FACE RECOGNITION BASED ATTENDANCE SYSTEM.

A

MAJOR PROJECT REPORT

Submitted in partial fulfillment of the requirements

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in

COMPUTER SCIENCE & ENGINEERING

by

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Dec-2021

CERTIFICATE

I hereby certify that the work which is being presented in the B.Tech. Minor Project Report entitled ***Face Recognition based Attendance System,*** in partial fulfillment of the requirements for the award of the degree of ***Bachelor of Technology*** in ***Computer Science& Engineering*** and submitted to the Department of Computer Science & Engineering, *Sagar Institute of Science & Technology (SISTec)***,** Bhopal (M.P.) is an authentic record of my own work carried out during the period from July-2021 to Dec-2021 under the supervision of **Prof. Vasima Khan (Project Guide).**

The content presented in this project has not been submitted by me for the award of any other degree elsewhere.

Signature

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This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Date:

Project Guide ***HOD*** ***Principal***

ABSTRACT

Uniqueness or individuality of an individual face is the representation of one's identity. In this project, face of an individual is used for the purpose of attendance making automatically.

Attendance of the student is very important for every college, university and school. Conventional methodology for taking attendance is by calling the name or roll number of the student and the attendance is recorded. Time consumption for this purpose is an important point of concern. Assume that the duration for one subject is around 60 minutes or 1 hour & to record attendance it takes 5 to 10 minutes and for every tutor this is consumption of time.

To stay away from these losses, an automatic process is used in this project which is based on image processing. In this project face detection and face recognition is used. Face detection is used to locate the position of face region and face recognition is used for marking the understudy's attendance.

The database of all the students in the class is stored and when the face of the individual student matches with one of the faces stored in the database then the attendance is recorded.

Sagar Institute of Science & Technology (SISTec), Bhopal

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Bhopal (M.P.)

DEC-2021

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At the end, we would like to express our sincere thanks to all our friends and others who helped us directly or indirectly during this project work.

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LIST OF ABBREVIATIONS

ACRONYM	FULL FORM
LBP	Local Binary Pattern
LBPH	Local Binary Pattern Histogram
VS Code	Visual Studio Code
CSV	Comma-Separated Values
PIL	Python Imaging Library
OS	Operating System
Open CV	Open Source Computer Vision Library
GUI	Graphical User Interface

CHAPTER-1
INTRODUCTION

CHAPTER-1
INTRODUCTION

1.1 ABOUT PROJECT

Face is the representation of one's identity. Hence, we have proposed an automated student attendance system based on face recognition. Face recognition system is very useful in life applications especially in security control systems. The airport protection system uses face recognition to identify suspects and FBI (Federal Bureau of Investigation) uses face recognition for criminal investigations

In this project, face of an individual is used for the purpose of attendance making automatically. "Face Recognition Based Attendance System" will be a software which will use face detection and face recognition. Face detection is used to locate the position of face region and face recognition is used for marking the understudy's attendance.

The database of all the students in the class is stored and when the face of the individual student matches with one of the faces stored in the database then the attendance is recorded. This software will be great solution to both student and faculty members.

1.2 PROJECT OBJECTIVES

- Reducing time wastage during conventional class attendance.
- Utilizing latest trends in machine vision to implement a feasible solution for class attendance system.
- Automating the whole process so that we have digital environment.
- Automating the whole process so that we have digital environment.
- Encouraging the use of technology in daily lives.

CHAPTER-2 SOFTWARE AND HARDWARE REQUIREMENTS

CHAPTER-2
SOFTWARE & HARDWARE REQUIREMENTS

2.1 INTRODUCTION

System requirements are the required specifications a device must have in order to use certain hardware or software. For example, a computer may require a specific I/O port to work with a peripheral device. A smartphone may need a specific operating system to run a particular app. System requirements are most commonly seen listed as minimum and recommended requirements. The minimum system requirements need to be met for the web application to run at all on your system, & the recommended system requirements, if met, will offer better software usability.

2.2 SOFTWARE REQUIREMENTS

There are following software requirements to work on this project-Language: Python 3.

- Operating System: Windows
- Tool: Visual Studio Code
- Open CV
- NumPy
- Pillow (PIL)
- Panda
- Tkinter
- OS
- CSV
- Date Time

2.2.1 PYTHON 3

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis. Python is a general purpose language, meaning it can be used to create a variety of different programs and isn't specialized for any specific problems. This versatility, along with its beginner-friendliness, has made it one of the most-used programming languages today. A survey conducted by industry analyst firm RedMonk found that it was the most

popular programming language among developers in 2021.

Python is commonly used for developing websites and software, task automation, data analysis, and data visualization. Since it's relatively easy to learn, Python has been adopted by many non-programmers such as accountants and scientists, for a variety of everyday tasks, like organizing finances.

2.2.2 VISUAL STUDIO CODE

Visual Studio Code is a lightweight but powerful source code editor which runs on your desktop and is available for Windows, macOS and Linux. It comes with built-in support for JavaScript, TypeScript and Node.js and has a rich ecosystem of extensions for other languages (such as C++, C#, Java, Pyhton, PHP, Go) and runtimes (such as .NET and Unity)**.**

2.2.3 OPEN CV

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 people of user community and estimated number of downloads exceeding 18 million. The library is used extensively in companies, research groups and by governmental bodies.

Along with well-established companies like Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda, Toyota that employ the library, there are many startups such as Applied Minds, VideoSurf, and Zeitera, that make extensive use of OpenCV. OpenCV's deployed uses span the range from stitching streetview images together, detecting intrusions in surveillance video in Israel, monitoring mine equipment in China, helping robots navigate and pick up objects at Willow Garage, detection of swimming pool drowning accidents in Europe, running interactive art in Spain and New York, checking runways for debris in Turkey, inspecting labels on products in factories around the world on to rapid face detection

in Japan.

It has C++, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS.OpenCV leans mostly towards real-time vision applications and takes advantage of MMX and SSE instructions when available. A full-featured CUDAand OpenCL interfaces are being actively developed right now. There are over 500 algorithms and about 10 times as many functions that compose or supportthose algorithms. OpenCV is written natively in C++ and has a templated interface that works seamlessly with STL containers.

OpenCV's application areas include:

- 2D and 3D feature toolkits
- Egomotion estimation
- Facial recognition system
- Gesture recognition
- Human–computer interaction (HCI)
- Mobile robotics
- Motion understanding
- Object identification
- Segmentation and recognition
- Stereopsis stereo vision: depth perception from 2 cameras
- Structure from motion (SFM)
- Motion tracking
- Augmented reality

2.2.4 NUMPY

NumPy is the fundamental package for scientific computing in Python. It is a Python library that provides a multidimensional array object, various derived objects (such as masked arrays and matrices), and an assortment of routines for fast operations on arrays, including mathematical, logical, shape manipulation, sorting, selecting, I/O, discrete Fourier transforms, basic linear algebra, basic statistical operations, random simulation and much more.

