FACE RECOGNITION ATTENDANCE SYSTEM

Major Project Report Phase-I

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of

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By

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SESSION 2022-23

FACE RECOGNITION ATTENDANCE SYSTEM

Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology Raipur (C.G.)

DECLARATION BY THE CANDIDATE

We the undersigned solemnly declare that the Major project report entitled **"Face Recognition Attendance System"** is based on our own work carried out during the course of our study under the supervision of ***Mr. Ashish Pandey***. We assert that the statements made and conclusions drawn are an outcome of the project work. We further declare that to the best of our knowledge and belief that the report does not contain any part of any work which has been submitted for the award of any other degree/diploma/certificate in this University/Deemed university of India or any other country.

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CERTIFICATE OF THE SUPERVISOR

This is to certify that the Major project report entitled **"*FACE RECOGNITION ATTENDANCE SYSTEM*"** is a record of project work carried out under my guidance and supervision for the partial fulfilment of degree of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.) India.

To the best of my knowledge and belief the report

i) Embodies the work of the candidate himself
ii) Has duly been completed
iii) Fulfils the partial requirement of the ordinance relating to the B.Tech. degree of the University
iv) Is up to the desired standard both in respect of contents and language for being referred to the examiners.

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CERTIFICATE BY THE EXAMINERS

The project report entitled **"*FACE RECOGNITION ATTENDANCE SYSTEM*" *HAS*** been examined by the undersigned as a part of the examination of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekanand Technical University, Bhilai

Internal Examiner	**External Examiner**
Date:	**Date:**

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List of Symbols

,	Comma
.	Full Stop
’	Inverted comma
()	Parenthesis
:	Colon
-	Hyphen
“ ”	Double inverted comma
[]	Angle bracket

List of Abbreviations

GUI	Graphical User Interface
LBPH	Local Binary Pattern Histogram
XML	Extensible Markup Language
SDLC	Software Development Life Cycle
DFD	Data Flow Diagram
ER	Entity Relationship
ER-D	Entity Relationship Diagram
SRS	System Requirement Specification

List of Figures

Tables of Contents

Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology Raipur (C.G)

ABSTRACT

In today's world of the latest technology, face recognition has become one of the best technologies for computer vision. It is a method to recognise a person's face from a still image or a video camera. In this paper, we have proposed a face-recognition attendance system. This application is based on facial extraction and face detection, which automatically detects a person's face through the camera. We are using the Haar-cascade algorithm for face detection and the LBPH algorithm for face recognition.

Keywords: Face Recognition, Face Detection, Automation

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CHAPTER -1

INTRODUCTION

1. Introduction About Project

Attendance Monitoring System deals with attendance of students in the class. The system will generate attendance of students on the basis of presence in class. Currently, the attendance for students is done manually. So, we have come with a solution to make an attendance system which will mark the attendance of students through face recognition and keep history of all attendance.

There is no reason that a critical educational practice like attendance should be viewed in the old, tedious manner in this age of rapidly evolving new technologies. In the conventional method, it is difficult to manage large groups of students in a classroom. Since it takes time and has a high risk of error when entering data into a system, it is not recommended.

This project will help eliminate the traditional attendance system, minimize manipulation during attendance and record the arrival time of the students. It is also very easy to use and manage. Like every application, there are some setbacks to this application. The application is not one hundred percent accurate. Different factors such as image quality and lack of data sets can decrease the efficiency of the application.

Face recognition has set an important biometric feature, which can be easily acquirable and is non-intrusive. Face recognition-based systems are relatively oblivious to various facial expression. Face recognition system consists of two categories: verification and face identification. Face verification is a 1:1 matching process, it compares face image against the template face images and whereas is a 1: N problems that compares a query face images.

Real-Time Face Recognition is a practical method for dealing with a large number of students attendance on a daily basis. Many algorithms and techniques have been developed to improve face recognition performance, but our proposed model employs the Haar cascade classifier to determine the positive and negative characteristics of the face, as well as the LBPH (Local binary pattern histogram) algorithm for face recognition, all of which are implemented in Python and the OpenCV library. For user interface purposes, we use the tkinter GUI interface.

An effective attendance monitoring system will save a lot of time for both students and faculties.

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CHAPTER –II

LITERATURE REVIEW & PROBLEM IDENTIFICATION

2.1 Literature Review & Problem Identification

In the face detection and recognition system, the process flow is initiated by being able to detect the facial features from a camera or a picture store in a memory. The algorithm processes the image captured and identifies the number of faces in the image by analyzing from the learned pattern and compare them to filter out the rest. This image processing uses multiple algorithm that takes facial features and compare them with known database [1].

The motivation behind this project is to simplify the means by which attendance is taken during lectures and how much time it takes. The use of ID cards or manually calling out attendance and writing it down on sheets is not productive and efficient. This system will detect the number of faces on the class and will also identify them from the store database. With the face detection and recognition system in place, it will be easy to tell if a student is actually present in the classroom.

The task of the proposed system is to capture the face of each student and to store it in the database for their attendance. The face of the student needs to be captured in such a manner that all the feature of the students' face needs to be detected, even the seating and the posture of the student need to be recognized.

Typically, this process can be divided into four stages,

1. Dataset Creation:

Images of students are captured using a web cam. Multiple images of single student will be acquired with varied gestures and angles. These images undergo pre-processing. The images are cropped to obtain the Region of Interest (ROI) which will be further used in recognition process. Next step is to resize the cropped images to particular pixel position. Then these images will be converted from RGB to gray scale images. And then these images will be savedas the names of respective student in a folder [5].

2. Face Detection:

Face detection here is performed using Haar-Cascade Classifier with OpenCV. Haar Cascade algorithm needs to be trained to detect human faces before it can be used for face detection. This is called feature extraction. The Haar cascade training data used is an xml file haarcascade_frontalface_default.

