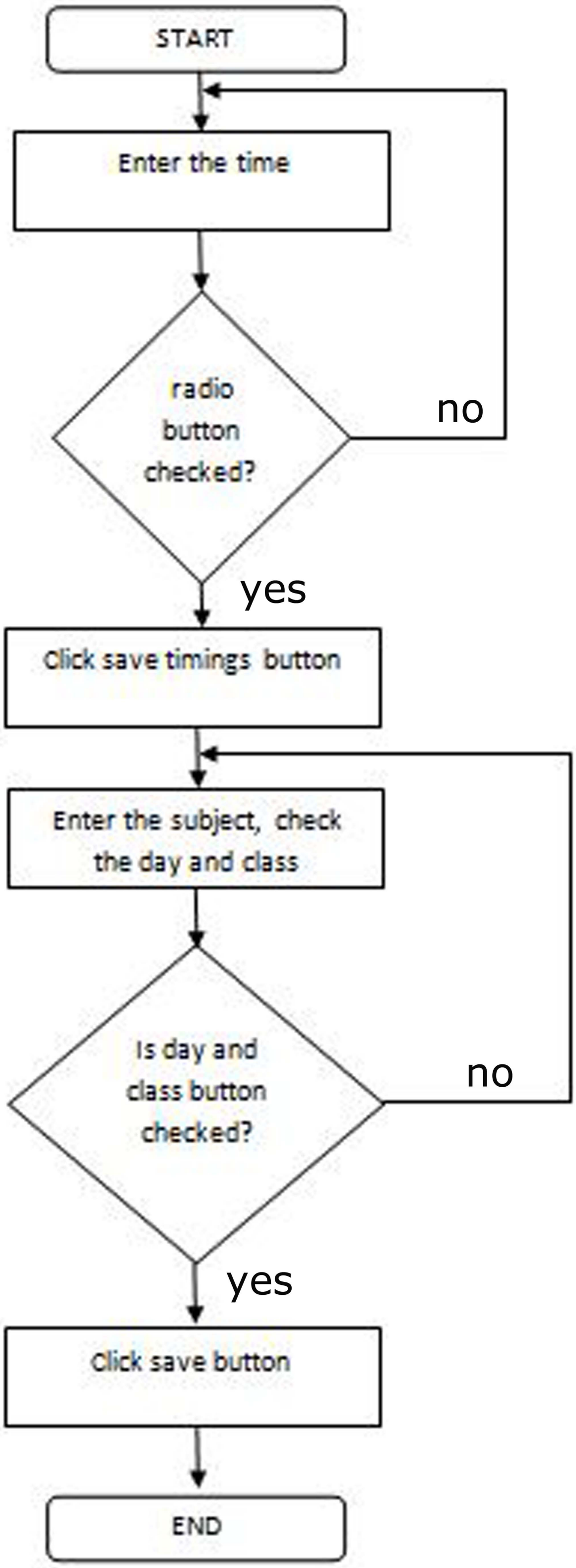


Figure 3.2: Flowchart of timetable software

Chapter 4

Implementation

4.1 Recognition - accomplished with PCA

The main purposes of a principal component analysis are the analysis of data to identify patterns and finding patterns to reduce the dimensions of the dataset with minimal loss of information. Here, our desired outcome of the principal component analysis is to project a feature space (our dataset consisting of n x d-dimensional samples) onto a smaller subspace that represents our data "well". A possible application would be a pattern classification task, where we want to reduce the computational costs and the error of parameter estimation by reducing the number of dimensions of our feature space by extracting a subspace that describes our data best.

4.1.1 Algorithm

- Obtain the dataset (images) to be trained.
- Compute the d-dimensional mean vector. (Average of all images).
- Calculate the scatter matrix or co-variant matrix.
- Compute eigenvectors and corresponding eigen values.
- Choose k-dimension eigenvectors.

- Transform the samples into new subspace.