At the core of the NumPy package, is the ndarray object. This encapsulates n-dimensional arrays of homogeneous data types, with many operations being performed in compiled code for performance. There are rrays have a fixed size at creation, unlike Python lists (which can grow dynamically). Changingthe size of an ndarray will create a new array and delete the original.

The elements in a NumPy array are all required to be of the same data type, and thus will be the same size in memory. The exception: one can have arrays of (Python, including NumPy) objects, thereby allowing for arrays of different sized elements.

NumPy arrays facilitate advanced mathematical and other types of operations on large numbers of data. Typically, such operations are executed more efficiently and with less code than is possible using Python's built-in sequences.

A growing plethora of scientific and mathematical Python-based packages are using NumPy arrays; though these typically support Python-sequence input, they convert such input to NumPy arrays prior to processing, and they often output NumPy arrays. In other words, in order to efficiently use much (perhaps even most) of today's scientific/mathematical Python-based software, just knowing how to use Python's built-in sequence types is insufficient - one also needs to know how to use NumPy arrays.
The points about sequence size and speed are particularly important in scientific computing. As a simple example, consider the case of multiplying each element in a 1-D sequence with the corresponding element in another sequence of the same length. If the data are stored in two Python lists, a and b, we could iterate over each element:

2.2.5 PILLOW

Python Imaging Library is a free and open-source additional library for the Python programming language that adds support for opening, manipulating, and saving many different image file formats. It is available for Windows, Mac OS X and Linux. The latest version of PIL is 1.1.7, was released in September 2009 and supports Python 1.5.2–2.7.[3]

Development of the original project, known as PIL, was discontinued in 2011.[2] Subsequently, a successor project named Pillow forked the PIL repository and added Python 3.x support.[4] This forkhas been adopted as a replacement for the original PIL in Linux distributions including Debian[5] and Ubuntu (since 13.04)

Capabilities : Pillow offers several standard procedures for image manipulation.

These include:

- per-pixel manipulations,
- masking and transparency handling,
- image filtering, such as blurring, contouring, smoothing, or edge finding,
- image enhancing, such as sharpening, adjusting brightness, contrast or color,
- adding text to images and much more.

2.2.6 PANDAS

Pandas is an open source Python package that is most widely used for data science/data analysis and machine learning tasks. It is built on top of another package named Numpy, which provides support for multi-dimensional arrays. As one of the most popular data wrangling packages, Pandas works well withmany other data science modules inside the Python ecosystem, and is typically included in every Pythondistribution, from those that come with your operating system to commercial vendor distributions like ActiveState's ActivePython.

What Can You Do With DataFrames Using Pandas?

Pandas makes it simple to do many of the time consuming, repetitive tasks associated with working withdata, including:

- Data cleansing
- Data fill
- Data normalization
- Merges and joins
- Data visualization
- Statistical analysis
- Data Inspection
- Loading and saving data

And much more. In fact, with Pandas, you can do everything that makes world-leading data scientists vote pandas as the best data analysis and manipulation tool available.

2.2.6 TKINTER

Tkinter is a Python binding to the Tk GUI toolkit. It is the standard Python interface to the Tk GUI

Toolkit. Tkinter is included with standard GNU/Linux, Microsoft Windows and macOS installs of Python.

The name Tkinter comes from Tk interface. Tkinter was written by Fredrik Lundh.

Description

As with most other modern Tk bindings, Tkinter is implemented as a Python wrapper around a complete Tcl interpreter embedded in the Python interpreter. Tkinter calls are translated into Tcl commands, which are fed to this embedded interpreter, thus making it possible to mix Python and Tcl in a single application.

There are several popular GUI library alternatives available, such as wxPython, PyQt, PySide, Pygame, Pyglet, and PyGTK.

Widget

The generic term for any of the building blocks that make up an application in a graphical user Interface.

Core widgets: The containers: frame, labelframe, toplevel, paned window. The buttons: button, radiobutton, checkbutton (checkbox), and menubutton.

The text widgets: label, message, text. The entry widgets: scale, scrollbar, listbox, slider, spinbox, entry (singleline), option menu, text (multiline), and canvas (vector and pixel graphics).

Tkinter provides three modules that allow pop-up dialogs to be displayed: tk.messagebox (confirmation, information, warning and error dialogs), tk.filedialog (single file, multiple file and directory selection dialogs) and tk.colorchooser (colour picker).

Pyhton 2.7 and Python 3.1 incorporate the "themed Tk" ("ttk") functionality of Tk 8.5.[5][6] This allows Tk widgets to be easily themed to look like the native desktop environment in which the application is running, thereby addressing a long-standing criticism of Tk (and hence of Tkinter). Some widgets are exclusive to ttk, such as the combobox, progressbar and treeview widgets.

2.3 HARDWARE REQUIREMENTS

- Microsoft Windows 7 / 8 / 10.
- PC or laptop with x86-64 (64-bit) compatible processors.
- 2 GHz or better processor is recommended.
- x86 (32-bit) processors can still be used, but the algorithm will not provide the specified

performance.

- AVX2 support is highly recommended. Processors that do not support AVX2 will still run the Face Verification SDK algorithm, but in a mode, which will not provide the specified performance. Most modern processors support this instruction set, but please check if a particular processor model supports it.
- At least 512 MB of free RAM should be available for the application.
- A camera or webcam which is accessible using DirectShow interface.
- One of following development environments for application development:
  Microsoft Visual Studio 2012 or newer (for application development under C/C++, C#, Visual Basic .Net)
- Microsoft .NET framework 4.5 or newer (for .NET components usage).

CHAPTER-3
PROBLEM DESCRIPTION

CHAPTER-3
PROBLEM DESCRIPTION

In Traditional student attendance marking technique is often facing a lot of trouble. The face recognition student attendance system emphasizes its simplicity by eliminating classical student attendance marking technique such as calling student names or checking respective identification cards. There are not only disturbing the teaching process but also causes distraction for students during exam sessions. Apart from calling names, attendance sheet is passed around the classroom during the lecture sessions. The lecture class especially the class with a large number of students might find it difficult to have the attendance sheet being passed around the class. Thus, face recognition student attendance system is proposed in order to replace the manual signing of the presence of students which are burdensome and causes students get distracted in order to sign for their attendance. Furthermore, the face recognition based automated student attendance system able to overcome the problem of fraudulent approach and lecturers does not have to count the number of students several times to ensure the presence of the students. The paper proposed by Zhao, W et al. (2003) has listed the difficulties of facial identification. One of the difficulties of facial identification is the identification between known and unknown images. In addition, paper proposed by Pooja G.R et al. (2010) found out that the training process for face recognition student attendance system is slow and time-consuming. In addition, the paper proposed by Priyanka Wagh et al. (2015) mentioned that different lighting and head poses are often the problems that could degrade the performance of face recognition based student attendance system. Hence, there is a need to develop a real time operating student attendance system which means the identification process must be done within defined time constraints to prevent omission. The extracted features from facial images which represent the identity of the students have to be consistent towards a change in background, illumination, pose and expression. High accuracy and fast computation time will be the evaluation points of the performance.

