A PROJECT REPORT

ON

"Smart Attendance Management System Based on Face Recognition"

Submitted in the partial fulfillment of the requirements for

The degree of

BACHELOR OF ENGINEERING IN COMPUTER ENGINEERING

By

1) ANIKET KHETLE (ROLL NO. 53)
2) NITESH MANJAREKAR (ROLL NO. 21)
3) NISHANT PATHARE (ROLL NO. 59)

UNDER THE GUIDANCE OF

Prof. Madhuri Dalal

Department of Computer Engineering
Saraswati College of Engineering, Kharghar, Navi Mumbai
University of Mumbai

2017-18

Saraswati College of Engineering, Kharghar

Vision:

To become center of excellence in Engineering education and research.

Mission:

To educate students to become quality technocrats for taking up challenges in all facets of life.

Department of Computer Engineering

Vision:

To imprint knowledge to our students to excel in engineering culture and research and nurture them to become ethically rich professional.

Mission:

To provide simulating learning environment with a technological orientation to maximize individual potential.

SARASWATI Education Society's
SARASWATI College of Engineering
Learn Live Achieve and Contribute
Kharghar, Navi Mumbai - 410 210.

(Approved by AICTE, recg. By Maharashtra Govt. DTE ,Affiliated to Mumbai University)

PLOT NO. 46/46A, SECTOR NO 5, BEHIND MSEB SUBSTATION, KHARGHAR, NAVI MUMBAI-410210

Tel. : 022-27743706 to 11 * Fax : 022-27743712 * Website: www.sce.edu.in

CERTIFICATE

*This is to certify that the requirements for the project report entitled "**Smart Attendance System based on Face Recognition**" have been successfully completed by the following students:*

Roll numbers	Name
1) 21	Nitesh Manjarekar
2) 53	Aniket Khetle
3) 59	Nishant Pathare

In partial fulfillment of Sem –VIII , **Bachelor of Engineering of Mumbai University in Computer Engineering** of Saraswati college of Engineering , Kharghar during the academic year 2017-18.

Internal Guide **External Examiner**

(Prof. Madhuri Dalal)

Project Co-ordinator **Head of Department**

(Prof. Madhuri Dalal) **(**Prof. Deepa Parasar)

Principal
(Dr. Manjusha Deshmukh)

DECLARATION

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included. I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(Nishant Pathare)

Date:

ACKNOWLEDGEMENT

After the completion of this work, words are not enough to express feelings about all those who helped us to reach goal.

It's a great pleasure and moment of immense satisfaction for us to express my profound gratitude to **Project Guide**, **Prof. Madhuri Dalal**, whose constant encouragement enabled us to work enthusiastically. His perpetual motivation, patience and excellent expertise in discussion during progress of the project work have benefited us to an extent, which is beyond expression.

We would also like to give our sincere thanks to **Prof. Deepa Parasar, Head of Department**, and **Prof.Madhuri Dalal, Project co-coordinator** from Department of Computer Engineering, Saraswati college of Engineering, Kharghar, Navi Mumbai, for their guidance, encouragement and support during a project.

I am thankful to **Dr. Manjusha Deshmukh, Principal,** Saraswati College of Engineering, Kharghar, Navi Mumbai for providing an outstanding academic environment, also for providing the adequate facilities.

Last but not the least we would also like to thank all the staffs of Saraswati college of Engineering (Computer Engineering Department) for their valuable guidance with their interest and valuable suggestions brightened us.

(Nishant Pathare)

ABSTRACT

A facial recognition system is an application of computer vision which is capable of performing two basic tasks of identification and verification of person. Conventionally attendance in schools, institutes and universities are taken by professors and records are stored in registers. This approach waste a lot of time. The objective of this project is to instigate a new approach for taking attendance automatically. The proposed system will automatically take attendance of students by recognizing their face. Thus it will save lot of time during lectures.

Face recognition is the identification of humans by the unique characteristics of their Faces. Face recognition technology is the least intrusive and fastest bio-metric technology. It works with the most obvious individual identifier the human face. This project aims at providing a system to automatically record the students' attendance during lecture hours in a hall or room using facial recognition technology instead of the traditional manual methods.

Table of Contents

List of Tables

List of Figures

CHAPTER 1
INTRODUCTON

1.1 GENERAL

Every institute has its own way of taking attendance. Some uses this old manual way for marking attendance some uses RF Id for marking attendance. Other biometric techniques such as iris, retina, thumb impression, palm identification, ear recognition is used. But all these methods also waste students' time as long queues are formed for marking attendance. Face recognition on the other hand advantage over these above mentioned techniques as it is nonintrusive, contact-free and has natural acquisition.

"A Smart Attendance Management System" uses the idea of continuous observation and integral validation process which enhance the reliability and performance of the system. System is implemented with raspberry pi and camera module. The given system will automatically take attendance of students by recognizing their face. It will detect the faces of students in classroom, compare them with features in database and will accordingly mark their attendance.

The Current attendance marking methods are monotonous & time consuming. Manually recorded attendance can be easily manipulated. Moreover, it is very difficult to verify one by one student in a large classroom environment with distributed branches whether the authenticated students are actually responding or not. Hence the system is proposed to tackle all these issues. The proposed system consists of a high resolution digital camera put on gate to monitor the classroom or office room. The data or images obtained by the camera are sent to a computer programmed system for further analysis. The obtained images are then compared with a set of reference images of each of the employees or students & mark the corresponding attendance.

1.2 OBJECTIVE AND PROBLEM STATEMENT

To develop An Efficient Attendance Management System based on Face recognition. The system should capture the video in classroom and should mark the attendance of students that are currently present in lecture.

This system will avoid wastage of time unlike manual attendance system. Also it will help in generating accurate reports of attendance within minimum time which is a very tedious task if we perform it manually. Also the system will provide security and reliability to the attendance records.

CHAPTER 2
LITERATURE REVIEW

Universality, permanence, uniqueness, performance and measurability are the factors which need to be satisfied by a biometric identifier. Many ideas have been proposed by researchers for biometric attendance system. G. Lakshmi et al. [1] developed a system for managing students with Open CV and raspberry pi module that is interfaced with fingerprint device. Aziza Ahemdi et al. [2] proposed an automatic attendance structure using techniques such as Adaboost for face detection and local binary pattern and histogram of orientation for features extraction.

There are plenty of face recognition algorithm are available and Chaoyang et al.[3] has shown the collation of three face recognition algorithms namely PCA, Linear Discriminant Analysis (LDA) and Elastic Bunch Graph Matching (EBGM) implemented with Matlab. Paper by Yohei Kawaguchi, Tetsuo Shoji, Weijane Lin, Koh Kakusho, And Michihiko Minoh, "Face Recognition-based Lecture Attendance System" [4] uses the idea of continuous observation and integral validation process which enhance the reliability and performance of the system.

CHAPTER 3

METHODOLOGY

3.1 ALGORITHMIC DETAILS

Algorithm Steps:-

1) Formation of students' database.
2) Capturing of classroom video.
3) Frame selection from the video.
4) Face detection by Haar Cascades algorithm
5) Features extraction using OpenCV.
6) Face recognition by comparing with database stored features.
7) Marking of attendance in database.

