CHAPTER 1

PROJECT OVERVIEW

1.1 INTRODUCTION:

Every institution requires a robust and constant system to give seats to their students to proper human involvement and guidance, and every institution have their own methodology to do, many in numbers are taking seat allotment manually with a printout paper of their seat no. by calling their respective names. During entering the classroom all students have very less time to see their seat on a daily basis. The ordinary method of calling the names of students manually is a time-consumingprocess. Printout paper of seat record system is assigned to each student with their corresponding identity but there is possibility of lost/broke or unapproved person may mistreat of their seat, while in other biometrics such as voice recognition, iris [2] or fingerprint [3], they are not 100% accurate. Seat Allotment   system is a technology capable of recognizing or validating a person from a digital image or a continuous image frame from a video source. There are numerous methods in which Seat allotment systems work, they work by differentiating selected Seat information from given information with faces within a database. It is also termed as Biometric Artificial Intelligence based on use cases that can individually identify a student by figure out patterns based on the student's facial information and shapes. The main use of seat allotment system for the direction of seat location is the quick and smartest way of Our seat and easy way to room number and all the information. Seat allotment is a more proper and faster technique among other approaches and scales down the chance of getting there seat very quickly and easily. Seat allotment contain following two steps, first step concerns the detection of

faces and second step contain recognition of those identified face images with the existing database that contain existing imagScatter

diagram of oriented angle and recognizing perform through deep learning. The frontend side (client) which consist of GUI which is established on electron JS and backend side consist of logic and python (server), an IPC (InterPersonal Communication) bridge is developed to communicate theseatobtainees [6]. Hence it contains number of face detection and recognition methods introduced. Face recognition is entirely either in the form of actualization based which covers the information of the whole frontal face or element based which covers the mathematical features like eyes, nose, eye brows, and cheeks to per two loads. The images deceive the face. Our system accepts face recognition progress to slow down the defect of existing system with the help of deep learning, it hasneed a good quality camera to capture the images of students, the detection process is done by d by the camera is transfer to system for further analysis, the input image is then correlated with a set of reference images of each of the student and record the Seat information of the students

. The main elements of this technology are as follows:

a) Face Detection b) Face Recognition

a)   Face Detection:

Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection also refers to the psychological process by which humans locate and attend to faces in a visual scene. Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class.

Examples include upper torsos, pedestrians, and cars. Face-detection algorithms focus on the detection of frontal human faces. It is analogous to image detection in which the image of a person is matched bit by bit. Image matches with the image stores in database. Any facial feature changes in the database will invalidate the matching process. A reliable face-detection approach based on the genetic algorithm and the eigen-face technique: Firstly, the possible human eye regions are detected by testing all the valley regions in the gray-level image. Then the genetic algorithm is used to generate all the possible face regions which include the eyebrows, the iris, the nostril and the mouth corners.

Each possible face candidateis normalized to reduce lightning effects caused due to uneven illumination and the shirring effect due to head movement. The fitness value of each candidate is measured based on its projection on the eigen-faces. After a number of iterations, all the face candidates with a high fitness value are selected for further verification. At this stage, the face symmetry is measured and the existence of the different facial   features   is   verified   for   each   face   of   the   candidate.

b)   Face Recognition:

A facial recognition system is a computer application capable of 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. Some facial recognition algorithms identify facial features 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 recognition. 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 distills an image into values and compares the values with templates to eliminate variances. Popular recognition algorithms include Principal Component Analysis using eigenfaces, Linear Discriminate Analysis, Elastic Bunch Graph Matching using the Fisher face algorithm, the Hidden Markov model, the Multilinear Subspace Learning using tensor representation, and the neuronal motivated dynamic link matching.

1.2   MOTIVATION:

The main motivation for me to go for this project was the slow and inefficient traditional manual Seat Allotment system. This made us to think why not make it automated fast and much efficient. Also, such face detection techniques are in use by department like crime investigation where they use cctv footages and detect the faces from the crime scene and compare those with criminal database to recognize them. Also, Facebook, it uses an algorithm called deep face whose accuracy to recognize is 97.25% which is as close as what humans have that is 97.53%.

1.3   ADVANTAGES OVER CURRENT SYSTEM:

The previous approach in which manually taking and maintains the Seat Allotment records was very inconvenient task. Traditionally, student's Seat Allotments are taken manually by using Seat Allotment sheet given by the faculty members in class, which is a time-consuming event. 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.

The ability to compute the Seat Allotment percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. This method could easily allow for impersonation and the Seat Allotment sheet could be stolen or lost. An automatic Seat Allotment management system using biometrics would provide the needed solution. The results showed improvedperformance over manual Seat Allotment management system. Biometric-based techniques have emerged as the most promising option for recognizing individuals in recent years since, instead of authenticating people and granting them access to physical and virtual domains based on passwords, PINs, smart cards, plastic cards, tokens, keys and so forth, these methods examine an individual's physiological and/or behavioral characteristics in order to determine and/or ascertain his identity.

Biometric based technologies include identification based on physiological characteristics (such as face, fingerprints, finger geometry, hand geometry, hand veins, palm, iris, retina, ear and voice) and behavioral traits (such as gait, signature and keystroke dynamics). Face recognition appears to offer several advantages over other biometric methods, a few of which are outlined here: Almost all these technologies require some voluntary action by the user, i.e., the user needs to place his hand on a hand-rest for fingerprinting or hand geometry detection and has to stand in a fixed position in front of a camera for iris or retina identification.

However, face recognition can be done passively without any explicit action or participation on the part of the user since face images can be acquired from a distance by a camera. This is particularly beneficial for security and surveillance purposes. Furthermore, data acquisition in general is fraught with problems for other biometrics: techniques that rely on hands and fingers can be rendered useless if the epidermis tissue is damaged in some way (i.e., bruised or cracked).

1.4 PROPOSED SYSTEM ARCHITECTURE:

The System Architecture Consists of basically three layers that is, the Application Layer, the System Layer and the Databases layer.

a)   APPLICATION LAYER:

There is the capturing phase in this the application captures the user's live feed frames and store the files to the database. Authentication is provided to the users. Admin username and password is implemented so that no bad use of the application is done.

The application layer can also be used to view Seat Allotment by using individual's Id and correct name for that ID. The Seat Allotment is generated as a text file with total present, absent and leaves an individual took.

b)   SYSTEM LAYER:

This is the layer where the processing is done that is the detection and recognition part at the server side. Haar Cascade algorithm is used which is based on Viola and Jones algorithm to detect images from the frames. Initially an integral image is generated from the frame which simply assigns numbers to the pixels generated by summing up the values. Further to detect the objects from the frames the haar-like feature is generated. The extracted features are passed through a trained classifier which detects the faces from the objects.These detected faces are cropped with making them grey-Scaled images and passed through the recognition module which by applying correlation to the cropped images and the images in the databases recognizes the faces.

c)   DATABASE LAYER:

The Database layer is a centralized database system which consists of student database and their Seat Allotment. The Organization's database is formed by initial feeding of the frames from which system detects faces grey-scales the images, crops them and stores them to the database and these stored images are hence forth used for the recognition part.

The results of the face recognition module are compared with the images from the Organization's database and after the successful comparison the Seat Allotment is updated to the database. The sheet is generated and saved in the form of an excel file.

1.5   FORMULATION OF PROBLEM WITH USING TECHNOLOGY:

It really is tedious to use those paper sheets to mark the Seat Allotment as there are many classes in an institute and each class has many students. These many sheets and entries are to be entered manually to keep the record. This is quite hectic and time consuming. What if an automation is brought up in such systems and also the paper work is eliminated?

The most common way to identify any human being is through his/her face. So why not mark the Seat Allotment of students or employees using face and recognition technologies! The current most efficient algorithm available is Haar Cascade Algorithm which uses Cascade functions and is available openly on OpenCV.

Image classification has been a quickly growing field over the past decade, and the use of Convolutional Neural Networks (CNNs) and other deep learning techniques is growing quickly. However, before CNNs became mainstream, another technique was widely used and continues to be used: Viola-Jones.

Any employee or teacher has a mobile phone or a laptop with a camera and can use it to

click the picture and upload to the system to mark the Seat Allotment. Hence, the idea is to build an application which provides user authentication, image capture and generates anSeat Allotmentdata sheet. The problem to be solved is detection of faces in an image.