3. Face Recognition:

Face recognition process can be divided into three steps- prepare training data, train face recognizer, prediction. Here training data will be the images present in the dataset. They will be assigned with an integer label of the student it belongs to. These images are then used for face recognition. Face recognizer used in this system is Local Binary Pattern Histogram.

Face Recognition is being able to uniquely identify and verify a person's face by comparing and analyzing a biometrics person's face. A face recognition system is an application that is used for identifying or verifying a person from a digital image.

Initially, the list of local binary patterns (LBP) of entire face is obtained. These LBPs are converted into decimal number and then histograms of all those decimal values are made. At the end, one histogram will be formed for each image in the training data. Later, during recognition process histogram of the face to be recognized is calculated and then compared with the already computed histograms and returns the best matched label associated with the student it belongs to [4].

4. Attendance Updation :

After face recognition process, the recognized faces will be marked as present in the excel sheet and the rest will be marked as absent. Faculties will be updated with monthly attendance sheet at the end of every month.

2.2 System Analysis

System analysis is the process by which an individual studies a system such that an information system can be analyzed, modeled, and a logical alternative can be chosen. Systemanalysis projects are initiated for three reasons: problems, opportunities, and directives. The people involved include system analysts, sponsors, and users. The process by which systems are developed can be described by the system development life cycle. The tasks, techniques, and tools used by the system development life cycle can be referred as a methodology. There are three classifications of the methodologies: traditional, information engineering, and object-oriented. Case tools are automated tools that support specific methodologies.

System analysis allows developers to objectively carry out quantitative assessments of system**s** in order to select and/or update the most efficient system architecture and to generate derived engineering data. During engineering, assessments should be performed every time technical choices or decisions are made to determine compliance with system requirements.

The most common benefit of system analysis and design is improving upon a previous system and enjoying increased operational efficiency. Systems analysis professionals are often called upon to look critically at systems, and redesign or recommend changes as necessary. Inside and outside of the business world, systems analysts help to evaluate whether a system is viable or efficient within the context of its overall architecture, and help to uncover the options available to the employing business or other party.

System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem-solving technique that improves the system and ensuresthat all the components of the system work efficiently to accomplish their purpose. Analysis specifies what the system should do.

A systems analysis includes defining process steps toward an end result. Each system will have specific variations based on the product or service, but most will follow a general framework.

1. Identify the human component. Evaluate the interconnections of all stakeholders within the system, which may include, though not limited to: policy or decision makers, leaders, employees, customers, recipients, creditors, suppliers and competitors.
2. Define the goals of each person interacting within the system and what tasks or roles they perform. Consider both expectations and policies and procedures that are in place.
3. Create a model that visually shows patterns of dependencies and usage within the system.
4. Define the primary navigation pathways that show supply and demand or defined hierarchy of steps that affect persons, products or services and determine whether the process is efficient and meets needs. Consider the points within the process that require decisions and how the decision dictates future steps.
5. Ideate on steps that are working well and those that may need changes to improve functionality. This may involve recognizing that a problem exists and working backward to find the root of the problem.
6. Design a strategy and create a plan to test the solution. This will require feedback to determine best practices or create flexibility to consider alternatives.
7. Repeat these steps for an ongoing cycle of quality assurance that monitors changing situations and factors in risk.

Objective observation is the key to a strong system analysis. The importance of questioning commonly held assumptions should be built into a systematic analysis. Each individual will have a perspective that is developed through their experiences within or accessing the system. Similarly, businesses and industries may have variations in goals and mission.

2.2.1 Requirement Analysis

Requirement analysis is significant and essential activity after elicitation. We analyze, refine, and scrutinize the gathered requirements to make consistent and unambiguous requirements. This activity reviews all requirements and may provide a graphical view of the entire system. After the completion of the analysis, it is expected that the understandability of the project may improve significantly. Here, we may also use the interaction with the customer to clarify points of confusion and to understand which requirements are more important than others.

This process usually consists of various graphical representations of the functions, data entities, external entities, and the relationships between them. The graphical view may help to find incorrect, inconsistent, missing, and superfluous requirements. Such models include the Data Flow diagram, Entity-Relationship diagram, Data Dictionaries, State-transition diagrams, etc. After modeling the requirements, we will have a better understanding of the system behavior. The inconsistencies and ambiguities have been identified and corrected. The flow of data amongst various modules has been analyzed. Elicitation and analyzing activities have provided better insight into the system. Now we finalize the analyzed requirements, and the next step is to document these requirements in a prescribed format.

After requirements gathering is complete, the analyst analyses the gathered requirements to form a clear understanding of the exact customer requirements and to weed out any problems in the gathered requirements. It is natural to expect the data collected from various stakeholders to contain several contradictions, ambiguities, and incompleteness.

The main purpose of the requirements analysis activity is to analyse the gathered requirements to remove all ambiguities, incompleteness, and inconsistencies from the gathered customer requirements and to obtain a clear understanding of the software to be developed.

During requirements analysis, the analyst needs to identify and resolve three main types of problems in the requirements:

Anomaly:

An anomaly is an ambiguity in a requirement. When a requirement is anomalous, several interpretations of that requirement are possible.

Inconsistency:

Two requirements are said to be inconsistent if one of the requirements contradicts the other.

Incompleteness:

An incomplete set of requirements is one in which some requirements have been overlooked. The lack of these features would be felt by the customer much later, possibly while using the software. Often, incompleteness is caused by the inability of the customer to visualise the system that is to be developed and to anticipate all the features that would be required.

Activities during Requirement Analysis:

1. **Problem Recognition:**
   The main aim of requirement analysis is to fully understand main objective of requirement that includes why it is needed, does it add value to product, will it be beneficial, does it increase quality of the project, does it will have any other effect.