4.1.2 Method to compute the eigen face taking example of two 5x5 matrices

[5] Consider the two matrices as shown.

p1 =

156	15	59	44	147
39	126	155	157	74
133	142	136	122	117
98	154	137	138	153
98	141	138	87	179

Matrix 1

p2 =

40	69	65	15	42
34	124	95	99	30
56	98	111	135	109
80	96	118	124	65
81	101	117	97	64

Matrix 2

Compute average of two matrices.

avImg =

0.3843	0.1647	0.2431	0.1157	0.3706
0.1431	0.4902	0.4902	0.5020	0.2039
0.3706	0.4706	0.4843	0.5039	0.4431
0.3490	0.4902	0.5000	0.5137	0.4275
0.3510	0.4745	0.5000	0.3608	0.4765

Subtract the average from each matrices

```
>> st.dataAvg{1}

ans =

    0.2275   -0.1059   -0.0118    0.0569    0.2059
    0.0098    0.0039    0.1176    0.1137    0.0863
    0.1510    0.0863    0.0490   -0.0255    0.0157
    0.0353    0.1137    0.0373    0.0275    0.1725
    0.0333    0.0784    0.0412   -0.0196    0.2255

>> st.dataAvg{2}

ans =

   -0.2275    0.1059    0.0118   -0.0569   -0.2059
   -0.0098   -0.0039   -0.1176   -0.1137   -0.0863
   -0.1510   -0.0863   -0.0490    0.0255   -0.0157
   -0.0353   -0.1137   -0.0373   -0.0275   -0.1725
   -0.0333   -0.0784   -0.0412    0.0196   -0.2255
```

Dimension is reduced for easier computation and the co variance of matrix is calculated.

```
C =

    0.2829   -0.2829
   -0.2829    0.2829
```

Matrix is re sized and eigen faces are computed.

4.1.3 Application of the algorithm in our project

1. Dataset(Images to be trained)

```
>> eigenfaces{1}

ans =

  1.0e-007 *

   -0.1148    0.0044    0.1059   -0.0287   -0.1139
   -0.0004   -0.0002    0.2059    0.2060   -0.0563
   -0.1116    0.2072   -0.2128   -0.2097   -0.0007
   -0.0015    0.2060   -0.2123    0.2096    0.2036
   -0.0014    0.2075   -0.2124    0.0008   -0.2201

>> eigenfaces{2}

ans =

   -0.3217    0.1497    0.0166   -0.0804   -0.2912
   -0.0139   -0.0055   -0.1664   -0.1608   -0.1220
   -0.2135   -0.1220   -0.0693    0.0360   -0.0222
   -0.0499   -0.1608   -0.0527   -0.0388   -0.2440
   -0.0471   -0.1109   -0.0582    0.0277   -0.3189
```

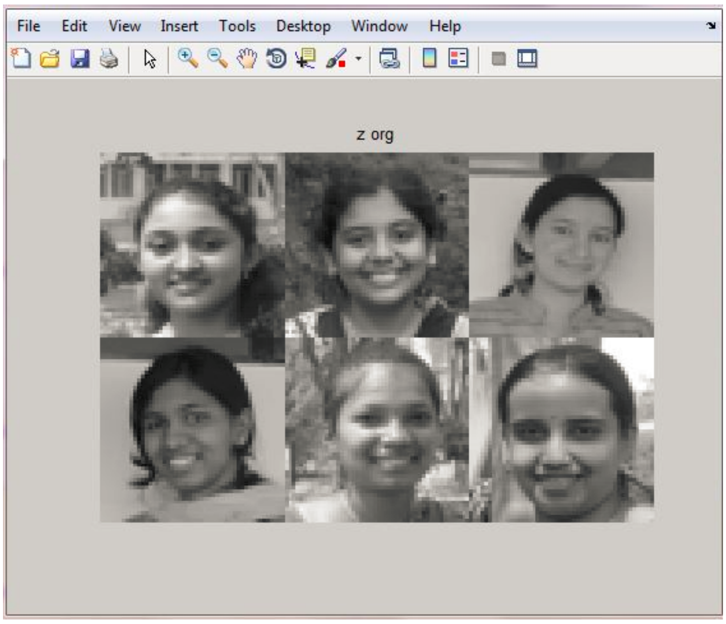


Figure 4.1: Original set of images

The set of images which are to be trained are considered. This forms the initial dataset which is shown in figure 4.1.

