

“Automated Real Time Face Recognition Based Attendance System”

**A Project Report Submitted to
Rajiv Gandhi Proudhyogiki Vishwavidyalaya**



**Towards Partial Fulfillment for the Award of
Bachelor of Engineering in *Information Technology***

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EXAMINER APPROVAL

The Project entitled "*Automated Real Time Face Recognition Based Attendance System*" submitted by Naman Jain (0827IT151068), Nitin Baghel (0827IT151076), Pranjal Soni (0827IT151082), Roshan Mahajan (0827IT151090), Sachin Patidar (0827IT151093) has been examined and is hereby approved towards partial fulfillment for the award of *Bachelor of Engineering degree in Information Technology* discipline, for which it has been submitted. It understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein, but approve the project only for the purpose for which it has been submitted.

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GUIDE RECOMMENDATION

This is to certify that the work embodied in this project entitled “***Automated Real Time Face Recognition Based Attendance System***” submitted by **Naman Jain (0827IT151068), Nitin Baghel (0827IT151076), Pranjal Soni (0827IT151082), Roshan Mahajan (0827IT151090), Sachin Patidar (0827IT151093)** is a satisfactory account of the bonafide work done under the supervision of ***Assistant Prof. Narendra Pal Singh***, is recommended towards partial fulfillment for the award of the Bachelor of Engineering (Information Technology) degree by Rajiv Gandhi Proudyogiki Vishwavidhyalaya, Bhopal.

(Project Guide)

(Project Coordinator)

STUDENTS UNDERTAKING

This is to certify that project entitled “***Automated Real Time Face Recognition Based Attendance System***” has developed by us under the supervision of ***Prof. Narendra Pal Singh***. The whole responsibility of work done in this project is ours. The sole intension of this work is only for practical learning and research.

We further declare that to the best of our knowledge, this report does not contain any part of any work which has been submitted for the award of any degree either in this University or in any other University / Deemed University without proper citation and if the same work found then we are liable for explanation to this.

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Executive Summary

Automated Real Time Face Recognition Based Attendance System

This project is submitted to Rajiv Gandhi Proudyogiki Vishwavidhyalaya, Bhopal (MP), India for partial fulfillment of Bachelor of Engineering in Information Technology branch under the sagacious guidance and vigilant supervision of ***Prof. Narendra Pal Singh.***

The project is based on Automation, the creation of technology and its application in order to control and monitor the production and delivery of various goods and services. It performs tasks that were previously performed by humans. Automation is being used in a number of areas such as manufacturing, transport, utilities, defense, facilities, operations and lately, information technology. Automation can be performed in many ways in various industries. For example, in the information technology domain, a software script can test a software product and produce a report. There are also various software tools available in the market which can generate code for an application. The purpose of this project is to implement Face Recognition Based Attendance System in real-time.

*“Far better is it to dare
mighty things, to win
glorious triumphs, even
though checkered by failure...
than to rank with those poor
spirits who neither enjoy nor
suffer much, because they
live in a gray twilight that
knows not victory nor
defeat.”*

- Theodore Roosevelt

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Chapter 1. Introduction

Introduction

The Project aims to automate the attendance marking process in an institution. Checking the performance of students and maintaining the attendance is a tedious process for institute. Each institute has adopted their own method of taking attendance i.e. calling the names or by passing the sheets. Several very popular automatic attendance systems currently in use are RFID (is an acronym for “radio-frequency identification” and refers to a technology whereby digital data encoded in RFID tags or smart labels are captured by a reader via radio waves), IRIS, FINGERPRINT etc. However, making queue is essential in these cases thus requires more time and it is intrusive in nature. Any damage to RFID card can make inappropriate attendance. Apart from this deploying these systems on large scale is not cost efficient. In order to have a system both time and cost efficient with no human intervention, facial recognition is the suitable solution also face is people's preliminary scheme of person identification. With the rapid development in the fields of image processing such as pattern recognition, facial recognition and signature recognition the efficiency of this system is keep on increasing. The system is attempting to provide an automated attendance system that carries out the face recognition task through an image stream to record the attendance in lectures or sections and keeping the database of attendance. After creating the database of the students/ candidates, it requires almost zero efforts from the user side. Thus, it makes the system effective.

1.1 Overview

Automated Real Time Face Recognition Based Attendance System aims to reduce the work of admin and making attendance marking process easy for him. It will be easy for the admin to maintain the data and can be accessed by him at any place any time. It also provides the secure system Face recognition is a biometric technique which involves determining if the image of the face of any given person matches any of the face images stored in a database. This problem is hard to solve automatically due to the changes that various factors, such as facial expression, aging and even lighting, can cause on the

image. Among the different biometric techniques facial recognition may not be the most reliable but it has several advantages over the others. It is widely used in various areas such as security and access control, forensic medicine, police controls and in attendance management system. The various techniques for marking attendance are:

- 1) Signature based System
- 2) Fingerprint based System
- 3) Iris Recognition
- 4) RFID based System
- 5) Face Recognition

1.2 Background and Motivation

According to the previous attendance management system, the accuracy of the data collected is the biggest issue. This is because the attendance might not be recorded personally by the original person, in another word, the attendance of a particular person can be taken by a third party without the realization of the institution which violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him/her to sign for the attendance which in fact student A didn't attend the class, but the system overlooked this matter due to no enforcement practiced. Supposing the institution establish enforcement, it might need to waste a lot of human resource and time which in turn will not be practical at all. Thus, all the recorded attendance in the previous system is not reliable for analysis usage. The second problem of the previous system is where it is too time consuming. Assuming the time taken for a student to sign his/her attendance on a 3-4 paged name list is approximately 1 minute. In 1 hour, only approximately 60 students can sign their attendance which is obviously inefficient and time consuming. The third issue is with the accessibility of that information by the legitimate concerned party. For an example, most of the parents are very concerned to track their child's actual Whereabouts to ensure their kid really attend the classes in college/school. However in the previous system, there are no ways for the parents to access such information. Therefore, evolution is needed to be done to the previous system to improve efficiency, data accuracy and provides accessibility to the information for those legitimate parties.

1.3 Problem Statement and Objectives

It is quite difficult to understand the problems as a whole so as to simplify it we have divided the entire problem in the sub problem which addressed are being in the project.

The Problems of existing system can be described as follows

1. It is cumbersome to maintain a huge set of records.
2. It is time Consuming. Error-prone.
3. It leads to wastage of Resources.

In order to solve the drawbacks of the previous system, the existing system will need to evolve. The proposed system will reduce the paper work where attendance will no longer involve any manual recording. The new system will also reduce the total time needed to do attendance recording. The new system will acquire individual attendance by means of facial-recognition to secure data accuracy of the attendance. The followings are the objectives of this project:

1. To develop a portable Smart Attendance System which is handy and self-powered.
2. To ensure the speed of the attendance recording process is faster than the previous system.
3. To create or generate a systematic ordered attendance sheet of the students in a compatible and précised format.
4. To able to recognize the face of an individual accurately based on the face database
5. Provide a user friendly web interface for admin to access the attendance database
6. Allow new students or staff to store their faces in the database by using a GUI.
7. Able to show an indication to the user whether the face- recognition process is successful or not.

1.4 Scope of the Project

The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to the institution. In this project, a smart device will be developed which is

capable of recognizing the identity of each individuals and eventually record down the data into a database system. Apart from that, a website will be developed to provide visual access to the information. The followings are the project scopes:

1. The targeted groups of the attendance monitoring system are the students and staff of an educational institution.
2. The database of the attendance management system can individual's information
3. The facial recognition process can only be done for 1 person at a time.



Fig.1.4.1

Fig 1.4.1 describes the process of automated attendance system in which image is captured for the identification and marking the attendance. As we can see in the fig1.4.1 the image is acquired properly.



Fig.1.4.2

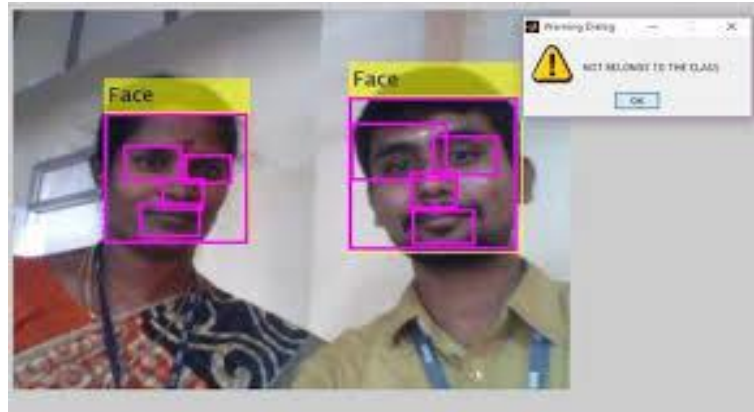


Fig.1.4.3

Fig1.4.2 and Fig1.4.3 describes that the multiple image can also be acquired by the system at a time. It will save the time of an individual for marking attendance. The process will be fast due to multiple detection of image by the system at a time.

1.5 Report Structure

The Automated Real Time Face Recognition Based Attendance System is primarily concerned with the Automation process in Institutes and whole project report is categorized into five chapters.

Chapter 1: Introduction - Introduction- introduces the background of the problem followed by rationale for the project undertaken. The chapter describes the objectives, scope and applications of the project.

Chapter 2: Review of Literature- explores the work done in the area of Project undertaken and discusses the limitations of existing system and highlights the issues and challenges of project area. The chapter finally ends up with the requirement identification for present project work based on findings drawn from reviewed literature and end user interactions.

Chapter 3: Proposed System starts with the project proposal based on requirement identified, followed by benefits of the project. The chapter also illustrate software engineering paradigm used along with different design representation. The chapter also includes diagram and details of major modules of the project. Chapter also gives insights of different type of feasibility study carried out for the project undertaken. Later it gives details of the different requirements for the developed project.

Chapter 4: Implementation - includes the details of different Technology/ Techniques/ Tools/ Programming Languages used in developing the Project. The chapter also includes the different user interface designed in project along with their functionality. Further it discusses the experiment results along with testing of the project. The chapter ends with evaluation of project on different parameters like accuracy and efficiency.

Chapter 5: Conclusion - Concludes with objective wise analysis of results and limitation of present work which is then followed by suggestions and recommendations for further improvement.

Chapter 2. Review of Literature

Review of Literature

There were many approaches used for dealing with disparity in images subject to illumination changes and these approaches were implemented in object recognition systems and also by systems that were specific to faces. A method for dealing with such variations was using gray-level information to extract a face or an object from shading approach. The main reason why gray scale representations are used for extracting descriptors instead of operating on color images directly is that gray scale simplifies the algorithm and reduces computational requirements. Here in our case, color is of limited benefit and introducing unnecessary information could increase the amount of training data required to achieve good performance. Being an ill-posed problem, these proposed solutions assumed either the object shape and reflectance properties or the illumination conditions. These assumptions made are too strict for general object recognition and therefore it didn't prove to be sufficient for face recognition. The second approach is the edge map of the image which is a useful object representation feature that is insensitive to illumination changes to certain extent. Edge images could be used for recognition and to achieve similar accuracy as gray level pictures.