2. **Evaluation and Synthesis:**
   Evaluation means judgement about something whether it is worth or not and synthesis means to create or form something.

3. **Modelling :**
   After complete gathering of information from above tasks, functional and behavioural models are established after checking function and behaviour of system using a domain model that also known as the conceptual model.

2.2.2 System Requirements Specification

The production of the requirements stage of the software development process is Software Requirements Specifications (SRS). This report lays a foundation for software engineering activities and is constructed when entire requirements are elicited and analyzed. SRS is a formal report, which acts as a representation of software that enables the customers to review whether it (SRS) is according to their requirements. Also, it comprises user requirements for a system as well as detailed specifications of the system requirements.

Non-Functional Requirements are the characteristics or attributes of the system that are necessary for the smooth operation of the system. Those requirements are listed below:

- The system should perform the process accurately and precisely to avoid problems.
- The system should be easy to modify for any updates.
- The system should be secure and maintain the privacy of the students.

Qualities of SRS:

- Correct
- Unambiguous
- Complete
- Consistent
- Ranked for importance and/or stability
- Verifiable
- Modifiable
- Traceable

The main sections of a software requirements specification are:

- Business drivers – this section describes the reasons the customer is looking to build the system, including problems with the current system and opportunities the new system will provide.
- Business Model – this section describes the business model of the customer that the system has to support, including organizational, business context, main business functions and process flow diagrams.
- Business/functional and system requirements -- this section typically consists of requirements that are organized in a hierarchical structure. The business/ are at the top level and the detailed system requirements are listed as child items.
- Business and system Use Cases -- this section consists of a Unified Modelling Language (UML) use case diagram depicting the key external entities that will be interacting with the system and the different use cases that they'll have to perform.
- Technical Requirements -- this section lists the non-functional requirements that make up the technical environment where software needs to operate and the technical restrictions under which it needs to operate.
- System qualities -- this section is used to describe the non-functional requirements that define the quality attributes of the system, such as reliability, serviceability, security, scalability, availability and maintainability.

Purpose of an SRS:

An SRS forms the basis of an organization's entire project. It sets out the framework that all the development teams will follow. It provides critical information to all the teams, including development, operations, quality assurance (QA) and maintenance, ensuring the teams are in agreement.

Using the SRS helps an enterprise confirm that the requirements are fulfilled and helps business leaders make decisions about the lifecycle of their product, such as when to retire a feature.

In addition, writing an SRS can help developers reduce the time and effort necessary to meet their goals as well as save money on the cost of development.

Alternatives to an SRS

In Agile methodologies, companies usually favour a more lightweight documentation of the requirements. For this approach to work, the customer had to be easily accessible to provide any necessary clarification on the requirements during development. It also assumes that the developers writing the user stories with the customer will be the developers building the system.

SOFTWARE REQUIREMENTS

- Python
- NumPy
- OpenCV:
- MYSQL
- Visual Studio Code

HARDWARE REQUIREMENTS

- 64-bit CPU (Intel /AMD architecture)
- Ryzen 5th or above processor
- More than 250MB storage
- GPU
- 4GB above RAM

2.3 SDLC Model

Incremental SDLC model is used in our project. Incremental Model is a process of software development where requirements divided into multiple standalone modules of the software development cycle. In this model, each module goes through the requirements, design, implementation and testing phases. Every subsequent release of the module adds function to the previous release. The process continues until the complete system achieved.

In our project as per Incremental model we have identify and analyze the system functional requirements and on the basis of requirements the design of the system functionality and the development method are finished with success.

In the incremental model, the testing phase checks the performance of each existing function as well as additional functionality. In the testing phase, the various methods are used to test the behavior of each task.

Types of Incremental model:

1. Staged Delivery Model: Construction of only one part of the project at a time.

2. Parallel Development Model – Different subsystems are developed at the same time. It can decrease the calendar time needed for the development, i.e., TTM (Time to Market) if enough resources are available.

When to use this:

1. Funding Schedule, Risk, Program Complexity, or need for early realization of benefits.
2. When Requirements are known up-front.
3. When Projects have lengthy development schedules.
4. Projects with new Technology.

- Error Reduction (core modules are used by the customer from the beginning of the phase and then these are tested thoroughly)
- Uses divide and conquer for a breakdown of tasks.
- Lowers initial delivery cost.
- Incremental Resource Deployment.

Advantages-

1. Prepares the software fast.
2. Clients have a clear idea of the project.
3. Changes are easy to implement.

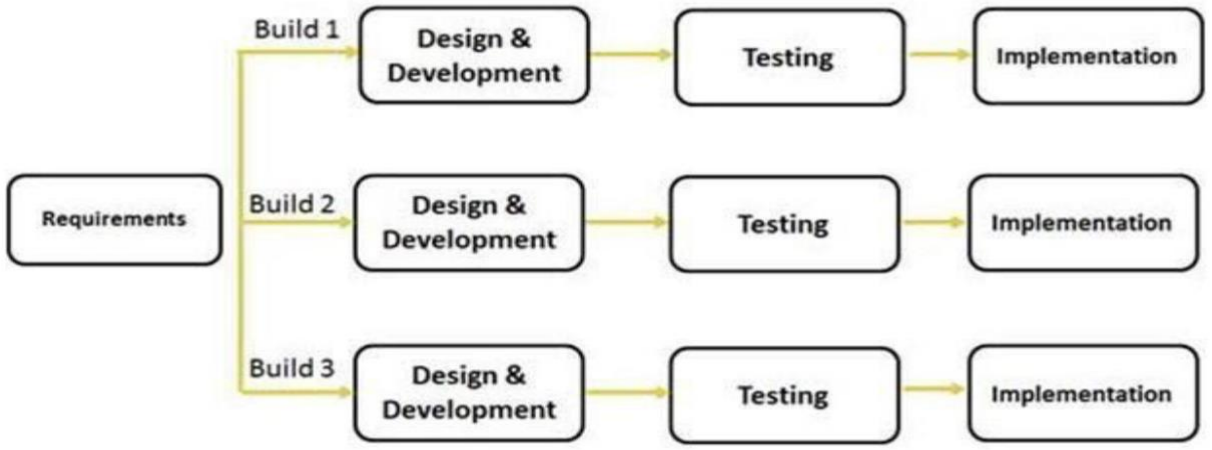

Fig. 2.1 Incremental Model

2.4 Data Flow Diagram:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It can be manual, automated, or a combination of both. It shows how data enters and leaves the system, what changes the information, and where data is stored.