A human can do this easily, but a computer needs precise instructions and constraints. To make the task more manageable, Viola–Jones requires full view frontal upright faces. Thus, in order to be detected, the entire face must point towards the camera and should not be tilted to either side. While it seems, these constraints could diminish the algorithm's utility somewhat, because the detection step is most often followed by a recognition step, in practice these limits on pose are quite acceptable.
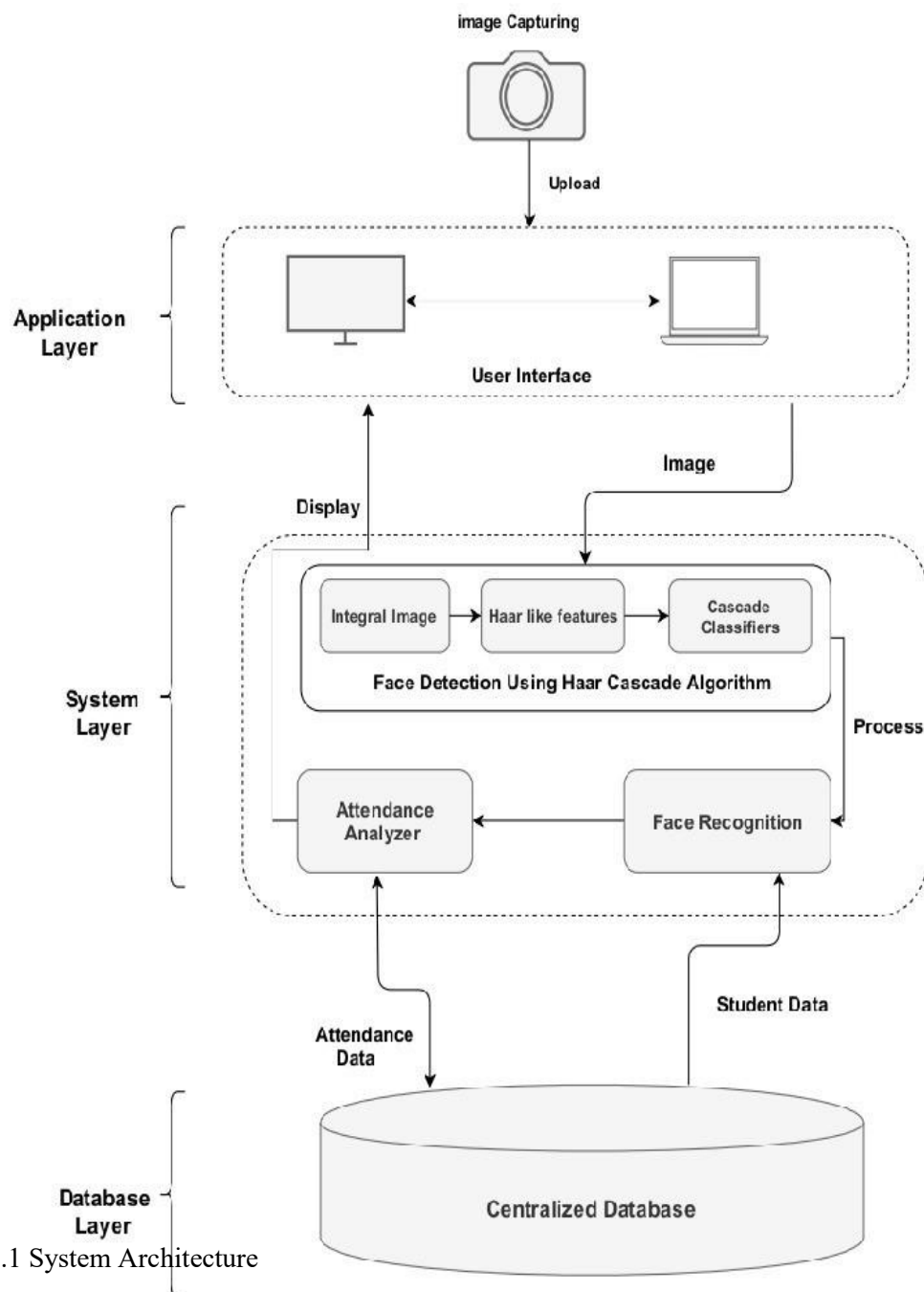
Figure 1.1 System Architecture

1.6   AIMS AND OBJECTIVES:

The objective of this project is to develop face recognition based automated student Seat Allotment system. Expected achievements in order to fulfill the objectives are:

- To detect the face segment from the video frame.

- To extract the useful features from the face detected.

- To classify the features in order to recognize the face detected.

- To record the Seat Allotment of the identified student.

Figure 1.2 Block Diagram of General Framework

1.7   HAAR CASCADE ALGORITHM:

Object Detection using Haar feature-based cascade classifiers is an effective object detectionmethod proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detectionusing a Boosted Cascade of Simple Features" in 2001. It is a machine learning based approachwhere a cascade function is trained from a lot of positive and negative images. It is then usedto detect objects in other images. Initially, the algorithm needs a lot of positive images (imagesof faces) and negative images (images without faces) to train the classifier. Then we need toextract features from it. They are just like our convolutional kernel. Each feature is a singlevalue obtained by subtracting sum of pixels under white rectangle from sum of pixels underblack rectangle. Now all possible sizes and locations of each kernel is used to calculate plentyof features. For each feature calculation, we need to find sum of pixels under white and blackrectangles. To solve this, they introduced the integral images. It simplifies calculation of sumof pixels, how large may be the number of pixels, to an operation involving just four pixels. Itmakes things super-fast.

OpenCV comes with a trainer as well as detector. If you want to train your own classifier forany object like car, planes etc. you can use OpenCV to create one. OpenCV already containsmany pre-trained classifiers for face, eyes, smile etc. Those XML files are stored in the folder.After that input image is loaded in grayscale mode. This algorithm mainly has

followingfunctionality.

A.   Face Detection

•   Integral image or summed area table is a data structure and algorithm for quickly and efficiently generating the sum of values in a rectangular subset of a grid. In the image processing domain, it is also known as an integral image.

•   Haar-like features are digital image features used in object recognition. They owe their name to their intuitive similarity with haar wavelets and were used in the first real-time face detector.

•   Cascade classifier is a particular case of ensemble learning based on the concatenation of several classifiers, using all information collected from the output from a given classifier as additional information for the next classifier in the cascade. Unlike voting or stacking ensembles, which are multi-expert systems, cascading is a multistage one.

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B.   Face Recognition

•   Initially the ROI is extracted from the source face image, ROI is the sub image and is smaller than the original image.

•   Normalized Cross-Correlation is performed on ROI and target image to find the peak coordinates.

•   The total offset or translation is carried out based on the position of the peak in the cross- correlation matrix.

•   Check for the successful extraction of face from target image and figure out where the face exactly matches inside of target image.

LITERATURE REVIEW

Seat Allotment: Automated Seat Allotment System Using Face Recognition.

2.1 ABSTRACT

The objective of this system is to present an automated system for human face recognition in a real time background for an organization to mark the Seat Allotment of their employees or students. So automated Seat Allotment using real time face recognition is a real-world solution which comes with day-to-day activities of handling employees or student. The task is very difficult as the real time background subtraction in an image is still a challenge. In the past two decades, face detection and recognition has proven to be very interesting research field of image processing. The work carried out describes an automated Seat Allotment system using video surveillance. The proposed algorithm is automatic and efficient in intelligent surveillance applications. Video surveillance is used to detect the object movement thereby the captured image undergoes face detection and recognition process and searches the student database and enters the Seat Allotment if it is valid in the list.

2.2 PROPOSED ALGORITHMS

Image classification has been a quickly growing field over the past decade, and the use of Convolutional Neural Networks (CNNs) and other deep learning techniques is growing quickly. However, before CNNs became mainstream, another technique was widely used and continues to be used: Viola-Jones.

This paper uses Viola and Jones algorithm for face detection and correlations formulas for face recognition. Viola and Jones algorithm is used for face detection. Where it is used in both creating database and face recognition process. Where in case creating database, it takes input image through a web camera continuously. Captured image undergoes face detection. Detected face will be cropped and stored in database. Where in case of face recognition if there is any movement video surveillance will be used to detect the moving object. The captured image undergoes face detection and further processed later by face recognition. The problem to be solved is detection of faces in an image. A human can do this easily, but a computer needs precise instructions and constraints. To make the task more manageable, Viola–Jones requires full view frontal upright faces. Thus, in order to be detected, the entire face must point towards the camera and should not be tilted to either side. While it seems, these constraints could diminish the algorithm's utility somewhat, because the detection step is most often followed by a recognition step, in practice these limits on pose are quite acceptable.
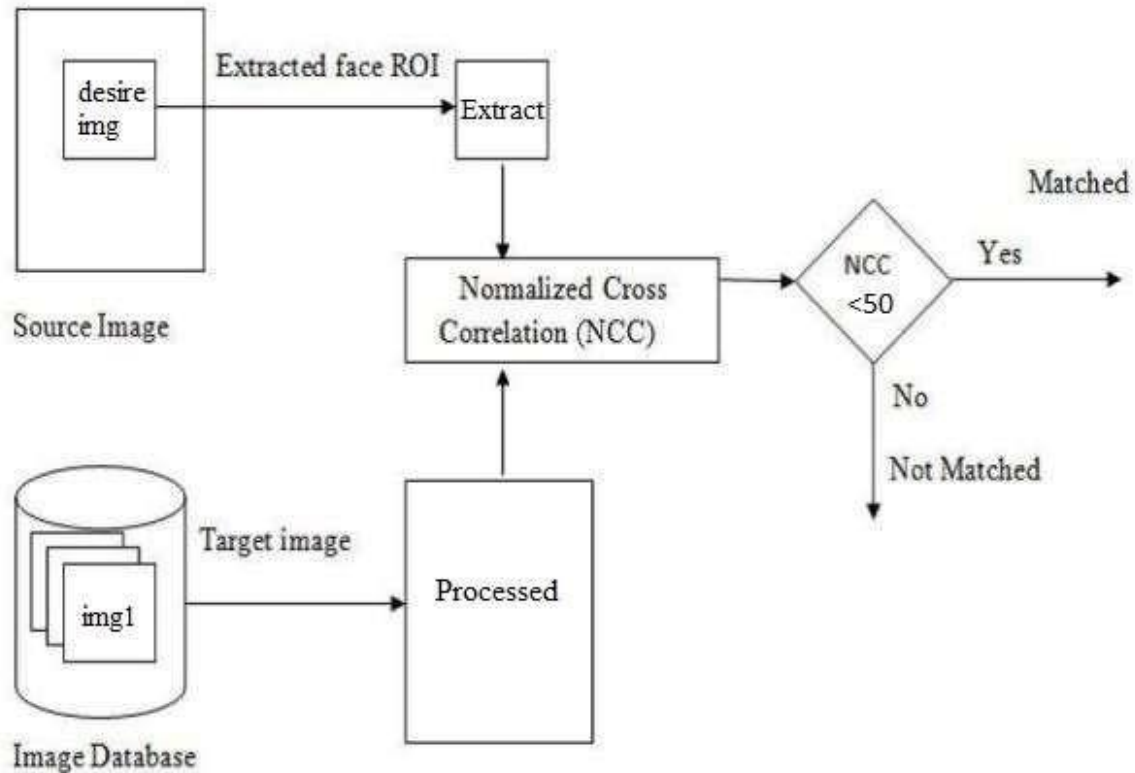
Figure 2.1: Stages of Face Recognition Algorithm

2.3 WEAKNESS:

- In Viola and Jones algorithm the result depends on the data and weak classifiers. The quality of the final detection depends highly on the consistence of the training set. Both the size of the sets and the interclass variability are important factors to take in account.
- The System overview does not provide the clear idea about components of the overall process.
- The analysis shows very bad results when in case of multiple person with different sequence.

2.4 HOW TO OVERCOME:

- The training of the data should be done in correct manner so that the quality final detection will increase.
- System overview should contain the overall architecture that will give the clear and comprehensive information of the project

Study of Implementing Automated Seat Allotment System using Face Recognition.

2.5 ABSTRACT:

Authentication is a significant issue in system control in computer-based communication. Human face recognition is an important branch of biometric verification and has been widely used in many applications, such as video monitor system, human-computer interaction, and door control system and network security. This paper describes a method for Student's Seat Allotment System which will integrate with the face recognition technology using Personal Component Analysis (PCA) algorithm. The system will record the Seat Allotment of the students in classroom environment automatically and it will provide the facilities to the faculty to access the information of the students easily by maintaining a log.