Flowchart:-

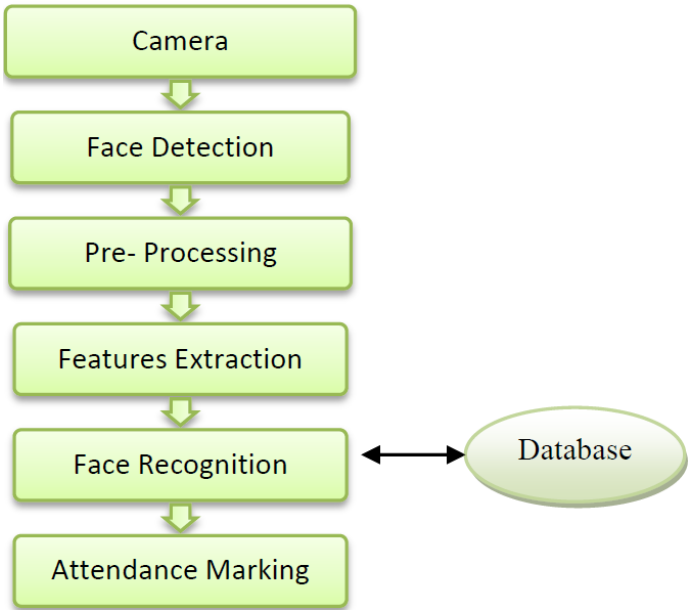


Fig 3.1. Flowchart

Haar Features:

A computer program that decides whether an image is a positive image (face image) or negative image (non-face image) is called a classifier. A classifier is trained on hundreds of thousands of face and non-face images to learn how to classify a new image correctly. OpenCV provides us with face detection classifiers namely Haar Classifier.

The Haar Classifier is a machine learning based approach, an algorithm created by Paul Viola and Michael Jones; which (as mentioned before) are trained from many positive images (with faces) and negatives images (without faces).

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

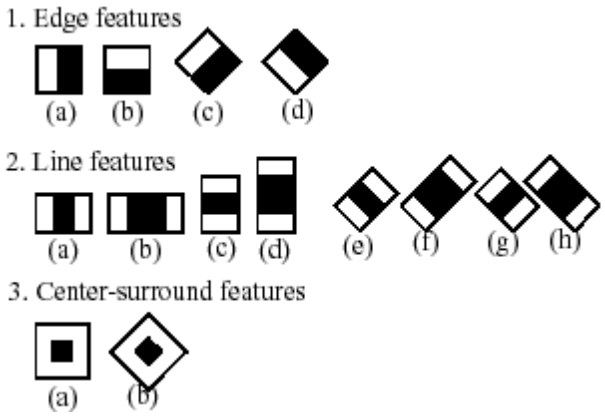


Fig.3.2. Haar Features types

Each window is placed on the picture to calculate a single feature. This feature is a single value obtained by subtracting the sum of pixels under the white part of the window from the sum of the pixels under the black part of the window.

All possible sizes of each window are placed on all possible locations of each image to calculate plenty of features.

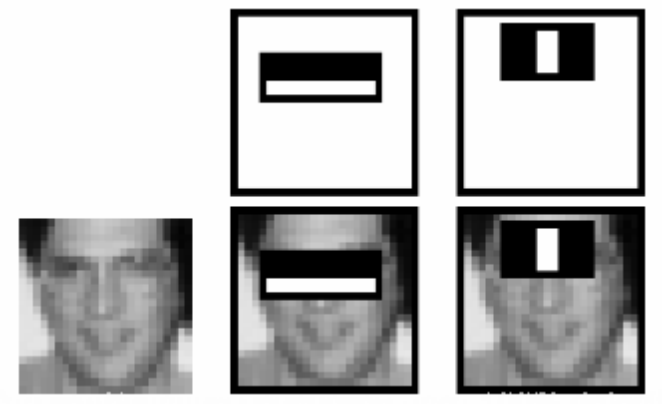


Fig.3.3. Haar Features

In above image, we are extracting two features. The first one focuses on the property that the region of the eyes is often darker than the area of the nose and cheeks. The second feature relies on the property that the eyes are darker than the bridge of the nose.

But among all these features calculated, most of them are irrelevant. For example, when used on the cheek, the windows become irrelevant because none of these areas are darker or lighter than other regions on the cheeks, all sectors here are the same.

So we promptly discard irrelevant features and keep only those relevant with a fancy technique called Adaboost. AdaBoost is a training process for face detection, which selects only those features known to improve the classification (face/non-face) accuracy of our classifier.

In the end, the algorithm considers the fact that generally: most of the region in an image is a non-face region. Considering this, its a better idea to have a simple method to check if a window is a non-face region, and if it's not, discard it right away and dont process it again. So we can focus mostly on the area where a face is.

Local Binary Pattern Histogram (LBPH):

The LBP feature vector, in its simplest form, is created in the following manner:

- Divide the examined window into cells (e.g. 16x16 pixels for each cell).
- For each pixel in a cell, compare the pixel to each of its 8 neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.
- Where the center pixel's value is greater than the neighbor's value, write "0". Otherwise, write "1". This gives an 8-digit binary number (which is usually converted to decimal for convenience).
- Compute the histogram, over the cell, of the frequency of each "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the center). This histogram can be seen as a 256-dimensional feature vector.
- Optionally normalize the histogram.
- Concatenate (normalized) histograms of all cells. This gives a feature vector for the entire window.

The feature vector can now be processed using the Support vector machine, extreme learning machines, or some other machine-learning algorithm to classify images. Such classifiers can be used for face recognition or texture analysis.

3.2 SYSTEM ANALYSIS AND DESIGN

3.2.1 SYSTEM ANALYSIS:

3.2.1.1 HARDWARE REQUIREMENTS

1. RAM : 512 MB RAM
2. Hard Drive : 40 GB Hard Drive
3. Processor : Intel Core 2 Processor
4. camera module (Webcam)

3.2.1.2 SOFTWARE REQUIREMENTS

1. **Python 2.7.9** – Python is an interpreted high-level programming language for general-purpose programming. It provides highly efficient features of computer vision.
2. **OpenCV 3.0.0** - (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. Features will be extracted from detected faces using OpenCV.
3. **PyQt4** - PyQt is one of the two most popular Python bindings for the Qt cross-platform GUI/XML/SQL C++ framework.
4. **Pyinstaller** - PyInstaller is a program that freezes (packages) Python programs into stand alone executables, under Windows, Linux, Mac OS X, FreeBSD, Solaris and AIX.
5. **S/W Requirement for Web UI:** Html, Php, Bootstrap.
6. **Database**: MySQL, Xampp