CHAPTER-3 LITERATURE SURVEY

CHAPTER-4
LITERATURE SURVEY

A literature survey or a literature review in a project report is that section which shows the various analyses and research made in the field of your interest and the results already published, taking into account the various parameters of the project and the extent of the project.

We have taken reference from various other methods of taking attendance. Arun Katara et al. (2017) mentioned disadvantages of RFID (Radio Frequency Identification) card system, fingerprint system and iris recognition system. RFID card system is implemented due to its simplicity. However, the user tends to help their friends to check in as long as they have their friend's ID card.

The fingerprint system is indeed effective but not efficient because it takes time for the verification process so the user has to line up and perform the verification one by one. However for face recognition, the human face is always exposed and contain less information compared to iris. Iris recognition system which contains more detail might invade the privacy of the user. Voice recognition is available, but it is less accurate compared to other methods.

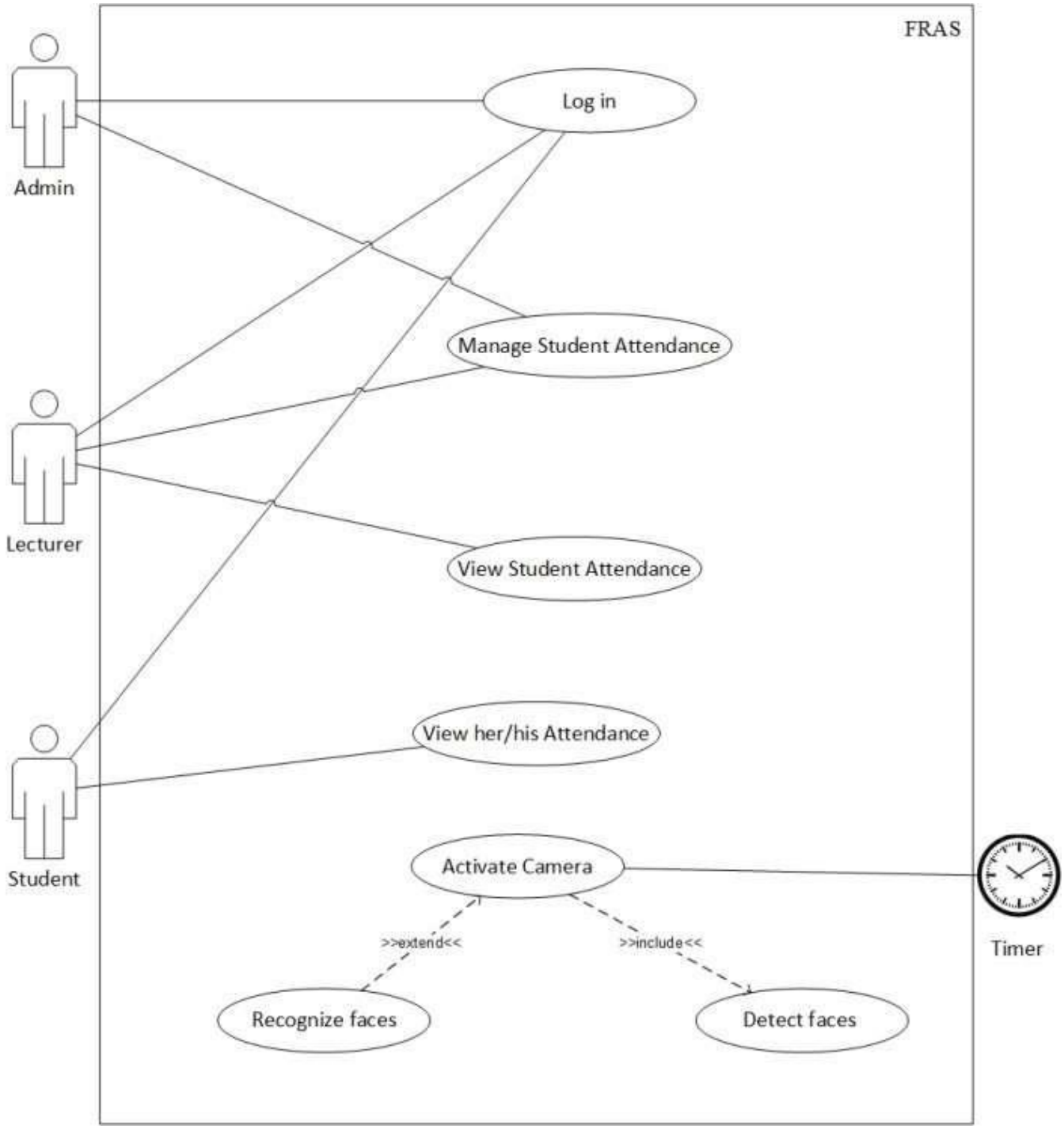
Hence, face recognition system is suggested to be implemented in the student attendance system.

CHAPTER-5

SOFTWARE REQUIREMENTS SPECIFICATION

CHAPTER-5
SOFTWARE REQUIREMENTS SPECIFICATION

5.1 USE CASE DIAGRAM



5.2 FUNCTIONAL REQUIREMENTS

System functional requirement describes activities and services that must provide.

- Taking and tracking student attendance by facial recognition in specific time.
- Sending the names of the absent student directly to the lecturer
- Permitting the lecturer to modify the student absent or late.
- The names of who is absent or late in the screen to avoid errors.

5.3 NON-FUNCTIONAL REQUIREMENTS

A non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. They are contrasted with functional requirements that define specific behavior or functions. A careful specification and adherence of non-functional requirements such as performance, security, privacy & availability are crucial to the success or failure of any software system.

- **Accuracy and Precision:** the system should perform its process in accuracy and Precision to avoid problems.
- **Modifiability:** the system should be easy to modify, any wrong should be correct.
- **Security:** the system should be secure and saving student's privacy.
- **Usability:** the system should be easy to deal with and simple to understand.
- **Maintainability:** the maintenance group should be able to fix any problem occur suddenly.
- **Speed and Responsiveness:** Execution of operations should be fast.