2.1 Preliminary Investigation

2.1.1 Current System

Traditional way of marking attendance involves a typical situation of students sitting in a classroom and the teacher calling out the names of the students individually to mark their attendance. The attendance is usually marked using hard resources - pen and paper. The huge attendance records that maintained are then used for later references.

2.2 Limitations of Current System

As Traditional way of marking the attendance is done manually and it also takes a lot of time in the process. It is also not secure enough as total count may differ from the actual one. So here we mention some limitation of current attendance system

1. It is cumbersome to maintain a huge set of records

2. It is time Consuming.
3. Error-prone.
4. Its leads to wastage of Resources.

2.3 Requirement Identification and Analysis for Project

Traditionally attendance was taken manually which is very time consuming and often leads to human error. Additionally, there are many uncertainties towards the sources of the attendance records which in fact, most of the attendance records are not retrieved from the actual situation. The old method that uses paper sheets for taking student's attendance can no longer be used. Based on the research, there are many solutions that are available to solve this issue.

According to research journal "Attendance System Using NFC Technology with Embedded Camera on Mobile Device" (Bhise, Khichi, Korde, Lokare, 2015). The attendance system is improved by using Near Field Communication (NFC) technology and mobile application. According to the research paper, each student is given a NFC tag that has a unique ID during their enrolment into the college. Attendance of each class will then be taken by touching or moving these tags on the lecturer mobile phone. The embedded camera on the phone will then capture the student's face to send all the data to the college server to do validation and verification. The advantages of this method are where the NFC is simple to use, and the speed of connection establishment is very high. It indeed speeds up the attendance taking process a lot. However, this system couldn't automatically spot the violation when the NFC tag is not personally tagged by the original owner. Apart from that, the convenience of the system which uses the mobile phone as the NFC reader was actually an inconvenience to the lecturer. Imagine if the lecturer had forgotten to bring their mobile phones to work, what would be the backup procedure for the attendance to be recorded? Moreover, most of the lecturer will not likely to prefer their personal smart phones to be used in this way due to privacy matter. Hence, unique information about the student like biometrics or face recognition, which is genuine for a student should be used in replacement of the NFC tag. This will ensure attendance to be taken originally by the actual student.

The second research journals "Face Recognition Based Attendance Marking System" (Senthamil Selvi, Chitrakala, Antony Jenitha, 2014) is based on the identification of

face recognition to solve the previous attendance system's issues. This system uses camera to capture the images of the employee to do face detection and recognition. The captured image is compared one by one with the face database to search for the worker's face where attendance will be marked when a result is found in the face database. The main advantage of 7 BCS (HONS) Computer Engineering Faculty of Information and Communication Technology (Perak Campus), UTAR this system is where attendance is marked on the server which is highly secure where no one can mark the attendance of other. Moreover, in this proposed system, the face detection algorithm is improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are invested in the accuracy of the face detection algorithm, the system is yet not portable. This system requires a standalone computer which will need a constant power supply that makes it not portable. This type of system is only suitable for marking staff's attendance as they only need to report their presence once a day, unlike students which require to report their attendance at every class on a particular day, it will be inconvenient if the attendance marking system is not portable. Thus, to solve this issue, the whole attendance management system can be developed on an embedded design so that it can be work similarly with just batteries that makes it portable.

The third research journal "Fingerprint Based Attendance System Using Microcontroller and LabView" (Kumar Yadav, Singh, Pujari, Mishra, 2015) proposed a solution of using fingerprint to mark the attendance. This system is using 2 microcontrollers to deal with the fingerprint recognition process. Firstly, the fingerprint pattern will be obtained through a fingerprint sensor, and then the information will be transmitted to microcontroller 1. Next microcontroller 1 will pass the information to microcontroller 2 to do the checking with the database that resides in it. After finding a student's match, the details are sent to the PC through serial communication to be displayed. This design is good as it accelerates development while maintaining design flexibility and simplifies testing. But again, this system is attached to a PC which makes it not portable. Other than that, the database information cannot be accessible easily. Meaning that, for the parents whom are interested in knowing their child's attendance cannot easily or conveniently access the information. Therefore, to provide accessibility of the student's information to the legitimate concerned party, the information can be uploaded to a web server for easy access. While the authentication for the appropriate access can be enforced through a login screen.

According to the forth research journal "RFID (is an acronym for "radio-frequency

identification” and refers to a technology whereby digital data encoded in RFID tags or smart labels are captured by a reader via radio waves. RFID is similar to bar-coding in that data from a tag or label are

captured by a device that stores the data in a database. RFID, however, has several advantages over systems that use barcode asset tracking software. The most notable is that RFID tag data can be read outside the line-of-sight, whereas barcodes must be aligned with an optical scanner) based Student Attendance System” (Hussain, Dugar, Deka, Hannan, 2014), the proposed solution is almost similar to the first research journal where RFID technology is used to improve the older attendance system. In this system, a tag and a reader is again used as a method of tracking the attendance of the students. The difference between the first journals with this is where attendance’s information can be accessed through a web portal. It provides more convenient for information retrieval.

BCS (HONS) Computer Engineering Faculty of Information and Communication Technology (Perak Campus), UTAR Again, this system is imperfect in the sense that, firstly, it is not portable, as the RFID reader can only work when it is connected to a PC. Secondly, the RFID tag is not genuine information that can uniquely identify a student, thus, resulting in the inaccuracy of the collected attendance information.

2.3.1 Conclusion

This chapter reviews the literature surveys that have been done during the project work. The related work that has been proposed by many researchers has been discussed. The research papers related to Face Recognition Attendance System has been discussed here. In conclusion, a better attendance monitoring system should be developed based on its portability, accessibility and the accuracy of the collected attendance information

Chapter 3. Proposed System

Proposed System

3.1 The Proposal

Face recognition is the procedure of classifying one or more people in images or videos by examining and relating patterns. Procedures for face recognition characteristically extract facial features and compare them to a database to find the best match. Face recognition is an imperative part of several biometric, security, and observation systems, as well as image and video indexing systems. To solve the problems identified in the existing system, we provide the face recognition based attendance system for the students who attend a certain lecture, laboratory or exam at the specific time. Thus saving the time and effort thereby reducing the distractions and disturbances. Additional advantage is when concerning exams, when the lecturer accidentally loses the attendance report of students or when the student lies about specifying the average attendance for attending the exam, the system will have a record of the students attendance of every class thereby allowing the students for attending the exam at a particular instance of time, thus protecting both lecturer's and students' rights. In addition, an automated performance evaluation would provide more accurate and reliable results avoiding human error. This work, proposes a system that takes the attendance for the students in a classroom. The system takes the attendance automatically using face recognition. However, it is difficult to estimate the attendance accurately using each result of face recognition independently because the face detection rate is not sufficiently high. The system proposes a method for estimating the attendance exactly using all the results of face recognition obtained. Endless surveillance improves the performance for the estimation of the attendance. We constructed the attendance system based on face recognition, and applied the system to classroom. This system relates the works in the field of attendance management and face recognition.

3.1 Benefits of the Proposed System

There can be many benefits of using Automated Real Time Face Recognition Based Attendance System. Some of them are mentioned here:-

1. Reduce paper work – The proposed system aims to reduce the paperwork for the admin.
2. Duplication of data entry can reduce-With the new system there cannot be duplication of data as it provides more security.
3. No need to maintain paper records-The proposed system reduces paperwork by providing

efficient system to maintain records.

4. Fast and readily available attendance-The system is fast and makes attendance marking process easy.

5. It saves their time and efforts-The system saves time and efforts as the attendance is marked by individual rather than one person.

6. The system is convenient and secure for the users-The system provides access to authorized user only who can check and maintain data thus making it more secure.

3.3 Diagrams

ER Diagram: - An entity relationship diagram (ERD), also known as an entity relationship model, is a graphical representation of an information system that depicts the relationships among people, objects, places, concepts or events within that system.

Entity 1-Student,

Attributes of entity Student-class ,studentid,name, subject,dept

Entity 2 –Detector,

Attributes of entity Detector-image no,face id

The diagram mentioned below (fig3.3.1) describes the entity relationship between two entities student and detector. The figure shows the graphical representation of automated real time face recognition based attendance system and describes how the attendance marking process is being carried out in the system.

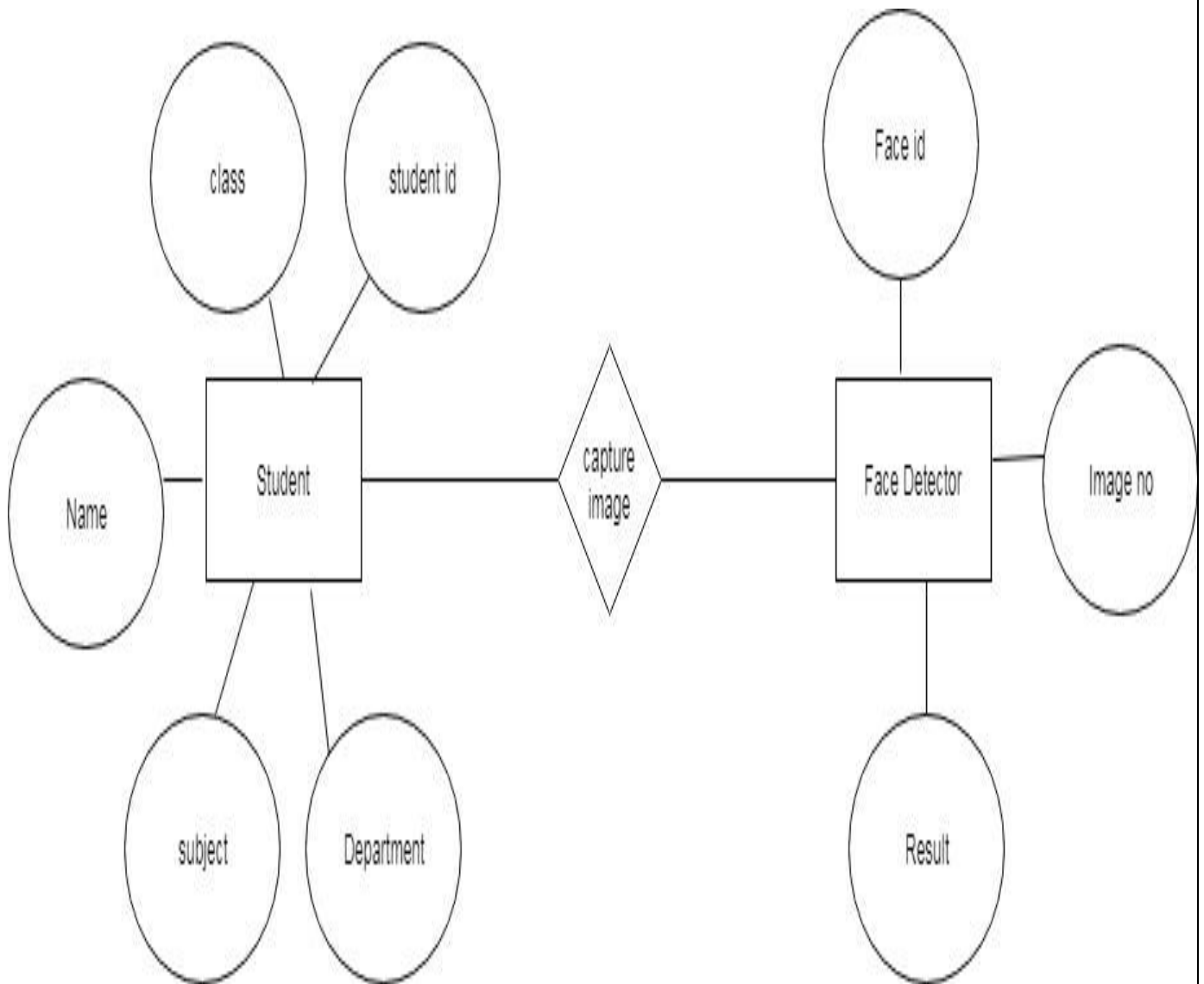


Fig.3.3.1

Class Diagram: - A class diagram is an illustration of the relationships and source code dependencies among classes in the Unified Modeling Language (UML). In this context, a class defines the methods and variables in an object, which is a specific entity in a program or the unit of code representing that entity.