2.6 PROPOSED ALGORITHMS:

This paper usesHaar Cascade technique for face recognition and image compression. The implementation of this project is done using OpenCV libraries for face detection and further processes.

The Haar Cascade method has been widely used in applications such as face recognition and image compression. Cascade is a common technique for finding patterns in data, and expressing the data as an eigenvector to highlight the similarities and differences between different data. Then the system implementation is divided into three major parts: Face Detection and Extract, Learn and Train Face Images, Recognize and Identification.
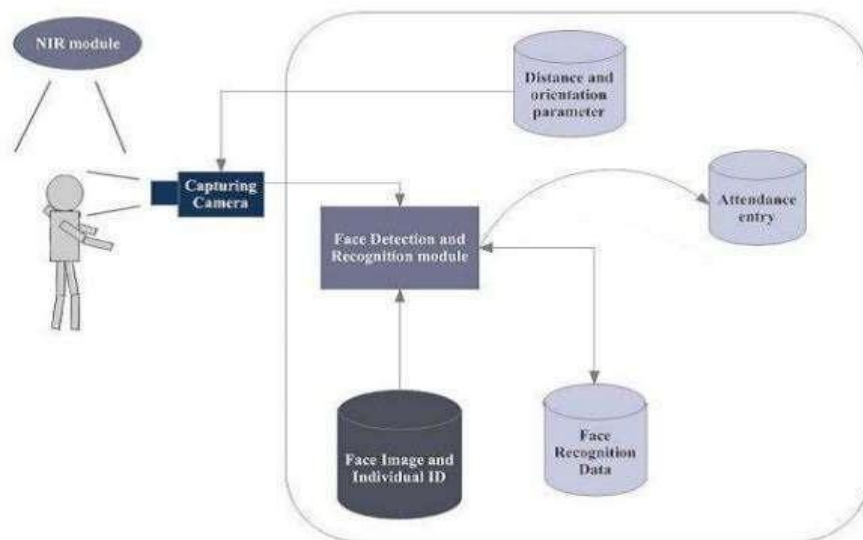
Implementation is done using OpenCV libraries which are open source and cross platform.

Figure 2.2 Haar Cascade Technique

2.7   WEAKNESS:

- This paper uses the Haar Cascade method which has two major disadvantages.
- The covariance matrix is difficult to be evaluated in an accurate manner.
- Even the simplest invariance could not be captured by the Cascade unless the training data explicitly provides this information.
- This paper is not giving a clear idea about face detection and recognition algorithms. Author explains the code of OpenCV instead of explaining the techniques and methods.

2.8   HOW TO OVERCOME:

- The training data should provide the information explicitly.
- Author should explain working of the algorithm which he is going to use instead of explaining the functions of OpenCv libraries

Algorithm for: an Efficient Seat Allotment system using Face Recognition.

2.9   ABSTRACT:

Students Seat Allotment in the classroom is a very important task and if taken manually wastes a lot of time. There are many automatic methods available for this purpose i.e. biometric Seat Allotment. All these methods also waste time because students have to make a queue to touch their thumb on the scanning device. This work describes the efficient algorithm that automatically marks the Seat Allotment without human intervention. This Seat Allotment is recorded by using a camera attached in front of the classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the database and mark the Seat Allotment. The paper reviews the related work in the field of Seat Allotment system then describes the system architecture, software algorithm and results.

2.10   PROPOSED ALGORITHM:

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

This paper uses the Haar Cascade algorithm for face detection and correlations formulas for face recognition. The Haar Cascade algorithm is used for face detection. Where it is used in both creating database and face recognition processes. Whencreating a database, it takes input images through a web camera continuously. Captured image undergoes face detection.

Detected face will be cropped and stored in the database. Where in case of face recognition if there is anymovement video surveillance will be used to detect the moving object. The captured image undergoes face detection and further processed later by face recognition.
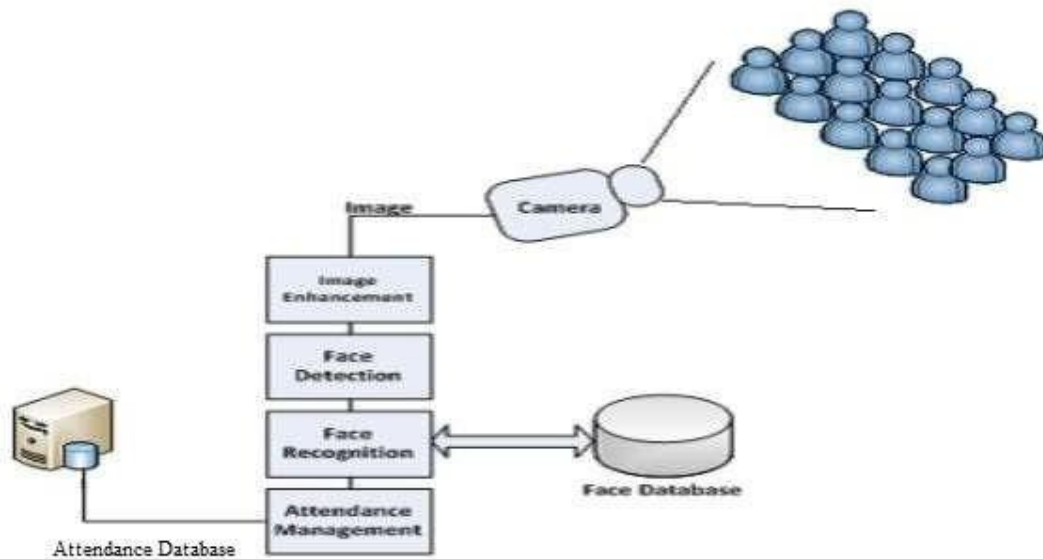

Figure: 2.3 Experimental Setup

2.11   WEAKNESS:

- It uses hardware like camera and button which makes it costly as these are to be installed in every classroom.
- Histograms fail if there are gray values that are physically apart from each other.

2.12   HOW TO OVERCOME:

- Make connectivity through application capture and upload from webcam for more processing of images using Haar Cascade Algorithm.

CHAPTER 3

FEASIBILITY REPORT

Feasibility Study:

A feasibility study is a high-level capsule version of the entire System analysis and Design Process. The study begins by classifying the problem definition. Feasibility is to determine if it's worth doing. Once an acceptance problem definition has been generated, the analyst develops a logical model of the system. A search for alternatives is analyzed carefully. There are 3 parts to the feasibility study.

3.1 Operational Feasibility:

Question that going to be asked are:
Will the system be used if it is developed and implemented?

If there was sufficient support for the project from the management and from the users.

Have the users been involved in planning and development of the Project.

Will the system produce poorer results in any respect or area?

This system can be implemented in the organization because there is adequate support from management and users. Being developed in Python so that the necessary operations are carried out automatically.

3.1 Technical feasibility:

- Does the necessary technology exist to do what has been suggested?
- Does the proposed equipment have the technical capacity for using the new system?
- Are there technical guarantees of accuracy, reliability and data security?
- The project is developed on Pentium IV with 256 MB RAM.
- The environment required in the development of system is any windows platform
- The observer pattern along with factory pattern will update the results eventually
- The language used in the development is PYTHON 3.6 & Windows Environment

3.2 Financial and Economic Feasibility:

The system developed and installed will be a good benefit to the organization. The system will be developed and operated in the existing hardware and software infrastructure. So, there is no need for additional hardware and software for the system.

CHAPTER 4

Requirement Analysis

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

PLATFORM REQUIREMENT:

4.1   SUPPORTIVE OPERATING SYSTEMS:

The supported operating systems include:

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

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

4.2   SOFTWARE REQUIREMENT:

- OpenCV 2.4.11 with gtk+
- python 3.6.0
- Pycharm 2017 or next(Community Edition)
- MS Excel
- Tkinter
- Openpyxl, numpy and PIL libraries.

OpenCV
(Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify   objects,

classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high-resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. OpenCV has more than 47 thousand usersand an estimated number of downloads exceeding 7 million. The library is used extensively in companies, research groups and by governmental bodies.

PyCharm

It is an integrated development environment (IDE) used in computer programming, specifically for the Python language. It is developed by the Czech company JetBrains. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems (VCSes), and supports web development with Django as well as Data Science with Anaconda.PyCharmis cross-platform, with Windows, macOS and Linux versions. PyCharm provides an API so that developers can write their own plugins to extend PyCharm features. Several plugins from other JetBrains IDE also work with PyCharm. There are more than 1000 plugins which are compatible with PyCharm.

Python offers multiple options for developing GUI (Graphical User Interface). Out of all the GUI methods, tkinteris the most commonly used method. It is a standard Python interface to the Tk GUI toolkit shipped with Python. Python with tkinter outputs the fastest and easiest way to create the GUI applications. Creating a GUI using tkinter is an easy task. tkinter also offers access to the geometric configuration of the widgets which can organize the widgets in the parent windows.

4.3. HARDWARE REQUIREMENTS:

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

Component	Minimum	Recommended
Processor	1.8 Ghz Dual Core Intel Pentium/AMD Athlon 64 X2	Intel Core i3-2100 2nd Generation
RAM	2 GB	4 GB
Camera	8 Mega-Pixel	16 Mega-Pixel DSLR
Disk	128 GB	512 GB
Network	1 MB/s plan	3 MB/s

Table 4.1: Hardware Requirement

CHAPTER 5

PROJECT DESIGN

5.1   DESIGN APPROACH:

Design is the first step in the development phase for any techniques and principles for the purpose of defining a device, a process or system in sufficient detail to permit its physical realization. Once the software requirements have been analyzed and specified the software design involves three technical activities: design, coding, implementation and testing that are required to build and verify the software. The design activities are of main importance in this phase, because in this activity, decisions ultimately affecting the success of the software implementation and its ease of maintenance are made. These decisions have the final bearing upon reliability and maintainability of the system. Design is the only way to accurately translate the customer requirements into finished software or a system. Design is the place where quality is fostered in development. Software design is a process through which requirements are translated into a representation of software. Preliminary design is concerned with the transformation of requirements into data.