CHAPTER-6

SOFTWARE DESIGN

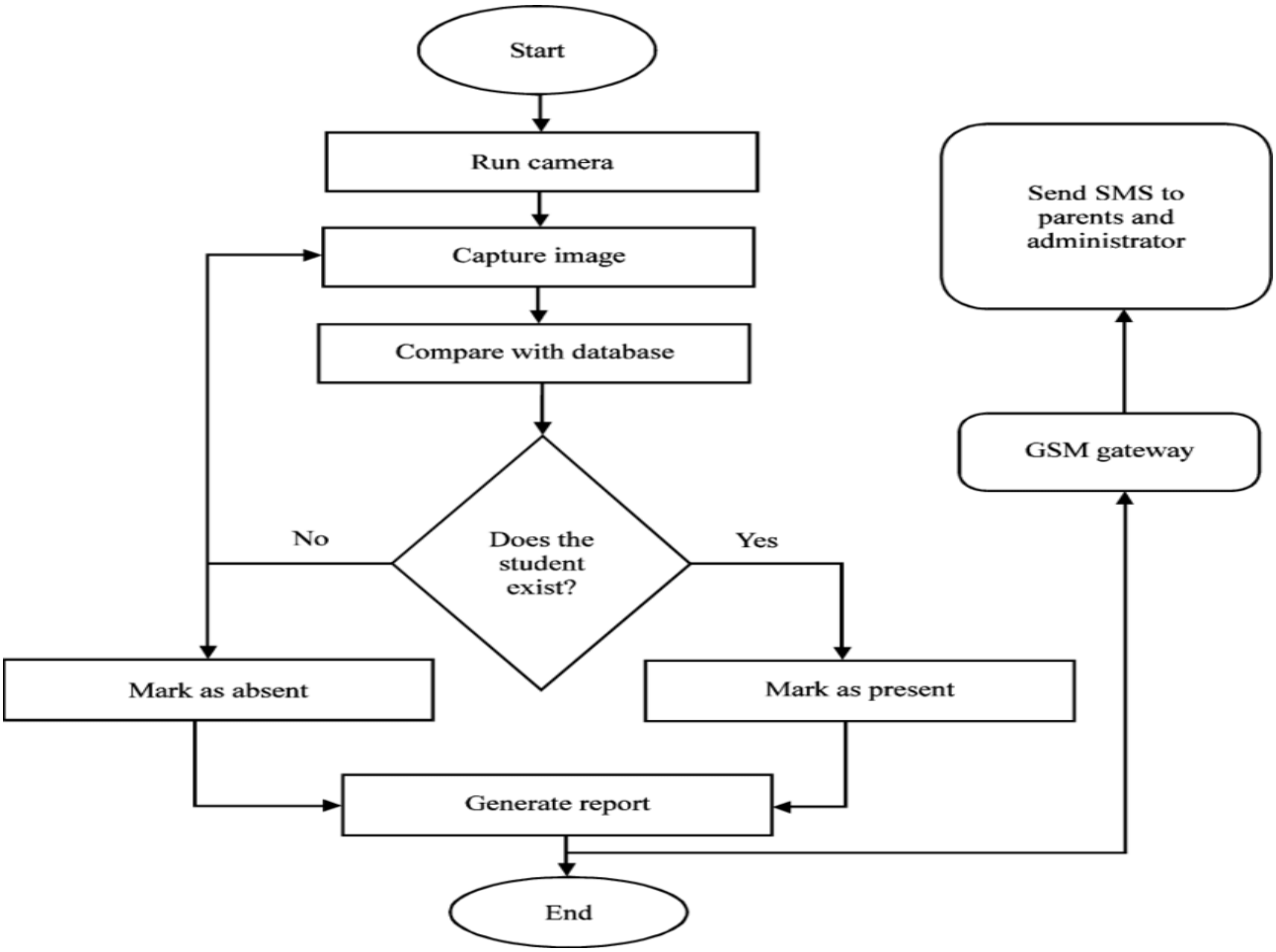
CHAPTER-6
SOFTWARE DESIGN

6.1 SCHEMA DIAGRAM

A database schema is the skeleton structure that represents the logical view of the entire database. It defines how the data is organized and how the relations among them areassociated. It formulates all the constraints that are to be applied on the data.

A database schema defines its entities and the relationship among them. It contains a descriptive detail of the database, which can be depicted by means of schema diagrams. It's the database designers who design the schema to help programmers understand the database and make it useful.

6.2 DATA FLOW DIAGRAM



CHAPTER-7
OUTPUT SCREENS

CHAPTER-7
OUTPUT SCREEN

- **INTERFACE SCREENSHOTS OF FRAS**

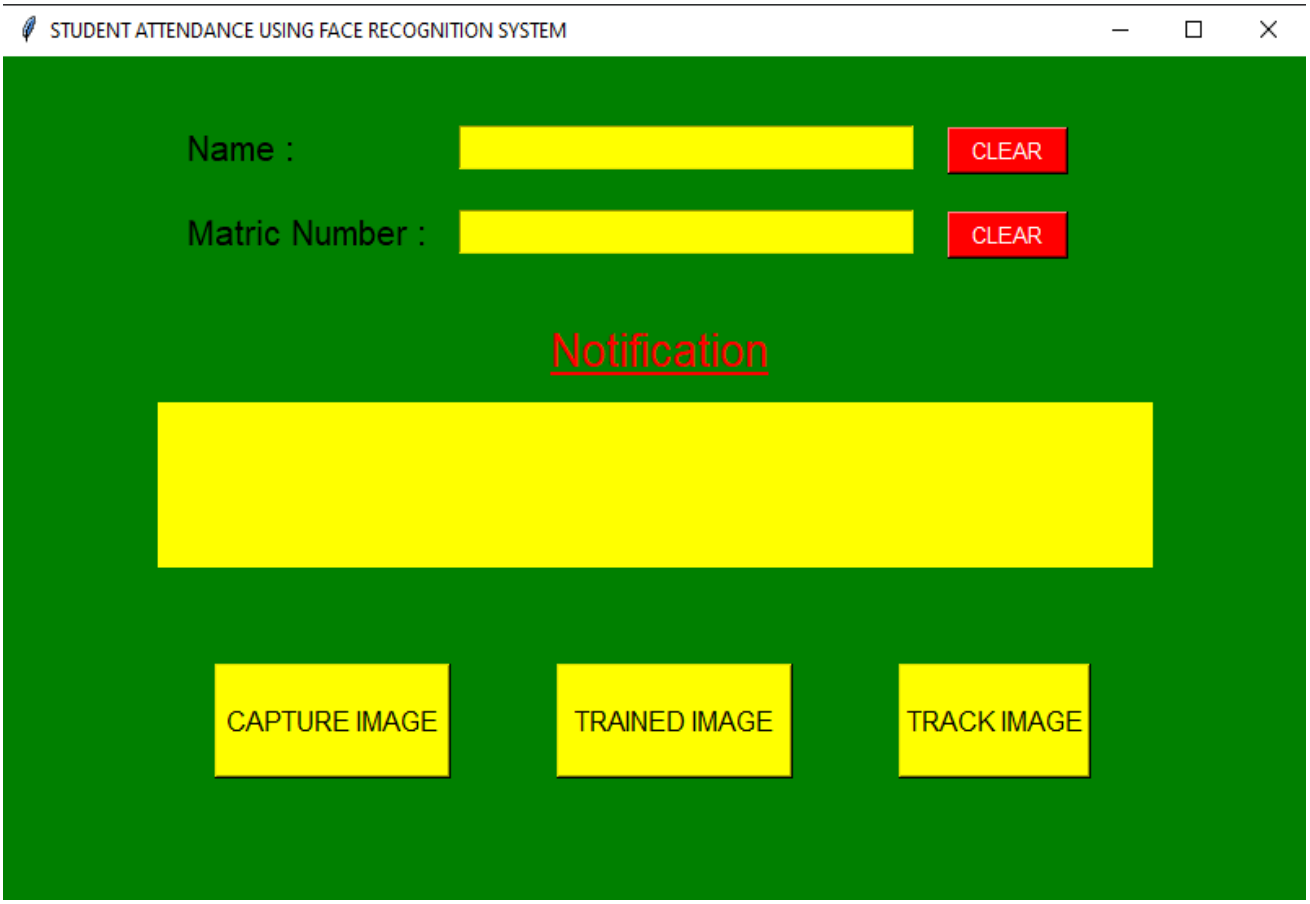


Fig 7.1: Data Collection Screen

Fig 7.1 The student interact with the system through the Graphical User Interface (GUI) above. The first step the student has to enter his details(Name and ID) this details will be stored in a csv file 'StudentDetailss.csv', the ID is Matric Number on the GUI. second step, the student will click on the CAPTURE IMAGE button to capture his faces, here 50pictures of the student will be taken and stored in the TrainingImages Folder. The haar-cascadeclassifier file to detect faces through the video stream while the student face is being captured. The notification board will print out the student details after a succesfull data collection.