Classes –Student,Detector,Dataset

Objects-Name,deptid,class,subject,image no,face id,

The Diagram mentioned below(fig3.3.2) describes the class diagram in which there are three classes and the objects in the classes are also mentioned below.

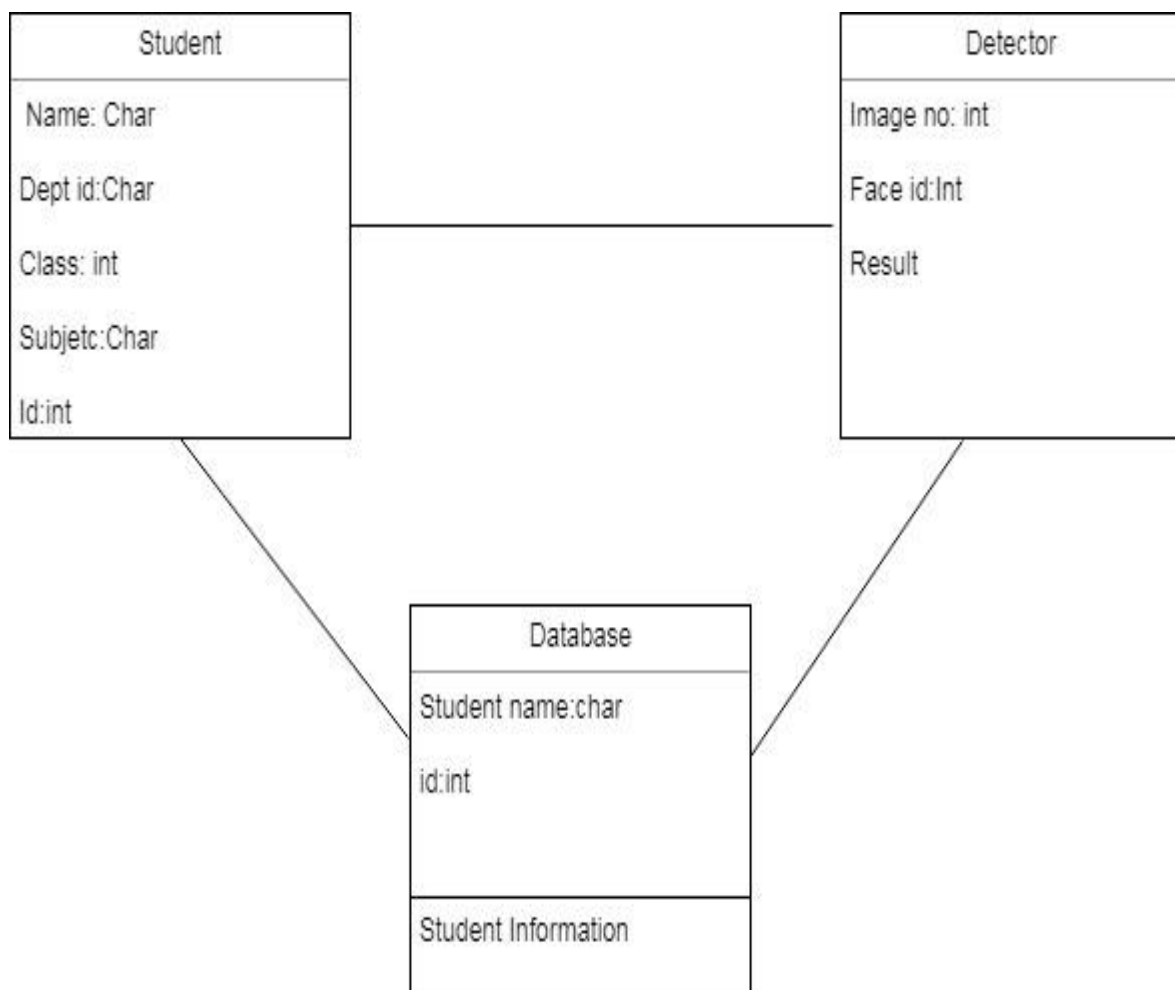


Fig.3.3.2

Use Case Diagram: - A use case diagram is a graphic depiction of the interactions among the elements of a system. A use case is a methodology used in system analysis to identify, clarify, and organize system requirements.

The diagram mentioned below (fig3.3.3) describes the use of the system and describes the interaction between the admin and student.

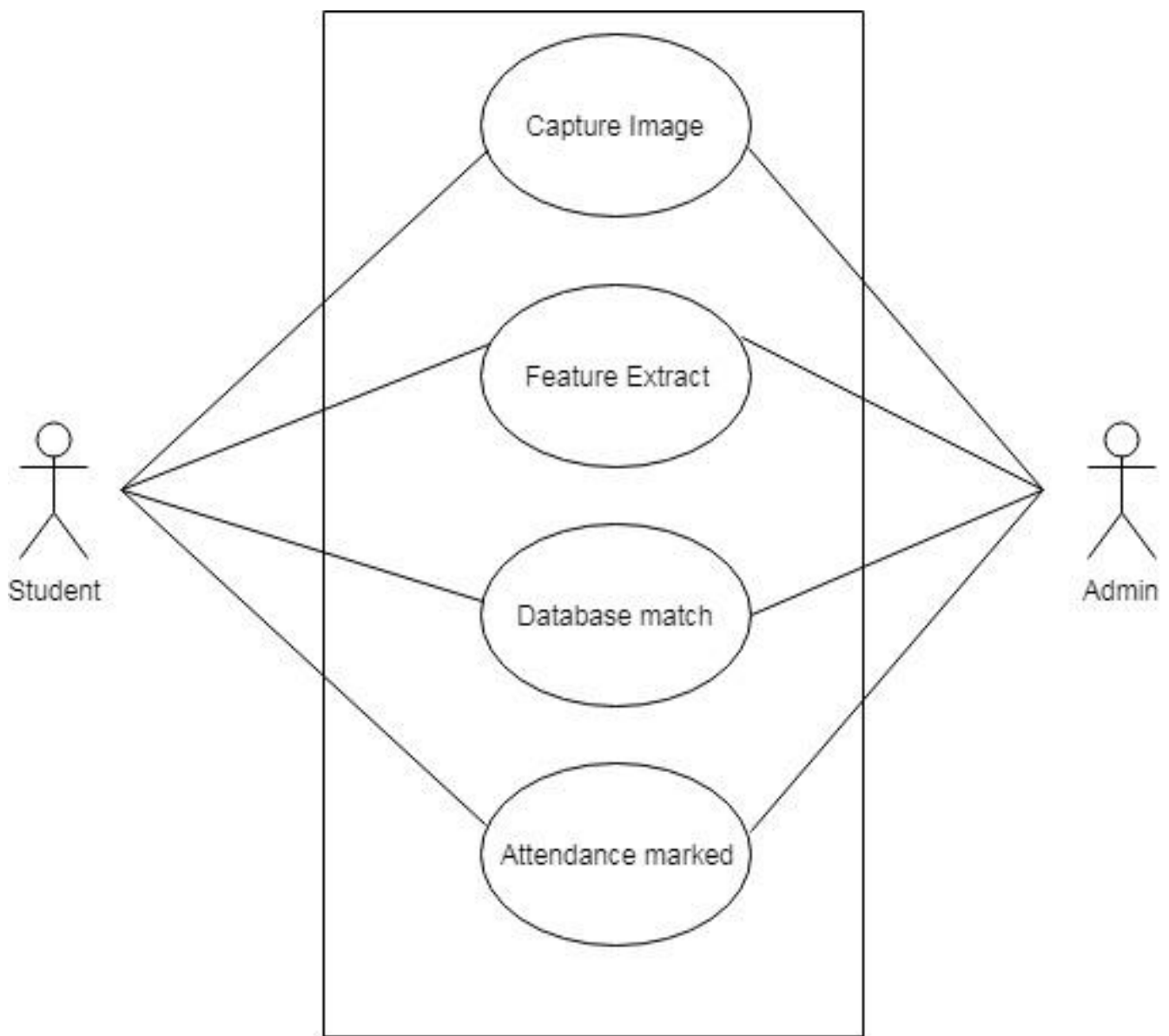


Fig.3.3.3

Activity Diagram: - An activity diagram is used to model a large activity's sequential work flow by focusing on action sequences and respective action initiating conditions. The state of an activity relates to the performance of each workflow step.

The diagram mentioned below (fig3.3.4) describes how the activity is performed in the system from start to stop.

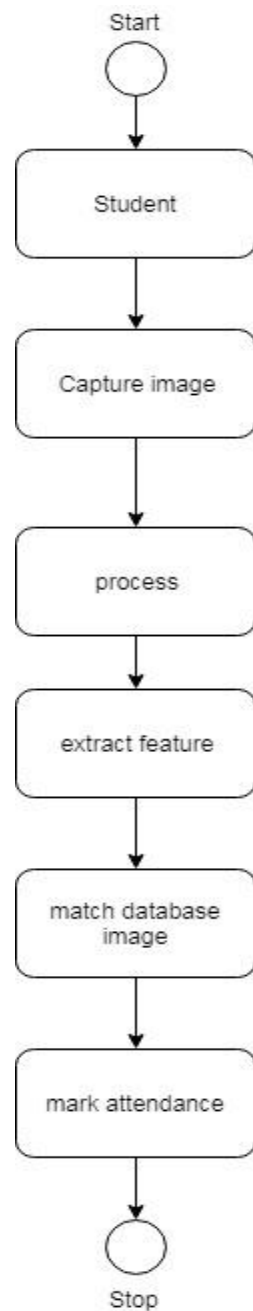


Fig3.3.4

Sequence Diagram: - A sequence diagram, in the context of UML, represents object collaboration and is used to define event sequences between objects for a certain outcome. A sequence diagram is an essential component used in processes related to analysis, design and documentation.