The Data Flow Diagram has 4 components:

- Process:

  Input to output transformation in a system takes place because of process function. The symbols of a process are rectangular with rounded corners, oval, rectangle or a circle.

- Data Flow:

  Data flow describes the information transferring between different parts of the systems. The arrow symbol is the symbol of data flow. A relatable name should be given to the flow to determine the information which is being moved. Data flow also represents material along with information that is being moved.

- Warehouse:

  The data is stored in the warehouse for later use. Two horizontal lines represent the symbol of the store. The warehouse is simply not restricted to being a data file rather it can be anything like a folder with documents, an optical disc, a filing cabinet.

- Terminator:

  The Terminator is an external entity that stands outside of the system and communicates with the system.

A data flow diagram can dive into progressively more detail by using levels and layers, zeroing in on a particular piece. DFD levels are numbered 0, 1 or 2, and occasionally go to even Level 3 or beyond. The necessary level of detail depends on the scope of what you are trying to accomplish.

- **DFD level 0** is also known as fundamental system model, or context diagram represents the entire software requirement as a single bubble with input and output data denoted by incoming and outgoing arrows. Then the system is decomposed and described as a DFD with multiple bubbles. Parts of the system represented by each of these bubbles are then decomposed and documented as more and more detailed DFDs. This process may be repeated at as many levels as necessary until the programat hand is well understood. It is essential to preserve the number of inputs and outputsbetween levels, this concept is called leveling by DeMacro. Thus, if bubble "A" has two inputs x1 and x2 and one output y, then the expanded DFD, that represents "A" should have exactly two external inputs and one external output.

- **DFD Level 1** provides a more detailed breakout of pieces of the Context Level Diagram. You will highlight the main functions carried out by the system, as you break down the high-level process of the Context Diagram into its subprocesses.

- **DFD Level 2** then goes one step deeper into parts of Level 1. It may require more text to reach the necessary level of detail about the system's functioning.

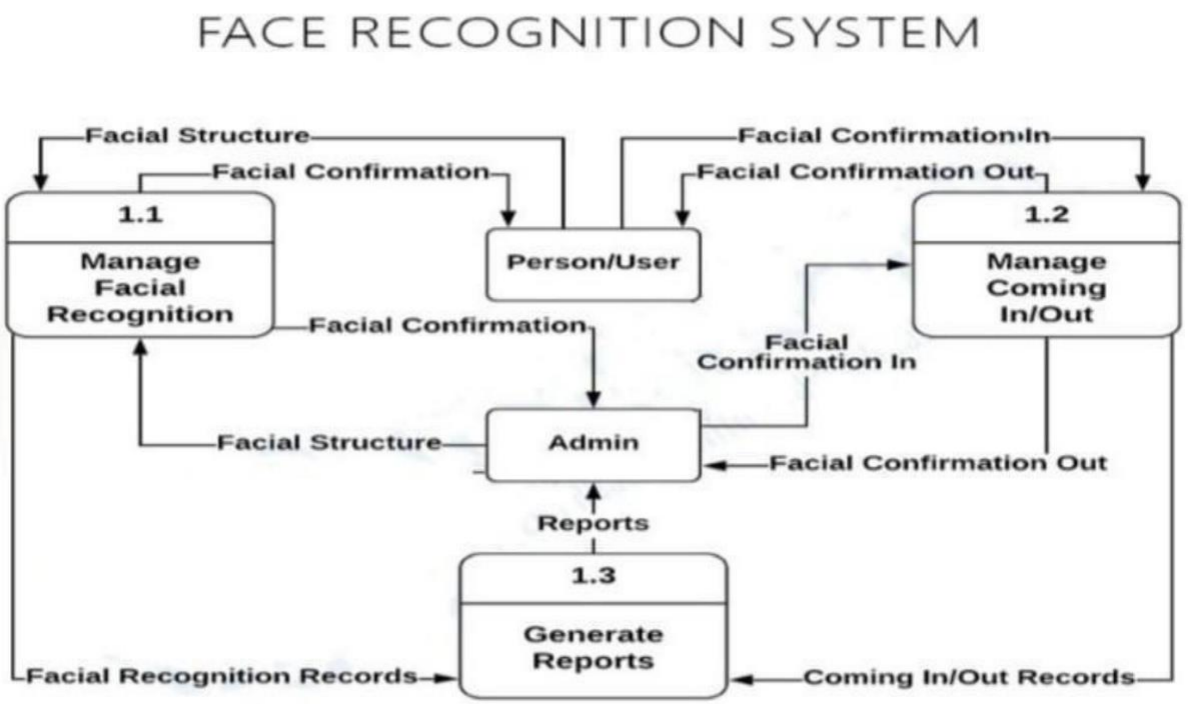

Fig. 2.2 Data Flow Diagram

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CHAPTER – III

SYSTEM ANALYSIS

3.1 Workflow Diagram

A workflow diagram (also known as a workflow) provides a graphic overview of the business process. Using standardized symbols and shapes, the workflow shows step by step how your work is completed from start to finish. It also shows who is responsible for work at what point in the process. Designing a workflow involves first conducting a thorough workflow analysis, which can expose potential weaknesses.