5.2   SOFTWARE ARCHITECTURAL DESIGNS:

Our system follows the three-tier architecture. First tier consists of GUI, Recognition tier and the Database.

1.GUI: The GUI (Graphical User Interface) in our project deals with the interface for the user where the user enters the name of the product, he/she wants to search. The GUI provides a platform for the user to communicate with the database.

Admin Login: Admin login is necessary so that unauthorized access to the application can bestopped

Here in GUI, there is Admin Username and Admin Password asked for further use ofapplication, where Admin username and Admin Password needs to be correct, and if that isnot, application will not run.

A notification Screen is also displayed giving out notification if the login is unauthorized or ifthe Admin Username and Admin Password is wrong.

A submit button is required for the application to process the given Admin Username andAdmin Password for further needs.

The admin login is necessary so that if an access is given to someone, without the correctusername and password, one cannot simply run the application for his use and change theSeat Allotment of oneself without the consent of faculty or admin. A faculty is solely responsiblefor the Seat Allotment management   in   a   traditional   way   and   here   also   they   are.
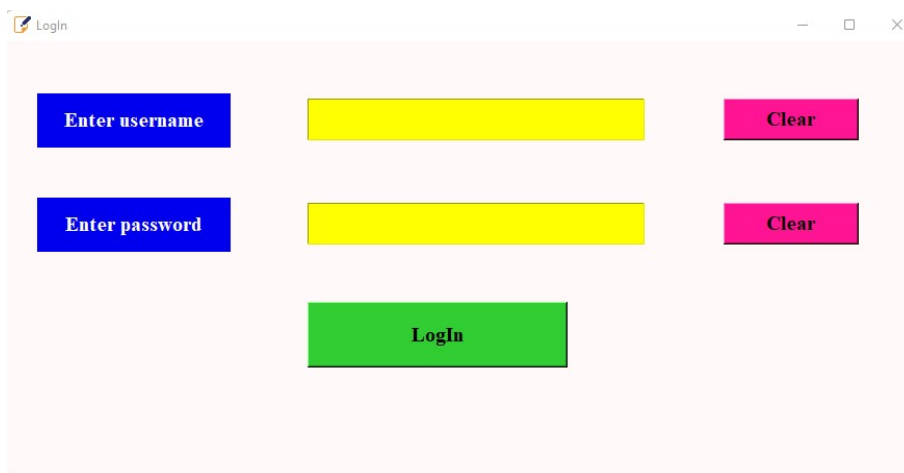
Figure 5.1: Admin Login

Student/ Faculty Login: Next is either Faculty or Student login where in Faculty Seat Allotmentcan be marked or a new entry can be filled with face recognition and face detection forSeat Allotment system.

In student login, the student can retrieve the total Seat Allotment marked of him with leave, absentstatus on a text file retrieved so that a student can view only his Seat Allotment record rather ofwhole class which can be viewed in a normal register Seat Allotment marking system.

After clicking on one of the two buttons, either be faculty or student, the application will runaccordingly for faculty permissions like marking Seat Allotment, adding new student or mark leavefor the student. And in student permission, he/she can retrieve his/her Seat Allotment from the firstday to that day in the .txt format.

To add a student the webcam of the hardware is necessary and which will take at most 60images of the student with a proper haar cascade format, after converting it to grayscale,encoded in the xml format with haar_cascade_default.xml which will create the data in theeigenvectors same as the process happened in viola and jones algorithm.

Figure 5.2 Faculty

Review Seat Allotment:
This GUI will be obtained after clicking onto the student button inFaculty/Student login. In this GUI, a student can access and review his/her Seat Allotment whichis being displayed on the certain dates with Present/Absent or Leave values.

To access his/her Seat Allotment, a student first needs to enter the correct Id and Name and if Iddoes not match with the name in the database the review Seat Allotment will not be generated.

Here, A notification space is also given to make GUI user-friendly, so that when there is awrong Id or name, it will notify the user about it and if the Seat Allotment is being generated, itwill also display like in figure 5.3.

In this GUI, the student can get full Seat Allotment from the starting day to the current day in theformat of the .txt file and with the day and Seat Allotment columns.

These two columns will contain all the individual Seat Allotment on a particular day so that astudent doesn't need to retrieve from the database which contains all the personal details ofother students and by making the application much more secure.

The day column will be traversed within the Seat Allotment xlsx file (MS excel file) where after the 2nd column, all other columns in Seat Allotment.xlsx will contain the date of the Seat Allotment taken. Underthis column, the Seat Allotment status (either present, absent or leave) is there under this columnfor every student.

Figure 5.3 Review Seat Allotment

Seat Allotment System: The main GUI where Face recognition and Face detection works is in thefaculty click where Faculty can Enter Id, name with a notification Label for Add new studentand also a student can apply for leave, with Seat Allotment marking buttons.
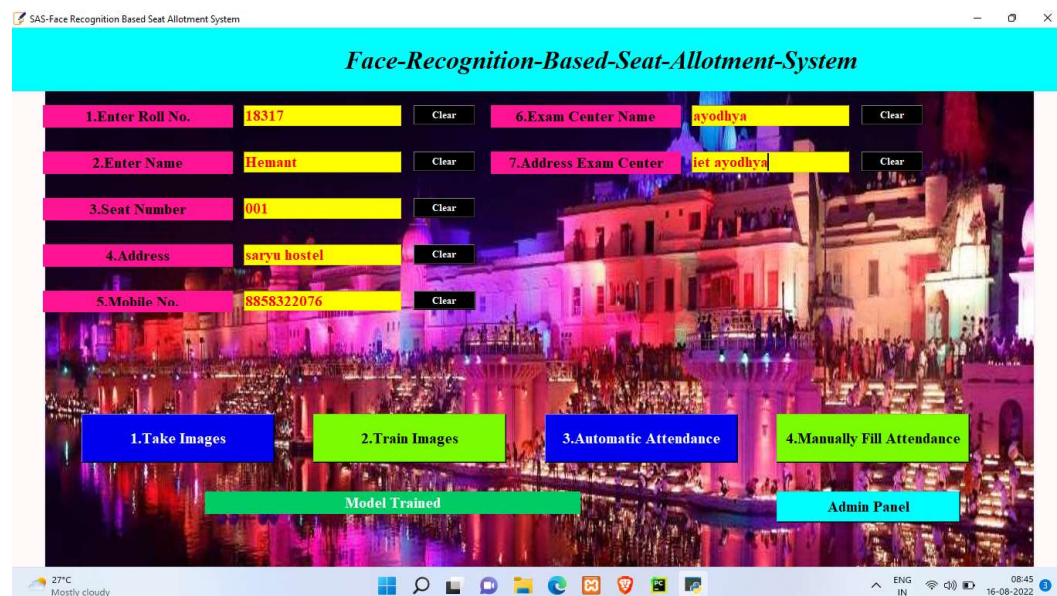

Figure 5.4 Model Trained

2.Trainer: At initial level the system is trained by providing 60 images of an individual. The images are given in gray scale form and further its histogram is made to enhance the recognition accuracy. If less images are provided the accuracy will decrease and application will face difficulty to detect the face.

Figure 5.5 Trained Images

3.Detection: Whenever any image is uploaded all the faces in it are cropped and stored for further comparison. Face detection uses classifiers, which are algorithms that detect what is either a face(1) or not a face(0) in an image. Classifiers have been trained to detect faces using thousands to millions of images in order to get more accuracy. OpenCV uses two types of classifiers, LBP (Local Binary Pattern) and Haar Cascades.

4.Face Recognition: Here the detected cropped faces are compared with the trained images from the database using correlation. if any of the cropped image is recognized then that Id would be marked present in the Seat Allotment data sheet.

5.Database: We have a centralized database with all the details of student and staff. The database is constructed using MS Excel. Every cropped or detected image compares itself with the trained images in this database, i.e. retrieval is done and also the Seat Allotment sheet   is   generated   on   this   database.