2. Average of all images

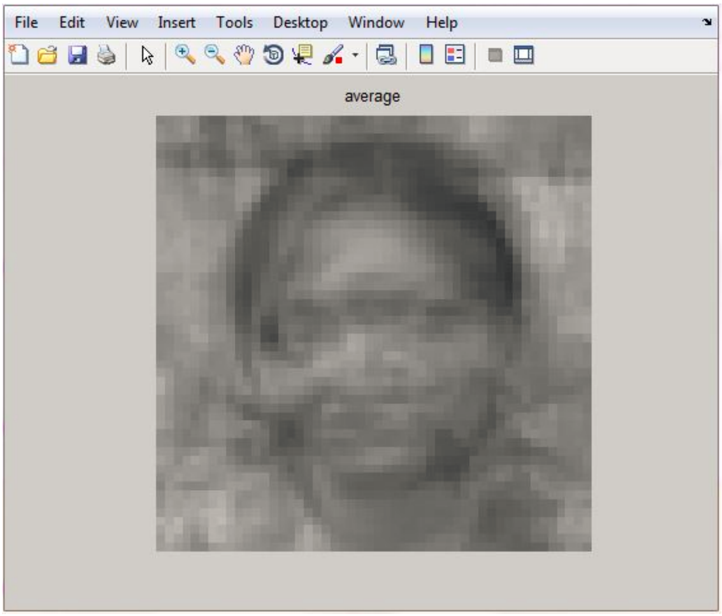


Figure 4.2: Average

After considering the images of all the required faces, the average of all the faces are to be taken as shown in figure 4.2. This forms a significant step in PCA.

3. Normalized images

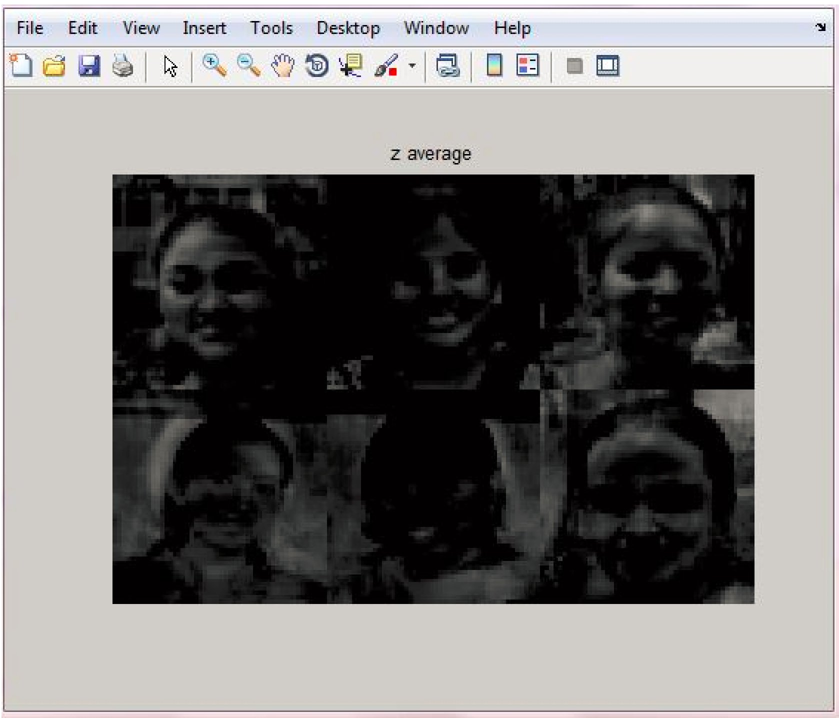


Figure 4.3: Individual mean

This image is obtained by subtracting each image from the average of all the images as shown in figure 4.3.

4. Co-variance

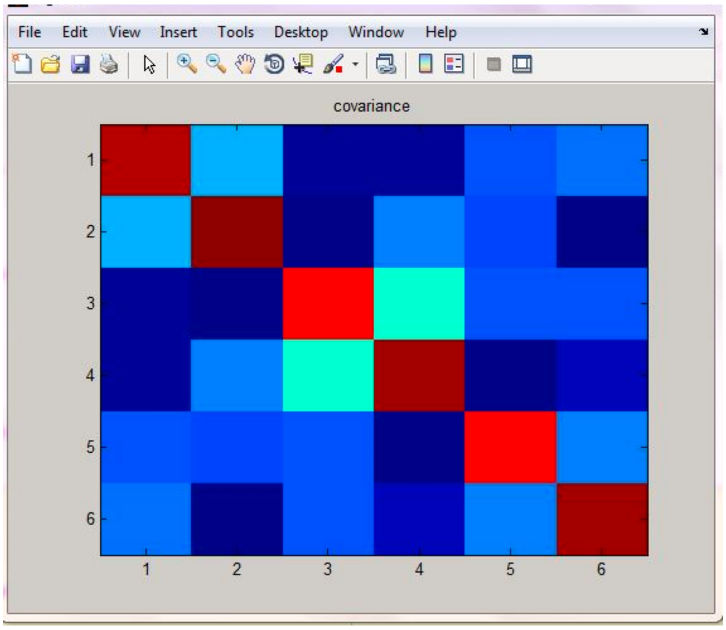


Figure 4.4: Co-Variance

The sample covariance Q between two of the different principal components over the dataset is given by:

$$Q(PC_{(j)}, PC_{(k)}) \propto (Xw_{(j)}) \cdot (Xw_{(j)}) \tag{4.1}$$
$$= w_{(j)}^T X^T X w_{(k)} \tag{4.2}$$
$$= w_{(j)}^T \lambda_{(k)} w_{(k)} \tag{4.3}$$
$$= \lambda_{(k)} w_{(j)}^T w_{(k)} \tag{4.4}$$