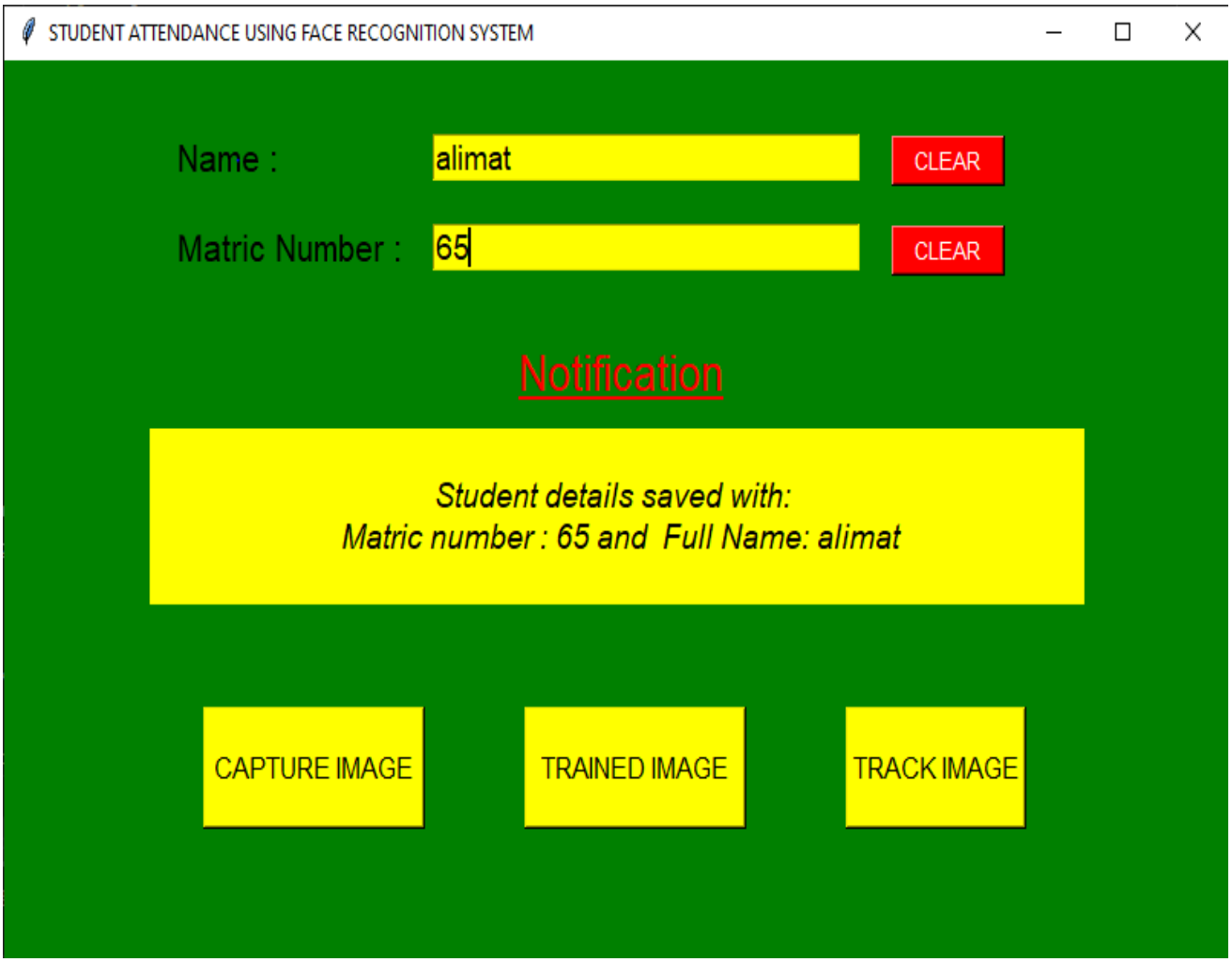


Fig 7.2: Image Trained

The features of this screen are as follows:

The student has to click on the **TRAIN IMAGE** button which will link his details, face features to the **LBPHrecognizer** to ease further face recognition, the recognizer will save the face features in the **trainner.yml** and "IMAGE TRAINED" will be printed on the GUI notification board after a successfull linkage.

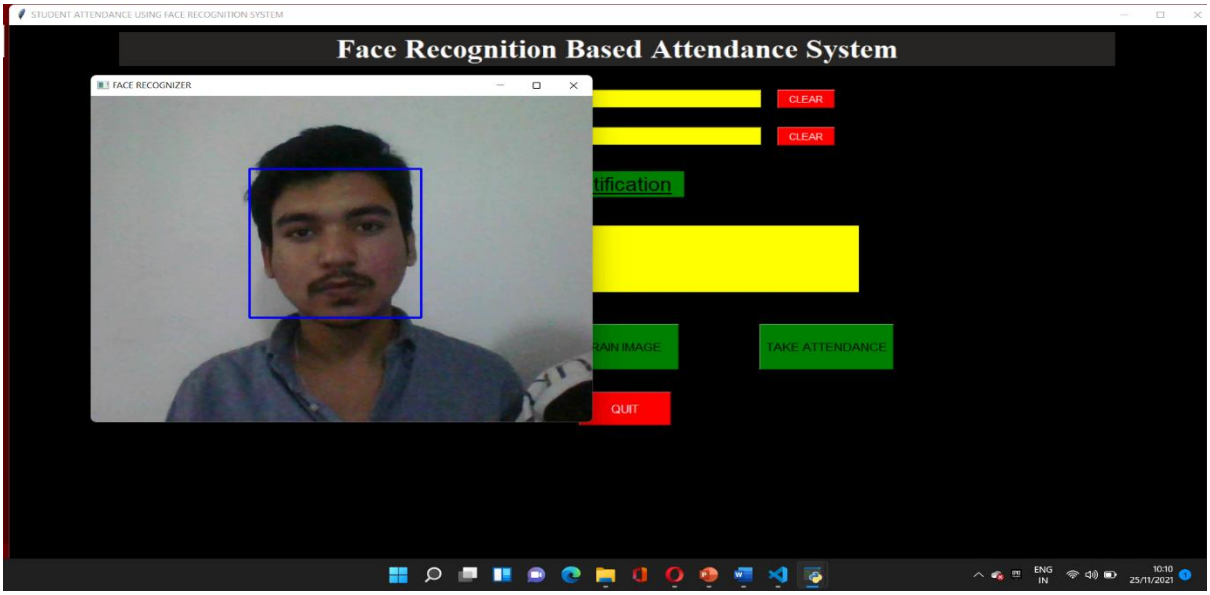


Fig 7.3: Face Tracking

Fig 7.3 shows the Face Tracking Screen. The features of this screen are as follows:

The student has to click on the **TRACK IMAGE** button to allow the face recognizer to track his face through a video stream, when trhe system successfully recognize the student face, his details will show and **"ATTENDANCE UPDATED"** will be printed out otherwise , the ID will be Unkown and **"ID UNKOWN, ATTENDANCE NOT UPDATED"** will be printed out. Simustenously, a csv file AttendanceFile.csv' will be updated with the **ID,NAME** of the student and **DATE** Aand **TIME** at which his face has recognized. the Unkown face captured will be store in the UnkownImages folder.

CHAPTER-8

DEPLOYMENT

CHAPTER-8
DEPLOYMENT

8.1 INTRODUCTION

This chapter describes how to deploy the windows desktop applications. The packaging and deployment of an application is often a neglected step from its development life cycle.

When building and testing an installer most developers think about simply running the setup manually with full UI, neglecting the enterprise deployment scenarios.

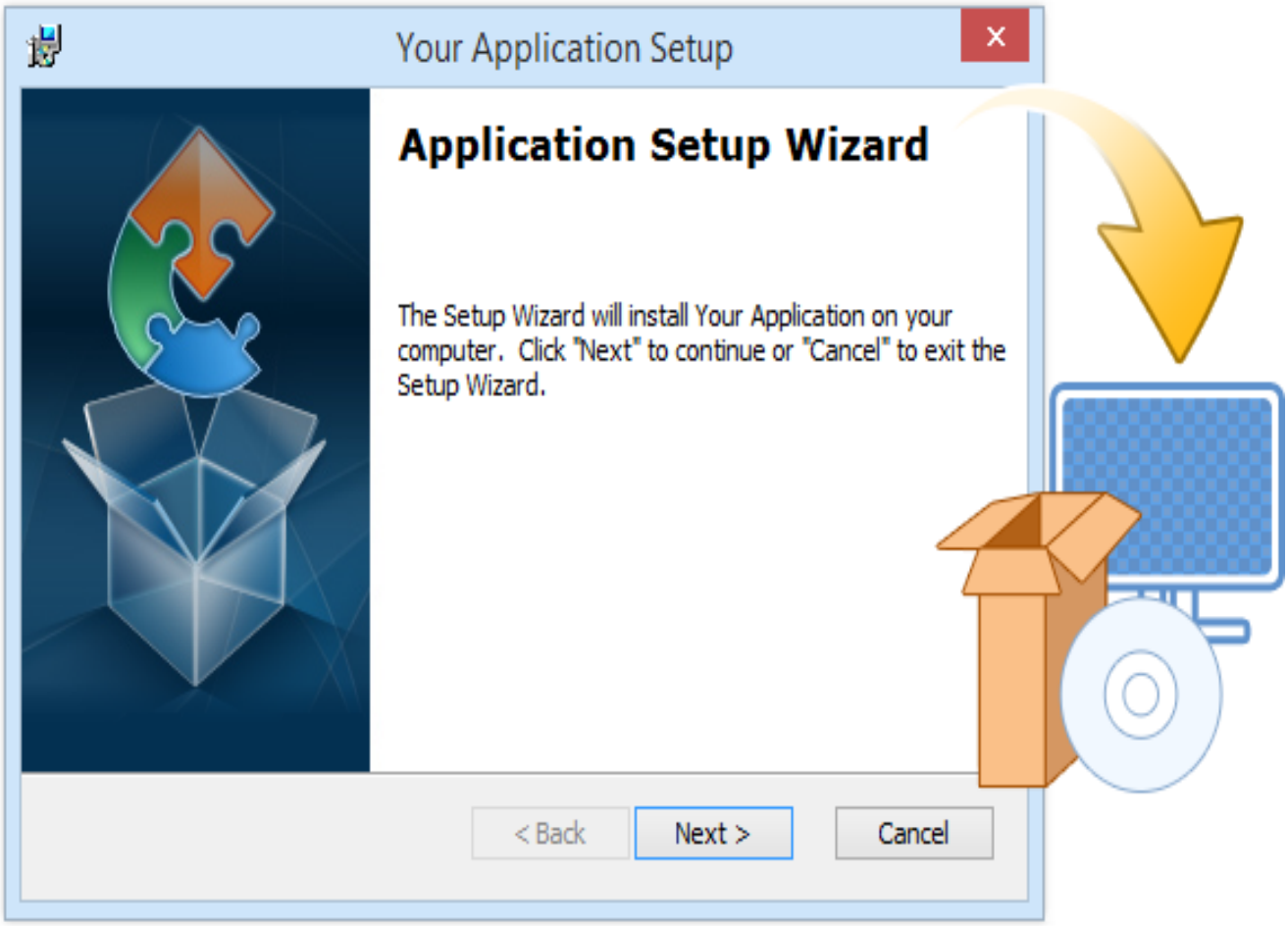


Fig 8.1: Download

8.1.1 THE STANDARD DEPLOYMENT TECHNOLOGY FOR WINDOWS

Since the launch of Office 2000 Microsoft has introduced Windows Installer. This is their recommended technology to be used for the installation, maintenance, and removal of software on Windows OS. There are other third party solutions that don't rely on the Windows Installer technologies, but we'll not get into comparing them, that is for another talk.