5.3   COMPONENT DIAGRAM:
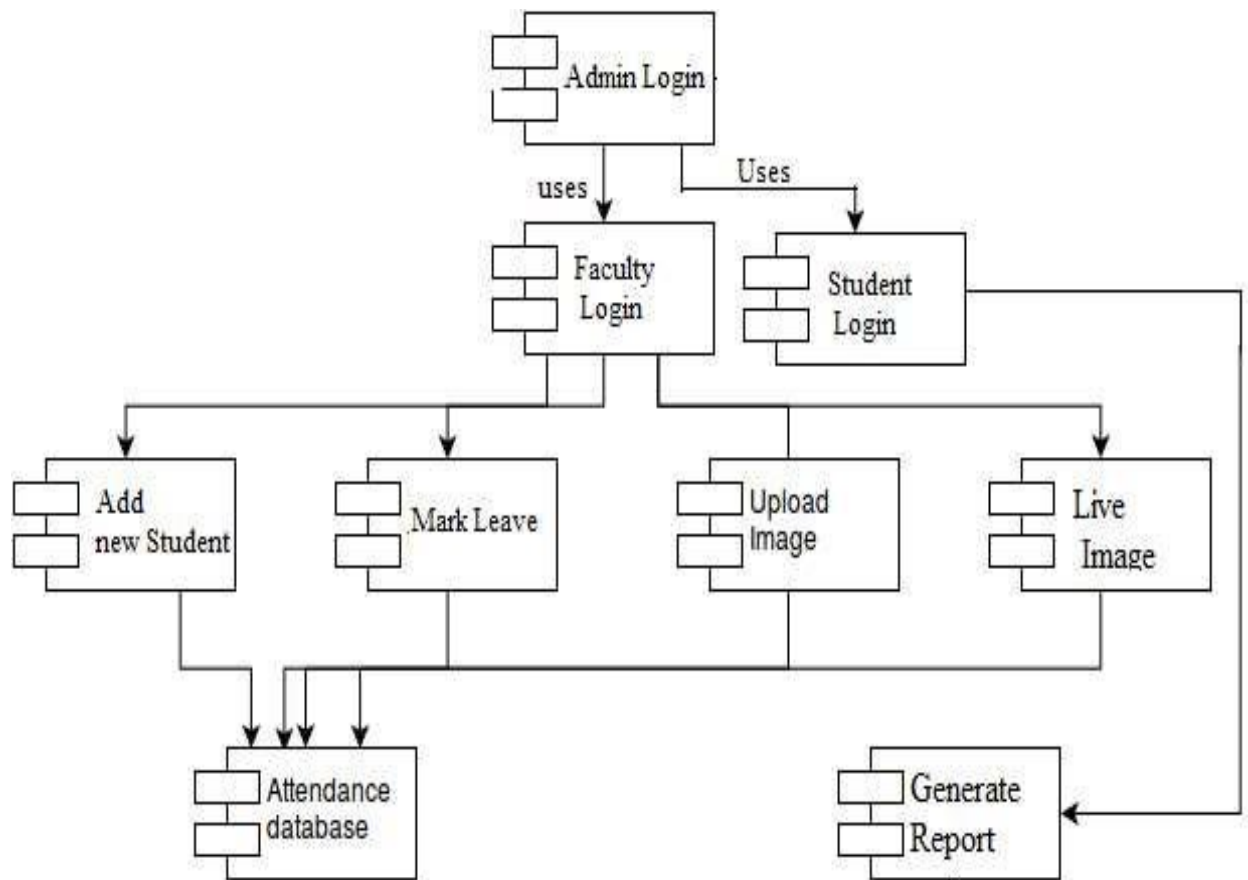
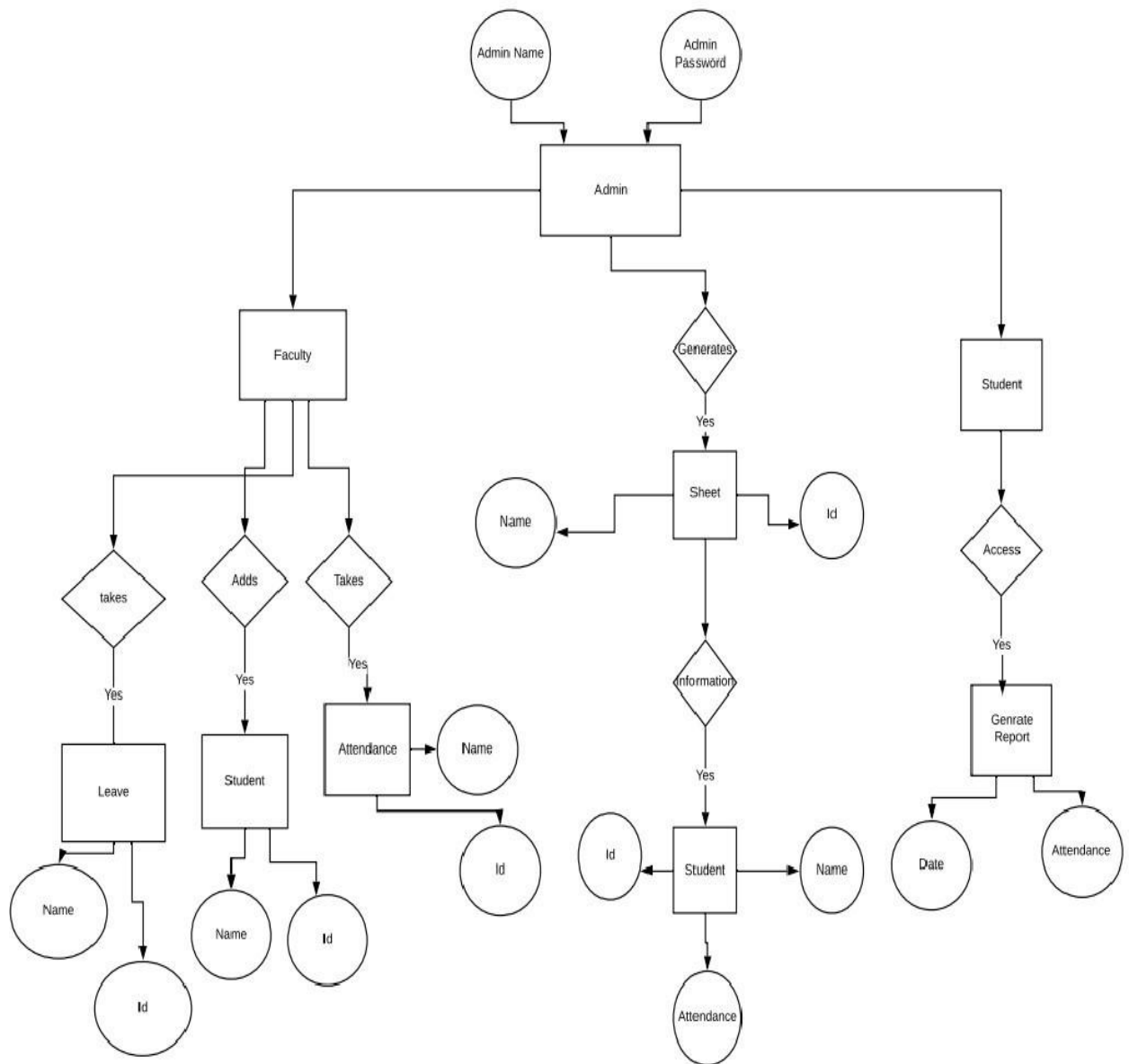Figure 5.6 Component Diagram of Real Time Analysis

5.4   E-R DIAGRAM DESIGN:

Figure 5.7 E-R Diagram of Real Time Product Analysis System

CHAPTER 6

IMPLEMENTATION DETAILS

ASSUMPTIONS AND DEPENDENCIES

6.1   ASSUMPTIONS:

The following Assumption was taken into consideration:

- The detector module should crop every human face from the input image and not to Crop other areas. So, it was assumed that the detector will be very accurate in cropping just and all the human faces from the uploaded image and save it for further recognition.

- The recognition module has to be very accurate in recognizing that is comparing the detected image with the images fetched from the database. So, it was assumed that the recognition module will correctly recognize all the faces from the uploaded image so that a correct Seat Allotment sheet is produced.

6.2   DEPENDENCIES:

The dependencies are as follows:

- Our scripts use opencv.Opencv provides libraries which has functions like CascadeClassifier() which are the core part of detection and recognition module.

- It also involves the haarcascade_frontalface_default.xml file. A Haar Cascade is basically a classifier which is used to detect particular objects from the source. The haarcascade_frontalface_default.xml is a haar cascade designed by OpenCV to detect the frontal face. A Haar Cascade works by training the cascade on thousands of negative images with the positive image superimposed on it. The haar cascade is capable of detecting features from the source.

6.3   IMPLEMENTATION METHODOLOGY:

The proposed system introduces an automated Seat Allotment system which integrates Face detection and face recognition algorithms. A webcam can capture an image or a video and upload to the application. The received file undergoes face detection and face recognition so the detected faces are extracted from the image.

The extracted faces are then compared with the saved faces of the database and on successful recognition the database is updated with the Seat Allotment and a sheet is generated and notification   is   generated   on   GUI.
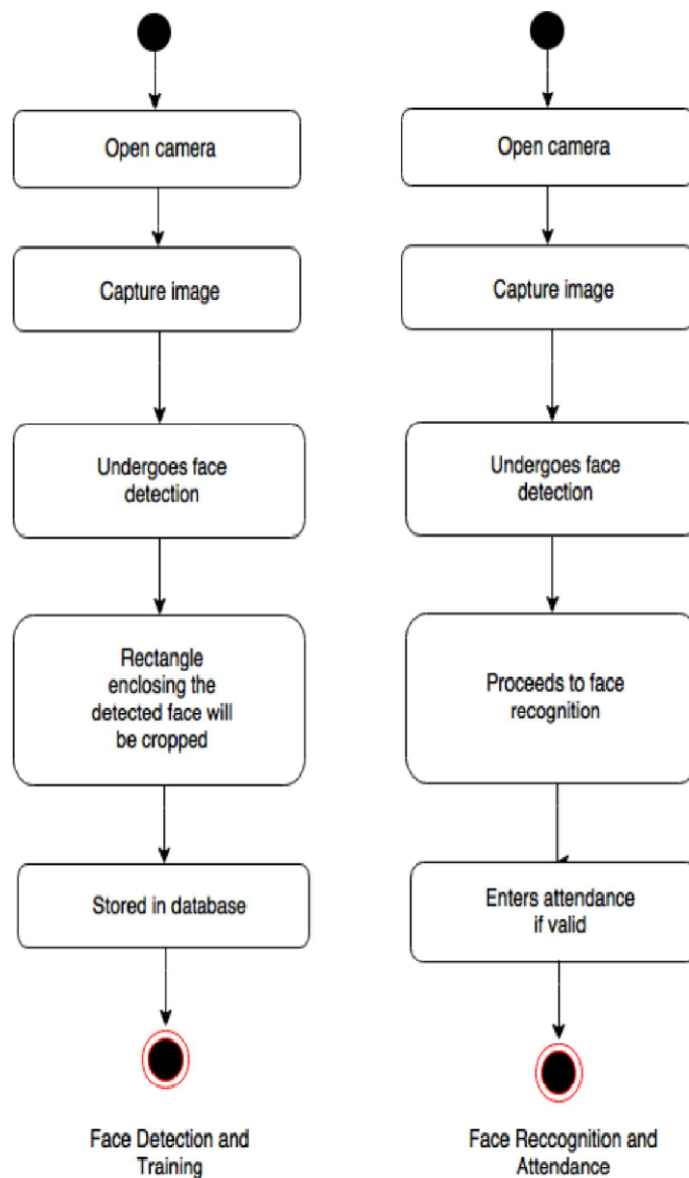
Figure 6.1 Flow Diagram This work is being carried out in five

stages:

Step 1: Generating Data for Training Initially the system is trained, that is the cropped images are saved to the database and they undergo detection and recognition. Further this data will be used to compare the detected images in all the uploaded files and mark the Seat Allotment.

Step 2: Capturing In this the capturing of the video or image will be done using a device and the captured file is saved to the database.

Step 3: Face Detection: The file saved to the database undergoes face detection using Haar cascade algorithm. The frames received are checked for the faces and those are cropped for further recognition.

Step 4: Face Recognition The detected images undergo correlation with the trained images of the databases. By this the detected images are now recognized.

Step 5: Seat Allotment Marking After the recognition process the students recognized are searched in the database and their Seat Allotment is marked.

6.4 COMPETITIVE ADVANTAGES OF PROJECT

- Currently either manual or biometric Seat Allotmentsystems are being used in which manual is hectic and time consuming. The biometric serves one at a time, so there is a need for such a system which could automatically mark the Seat Allotment of many persons at the same time.