5. Eigen matrix of each of the images The eigen matrix of each of the faces is shown in figure 4.5

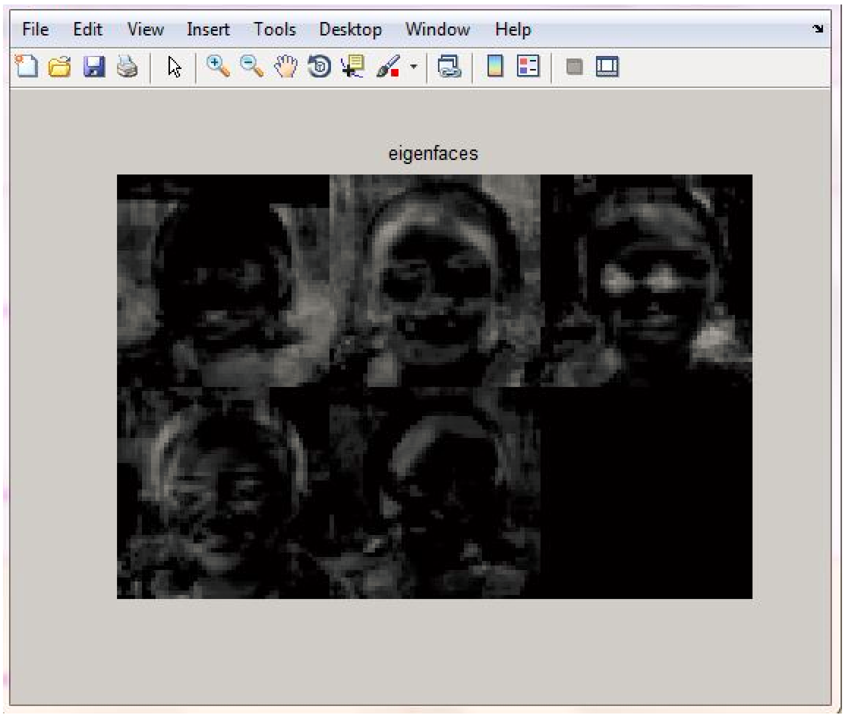


Figure 4.5: Eigen faces

4.2 Face detection

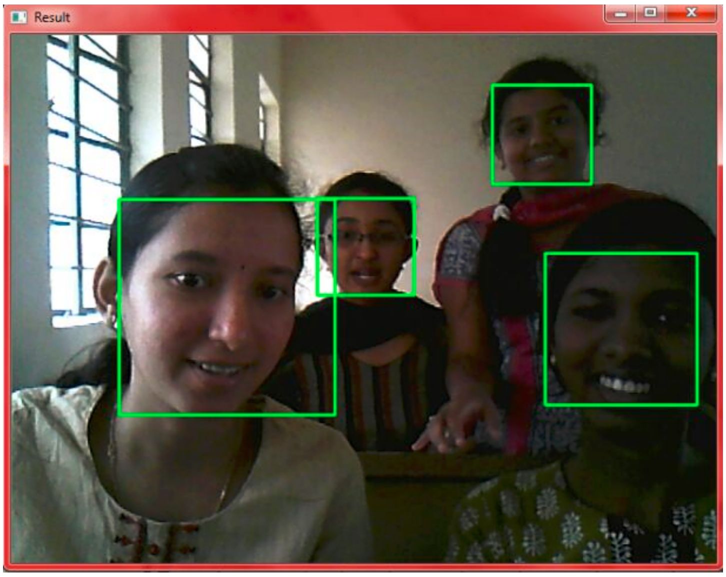


Figure 4.6: Detected faces

The detected faces using viola Jones method are shown in figure 4.6.

4.3 Timetable feeding mechanism

The entire project provides a flexibility of entering the required timetable. Hence, the project becomes generic so that it can be installed at any particular place. The timetable feeding software window is shown in figure 4.7 and figure 4.8.