3.2.2 DESIGN DETAILS :

3.2.2.1 Architecture:

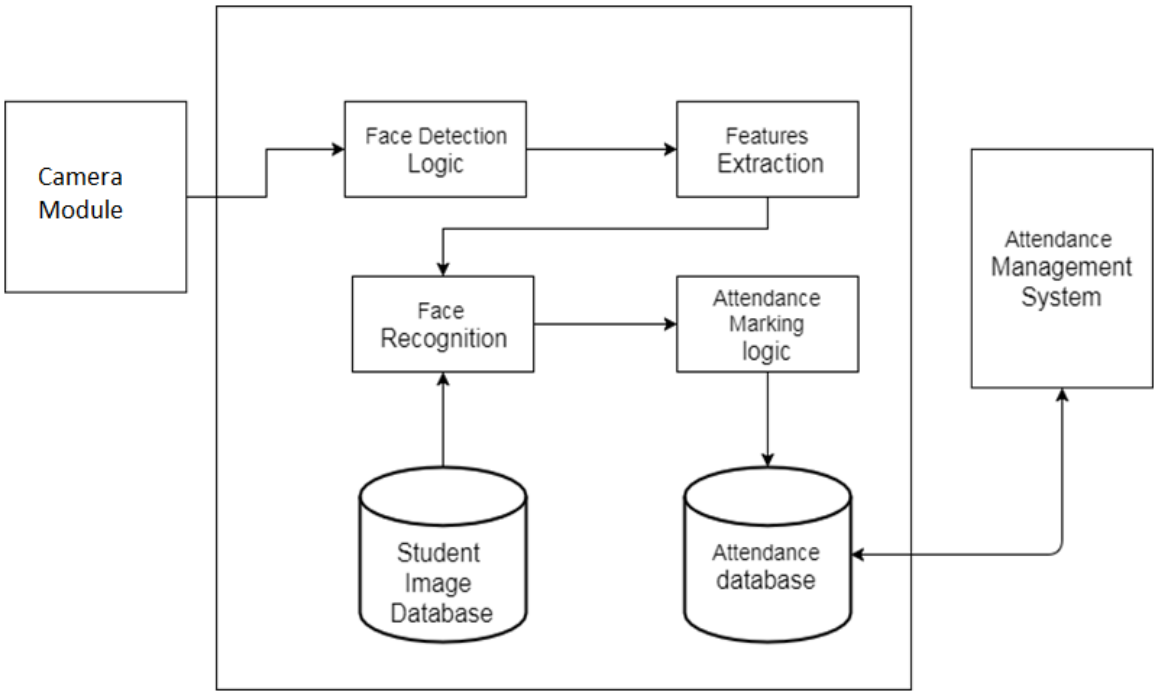


Fig.3.4. Architecture diagram

The system is divided into three modules:

1) **Hardware module (Camera Interface):**

   Camera module is placed at such position in classroom from where all students are clearly visible. Camera will record short temporary video, which will be processed by attendance marking module.

2) **Face detection and attendance marking module:**

   In this section, faces of students are detected and features are extracted from these faces. These features are compared with already existing features in database. According to the result of comparison attendance is marked.

3) **Attendance management module:**

   This module consists of user interface; through which user can actually see the records of student's attendance and can generate reports accordingly.