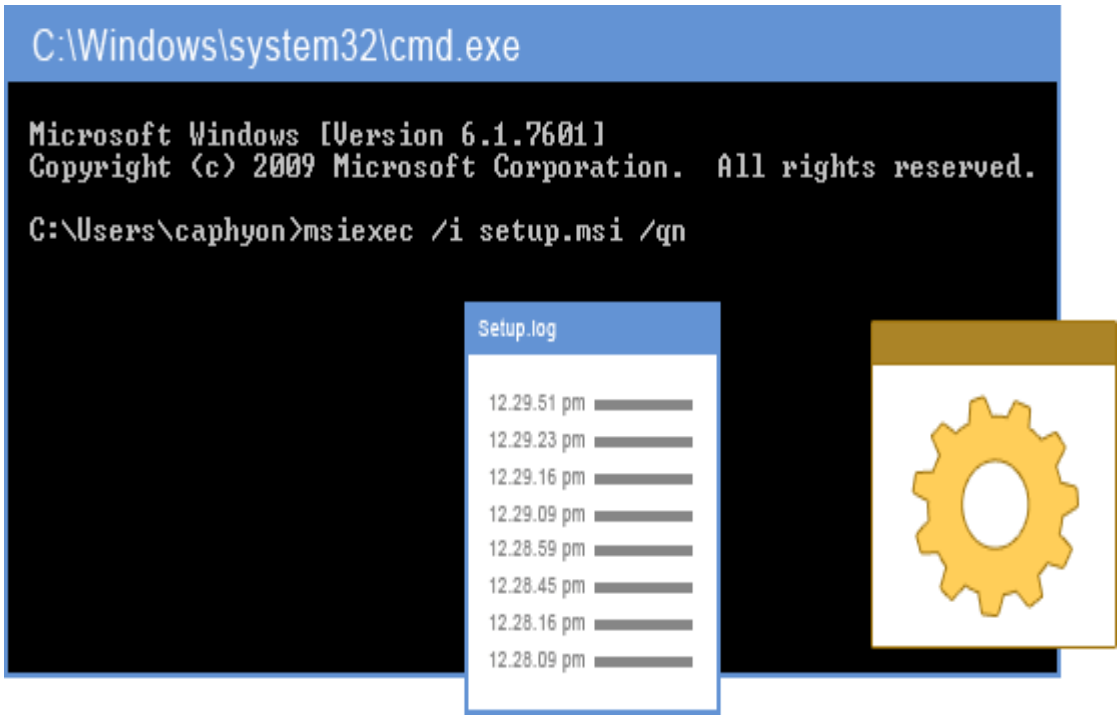


Fig 8.3: Install

Building a basic MSI package with Advanced Installer is very easy. An MSI built with our default settings is a big step towards preparing your package for enterprise deployment, helping you to get rid of all the support tickets where you explain and assist the admins to deploy your application in their companies.

An MSI package will allow admins to:

- install it silently
- configure it using Windows Installer properties, e.g. change the default install path
- edit/customize its contents using specialized MSI editor tools
- easily leverage the OS power for system restore points and automatic repairs for broken installations
- gather verbose logging for debugging purposes.

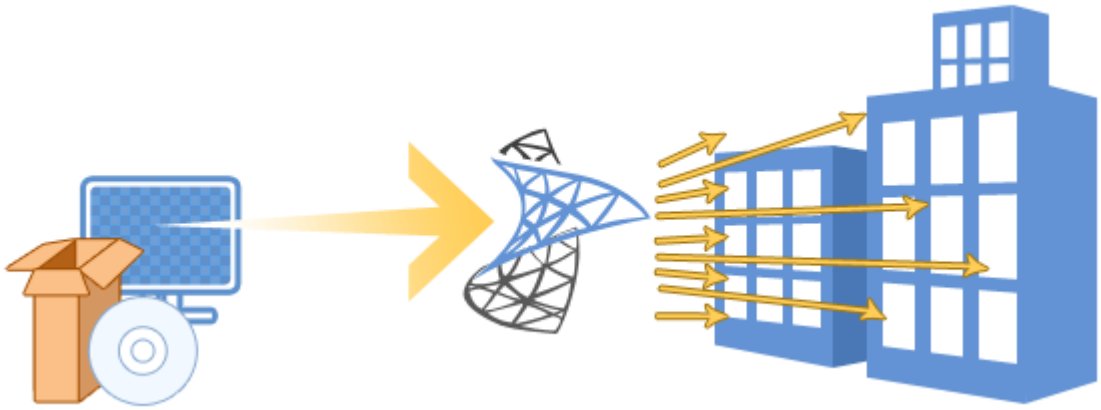


Fig 8.4: Illustration

Fig 8.5 shows the illustration.

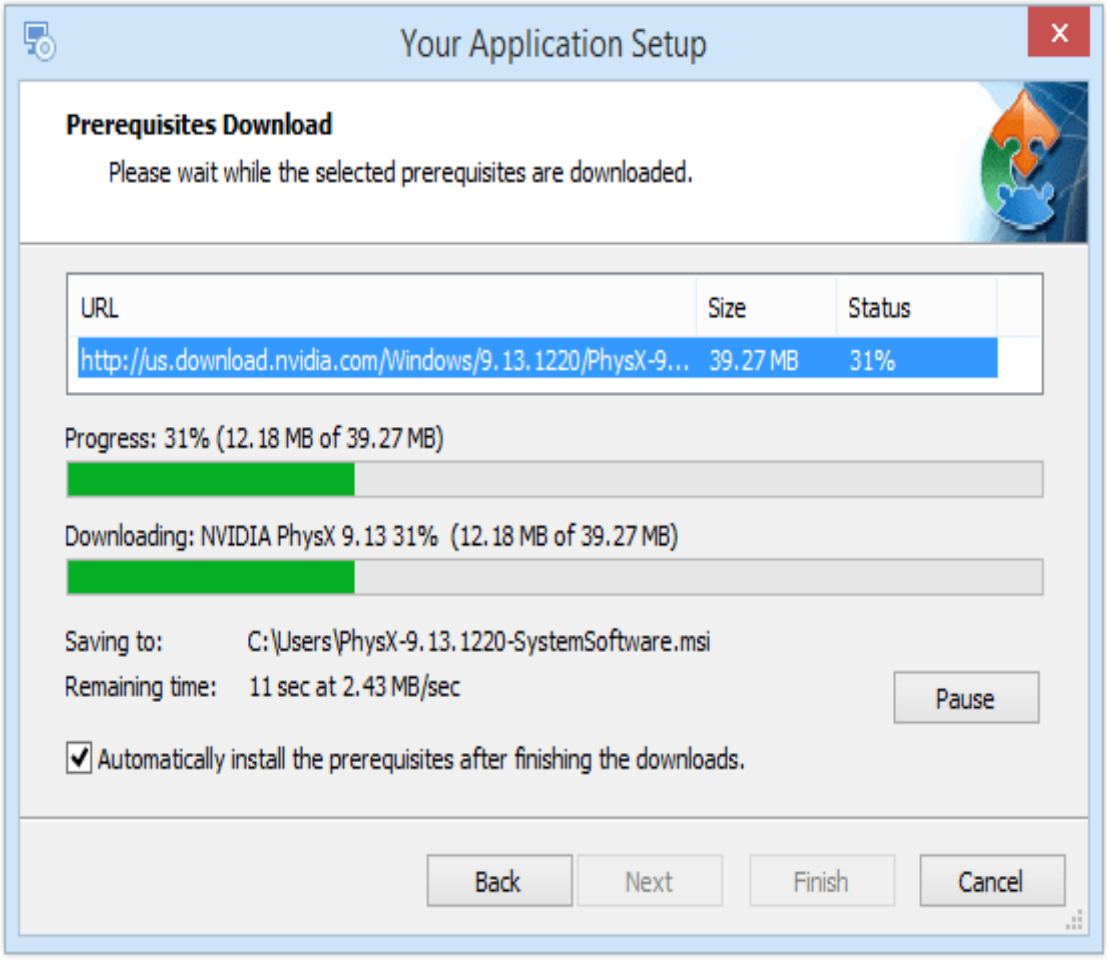


Fig 8.5: Application Setup

Fig 8.5. show the page of application setup.