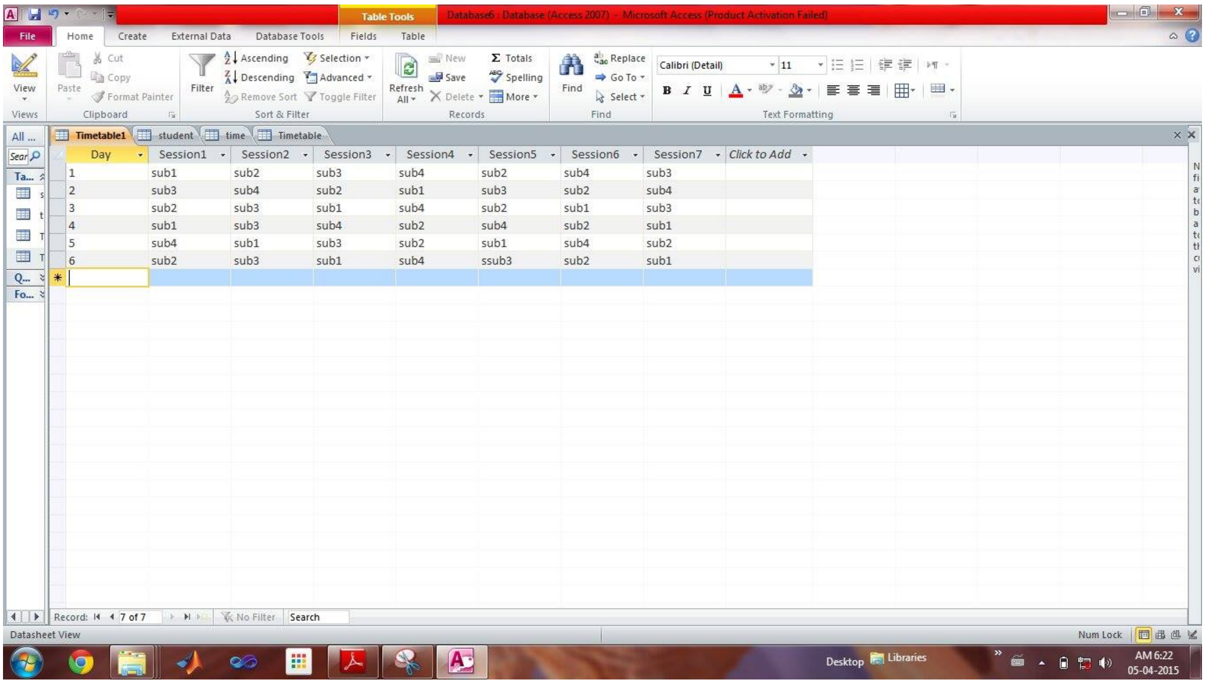


Figure 4.7: Timetable

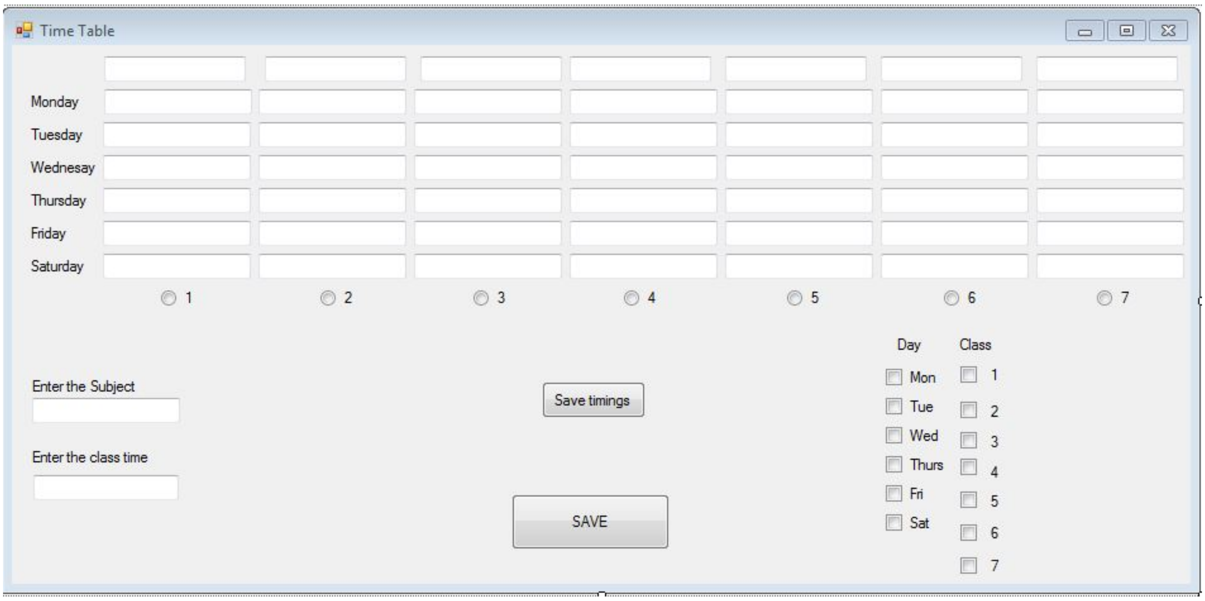


Figure 4.8: Timetable feeding software window

Chapter 5

Results and discussion

This chapter gives an insight about the obtained results from our project in all possible lighting conditions.

5.1 Face recognition

Face recognition was successfully implemented by using the algorithms stated previously. The image output is shown in the figures 5.1 and 5.2.