A workflow analysis can help you define, standardize and identify critical areas of your process. Originating from the manufacturing industry, workflows are used by a variety of industries from government to finance to commerce and are easier than ever to create.

Each element of a workflow is designed to illustrate the flow between each step. Each step includes one of three parameters:

- **Input**: the labor, capital, equipment or information that's required to complete the step.
- **Transformation**: the changes that create the output, such as location, physical characteristics, change in ownership or purpose.
- **Output**: the result of the transformation

A workflow provides a visual representation of an entire process, which helps you not only understand it more thoroughly but also pinpoint potential problems or bottlenecks before they happen. They're also useful if you're trying to track metrics for a process, improve a process by eliminating inefficiencies, or automate a manual process. Workflows are also useful for employees to understand their particular roles and how they relate to other departments, which can lead to better communication and more cohesiveness.

Steps for successful workflow diagram:

1. First, determine what point of view you are diagramming for: the business or its customers. Also, are you showing how the process currently works—known as the "as is" process? Or are you showing the “to be” process—how you want the new implementation to look?

2. Next, you’ll want to design a rough sketch of your current business process. Consider this a general overview that shows high-level steps in your process—work or activities that happen repeatedly in your organization.

3. After you’ve created your initial diagram, you’re ready to dive into the details. This is the requirements gathering phase, where you’ll obtain information from the people involved in each step.

4. After you have all the information you need, conduct a workflow analysis, keeping these three steps in mind to help eliminate inefficiencies:

- Categorize: One way to quickly pinpoint weak areas is to rank tasks based on importance: “vital,” “useful,” “nice but not necessary,” and “should eliminate.” Divide tasks by job description to ensure that the tasks are aligned with the appropriate job title and level of expertise.
- Pinpoint weak areas: Look for redundancies, bottlenecks, double data entry and multiple steps that cause delays.
- Think ahead: A workflow analysis is also a good time to ensure that your company is aligning with future goals. What are your company’s goals for the next five years? What tasks are required to reach those goals, and are they represented in your current workflow?

5. Now you’re ready to design.

Fig. 3.1 Work Flow Diagram

3.2 E-R Diagram

ERD stands for entity relationship diagram. People also call these types of diagrams ER diagrams and Entity Relationship Models. An ERD visualizes the relationships between entities like people, things, or concepts in a database. An ERD will also often visualize the attributes of these entities.

By defining the entities, their attributes, and showing the relationships between them, an ER diagram can illustrate the logical structure of databases. This is useful for engineers hoping to either document a database as it exists or sketch out a design of a new database.

An ER diagram can help businesses document existing databases and thereby troubleshoot logic or deployment problems or spot inefficiencies and help improve processes when a business wants to undertake business process re-engineering. ERDs can also be used to design and model new databases and make sure that engineers can identify any logic or designflaws before they're implemented in production.

- Document an existing database structure
- Debug, troubleshoot, and analyze
- Design a new database
- Gather design requirements
- Business process re-engineering (BPR)

When documenting a system or process, looking at the system in multiple ways increases the understanding of that system. ERD diagrams are commonly used in conjunction with a data flow diagram to display the contents of a data store. They help us to visualize how data is connected in a general way, and are particularly useful for constructing a relational database.

Following are the main components and its symbols in ER Diagrams:

- **Rectangles:** This Entity Relationship Diagram symbol represents entity types
- **Ellipses:** Symbol represent attributes
- **Diamonds:** This symbol represents relationship types
- **Lines:** It links attributes to entity types and entity types with other relationship types
- **Primary key:** attributes are underlined
- **Double Ellipses:** Represent multi-valued attributes

This model is based on three basic concepts:

- Entities
- Attributes
- Relationships

1. Entity:

A real-world thing either living or non-living that is easily recognizable and nonrecognizable. It is anything in the enterprise that is to be represented in our database. It may be a physical thing or simply a fact about the enterprise or an event that happens in the real world.

2. Attributes:

It is a single-valued property of either an entity-type or a relationship-type.

3. Relationships:

Relationship is nothing but an association among two or more entities.

One-to-one − When only one instance of an entity is associated with the relationship, it is marked as '1:1'. The following image reflects that only one instance of each entity should be associated with the relationship. It depicts one-to-one relationship.

One-to-many − When more than one instance of an entity is associated with the relationship, it is marked as '1:N'. The following image reflects that only one instance of each entity on the left and more than one instance of an entity on the right can be associated with the relationship. It depicts one-to-many relationship.

Many-to-one − When more than one instance of an entity is associated with the relationship; it is marked as 'N:1'. The following image reflects that only one instance of each entity on the left and only instance of an entity on the right can be associated with the relationship. It depicts many-to-one relationship.

Many-to-many − Each record of the first table can relate to any records (or no records) in the second table. Similarly, each record of the second table can also relate to more than one record of the first table. It is also represented an **N: N** relationship.

Participation Constraints:

- Total Participation: Each entity is involved in the relationship. Total participation is represented by double lines..

- Partial Participation: Not all entities are involved in the relationship. Partial participation is represented by single lines.

Weak Entity Type:

The entity sets which do not have sufficient attributes to form a primary key are known as **weak entity sets** and the entity sets which have a primary key are known as strong entity sets. Weak entity is dependent on strong entity to ensure the existence of weak entity.