3.2.2.2 Usecase Diagram:

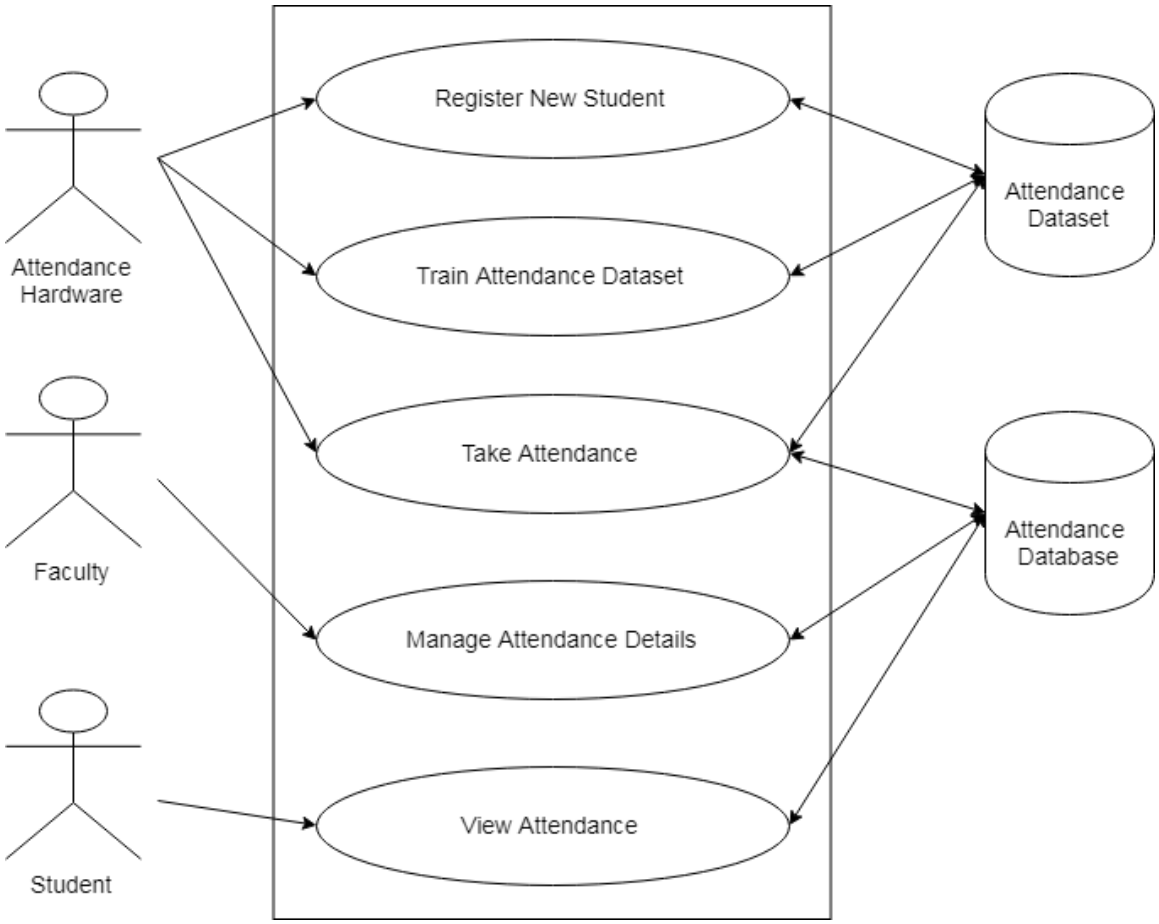


Fig 3.5 Usecase Diagram

3.2.2.3 DFD Diagram:

1. Level-0 DFD:

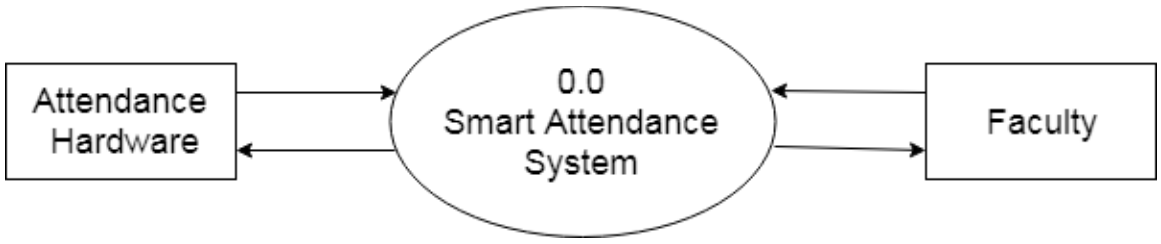


Fig 3.6 Level-0 DFD

2. Level-1 DFD:

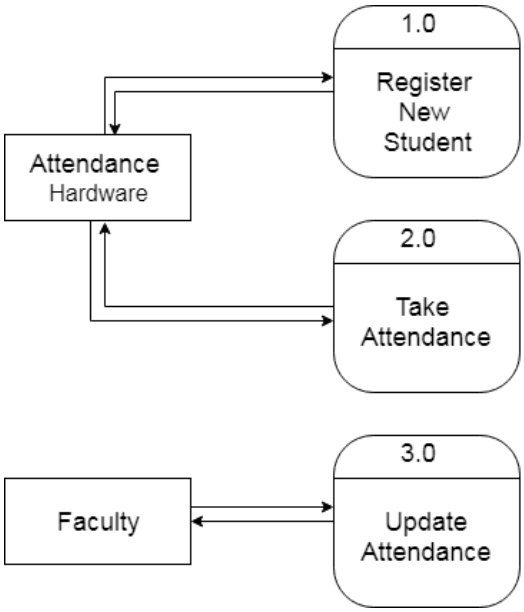


Fig 3.7 Level-1 DFD

3. Level-2 DFD:

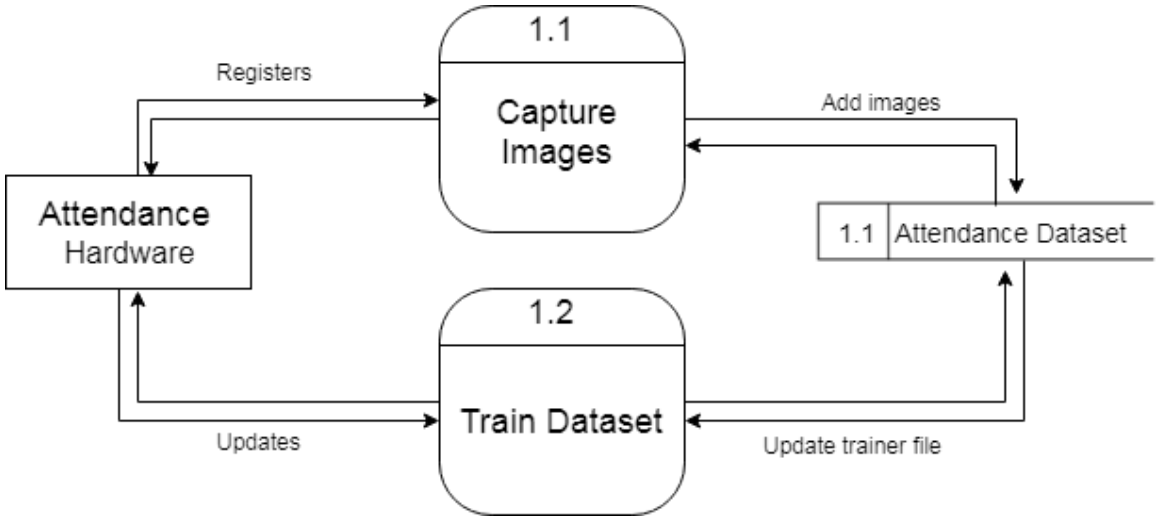


Fig 3.8 Register Student

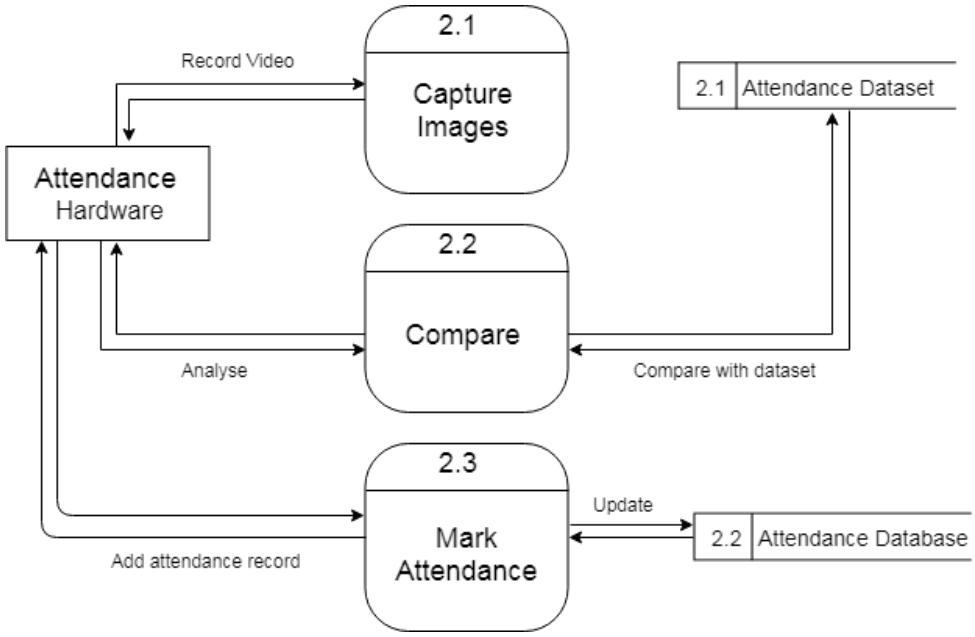


Fig 3.9 Take Attendance

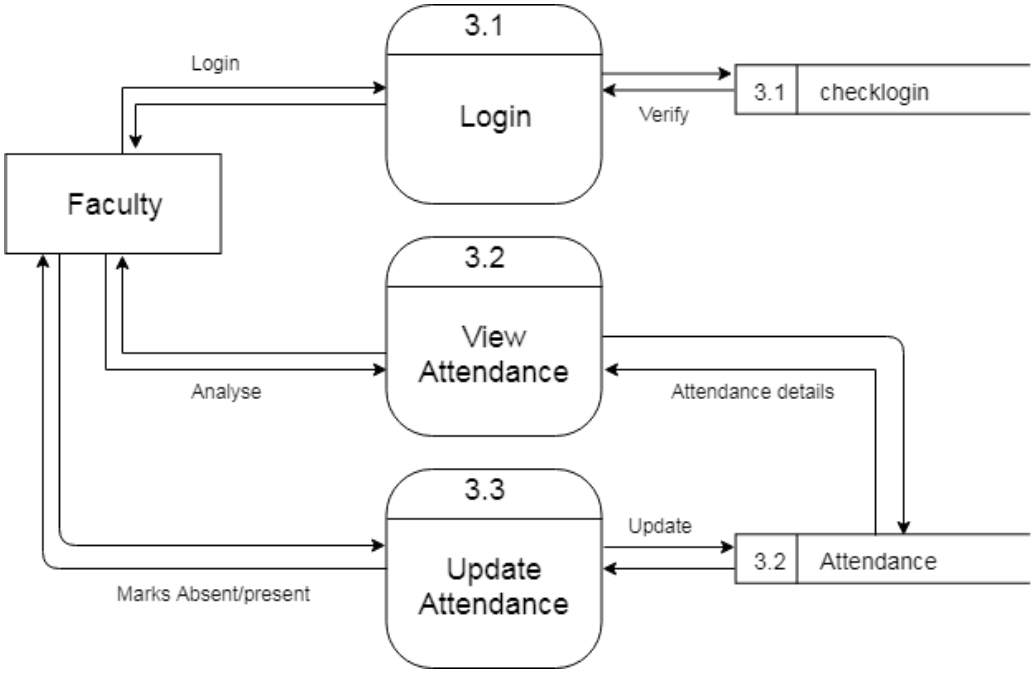


Fig 3.10 Update Attendance

3.2.2.4 Activity Diagram:

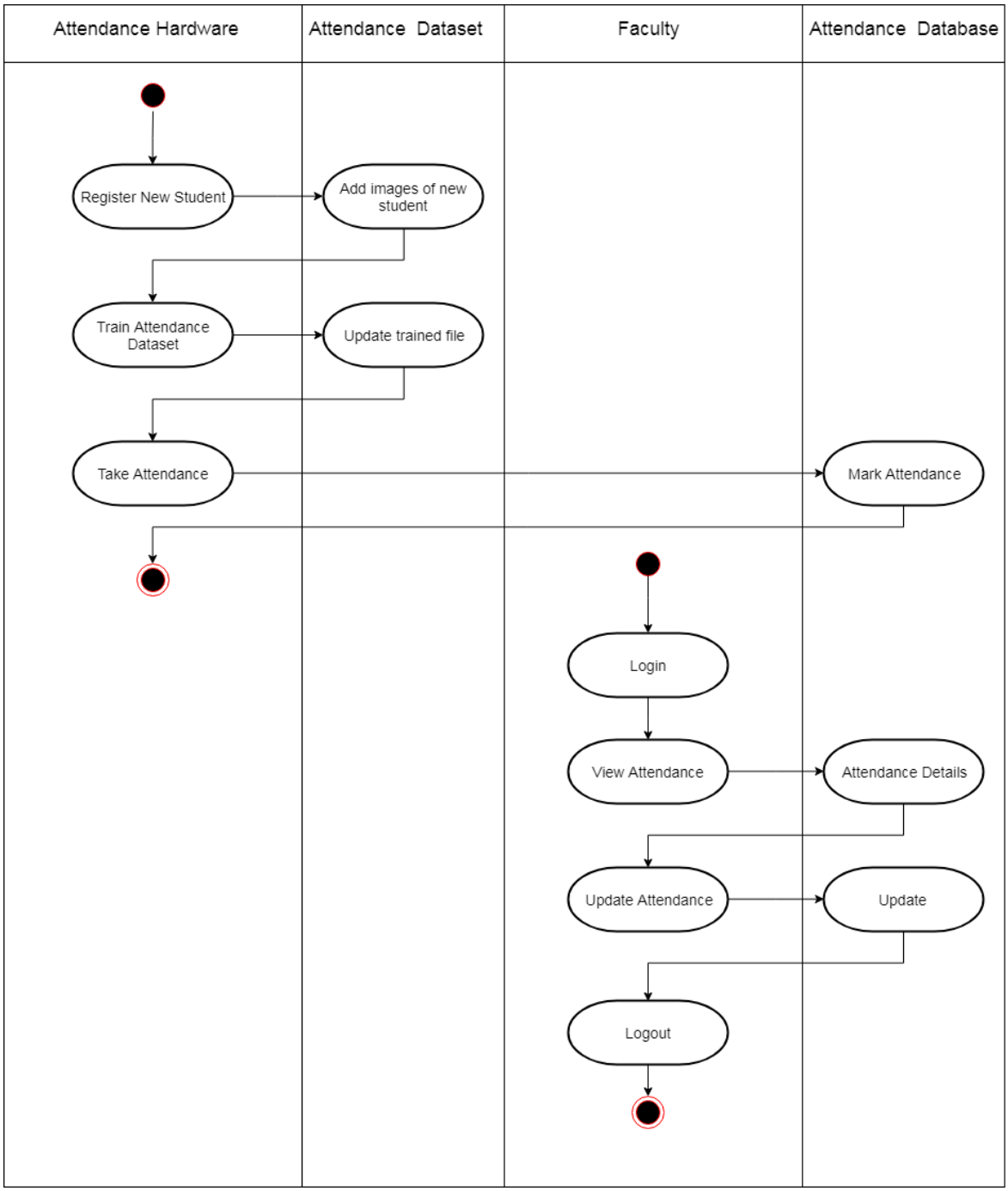


Fig 3.11 Activity Diagram

3.3 PROJECT TIMELINE

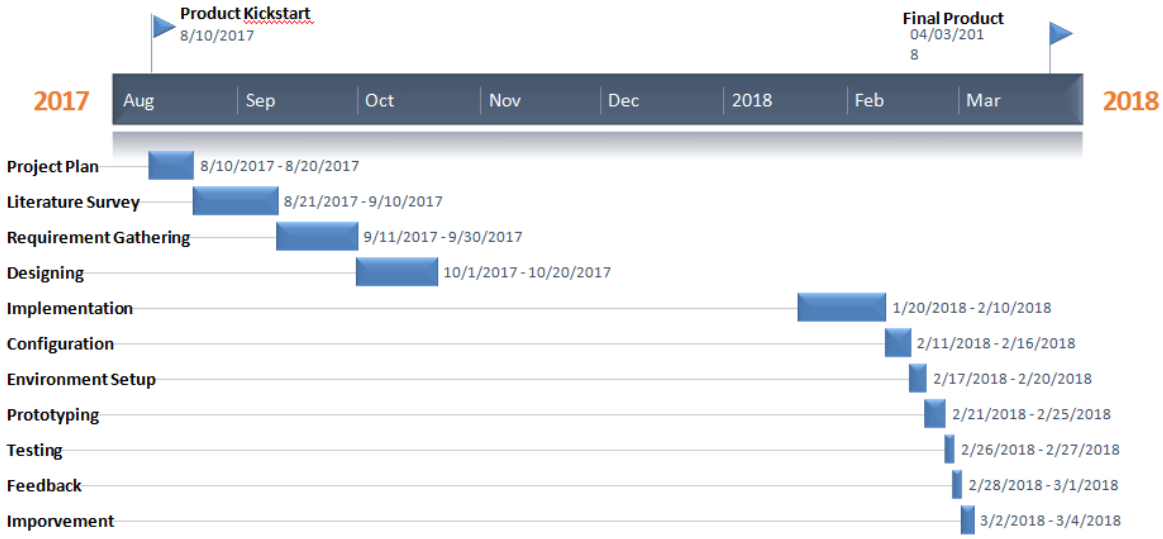


Fig 3.12 Project Timeline

CHAPTER 4

IMPLEMENTATION AND RESULTS

4.1 IMPLEMENATAION:

1. The student database is collected.
2. The database includes roll numbers of the students & their images.
3. Camera module connected with raspberry pi is placed at such position in classroom from where all students are clearly visible.
4. Camera will record short temporary video, which will be processed by raspberry pi.
5. Camera module will detect the faces of students using Haar Cascade features.
6. Features will be extracted from detected faces using OpenCV.
7. These features are compared with already existing features in database
8. According to the result of comparison attendance is marked.