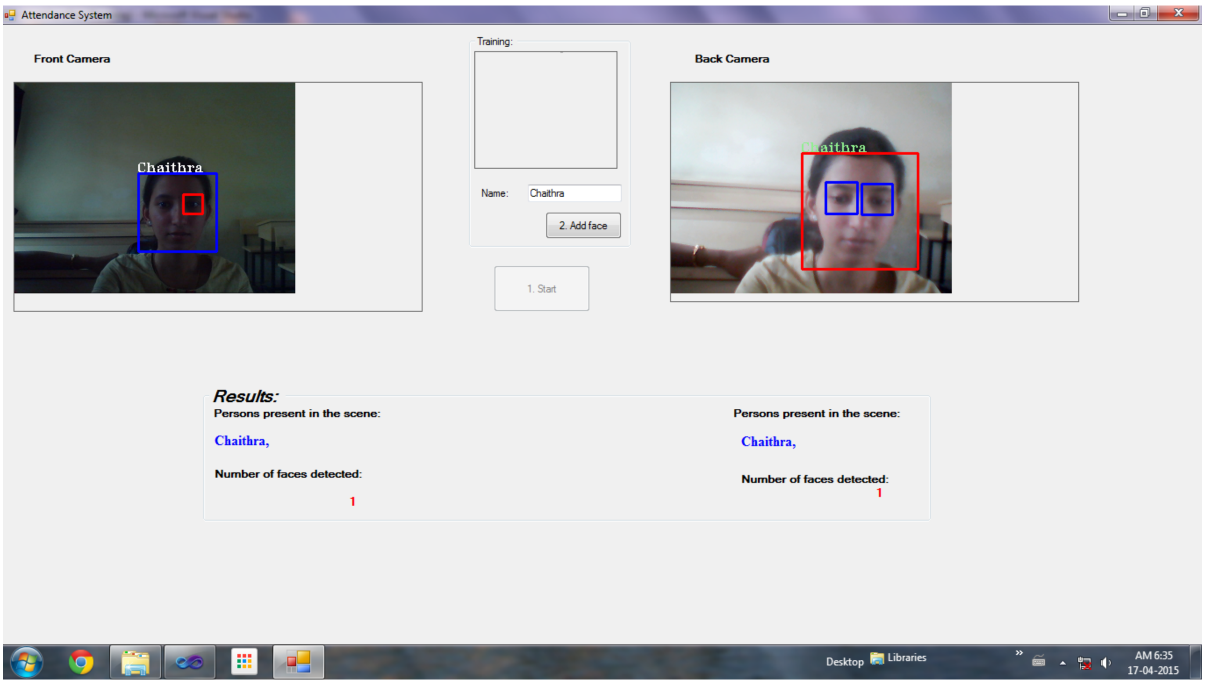


Figure 5.1: Recognized faces