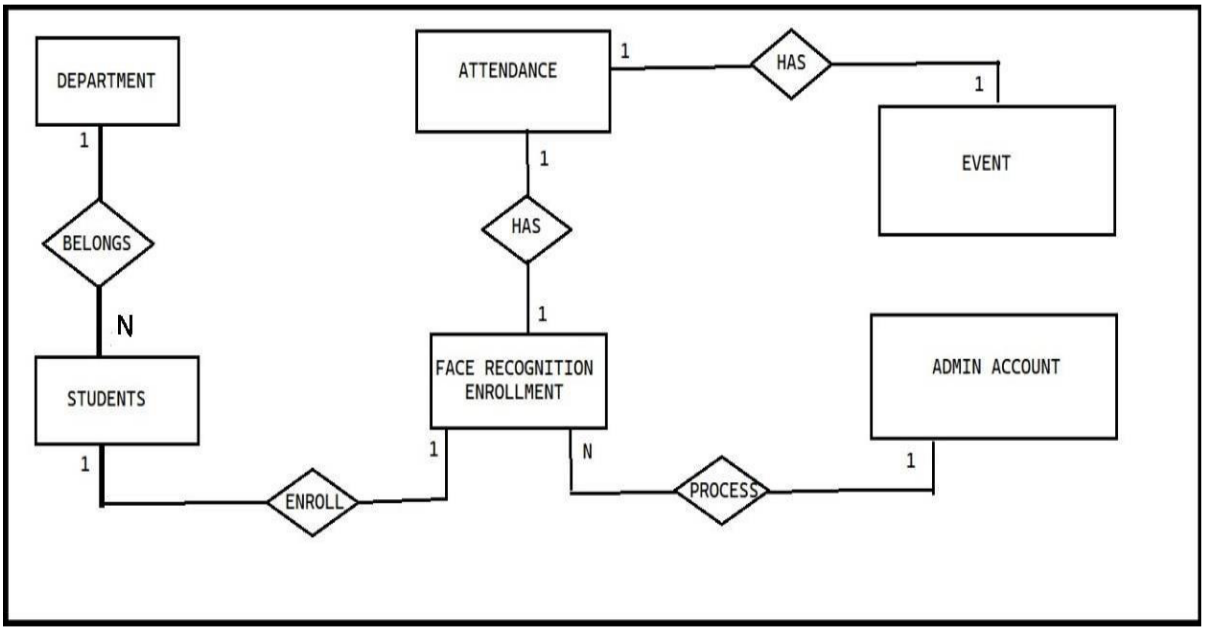

Fig. 3.2 E-R Diagram

3.3 Use Case Diagram

In the Unified Modelling Language (UML), a use case diagram can summarize the details of your system's users (also known as actors) and their interactions with the system. To build one, you'll use a set of specialized symbols and connectors. An effective use case diagram can help your team discuss and represent:

- Scenarios in which your system or application interacts with people, organizations, or external systems
- Goals that your system or application helps those entities (known as actors) achieve
- The scope of your system

It is essential to analyze the whole system before starting with drawing a use case diagram, and then the system's functionalities are found. And once every single functionality is identified, they are then transformed into the use cases to be used in the use case diagram.

After that, we will enlist the actors that will interact with the system. The actors are the person or a thing that invokes the functionality of a system. It may be a system or a private entity, such that it requires an entity to be pertinent to the functionalities of the system to which it is going to interact.

Once both the actors and use cases are enlisted, the relation between the actor and use case/ system is inspected. It identifies the no of times an actor communicates with the system. Basically, an actor can interact multiple times with a use case or system at a particular instance of time.

Following are some rules that must be followed while drawing a use case diagram:

1. A pertinent and meaningful name should be assigned to the actor or a use case of a system.
2. The communication of an actor with a use case must be defined in an understandable way.

Purpose of Use-Case Diagram:

The main purpose of a use case diagram is to portray the dynamic aspect of a system. It accumulates the system's requirement, which includes both internal as well as external influences. It invokes persons, use cases, and several things that invoke the actors and elements accountable for the implementation of use case diagrams. It represents how an entity from the external environment can interact with a part of the system.

Following are the purposes of a use case diagram given below:

1. It gathers the system's needs.
2. It depicts the external view of the system.
3. It recognizes the internal as well as external factors that influence the system.
4. It represents the interaction between the actors.

Following are some rules that must be followed while drawing a use case diagram:

1. A pertinent and meaningful name should be assigned to the actor or a use case of a system.
2. The communication of an actor with a use case must be defined in an understandable way.
3. Specified notations to be used as and when required.
4. The most significant interactions should be represented among the multiple no of interactions between the use case and actors.