The Sequence Diagram mentioned below (3.3.5) describes how the operation is carried out in the system for marking the attendance.

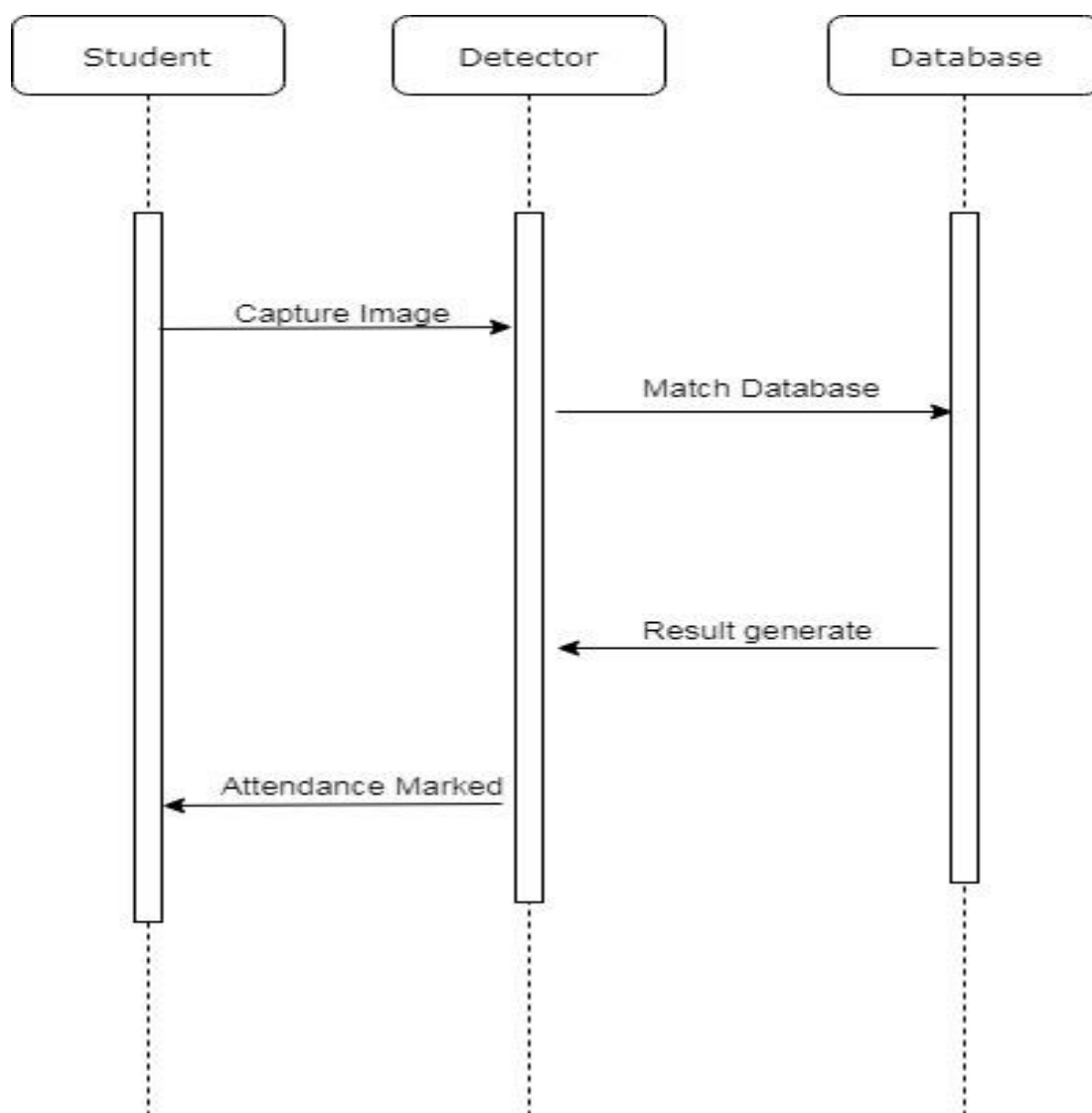


Fig3.3.5

3.4 Feasibility Study

A feasibility study is an analysis of how successfully a system can be implemented, accounting for factors that affect it such as economic, technical and operational factors to determine its potential positive and negative outcomes before investing a considerable amount of time and money into it. Feasibility study includes consideration of all possible ways to provide a solution to the given problem. The proposed solution should satisfy all the user requirements and should be flexible enough so that future changes can be easily done on the basis of upcoming requirements.

3.4.1 Technical

Technical feasibility is the process of validating the technology assumptions, architecture and design of a product or project. This includes the study of function, performance and constraints that may affect the ability to achieve acceptable systems. For this feasibility study, we studied complete functionality to be provided in the system and checked if everything was possible using frontend and backend platforms.

3.4.2 Economical

The purpose of an economic feasibility study (EFS) is to demonstrate the net benefit of a proposed project for accepting or disbursing electronic funds/benefits, taking into consideration the benefits and costs to the agency, other state agencies, and the general public as a whole. This is a very important aspect to be considered while developing a project. The technology was decided based on minimum possible cost factor. All the hardware and software costs have to be fulfilled by the institute. Overall we have estimated that the benefits the institute is going to receive from the proposed system will surely overcome the initial cost and later on the running cost for the system.

3.4.3 Operational

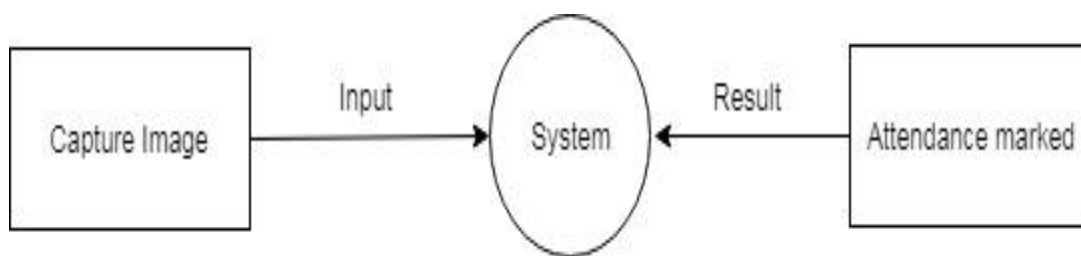
Operational feasibility refers to the measure of solving problems with the help of a new proposed system. It helps in taking advantage of the opportunities and fulfills the requirements as identified during the development of the project. The proposed system automates the attendance marking process making it more convenient and also saves time. It

takes care that the management and the users support the project No doubt the proposed system is full gui based that is user friendly. A proper training has to be conducted to let know the essence of the system to the users so that they feel comfortable with new system. As far our study is concerned the customer will be comfortable and happy with the system as system will save their lot of time.

3.5 Design Representation

3.5.1 Dataflow Diagram

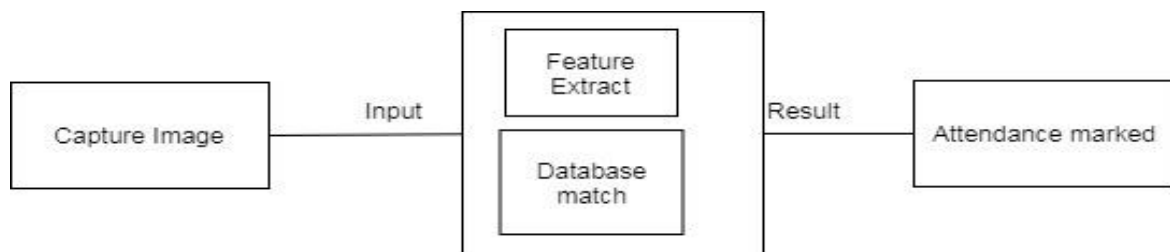
Data flow diagrams are used to graphically represent the flow of data in a business information system. DFD describes the processes that are involved in a system to transfer data from the input to the file storage and reports generation. Data flow diagrams can be divided into logical and physical. The logical data flow diagram describes flow of data through a system to perform certain functionality of a business. The physical data flow diagram describes the implementation of the logical data flow.



DFD LEVEL 0

Fig.3.5.1.1

The figure above (3.5.1.1) describes the first level dfd diagram which gives the basic idea how the process is carried out in the system.



DFD LEVEL 1

Fig.3.5.1.2

The figure above (3.5.1.2) is a level 2 dfd diagram which gives the deep knowledge of how the process is performed in the system.

3.6 Deployment requirements

There are various requirements (hardware, software and services) to successfully deploy the system. These are mentioned below:

3.6.1 Hardware

- Processor: Pentium –IV.
- Speed: 1.1 GHz.
- RAM: 512 MB(min).
- Hard Disk: 40 GB.
- Key Board: Standard Windows Keyboard.
- Mouse: Two or Three Button Mouse.
- Monitor

3.6.2 Software

- Operating system: Windows 7 or above operating system is required to complete the Automated Real Time Face Recognition Based Attendance System
- Coding Language: Python Language is used in this project
- Dataset-It is used to save the information captured by the system.

3.7 Conclusion

This chapter mentions the current system and its limitation and also describes the proposed system and its benefits over the current system. The diagrams are also mentioned to describe the proposed project effectively and the software and hardware requirement are also mentioned for the project.

Chapter 4. Implementation

Implementation

For resolving the problem of attendance in institution Face Recognition Attendance System is a system that is designed in such a way that it will automate the attendance process in institutes.

4.1 Technique Used

4.1.1 Automation:-

Automation is the creation of technology and its application in order to control and monitor the production and delivery of various goods and services. It performs tasks that were previously performed by humans. Automation is being used in a number of areas such as manufacturing, transport, utilities, defense, facilities, operations and lately, information technology.

Automation can be performed in many ways in various industries. For example, in the information technology domain, a software script can test a software product and produce a report. There are also various software tools available in the market which can generate code for an application. The users only need to configure the tool and define the process. In other industries, automation is greatly improving productivity, saving time and cutting costs.

Automation is evolving quickly and business intelligence in applications is a new form of high-quality automation. In the technology domain, the impact of automation is increasing rapidly, both in the software/hardware and machine layer. However, despite advances in automation, some manual intervention is always advised, even if the tool can perform most of the tasks.

Companies implementing process automation have a competitive advantage over their competitors, both in operability and reliability. Process automation reduces operative costs and increases both, speed and reliability of task implementation, development, and support. Enhances work continuity, and satisfies the demand for IT departments and computer systems. It improves strategic analysis and streamlines the deployment of applications through automated job execution. Eliminates manual execution of command sequences

subjected to human error, increasing efficiency and productivity of the organization. It enables visibility and control of all workflows and tasks, providing status reports of completed processes, in progress and incoming tasks. It supports both, local, virtual and hybrid environments in the Cloud, increasing the possibilities of management and process control.

4.2 Tools/Technology:-

4.2.1 Open CV

OpenCV supports a wide variety of programming languages such as C++, Python, Java, etc., and is available on different platforms including Windows, Linux, OS X, Android, and iOS. Interfaces for high-speed GPU operations based on CUDA and OpenCL are also under active development. OpenCV-Python is the Python API for OpenCV, combining the best qualities of the OpenCV C++ API and the Python language. OpenCV-Python is a library of Python bindings designed to solve computer vision problems. OpenCV introduces a new set of tutorials which will guide you through various functions available in OpenCV-Python.