4.2 RESULTS:

4.2.1. DATABASE FOR WEBSITE:

1. **Table 1(attendance)**

Field	Type	Null	Key	Default	Extra
id	int(10)	NO	PRI	*NULL*	auto_increment
rollno	int(10)	NO		*NULL*	
date	date	NO		*NULL*	
subject	varchar(10)	NO		*NULL*	
att	int(5)	NO		0	

2. **Table 2 (attendance_data)**

Field	Type	Null	Key	Default	Extra
rollno	int(11)	NO	PRI	*NULL*	
name	varchar(50)	YES		*NULL*	
dept	varchar(20)	NO		computer	

3. **Table 3 (checklogin)**

Field	Type	Null	Key	Default	Extra
id	int(10)	NO	PRI	*NULL*	auto_increment
fname	varchar(50)	NO		*NULL*	
username	varchar(20)	NO		*NULL*	
password	varchar(10)	NO		*NULL*	
subject	varchar(30)	NO		*NULL*	

4. **Example View (HMI)**

Field	Type	Null	Key	Default	Extra
id	int(10)	NO		0	
rollno	int(10)	NO		*NULL*	
date	date	NO		*NULL*	
att	int(5)	NO		0	

4.2.2. FACE FEATURES DATASET:

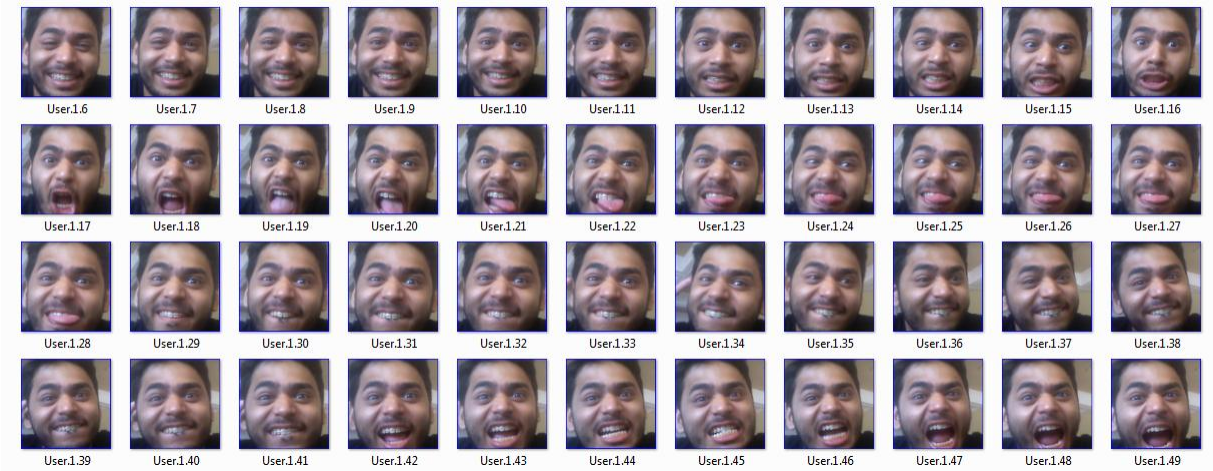


Fig 4.1: Face Dataset

4.2.3 .WORKING:

1.HOME:

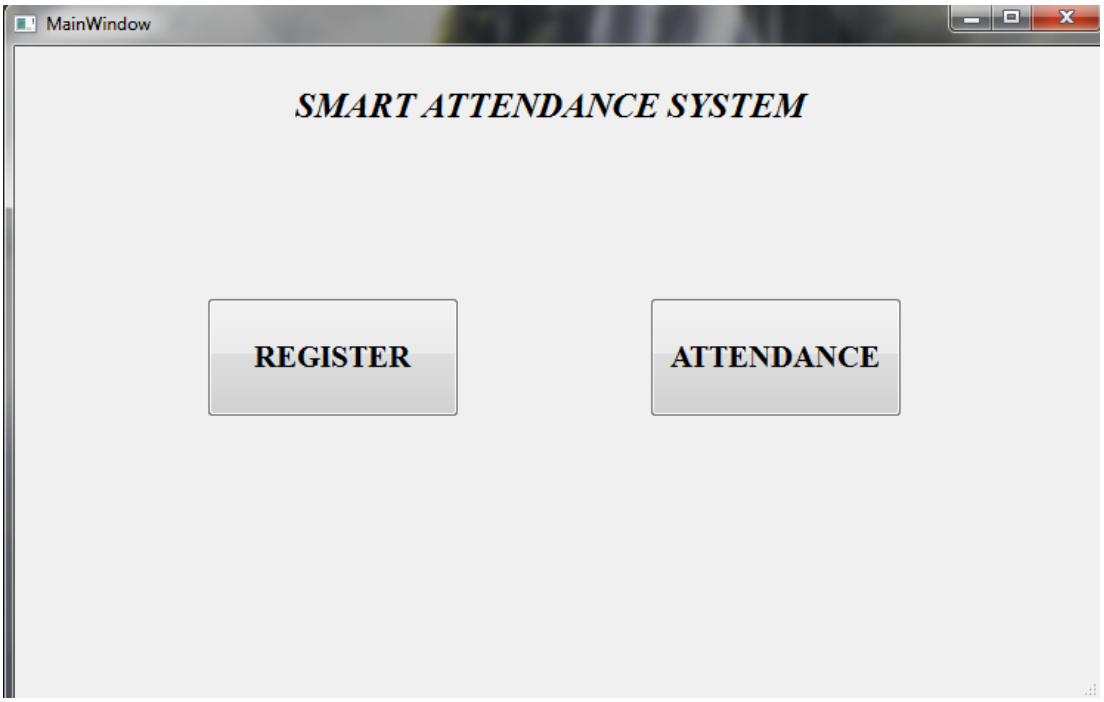


Fig 4.2. Home Window

2. REGISTER:

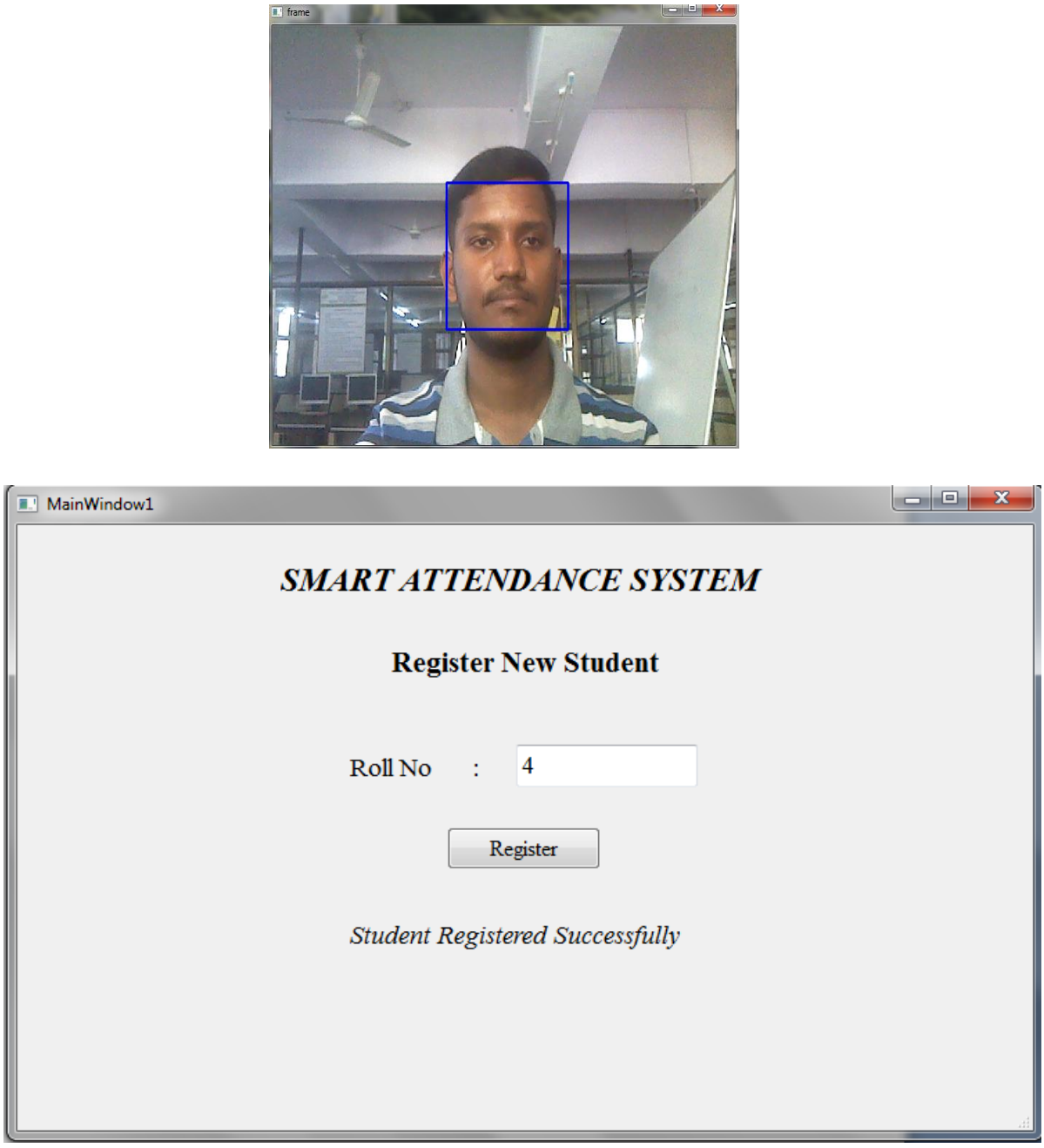
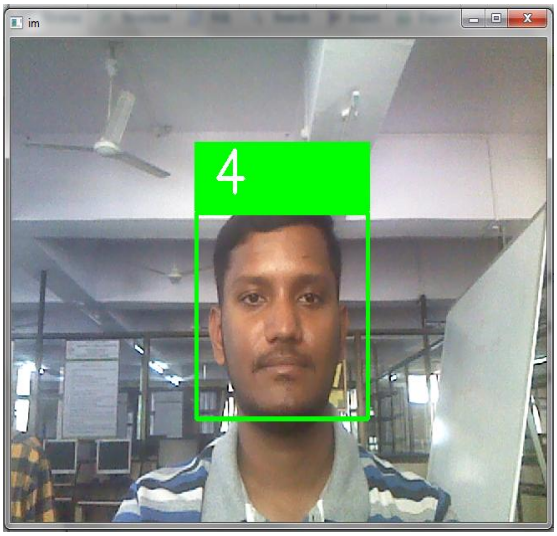