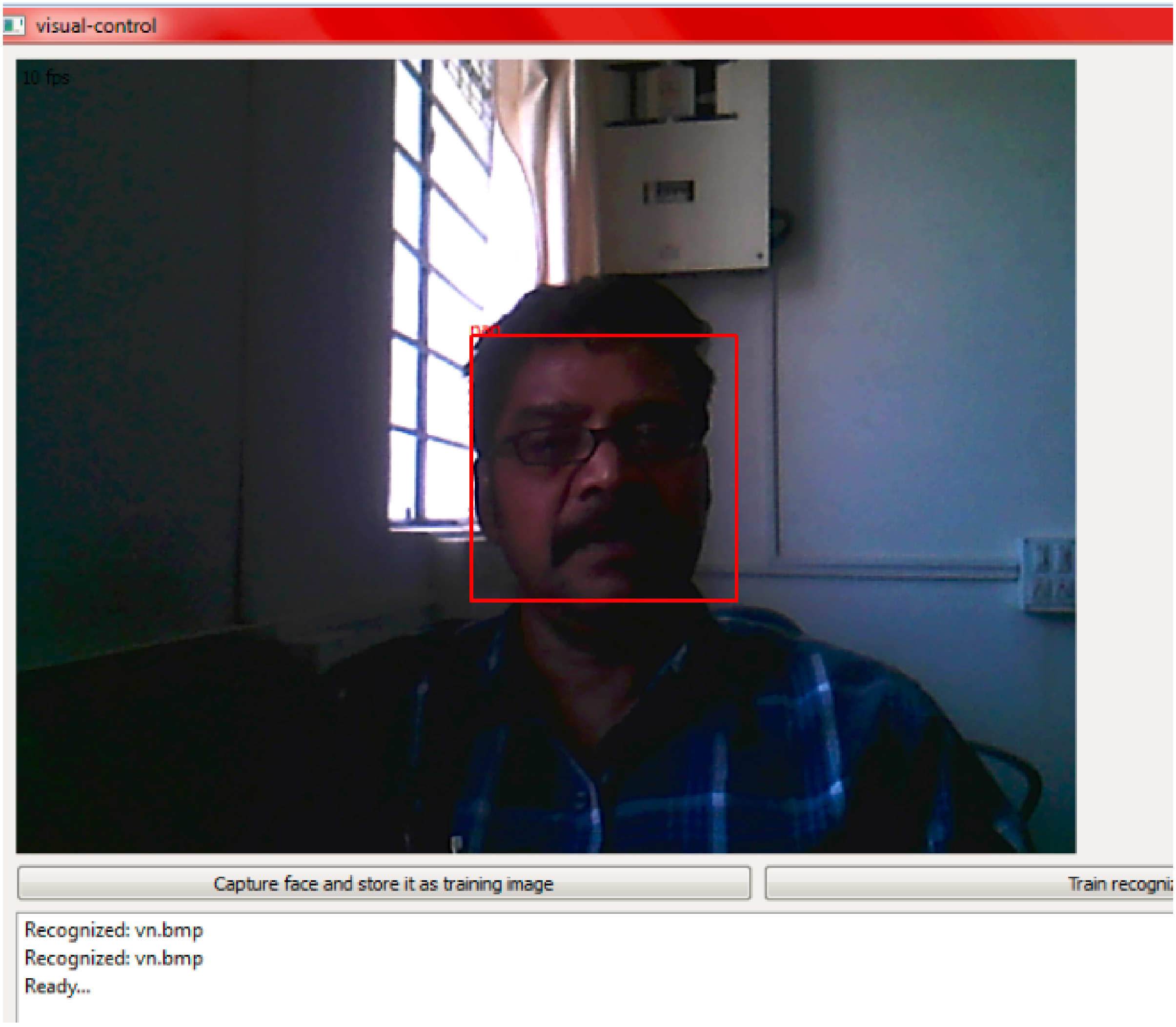
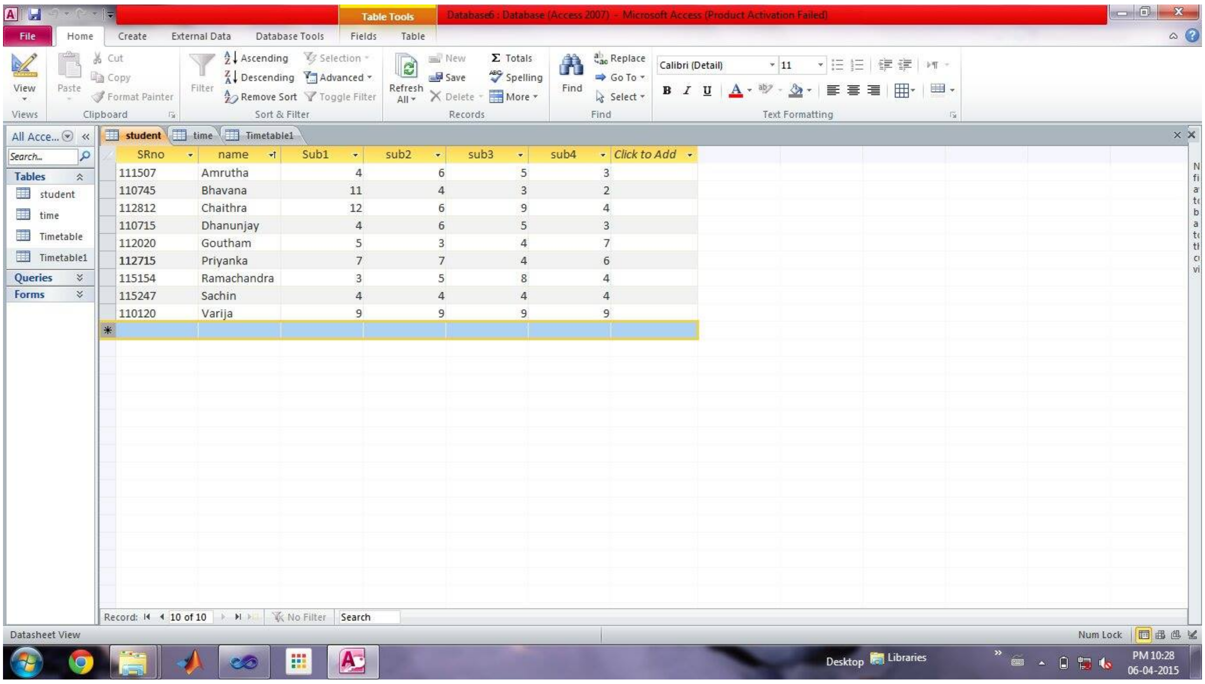