CHAPTER-9

CONCLUSION AND FUTURE WORK

CHAPTER-9
CONCLUSION AND FUTURE WORK

9.1 CONCLUSION

In this approach, a face recognition based automated student attendance system is thoroughly described. The proposed approach provides a method to identify the individuals by comparing their input image obtained from recording video frame with respect to train image. This proposed approach able to detect and localize face from an input facial image, which is obtained from the recording video frame. Besides, it provides a method in pre-processing stage to enhance the image contrast and reduce the illumination effect. Extraction of features from the facial image is performed by applying both LBP and PCA. The algorithm designed to combine LBP and PCA able to stabilize the system by giving consistent results. The accuracy of this proposed approach is 100 % for high-quality images, 92.31 % for low-quality images and 95.76 % of Yale face database when two images per person are trained**.**

As a conclusion for analysis, the extraction of facial feature could be challenging especially in different lighting. In pre-processing stage, Contrast Limited Adaptive Histogram Equalization (CLAHE) able to reduce the illumination effect. CLAHE perform better compared to histogram equalization in terms of contrast improvement. Enhanced LBP with larger radius size specifically, radius size two, perform better compared to original LBP operator, with less affected by illumination and more consistent compared to other radius sizes**.**

9.2 FUTURE WORK

In this proposed approach,there are a few limitations. First,the input image has to be frontal and a upright single facial image. Second,the accuracy might drop under extreme illumination problem. Third,false recognition might occur if the captured image is blurred. Besides, LBP is textural based descriptor which extracts local features. Hence, test image and train image have to be the same quality which is captured by using the same device in order to have high accuracy. Lastly, if an individual wears make up in the image for face recognition, the important features will be covered.

In fact, a better camera with a better lighting source able to reduce the illumination problem and also able to avoid the captured of blurred images. In this proposed approach, laptop built

in camera is a default device. However the lighting source of the laptop camera is very dim, this cause the system to be unstable. For future work, a better camera and a better lighting source can be used in order to obtain better result. This can reduce the dependency on the brightness of environment, especially the places to capture test and train images. Furthermore, a face recognition system which has more faces other than a single facial image can be designed. This can increase the efficiency of the system. The test image and train image in this approach is highly related to each other and highly dependent on the image captured device. The capture device has to be the same for this approach to perform better. Thus, other algorithms can be used instead of LBP, for example A.I (artificial intelligence) algorithm which can be implemented to perform the face recognition. CNN (Convolution Neural Network) which is a hot topic recently, is a machine deep learning algorithm which is able to perform recognition with less dependency on a particular train image given a large database. However, CNN requires an extremely large database to increase its accuracy or having relatively small class size to have high performance.

In pre-processing stage, an algorithm, for instance affine transform can be applied to align the facial image based on coordinates in the middle of the eyes. This might help, especially in PCA algorithm, which it maps test image to train image to perform face recognition.

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PROJECT SUMMARY

About Project

Title of the project	**Face Recognition based Attendance Sys.**
Semester	**5th**
Members	**Mohammad Ibrahim Saleem, Hira Khan Saad Ahmad and Mohd Mufeez.**
Team Leader	**Mohd Ibrahim Saleem**
Describe role of every member in the project	**Hira Khan– Front end and back end developing** **Mohd Ibrahim Saleem—Back end developing** **Mohd Mufeez—Front end designing** **Saad Ahmed—Front end designing**
What is the motivation for selecting this project?	**The main aim behind the development of this project is to improvise the conventional method of attendance using face recognition technique.**
Project Type (Desktop Application, Web Application, Mobile App, Web)	**Desktop application**

Tools and technologies

Programming language Used	**PYTHON**
IDE used (with version)	**Microsoft Visual Studies code(1.51.1)**
Front End Technologies (with version, wherever Applicable)	**TKINTER**
Back End Technologies (with version, wherever applicable)	**PYTHON**
Database used (with version)	**MySQL(1.2.12), phpMyAdmin , google spreadsheets**

Software Design & Coding

SDLC model followed (Waterfall, Agile, Spiral etc.)	**Agile**
Why above SDLC model is followed?	**Agile model has a set of guidelines that are: small, highly motivated project team and supports changing requirements. We need both guidelines to develop our project.**
Justify that the SDLC model mentioned above is followed in the project.	**We are the team of three members. Since, we didn't exactly know all the functionalities or the functionalities were frequently changing, we use Agile model, so that we could make desired changes whenever needed.**

Software Design approach followed (Functional or Object Oriented)	**Object Oriented Approach**
Name the diagrams developed (according to the Design approach followed)	**Class diagram, Use Case diagram and Table Structures**
In case Object Oriented approach is followed, which of the OOPS principles are covered in design?	**Inheritance and Singleton class pattern**
Are the entries in database encrypted?	**Yes, password are encrypted**
Front end validations applied (Yes / No)	**Yes**
Session management done (in case of web applications)	**Yes**
Is application browser	**Compatible for higher versions some features are not supported in**
Exception handling done (yes/no)	**Yes**
Commenting done in code	**Yes**
Naming convention followed	**Yes**
Total number of Use-cases	**1**

Project Requirements

MVC architecture followed (Yes / No)	**Yes**
If yes, write the name of MVC architecture followed (MVC-1, MVC-2)	**MVC-2**
Design Pattern used (Yes / No)	**Yes**
If yes, write the name of Design Pattern used	**Singleton class design pattern and mvc design pattern**
Interface type (CLI / GUI)	**GUI**
No. of Actors	**3**
Name of Actors	**Admin, Teacher, User**
Total no. of Functional Requirements	**23**
List few important non-Functional Requirements	**Availability , security, usability, maintainability , reliability, recoverability**

Testing

Which testing is performed? (Manual or Automation)	**Manual**
Is Beta testing done for this project?	**No**

APPENDIX 1

GLOSSARY OF TERMS

A

API Application Programming Interface. A communication protocols and tools, for building software. It's a set of clearly defined methods of communication among various components. A good API makes it easier to develop a computer program by providing all the building blocks, which are then put together by the programmer.

Application From a component perspective, an Android application consists of one or more activities, services, listeners, and intent receivers. From a source file perspective, an Android application consists of code, resources, assets, and a single manifest. During compilation, these files are packaged in a single file called an application package file (.apk).

G

GUI The graphical user interface, is a type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, instead of text-based user interfaces, typed command labels or text navigation. GUIs were introduced in reaction to the perceived steep learning curve of command-line interfaces (CLIs), which require commands to be typed on a computer keyboard.

F

FR Functional Requirements. FR are the working characteristics of a product. These are based on how end users will use the product.

I

IDE An Integrated Development Environment (IDE) is a software suite that consolidates the basic tools developers need to write and test software.

N

NFR Non-Functional Requirements. NFRs define system attributes such as security, reliability, performance, maintainability, scalability etc.

U

UML Unified Modeling Language. It is a general purpose modelling language. It's not a programming language, it is rather a visual language. UML is linked with object oriented design and analysis. UML makes the use of elements and forms associations between them to form diagrams.