Fig 4.3. Register Window

3. TAKE ATTENDANCE:



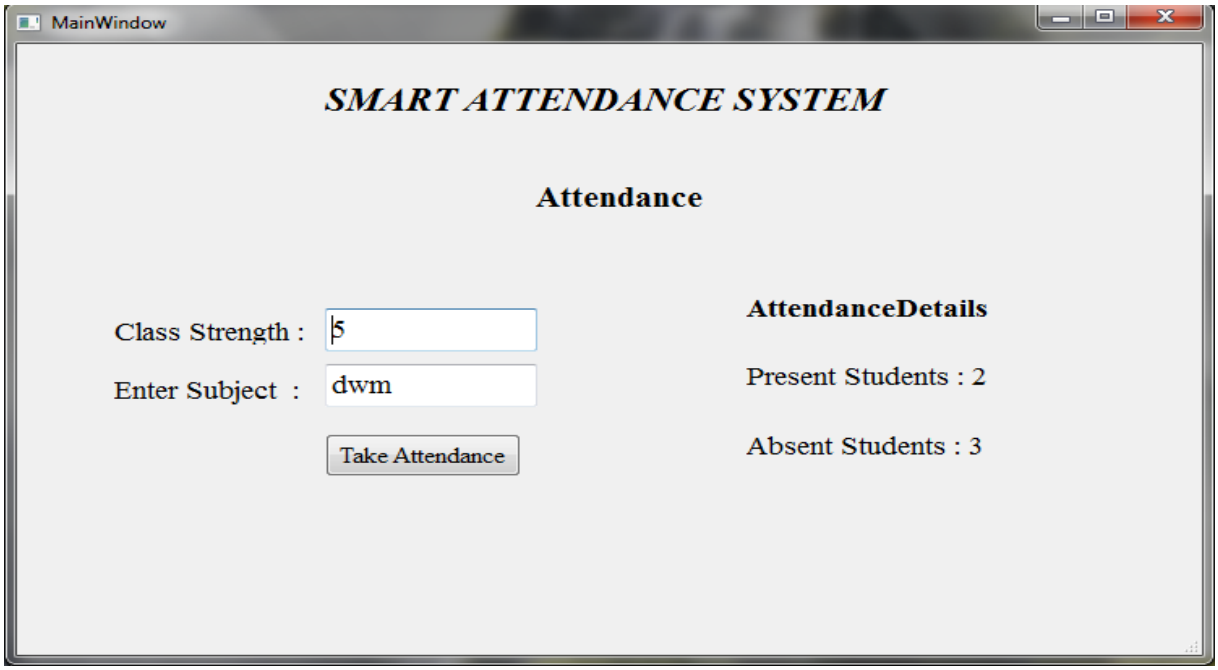


Fig 4.4. Attendance Window

4.2.4 WEB UI:

1. HOME :

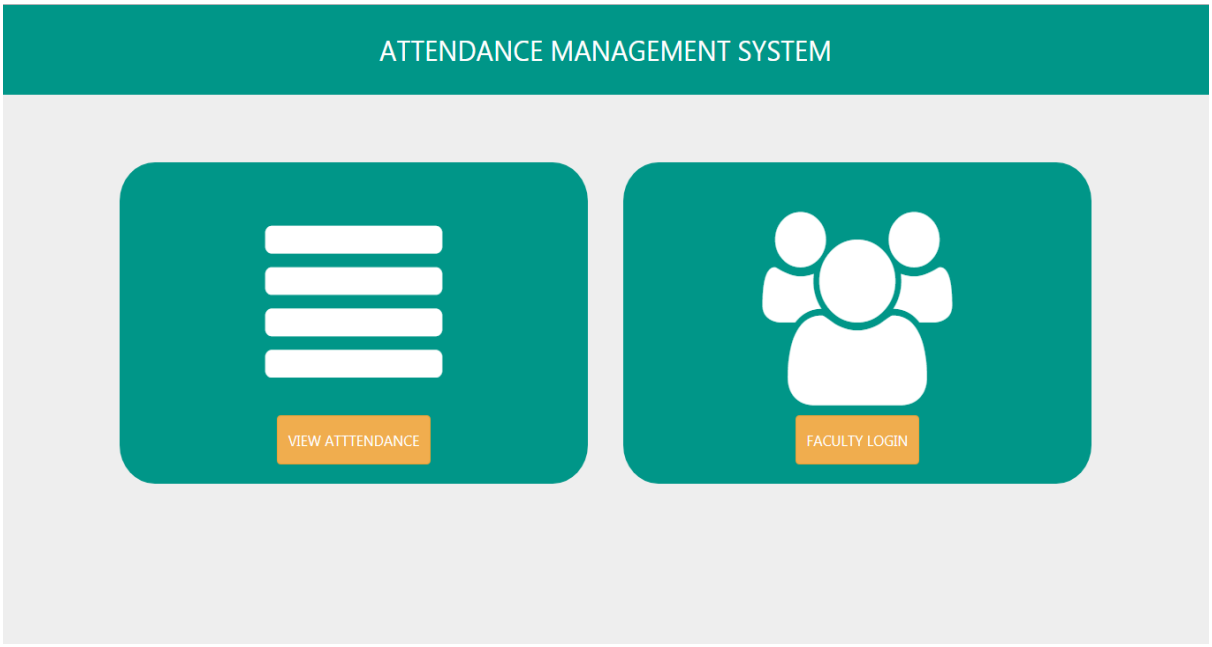


Fig 4.5. Home Page

2. VIEW ATTENDANCE DETAILS :

Human Machine Interaction

ROLL NO.	NO. LECTURES/TOTAL LECTURES	PERCENTAGE
1	1/1	100%
3	1/1	100%
4	1/1	100%

Parallel Distributed System

ROLL NO.	NO. LECTURES/TOTAL LECTURES	PERCENTAGE
1	1/1	100%
2	1/1	100%
4	1/1	100%
5	1/1	100%

Fig 4.6. View Attendance Page

3. UPDATE ATTENDANCE

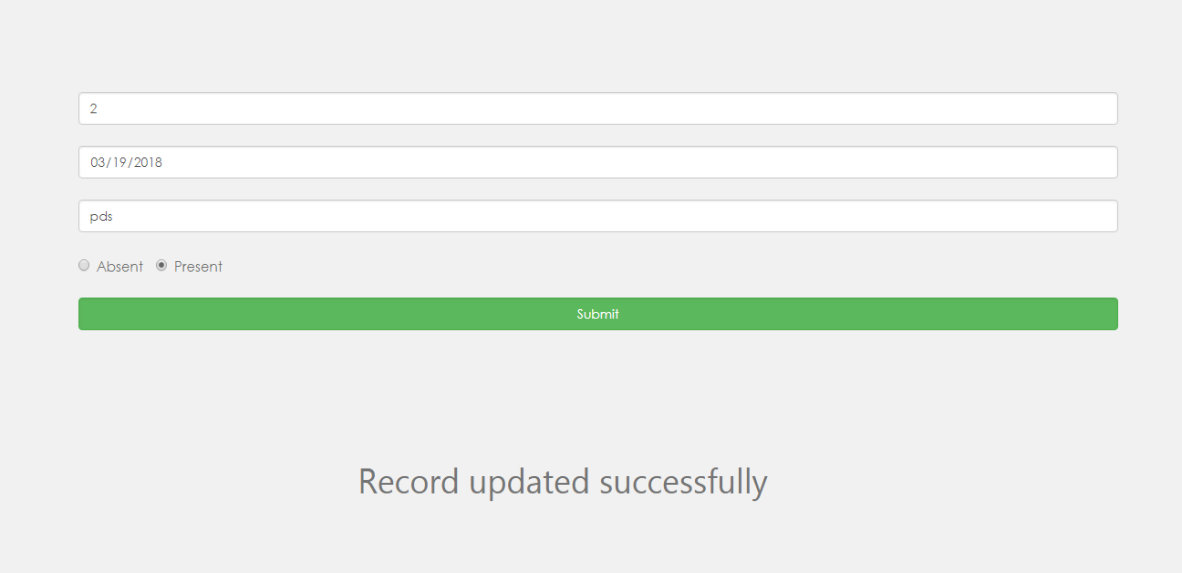


Fig 4.7 Update Attendance

CHAPTER 5
CONCLUSION

"A Smart Attendance System" is an attendance system for a lectures, system by which lecturer record student's attendance. It saves time and effort, especially if it is a lecture with huge number of students. This attendance system shows the use of facial recognition techniques for the purpose of student attendance and for the further process this record of student can be used to analyze attendance details. The system provides reliability and security to attendance information. It also provides better accessibility as the system can be accessed by authorized user from anywhere.

CHAPTER 6
FUTURE SCOPE

An android application can be developed so that the availability of the software could be increased. Instead of using the Webcam, the student's group photo could be uploaded to the Google drive via the android application and can be accessed globally. We can use the same system with some minor changes in the security sector to detect and recognize unauthorized entities. The system could be used in corporate sector so as to automatically mark the attendance of the employees and generate a payroll.

CHAPTER 7
REFERENCE

1) G. Lakshmi Priya, M. Pandimadevi, G. Ramu Priya, and P. Ramya, "Implementation of Attendance Management Systen using SMART-FR," Intenational Journal Of Advnce Research Computer And Communcation Engineering, vol. 3, issue 11, pp. 8532-8536, November 2014.

2) Aziza Ahmedi , 2Dr Suvarna Nandyal, "An Automatic Attendance System Using Image processing", The International Journal Of Engineering And Science (IJES), vol. 4, issue 11.

3) Chaoyang Zhang, Zhaoxian Zhou, Hua Sun, and Fan Dong, "Comparison of Three Face Recognition Algorithms", International Conference on Systems and Informatics (ICSAI 2012), IEEE, pp. 1896-1900.

4) Yohei Kawaguchi, Tetsuo Shoji, Weijane Lin, Koh Kakusho, And Michihiko Minoh, "Face Recognition-based Lecture Attendance System", IEEE Conference Publicaton.