Figure 5.2: Recognized face

5.2 Increment in the attendance

According to the faces detected, corresponding attendance is incremented by reading the time and date from the system and finding the particular subject which is suitably fed in the timetable. Attendance is incremented only to the punctual student who remains in the class for full time. If the student goes out of the class in the middle, his net attendance for that particular class will be zero. The attendance database is shown in figure 5.3.



SRno	name	Sub1	sub2	sub3	sub4
111507	Amrutha	4	6	5	3
110745	Bhavana	11	4	3	2
112812	Chaithra	12	6	9	4
110715	Dhanunjay	4	6	5	3
112020	Goutham	5	3	4	7
112715	Priyanka	7	7	4	6
115154	Ramachandra	3	5	8	4
115247	Sachin	4	4	4	4
110120	Varija	9	9	9	9

Figure 5.3: Attendance table

	Lighting Condition	Total number of trials	Correct output	False positive	% Accuracy
Face Detection	Low contrast	40	30	10	75%
	Medium	40	35	5	87.5%
	Bright	40	37	1	97.5%
Face recognition	Low contrast	30	16	14	53.33%
	Medium	30	26	4	86.67%
	Bright	32	29	3	90.625%

Figure 5.4: Analysis of output

Chapter 6

Conclusion

The developed system provides an efficient solution and the best strategy to maintain the record of attendance in a systematic manner. The whole project concentrates on various areas and integrates all modules to form an appealing and easy to handle software package. The processing part of the project mainly concentrates on face detection and recognition using standard algorithms. External camera is integrated on a single computer device to maintain the record of students getting into the class and also going out. This module works in tandem with the timetable software. The entire package has the privilege to fetch the student database which can also be regularly updated.

There is flexibility in every part of the project. Any faces can be trained to include in the recognition. Also, the timetable can be fed by the user so that if there are any changes, they can be handled easily. Also, updating student database is also not an issue.

6.1 Scope for further enhancements

Our project can be extended to a versatile environment and can me made adaptable. The face recognition unit can be enhanced to recognize faces with various lighting schemes. Also, the system can be made more generic in terms of feeding the timetable. This system can be made suitable to deployed in a base having a vast number of audience. This demands perfection in face recognition and other backup systems.

6.2 Applications

Though the project mainly concentrates on maintaining students' attendance, it can be used in many other places. Following are the few significant applications.

6.2.1 Government offices

Lack of punctuality is one of the most common complaints in government offices. Our system can be deployed in such cases to ensure that the officers staying at the office for full time are alone entitled for all benefits.

6.2.2 Seminars and Workshops

Instead of wasting time in seminar halls or workshops in knowing the attendees, this system can be used to manage the entire part of attendance. This saves man power as well as time.

6.2.3 Hospitals

Hospitals demand for a lot of time based activities. Doctor should attend patients in time; enter operation theater in time etc. All these things can be monitored by our system.

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