- This system is cost efficient, no extra hardware required just a daily laptop or computer with a webcam. Hence it is easily deployable.

- The work of the administration department to enter the Seat Allotment is reduced and also stationary cost so every institute or organization will opt for such a time and money saving system.

- Not only in institutes or organizations, it can also be used at any public places or entry- exit gates for advance surveillance.

- One of the big benefits of using facial biometric systems in any organization is that you won't have to worry about time fraud. It will be impossible for buddy punching to occur, since everyone has to have to go through face scanning biometrics devices.
- It provides better security with a face biometrics system. Not only can you track students through biometrics time Seat Allotment tracking, but any visitors can be added to the system and tracked throughout the area too. Anyone that is not in the system will not be given access.

- Many companies like the fact that biometric imaging systems are automated. You won't have to worry about having someone there to monitor the system 24 hours a day.
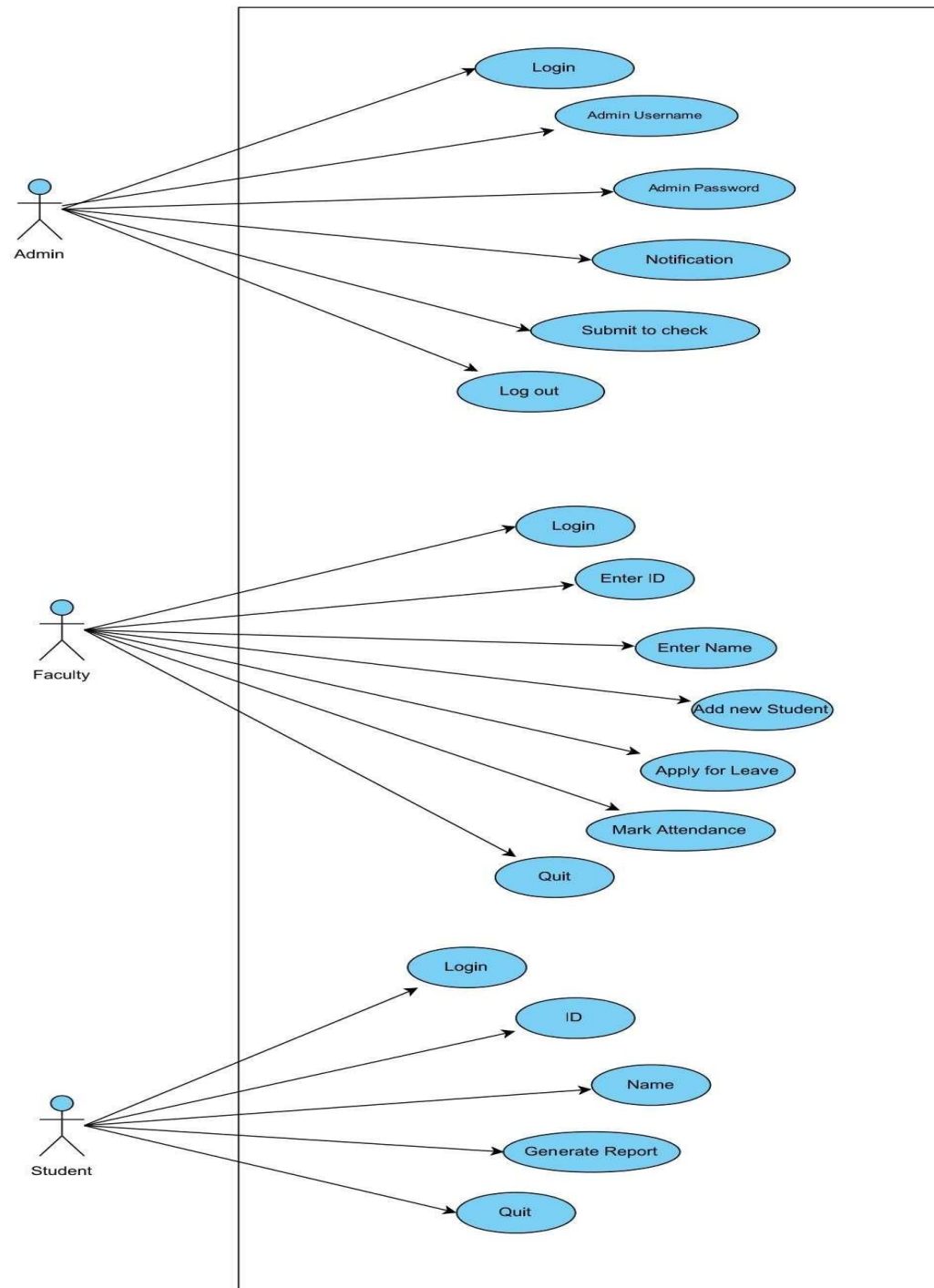
6.5   USE CASE DIAGRAMS:

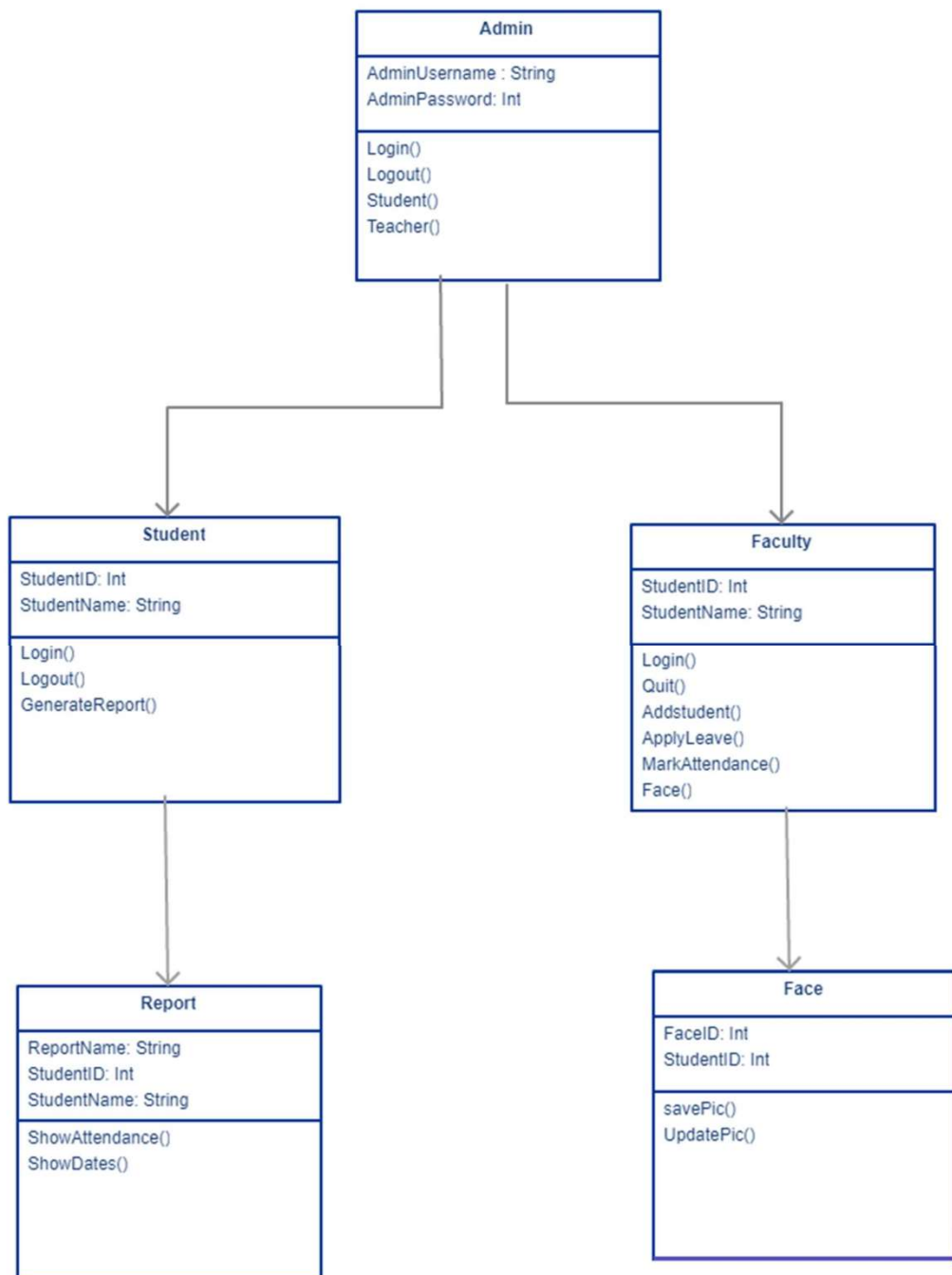Figure 6.2 Use Case Diagram

6.6   CLASS DIAGRAM:

Admin

AdminUsername : String
AdminPassword: Int

Login()
Logout()
Student()
Teacher()

Student

StudentID: Int
StudentName: String

Login()
Logout()
GenerateReport()

Faculty

StudentID: Int
StudentName: String

Login()
Quit()
Addstudent()
ApplyLeave()
MarkAttendance()
Face()

Report

ReportName: String
StudentID: Int
StudentName: String

ShowAttendance()
ShowDates()

Face

FaceID: Int
StudentID: Int

savePic()
UpdatePic()

Figure 6.3 Class Diagram

6.7 DATA FLOW DIAGRAMS:

A graphical tool used to describe and analyze the moment of data through a system manual or automated including the process, stores of data, and delays in the system. Data Flow Diagrams are the central tool and the basis from which other components are developed. The transformation of data from input to output, through processes, may be described logically and independently of the physical components associated with the system. The DFD is also know as a data flow graph or a bubble chart.

DFDs are the model of the proposed system. They clearly should show the requirements on which the new system should be built. Later during design activity this is taken as the basis for drawing the system's structure charts. The Basic Notation used to create a DFD's are as follows:

1.Dataflow: Data moves in a specific direction from an origin to a destination.

2.Process: People, procedures, or devices that use or produce (Transform) Data. The physical component is not identified.

3.Source: External sources or destination of data, which may be People, programs, organizations or other entities.