4.2.2 Tensor Flow:-

Tensor Flow is a Python library for fast numerical computing created and released by Google. It is a foundation library that can be used to create Deep Learning models directly or by using wrapper libraries that simplify the process built on top of Tensor Flow. Tensor Flow is an open source library for fast numerical computing. It was created and is maintained by Google and released under the Apache 2.0 open source license. The API is nominally for the Python programming language, although there is access to the underlying C++ API. It can run on single CPU systems, GPUs as well as mobile devices and large scale distributed systems of hundreds of machines. Unlike other numerical libraries intended for use in Deep Learning like Theano, TensorFlow was designed for use both in research and development and in production systems.

4.2.3 Keras:-

Keras is an open-source neural-network library written in Python. It is capable of running on top of TensorFlow, Microsoft Cognitive Toolkit, Theano, or PlaidML.[1][2] Designed to

enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible. It was developed as part of the research effort of project ONEIROS (Open-ended Neuro-Electronic Intelligent Robot Operating System), and its primary author and maintainer is François Chollet, a Google engineer. Chollet also is the author of the Xception deep neural network model. Keras contains numerous implementations of commonly used neural-network building blocks such as layers, objectives, activation functions, optimizers, and a host of tools to make working with image and text data easier.

4.3 Language Used:-

Python

Python is an interpreted, object-oriented programming language similar to PERL, that has gained popularity because of its clear syntax and readability. Python is said to be relatively easy to learn and portable, meaning its statements can be interpreted in a number of operating systems, including UNIX-based systems, Mac OS, MS-DOS, OS/2, and various versions of Microsoft Windows 98. A notable feature of Python is its indenting of source statements to make the code easier to read. Python offers dynamic data type, ready-made class, and interfaces to many system calls and libraries. It can be extended, using the C or C++ language.

There are two attributes that make development time in Python faster than in other programming languages:

1. Python is an interpreted language, which precludes the need to compile code before executing a program because Python does the compilation in the background. Because Python is a high-level programming language, it abstracts many sophisticated details from the programming code. Python focuses so much on this abstraction that its code can be understood by most novice programmers.
2. Python code tends to be shorter than comparable codes. Although Python offers fast development times, it lags slightly in terms of execution time. Compared to fully compiling languages like C and C++, Python programs execute slower. Of course, with the processing speeds of computers these days, the speed differences are usually only observed in benchmarking tests, not in real-world operations. In most cases, Python is already included in Linux distributions and Mac OS X machines. Python can be used as the script in Microsoft's Active Server Page (ASP) technology. The scoreboard system for the Melbourne

(Australia) Cricket Ground is written in Python. Z Object Publishing Environment, a popular Web application server, is also written in the Python language.