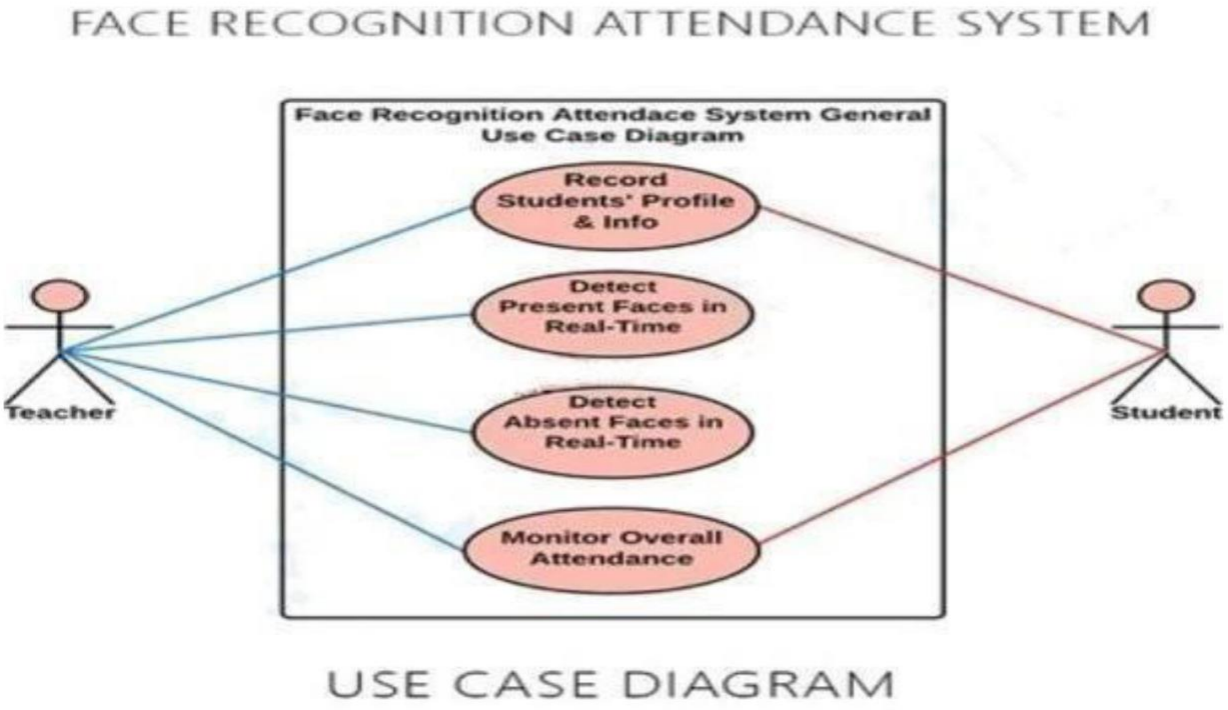

Fig. 3.3 Use Case Diagram

3.4 Sequence Diagram

A sequence diagram is a type of interaction diagram because it describes how and in what order group of objects works together. These diagrams are used by software developers and business professionals to understand requirements for a new system or to document an existing process. Sequence diagrams are sometimes known as event diagrams or event scenarios.

Sequence diagrams can be useful references for businesses and other organizations. Try drawing a sequence diagram to:

- Represent the details of a UML use case.
- Model the logic of a sophisticated procedure, function, or operation.
- See how objects and components interact with each other to complete a process.
- Plan and understand the detailed functionality of an existing or future scenario

The following scenarios are ideal for using a sequence diagram:

- Usage scenario: A usage scenario is a diagram of how your system could potentially be used. It's a great way to make sure that you have worked through the logic of every usage scenario for the system.
- Method logic: Just as you might use a UML sequence diagram to explore the logic of a use case, you can use it to explore the logic of any function, procedure, or complex process.
- Service logic: If you consider a service to be a high-level method used by different clients, a sequence diagram is an ideal way to map that out.

Purpose of Sequence Diagram:

1. To model high-level interaction among active objects within a system.
2. To model interaction among objects inside a collaboration realizing a use case.
3. It either models generic interactions or some certain instances of interaction.

Notations of Sequence Diagram:

1. Lifeline:

An individual participant in the sequence diagram is represented by a lifeline. It is positioned at the top of the diagram.

2. Actor:

A role played by an entity that interacts with the subject is called as an actor. It is out of the scope of the system. It represents the role, which involves human users and external hardware or subjects. An actor may or may not represent a physical entity, but it purely depicts the role of an entity. Several distinct roles can be played by an actor or vice versa.

3. Activation:

It is represented by a thin rectangle on the lifeline. It describes that time period in which an operation is performed by an element, such that the top and the bottom of the rectangle is associated with the initiation and the completion time, each respectively.

4. Messages:

The messages depict the interaction between the objects and are represented by arrows. They are in the sequential order on the lifeline. The core of the sequence diagram is formed by messages and lifelines.