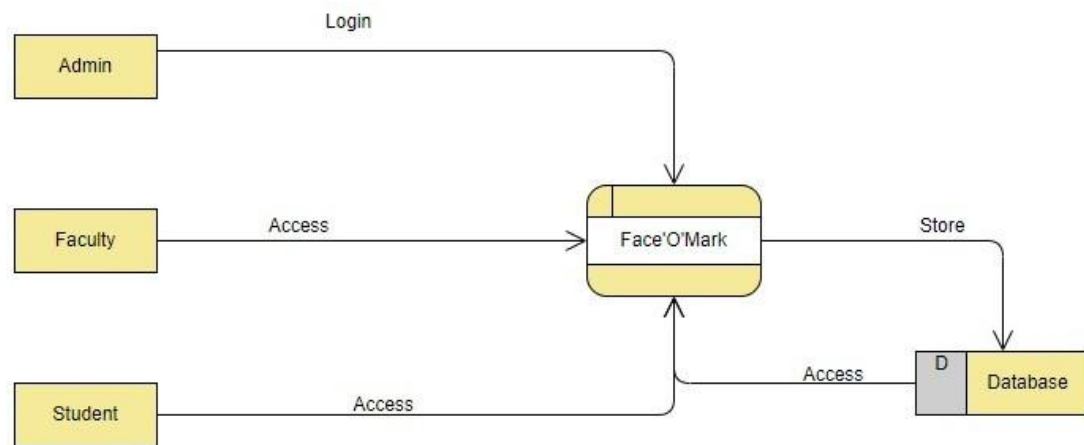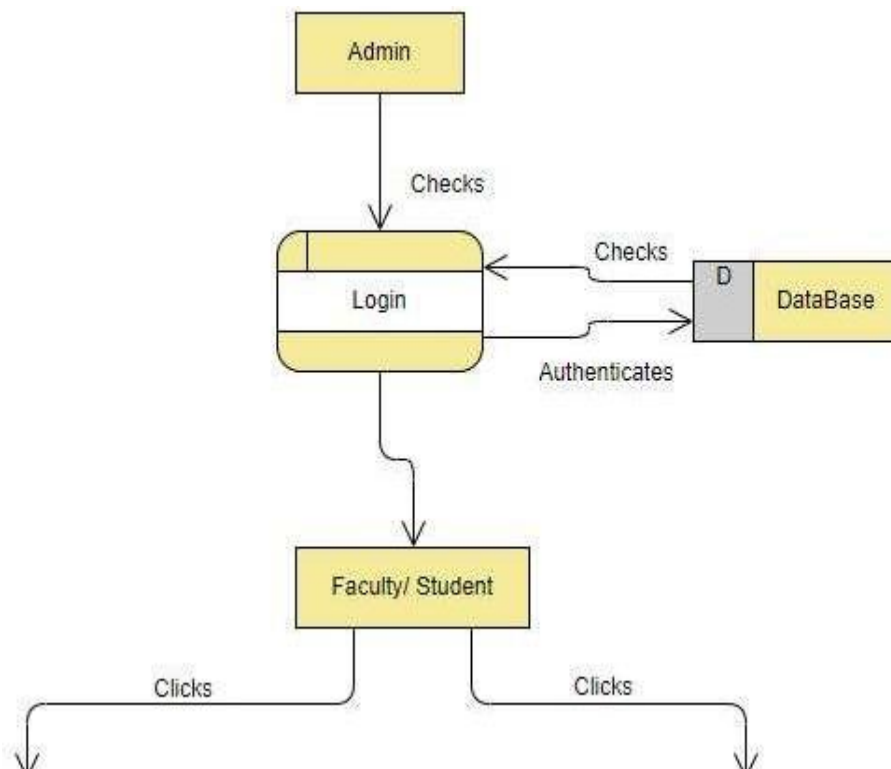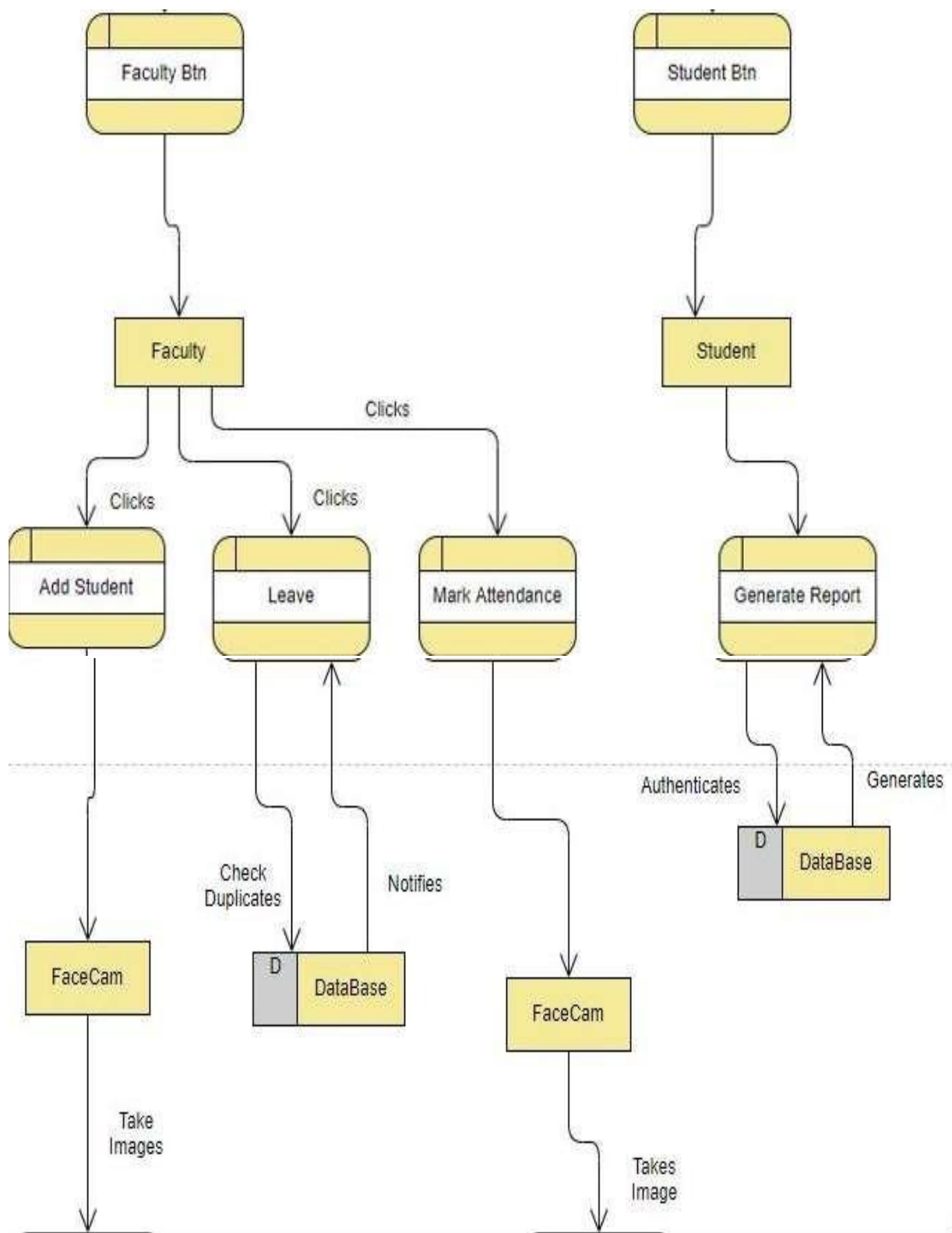**4.Data Store:** Here data are stored or referenced by a process in the System.

Level 0 DFD:

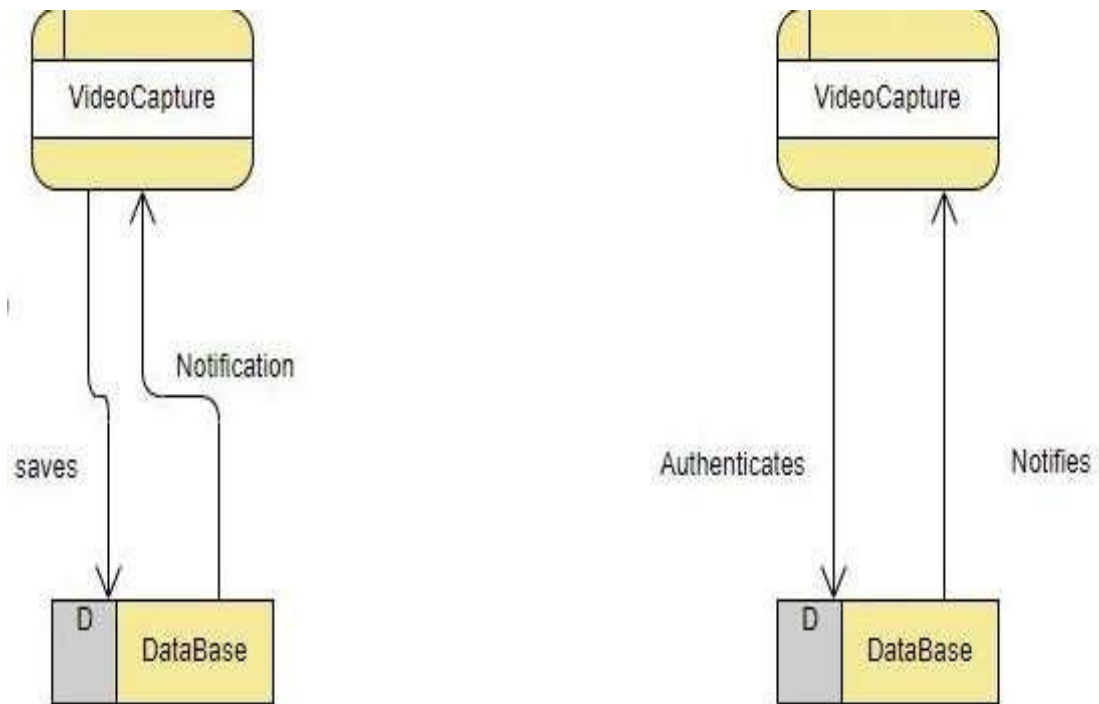
Figure 6.4 Level 0 Data flow Diagram

Level 1 DFD:

Figure 6.5 Level 1 Data Flow Diagram

CHAPTER 7

TECHNOLOGY DESCRIPTION FEATURES OF THE LANGUAGE

USED:

7.1   About Python:

Python is one of those rare languages which can claim to be both *simple* and *powerful*. You will find yourself pleasantly surprised to see how easy it is to concentrate on the solution to the problem rather than the syntax and structure of the language you are programming in.

Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

7.2 Features of python Simple

Python is a simple and minimalistic language. Reading a good Python program feels almost like reading English, although very strict English! This pseudocode nature of Python is one of its greatest strengths. It allows you to concentrate on the solution to the problem rather than the language itself.

Easy to Learn

As you will see, Python is extremely easy to get started with. Python has an extraordinarily simple syntax, as already mentioned.

Free and Open Source

Python is an example of a *FLOSS* (Free/Libre and Open-Source Software). In simple terms, you can freely distribute copies of this software, read its source code, make changes to it, and use pieces of it in new free programs. FLOSS is based on the concept of a community which

share knowledge. This is one of the reasons why Python is so good - it has been created and is constantly improved by a community who just want to see a better Python.

High-level Language

When you write programs in Python, you never need to bother about the low-level details such as managing the memory used by your program, etc.

Portable

Due to its open-source nature, Python has been ported to (i.e. changed to make it work on) many platforms. All your Python programs can work on any of these platforms without requiring any changes at all if you are careful enough to avoid any system-dependent features.

You can use Python on GNU/Linux, Windows, FreeBSD, Macintosh, Solaris, OS/2, Amiga, AROS, AS/400, BeOS, OS/390, z/OS, Palm OS, QNX, VMS, Psion, Acorn RISC OS, VxWorks, PlayStation, Sharp Zaurus, Windows CE and PocketPC!

Interpreted

This requires a bit of explanation.

A program written in a compiled language like C or C++ is converted from the source language i.e. C or C++ into a language that is spoken by your computer (binary code i.e. 0s and 1s) using a compiler with various flags and options. When you run the program, the linker/loader software copies the program from hard disk to memory and starts running it.

Python, on the other hand, does not need compilation to binary. You just *run* the program directly from the source code. Internally, Python converts the source code into an intermediate form called bytecodes and then translates this into the native language of your computer and then runs it. All this, actually, makes using

Python is much easier since you don't have to worry about compiling the program, making sure that the proper libraries are linked and loaded, etc. This also makes your Python programs much more portable, since you can just copy your Python program onto another computer and it just works!

Object Oriented

Python supports procedure-oriented programming as well as object-oriented programming. In *procedure-oriented* languages, the program is built around procedures or functions which are nothing but reusable pieces of programs. In *object-oriented* languages, the program is built around objects which combine data and functionality. Python has a very powerful but simplistic way of doing OOP, especially when compared to big languages like C++ or Java.

Extensible

If you need a critical piece of code to run very fast or want to have some piece of algorithm not to be open, you can code that part of your program in C or C++ and then use it from your Python program.

Embeddable

You can embed Python within your C/C++ programs to give *scripting* capabilities for your program's users.

7. 3 Extensive Libraries

The Python Standard Library is huge indeed. It can help you do various things involving regular expressions, documentation generation, unit testing, threading, databases, Openpyxl,Tkinter GUI (graphical user interfaces), cx_freeze, OpenCV, OpenCV-lib, time, OS, winows and other system-dependent stuff. Remember, all this is always available wherever Python is installed. This is called the *Batteries Included* philosophy of Python.

CHAPTER 8

TESTING

Software testing is a critical element of software quality assurance and represents the ultimate reviews of specification, design and coding. Testing represents an interesting anomaly for the software. During earlier definition and development phases, it was attempted to build software from an abstract concept to a tangible implementation. No system is error free because it is so till the next error crops up during any phase of the development or usage of the product. A sincere effort however needs to be put to bring out a product that is satisfactory.

The testing phase involves the testing of development system using various data. Preparation of the test data plays a vital role in system testing. After preparing the test data, the system under study was tested using those data. While testing the system, by using the test data, errors were found and corrected by using the following testing steps and corrections were also noted for future use. Thus, a series of testing is performed on the proposed system before the system is ready for implementation.

The various types of testing done on the system are:

- Integration testing
- Validation testing
- Unit testing
- Output testing
- User Acceptance testing (beta Testing)

8.1   Unit testing:

Unit testing focuses on verification effort on the smallest unit of software design module. Using the unit test plans prepared in the design phase of the system development as a guide, important control paths are tested to uncover errors within the boundary of the modules. The interfaces of the modules are tested to ensure proper flow of information into and out of the modules under consideration boundary conditions were checked. All independent paths were exercised to ensure that all statements in the module have been executed at least once and all error- handling paths were tested.

Each unit is thoroughly tested to check if it might fail in any possible situation. This testing is carried during the programming state itself. At the end of this testing phase each module is found to have an adverse effect working satisfactorily, as regard to the expected output from the   module.

8.2   Integration Testing:

Data can be lost across an interface, one module can on another; sub-functions when combined may not produce the desired major function: global data structures can present problems. Integration testing is a systematic technique for the program structure while at the same time concluding tests to uncover errors associated with interface. All modules are combined in this testing step. Then the entire program is tested as a whole. Each of the module is integrated and tested separately and later all modules are tested together for some time to ensure the system as a whole works well without any errors.

8.3   Validation Testing:

At the culmination of the integration testing, the software is completely assembled as a package, interfacing errors have been uncovered and corrected, and a final series of software validation testing began. Here we test if the system functions in a manner that can be reasonably expected by the customer. The system is tested against the system requirement specification.

Output Testing:

After performing validation testing, the next phase is output testing of the proposed system, since no system can be useful if it does not produce the desired output in the specified format. The output generated or displayed by the system under consideration is tested by asking the user about the format required by them, here, the output format is considered in two ways: One is on the screen and the other is on the printed form. Beta testing is carried output by the client, and minor errors that have been discovered by the client are rectified to improve the user friendliness of the system.

8.4   User Acceptance Testing (Beta Testing):

User Acceptance Testing (UAT), also known as beta or end-user testing, is defined as testing the software by the user or client to determine whether it can be accepted or not**.** This is the final testing performed once the functional, system and regression testing are completed.

The main purpose of this testing is to validate the software against the business requirements. This validation is carried out by the end users who are familiar with the business requirements. As the user acceptance test is the last testing that is carried out before the software goes live, obviously this is the last chance for the customer to test the software and measure if it is fit for the purpose. This is typically the last step before the product goes live or before the delivery of the product is accepted. This is performed after the product itself is thoroughly tested.

Users or client?: This could be either someone who is buying a product (in the case of commercial software) or someone who has had a software custom built through a software service provider or the end user if the software is made available to them ahead of the time and when their feedback is sought out.The team can be comprised of beta testers or the customer should select UAT members internally from every group of the organization so that each and every user role can be tested accordingly. After performing loads of system, integration and regression testing one would wonder about the necessity of this testing. Actually speaking, this is the most important phase of the project as this is the time at which the users who are actually going to use the system would validate the system for its fit to purpose. UAT is a test phase that largely depends on the perspective of the end users and the

domain knowledge of a department that represents the end users.

CHAPTER 9

FUTURE ENHANCEMENTS AND SCOPE

9.1 FUTURE ENHANCEMENTS:

The Future enhancements of this project include the following:

- Absentee to get Email

- Camera Access by mobile Camera rather Web cam.

- Get an ID card with name, class, ID, Barcode and Photo on it.

- Student can access his/her Seat Allotment dates individually to his Email account

- More Authority to the Admin like, add or remove Faculty, update student details etc.

- More information can be stored of students like EmailID, Address, PhoneNo etc.

- Semester and Class wise access to Faculty

- More than one Faculty can Access the Application

9.2 FUTURE SCOPE

It can be easily implemented at any institute or organization.

A method could be proposed to illustrate robustness against the variations that is, in near future we could build a system which would be robust and would work in undesirable conditions too. Here it is proposed for an institute to take the Seat Allotment of the students but in future it can be used to do the same work at entry as well as exit points.

I am working to improve the face recognition effectiveness to build more efficient systems in near future.

In further work, authors intend to improve face recognition effectiveness by using the interaction among our system, the users and the administrators. On the other hand, our system can be used in a completely new dimension of face recognition application, mobile based face recognition, which can be an aid for common people to know about any person being photographed by cell phone camera including proper authorization for accessing a centralized   database.

CHAPTER 10

CONCLUSION

In order to maintain the Seat Allotment this system has been proposed. It replaces the manual system with an automated system which is fast, efficient, cost and time saving as it replaces the stationary material and the paperwork. Hence this system is expected to give desired results and in future could be implemented for logout. Also, the efficiency could be improved by integrating other techniques with it in near future.

In this system we have implemented Seat Allotment records to assist Faculty. It saves time andeffort, especially if it is a lecture with a huge number of students. Automated Seat Allotment Systemhas been envisioned for the purpose of reducing the drawbacks in the traditional (manual)system.

This Seat Allotmentsystem demonstrates the use of image processing techniques in the classroom. This system can not only merely help in the Seat Allotment system, but also improvethe   goodwill   of   an   institution.

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- Learning OpenCV: Computer Vision with the OpenCV Library by Gary RostBradski   O'REILLY

Appendix I

I What is the Local Binary Pattern?

Local binary patterns (LBP) is a type of visual descriptor used for classification in computer vision. LBP is the particular case of the Texture Spectrum model proposed in 1990. LBP was first described in 1994. It has since been found to be a powerful feature for texture classification; it has further been determined that when LBP is combined with the Histogram of oriented gradients (HOG) descriptor, it improves the detection performance considerably on some datasets.

II   The LBP feature vector:

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 counterclockwise.

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.

III   What is ROI?

A region of interest (often abbreviated ROI), is a selected subset of samples within a dataset identified for a particular purpose. The concept of a ROI is commonly used in many application areas. For example, in medical imaging, the boundaries of a tumor may be defined on an image or in a volume, for the purpose of measuring its size. The endocardial border may be defined on an image, perhaps during different phases of the cardiac cycle, for example end-systole and end-diastole, for the purpose of assessing cardiac function. In geographical information systems (GIS), a ROI can be taken literally as a polygonal selection from a 2D map. In computer vision and optical character recognition, the ROI defines the borders of an object under consideration.

In many applications, symbolic (textual) labels are added to a ROI, to describe its content in a compact manner. Within a ROI may lie individual points of interest (POIs).

IV   Correlation

Correlation technique is used for face recognition. After the face detection image undergoes a face recognition process, the test image will be compared with training images in order to perform face recognition.