4.4 Screenshots:-

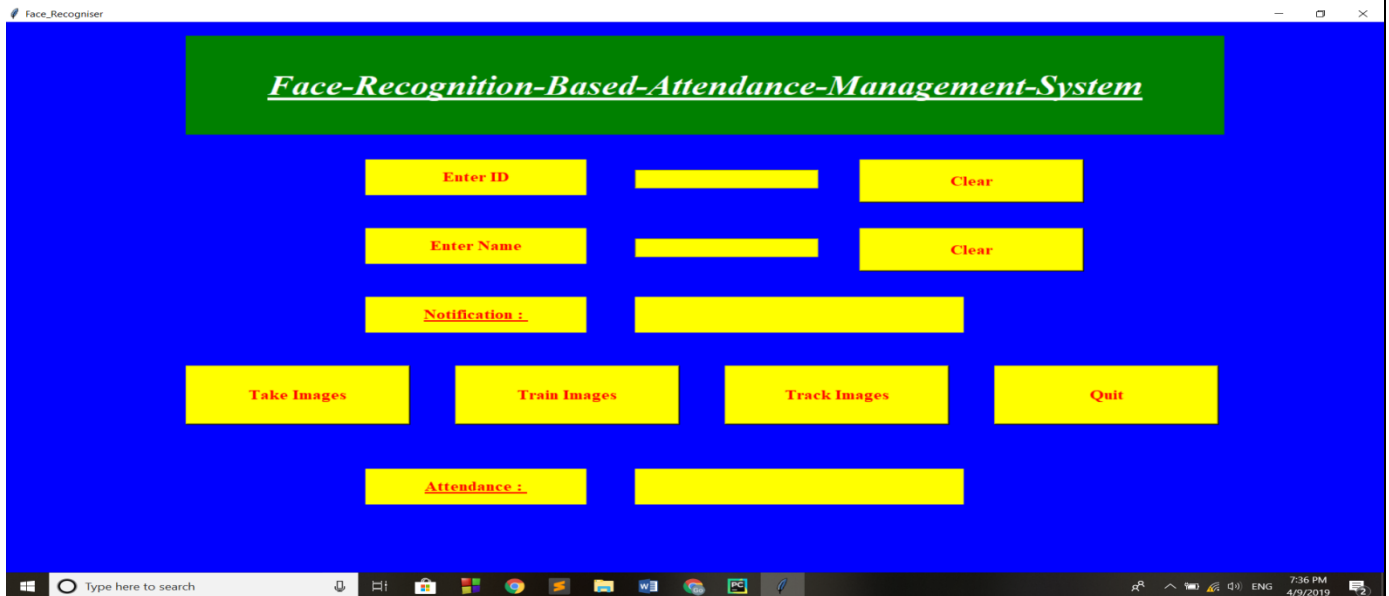


Fig 4.4.1



Fig 4.4.2



Fig 4.4.3

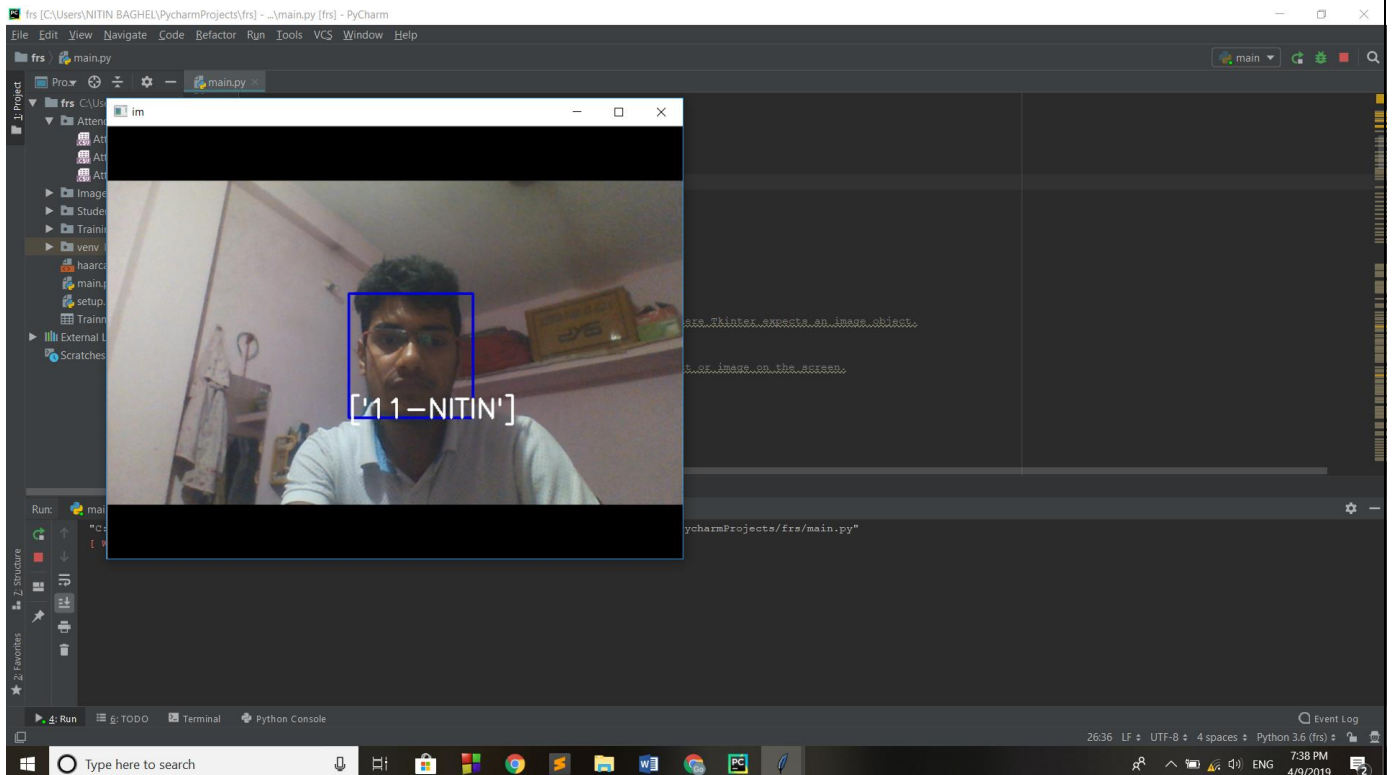


Fig4.4.4

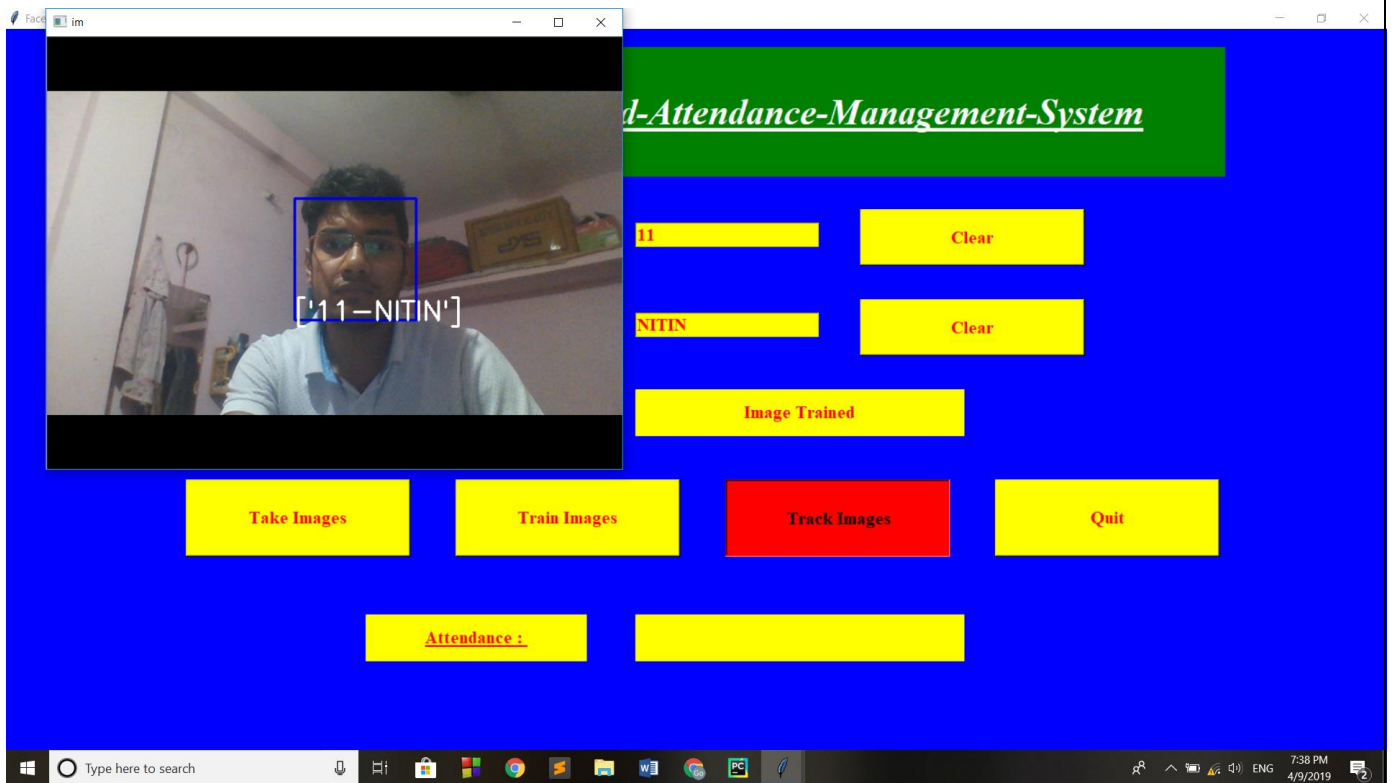


Fig4.4.5



Fig 4.4.6

Automated Real Time Face Recognition Based Attendance System

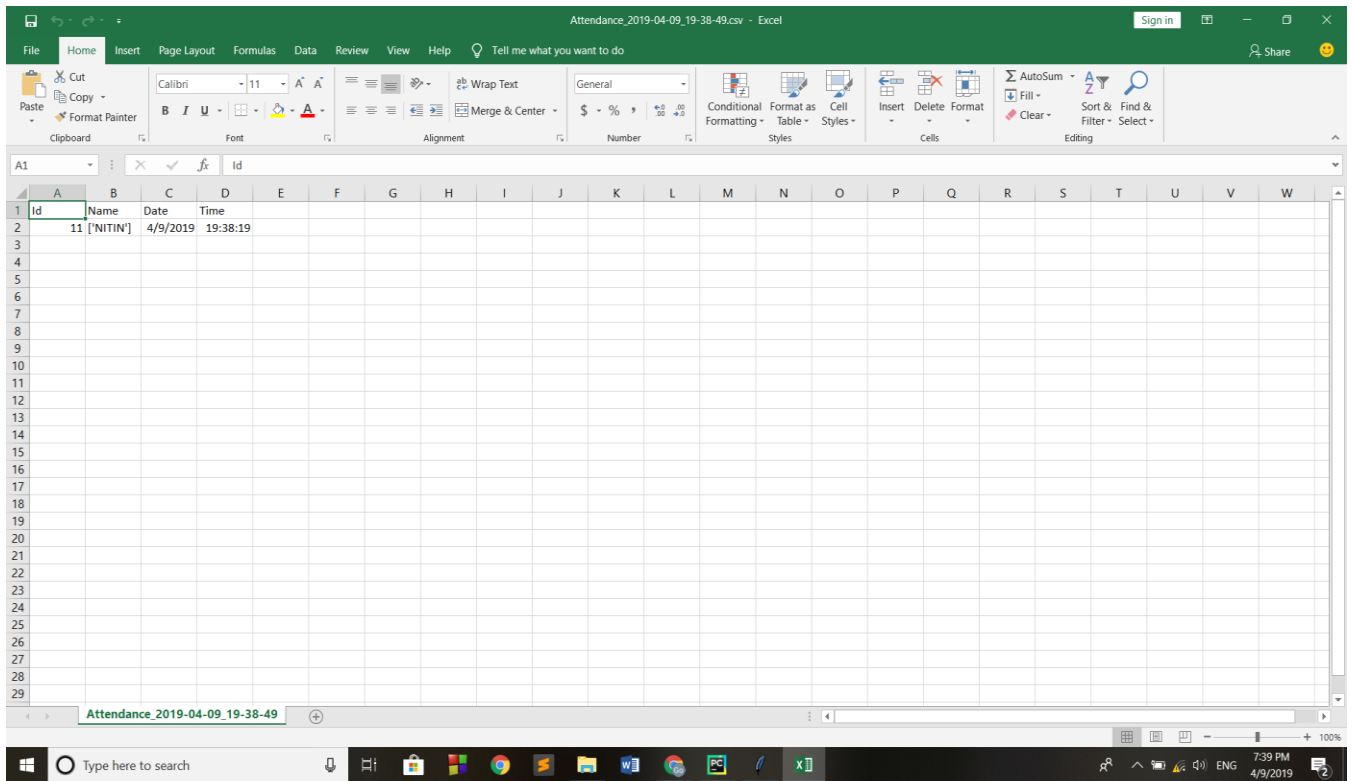


Fig4.4.7

4.5 Testing:-

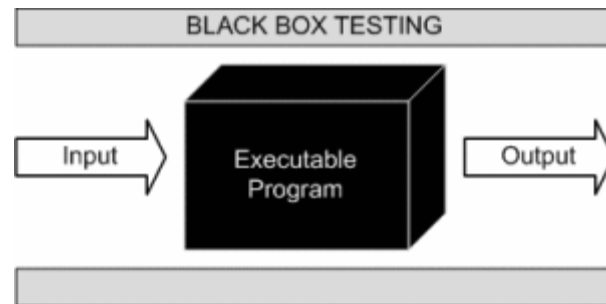
Testing is the process of evaluation of a system to detect differences between given input and expected output and also to assess the feature of the system. Testing assesses the quality of the product. It is a process that is done during the development process.

4.5.1 Strategy used:-

Tests can be conducted based on two approaches –

- 1.) Functionality testing
- 2.) Implementation testing

The testing method used here is Black Box Testing. BLACK BOX TESTING, also known as Behavioral Testing is a software testing method in which the internal structure/design/implementation of the item being tested is not known to the tester. These tests can be functional or non-functional, though usually functional.



This method is named so because the software program, in the eyes of the tester, is like a black box; inside which one cannot see. This method attempts to find errors in the following categories:

1. Incorrect or missing functions
 2. Interface errors
 3. Errors in data structures or external database access
 4. Behavior or performance errors
 5. Initialization and termination errors
- It is carried out to test functionality of the program. It is also called 'Behavioral' testing. The tester in this case, has a set of input values and respective desired results.

4.5.2 Test Cases and Analysis:-

A Test Case is a set of actions executed to verify a particular feature or functionality of your software application. A test case is a single executable test which a tester carries out. It guides them through the steps of the test. You can think of a test case as a set of step-by-step instructions to verify something behaves as it is required to behave.

Test case 1:-

Table 1: Test case here is used to ensure the image is properly acquired by the system.

Test case summary	To detect image properly.
Test procedure	Show your face to camera

Automated Real Time Face Recognition Based Attendance System

Expected result	The image is acquired properly.
-----------------	---------------------------------

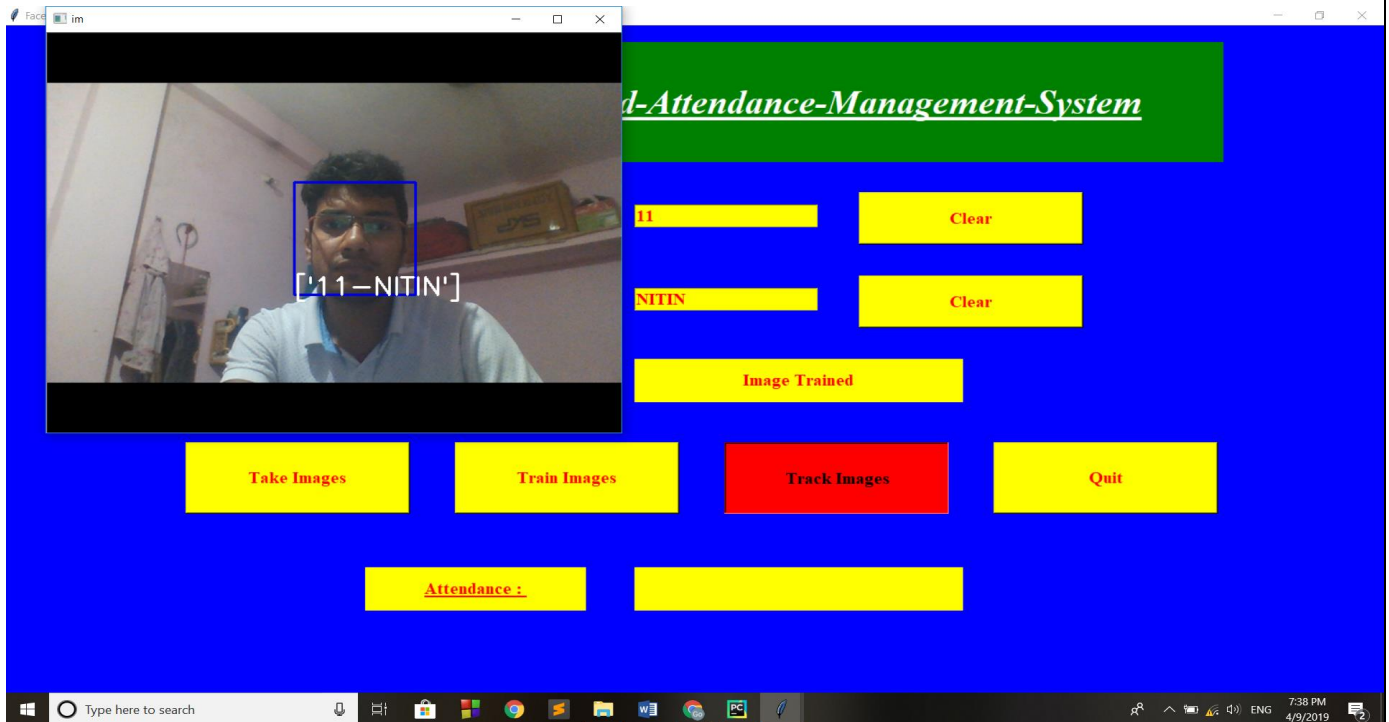


Fig 4.5.2.1

Test case 2:-

Table 2:- Test case here is used to ensure that the information is generated as provided.

Test case summary	To ensure attendance information is generated.
Test procedure	Enter Student Details.
Expected result	The information is generated as provided.

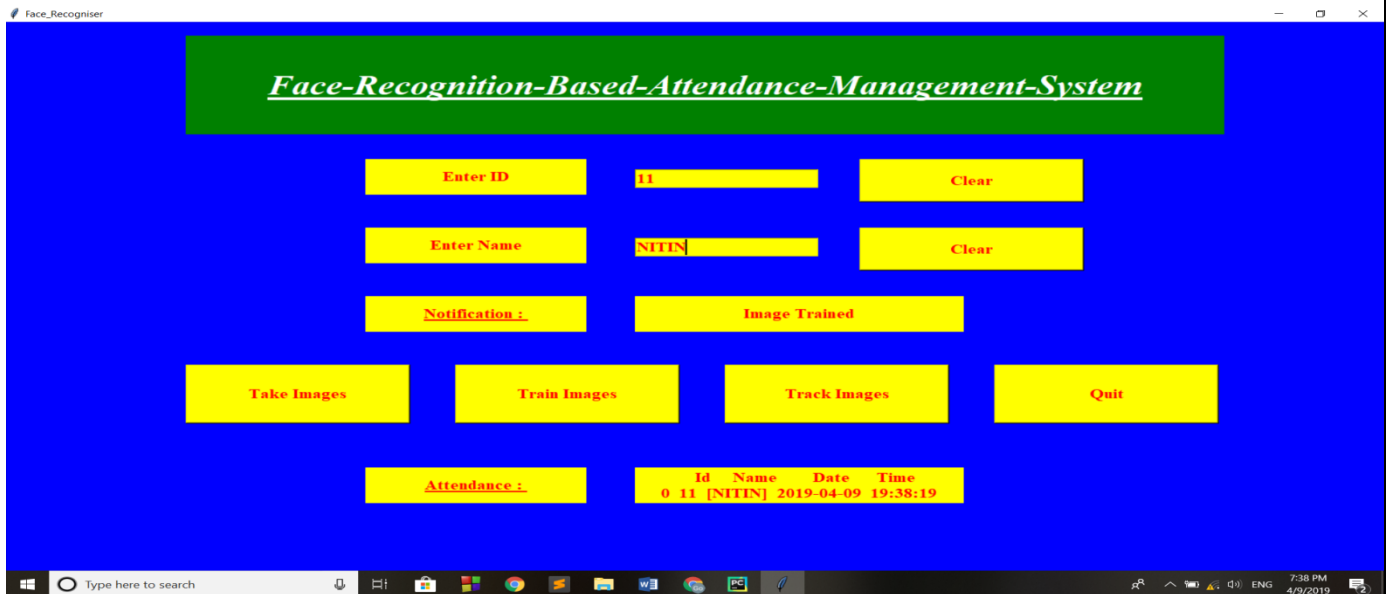


Fig 4.5.2.2

Test case 3:-

Table 3:- The Test case here is used to ensure the information is correctly is stored.

Test case summary	To ensure information is Stored.
Expected result	The information is stored correctly.

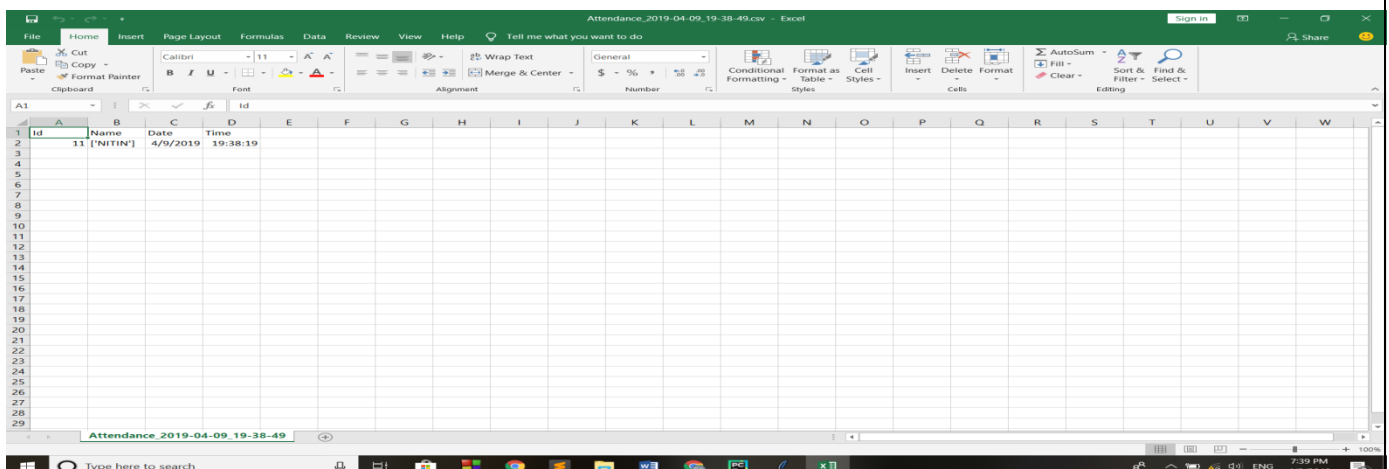


Fig4.5.2.3

4.7 Conclusion

The Chapter mentions the technique used in the project. It also describes the tools and technology used in the project. It also describes the testing performed and various test cases carried out to ensure the project work as per it is required.

Chapter 5. Conclusion

Conclusion

5.1 Conclusion

The project focuses on developing an automated attendance system. 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 technique for the purpose of student attendance and for the further process this record of student can be used in exam related issues. It is not possible to identify faces having similar facial features. The system can be extended to respond to the presence of newcomers in the classrooms. Also, means to mark attendance without the intervention of teachers in a classroom i.e. automatically marking attendance at the beginning of every hour can be implemented. It can be extended to video surveillance to detect frauds at crowded areas such as bus stands, theatres, railway stations where in by face recognition techniques, the identity of the culprits can be found.

5.2 Limitations of the Work

1. It is also very challenging while dealing with the pre-processing of the captured image.
2. Sometimes the face will not be detected due to the heavy focus of light.
3. If the student changes the direction of his face while capturing, then the duplication of the person is replaced with the other.
4. The exact face is not determined if the student moves his face.
5. The images may not be stored into the database due to specification error.

5.3 Suggestion and Recommendations for Future Work

The project has a very vast scope in future. The project can be applied on intranet in prospect. Project can be modernized in nearby future as, when an obligation for the same arises, as it is very flexible in terms of development. And the enhancement approach of

camera planning based on the outcome of the position valuation in order to progress the face detection effectiveness. In further work will intend to improve the face detection efficiency by means of the interaction among the system, students and the lecturer. The enhancement process will work on the process of capturing the image at a far distance by having a heavily high resolution camera. On the other hand, the system can be enriched by integrating video-streaming service and lecture archiving system.

The Future scope of projects is as follows:-

1. It can be extended to video surveillance to detect frauds at crowded areas such as bus stands, theatres, railway stations where in by face recognition techniques, the identity of the culprits can be found
2. Bar encryption reader centered attendance classification.
3. Distinct Attendance method with the snapshot by means of Student login.

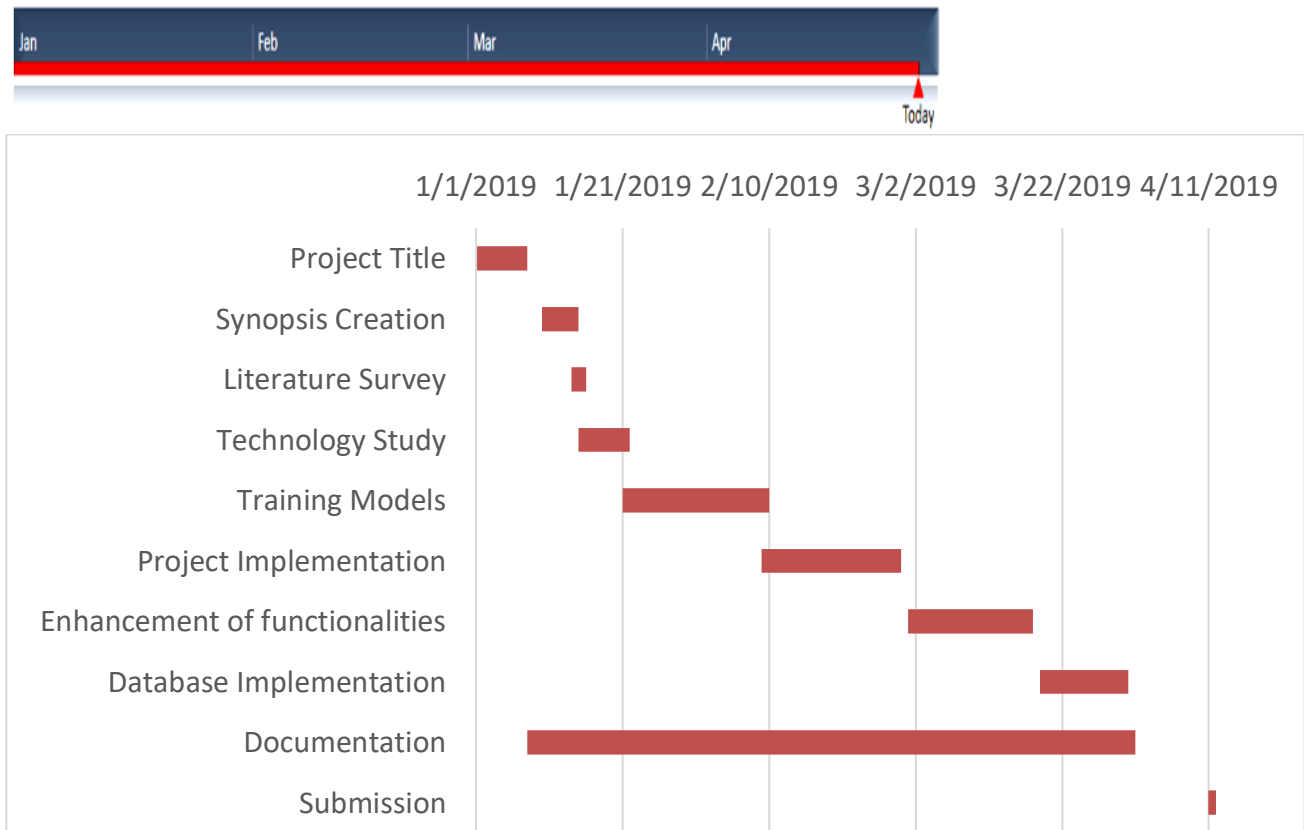
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Guide Interaction Sheet

Date	Discussion	Action Plan
15/02/2019	Discussed about the title of the project	Automated Real Time Face Recognition Based Attendance System
18/02/2019	Discussion on the technology to be used	Python
25/02/2019	Discussion of the creation of synopsis of the project	Gathering of information for synopsis creation
18/03/2019	Suggestions on how to do a literature survey and preliminary investigation on the topic	Many research papers were read and understood and their abstracts were to be written.
26/03/2019	Discussion on the implementation of the project	Using automation technique we decided to implement
01/04/2019	Discussion on the objective of the project(Automated Real Time Face Recognition Based Attendance System)	Decided to Include the logic to be used
01/04/2019	For retrieving student information and store it in database	Action taken that for each user an entry must be made in the database so that count can be made easy
04/04/2019	Discussion on project documentation	Decided to write the content and integrate it in the proper format of the report

Gantt chart



A Gantt chart is a horizontal bar chart that visually represents a project plan over time. Modern Gantt charts typically show you the status of—as well as who's responsible for each task in the project. Here The Gantt Chart represents shows the project journey of Automated Real Time Face recognition based Attendance System. The Gantt chart shows the date when project was initialized and also mentions the date when project was completed in all respects. The chart shows every step that has been carried out for the completion of project.

Source Code

```
import tkinter as tk
from tkinter import Message ,Text
import cv2,os
import shutil
import csv
import numpy as np
from PIL import Image, ImageTk
import pandas as pd
import datetime
import time
import tkinter.ttk as ttk
import tkinter.font as font

window = tk.Tk()

window.title("Face_Recogniser")

dialog_title = 'QUIT'
dialog_text = 'Are you sure?'

#window.geometry('1280x720')
window.configure(background='blue')

#window.attributes('-fullscreen', True)

window.grid_rowconfigure(0, weight=1)
window.grid_columnconfigure(0, weight=1)

#path = "profile.jpg"

#Creates a Tkinter-compatible photo image, which can be used everywhere Tkinter expects
an image object.
#img = ImageTk.PhotoImage(Image.open(path))

#The Label widget is a standard Tkinter widget used to display a text or image on the screen.
#panel = tk.Label(window, image = img)

#panel.pack(side = "left", fill = "y", expand = "no")

#cv_img = cv2.imread("img541.jpg")
#x, y, no_channels = cv_img.shape
#canvas = tk.Canvas(window, width = x, height =y)
#canvas.pack(side="left")
#photo = PIL.ImageTk.PhotoImage(image = PIL.Image.fromarray(cv_img))
```

```
# Add a PhotoImage to the Canvas
#canvas.create_image(0, 0, image=photo, anchor=tk.NW)

#msg = Message(window, text='Hello, world!')

# Font is a tuple of (font_family, size_in_points, style_modifier_string)

message = tk.Label(window, text="Face-Recognition-Based-Attendance-Management-System",bg="Green" ,fg="white" ,width=50 ,height=3,font=('times', 30, 'italic bold underline'))

message.place(x=200, y=20)

lbl = tk.Label(window, text="Enter ID",width=20 ,height=2 ,fg="red" ,bg="yellow" ,font=('times', 15, ' bold '))
lbl.place(x=400, y=200)

txt = tk.Entry(window,width=20 ,bg="yellow" ,fg="red",font=('times', 15, ' bold '))
txt.place(x=700, y=215)

lbl2 = tk.Label(window, text="Enter Name",width=20 ,fg="red" ,bg="yellow" ,height=2 ,font=('times', 15, ' bold '))
lbl2.place(x=400, y=300)

txt2 = tk.Entry(window,width=20 ,bg="yellow" ,fg="red",font=('times', 15, ' bold '))
txt2.place(x=700, y=315)

lbl3 = tk.Label(window, text="Notification : ",width=20 ,fg="red" ,bg="yellow" ,height=2 ,font=('times', 15, ' bold underline '))
lbl3.place(x=400, y=400)

message = tk.Label(window, text="" ,bg="yellow" ,fg="red" ,width=30 ,height=2, activebackground = "yellow" ,font=('times', 15, ' bold '))
message.place(x=700, y=400)

lbl3 = tk.Label(window, text="Attendance : ",width=20 ,fg="red" ,bg="yellow" ,height=2 ,font=('times', 15, ' bold underline '))
lbl3.place(x=400, y=650)

message2 = tk.Label(window, text="" ,fg="red" ,bg="yellow",activeforeground = "green",width=30 ,height=2 ,font=('times', 15, ' bold '))
message2.place(x=700, y=650)

def clear():
    txt.delete(0, 'end')
    res = ""
    message.configure(text= res)
```

```
def clear2():

    txt2.delete(0, 'end')
    res = ""
    message.configure()

def is_number(s):
    try:
        float(s)
        return True
    except ValueError:
        pass

    try:
        import unicodedata
        unicodedata.numeric(s)
        return True
    except (TypeError, ValueError):
        pass

    return False

def TakeImages():
    Id=(txt.get())
    name=(txt2.get())
    if(is_number(Id) and name.isalpha()):
        cam = cv2.VideoCapture(0)
        harcascadePath = "haarcascade_frontalface_default.xml"
        detector=cv2.CascadeClassifier(harcascadePath)
        sampleNum=0
        while(True):
            ret, img = cam.read()
            gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
            faces = detector.detectMultiScale(gray, 1.3, 5)
            for (x,y,w,h) in faces:
                cv2.rectangle(img,(x,y),(x+w,y+h),(255,0,0),2)
                #incrementing sample number
                sampleNum=sampleNum+1
                #saving the captured face in the dataset folder TrainingImage
                cv2.imwrite("TrainingImage\ "+name + "." +Id + ".jpg", gray[y:y+h,x:x+w])
                #display the frame
                cv2.imshow('frame',img)
                #wait for 100 milliseconds
                if cv2.waitKey(100) & 0xFF == ord('q'):
                    break
                # break if the sample number is morethan 100
                elif sampleNum>60:
                    break
            cam.release()
            cv2.destroyAllWindows()
            res = "Images Saved for ID : " + Id + " Name : " + name
```

```
row = [Id , name]
    with open('StudentDetails\\StudentDetails.csv','a+') as csvFile:

        writer = csv.writer(csvFile)
        writer.writerow(row)
        csvFile.close()
        message.configure(text= res)
else:
    if(is_number(Id)):
        res = "Enter Alphabetical Name"
        message.configure()
    if(name.isalpha()):
        res = "Enter Numeric Id"
        message.configure(text= res)

def TrainImages():
    recognizer = cv2.face_LBPHFaceRecognizer.create()#recognizer =
cv2.face.LBPHFaceRecognizer_create()#$cv2.createLBPHFaceRecognizer()
    harcascadePath = "haarcascade_frontalface_default.xml"
    detector =cv2.CascadeClassifier(harcascadePath)
    faces,Id = getImagesAndLabels("TrainingImage")
    recognizer.train(faces, np.array(Id))
    recognizer.save("Trainer.yml")
    res = "Image Trained"+", ".join(str(f) for f in Id)
    message.configure(text= res)

def getImagesAndLabels(path):
    #get the path of all the files in the folder
    imagePath=[os.path.join(path,f) for f in os.listdir(path)]
    #print(imagePaths)

    #create empth face list
    faces=[]
    #create empty ID list
    Ids=[]
    #now looping through all the image paths and loading the Ids and the images
    for imagePath in imagePath:
        #loading the image and converting it to gray scale
        pilImage=Image.open(imagePath).convert('L')
        #Now we are converting the PIL image into numpy array
        imageNp=np.array(pilImage,'uint8')
        #getting the Id from the image
        Id=int(os.path.split(imagePath)[-1].split(".")[1])
        # extract the face from the training image sample
        faces.append(imageNp)
        Ids.append(Id)
    return faces,Ids

def TrackImages():
    recognizer = cv2.face.LBPHFaceRecognizer_create()#cv2.createLBPHFaceRecognizer()
    recognizer.read("Trainer.yml")
```

```

harcascadePath = "haarcascade_frontalface_default.xml"
faceCascade = cv2.CascadeClassifier(harcascadePath);
df=pd.read_csv("StudentDetails\StudentDetails.csv")

cam = cv2.VideoCapture(0)
font = cv2.FONT_HERSHEY_SIMPLEX
col_names = ['Id','Name','Date','Time']
attendance = pd.DataFrame(columns = col_names)
while True:
    ret, im =cam.read()
    gray=cv2.cvtColor(im,cv2.COLOR_BGR2GRAY)
    faces=faceCascade.detectMultiScale(gray, 1.2,5)
    for(x,y,w,h) in faces:
        cv2.rectangle(im,(x,y),(x+w,y+h),(225,0,0),2)
        Id, conf = recognizer.predict(gray[y:y+h,x:x+w])
        if(conf < 50):
            ts = time.time()
            date = datetime.datetime.fromtimestamp(ts).strftime('%Y-%m-%d')
            timeStamp = datetime.datetime.fromtimestamp(ts).strftime('%H:%M:%S')
            aa=df.loc[df['Id'] == Id]['Name'].values
            tt=str(Id)+"-"+aa
            attendance.loc[len(attendance)] = [Id,aa,date,timeStamp]

        else:
            Id='Unknown'
            tt=str(Id)
            if(conf > 75):
                noOfFile=len(os.listdir("ImagesUnknown"))+1
                cv2.imwrite("ImagesUnknown\Image"+str(noOfFile) + ".jpg", im[y:y+h,x:x+w])
                cv2.putText(im,str(tt),(x,y+h), font, 1,(255,255,255),2)
            attendance=attendance.drop_duplicates(subset=['Id'],keep='first')
            cv2.imshow('im',im)
            if (cv2.waitKey(1)==ord('q')):
                break
    ts = time.time()
    date = datetime.datetime.fromtimestamp(ts).strftime('%Y-%m-%d')
    timeStamp = datetime.datetime.fromtimestamp(ts).strftime('%H:%M:%S')
    Hour,Minute,Second=timeStamp.split(":")
    fileName="Attendance\Attendance_"+date+"_"+Hour+"-"+Minute+"-"+Second+".csv"
    attendance.to_csv(fileName,index=False)
    cam.release()
    cv2.destroyAllWindows()
    #print(attendance)
    res=attendance
    message2.configure(text= res)

clearButton = tk.Button(window, text="Clear", command=clear ,fg="red" ,bg="yellow"
,width=20 ,height=2 ,activebackground = "Red" ,font=('times', 15, ' bold '))
clearButton.place(x=950, y=200)
clearButton2 = tk.Button(window, text="Clear", command=clear2 ,fg="red" ,bg="yellow"

```

```
,width=20 ,height=2, activebackground = "Red" ,font=('times', 15, ' bold '))

clearButton2.place(x=950, y=300)
takeImg = tk.Button(window, text="Take Images", command=TakeImages ,fg="red"
,bg="yellow" ,width=20 ,height=3, activebackground = "Red" ,font=('times', 15, ' bold '))

takeImg.place(x=200, y=500)
trainImg = tk.Button(window, text="Train Images", command=TrainImages ,fg="red"
,bg="yellow" ,width=20 ,height=3, activebackground = "Red" ,font=('times', 15, ' bold '))

trainImg.place(x=500, y=500)
trackImg = tk.Button(window, text="Track Images", command=TrackImages ,fg="red"
,bg="yellow" ,width=20 ,height=3, activebackground = "Red" ,font=('times', 15, ' bold '))
trackImg.place(x=800, y=500)
quitWindow = tk.Button(window, text="Quit", command=window.destroy ,fg="red"
,bg="yellow" ,width=20 ,height=3, activebackground = "Red" ,font=('times', 15, ' bold '))
quitWindow.place(x=1100, y=500)
copyWrite = tk.Text(window, background=window.cget("background"),
borderwidth=0,font=('times', 30, 'italic bold underline'))
copyWrite.tag_configure("superscript", offset=10)

copyWrite.configure(state="disabled",fg="red" )
copyWrite.pack(side="left")
copyWrite.place(x=800, y=750)

window.mainloop()
```