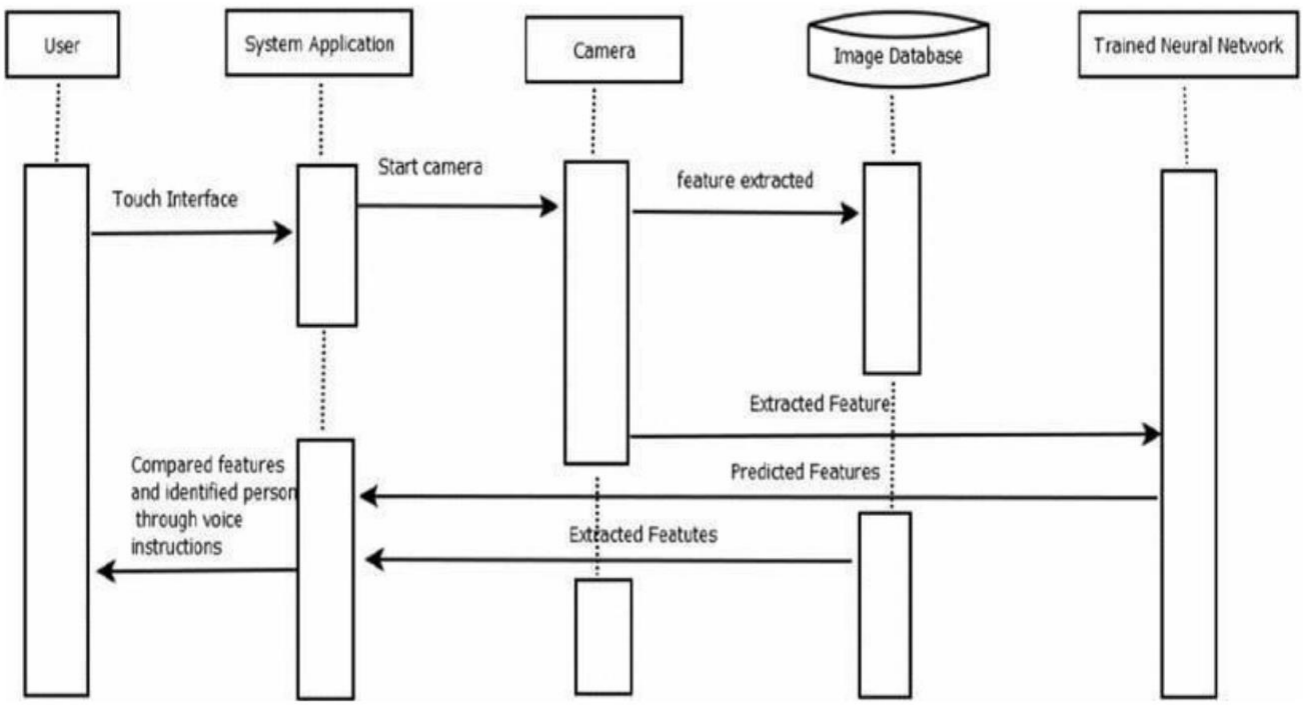

Fig. 3.4 Sequence Diagram

3.5 Class Diagram

Class diagram describes the attributes and operations of a class and also the constraints imposed on the system. The class diagrams are widely used in the modeling of object-oriented systems because they are the only UML diagrams, which can be mapped directly with object-oriented languages. Class diagram is a static diagram. It represents the static view of an application. Class diagram is not only used for visualizing, describing, and documenting different aspects of a system but also for constructing executable code of the software application.

The purpose of class diagram is to model the static view of an application. Class diagrams are the only diagrams which can be directly mapped with object-oriented languages and thus widely used at the time of construction.

UML diagrams like activity diagram, sequence diagram can only give the sequence flow of the application, however class diagram is a bit different. It is the most popular UML diagram in the coder community.

The purpose of the class diagram can be summarized as −

- Analysis and design of the static view of an application.
- Describe responsibilities of a system.
- Base for component and deployment diagrams.
- Forward and reverse engineering.

Class diagrams are used for −

- Describing the static view of the system.
- Showing the collaboration among the elements of the static view.
- Describing the functionalities performed by the system.
- Construction of software applications using object-oriented languages

Class diagrams have a lot of properties to consider while drawing but here the diagram will be considered from a top-level view.

Class diagram is basically a graphical representation of the static view of the system and represents different aspects of the application. A collection of class diagrams represents the whole system.

The following points should be remembered while drawing a class diagram −

- The name of the class diagram should be meaningful to describe the aspect of the system.
- Each element and their relationships should be identified in advance.
- Responsibility (attributes and methods) of each class should be clearly identified
- For each class, minimum number of properties should be specified, as unnecessary properties will make the diagram complicated.
- Use notes whenever required to describe some aspect of the diagram. At the end of the drawing it should be understandable to the developer/coder.
- Finally, before making the final version, the diagram should be drawn on plain paper and reworked as many times as possible to make it correct.

In a nutshell it can be said, class diagrams are used for −

- Describing the static view of the system.
- Showing the collaboration among the elements of the static view.
- Describing the functionalities performed by the system.
- Construction of software applications using object-oriented languages.

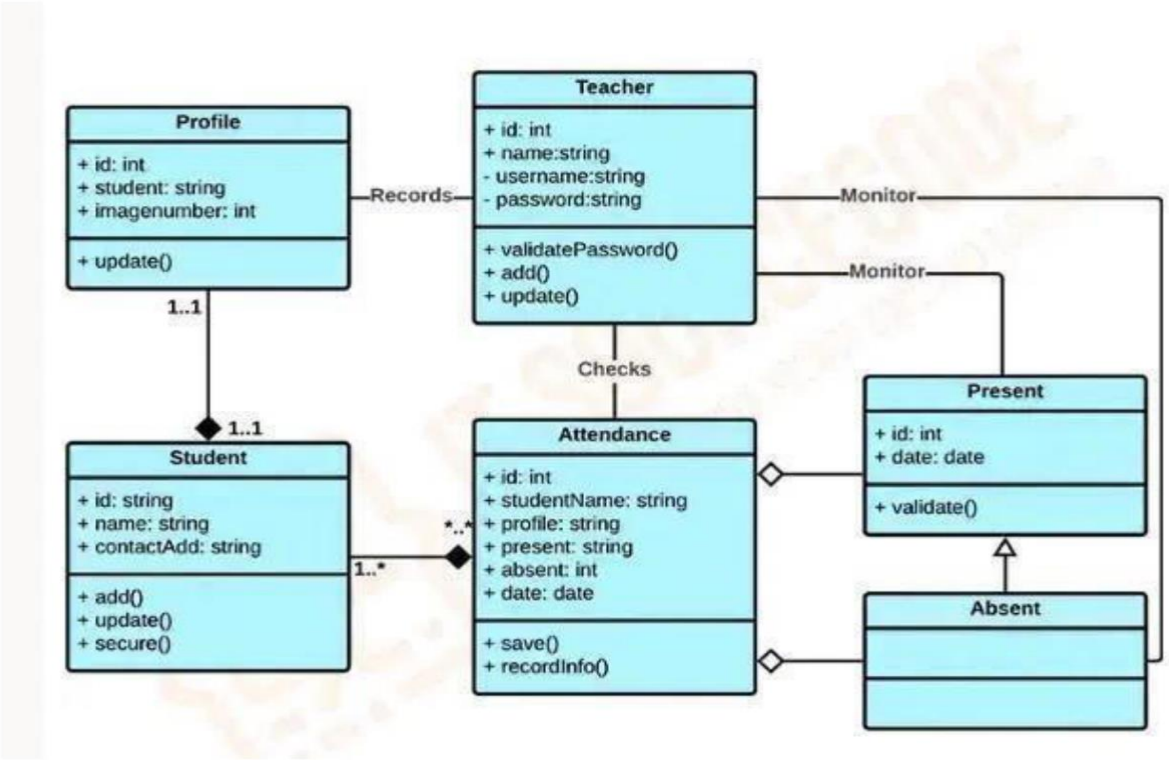

Fig. 3.5 Class Diagram

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Chapter IV

SNAPSHOTS

4. Snapshots

Fig. 4.1 Main User Interface

Fig. 4.2 Student Details Interface

Fig. 4.3 Face Recognition Button

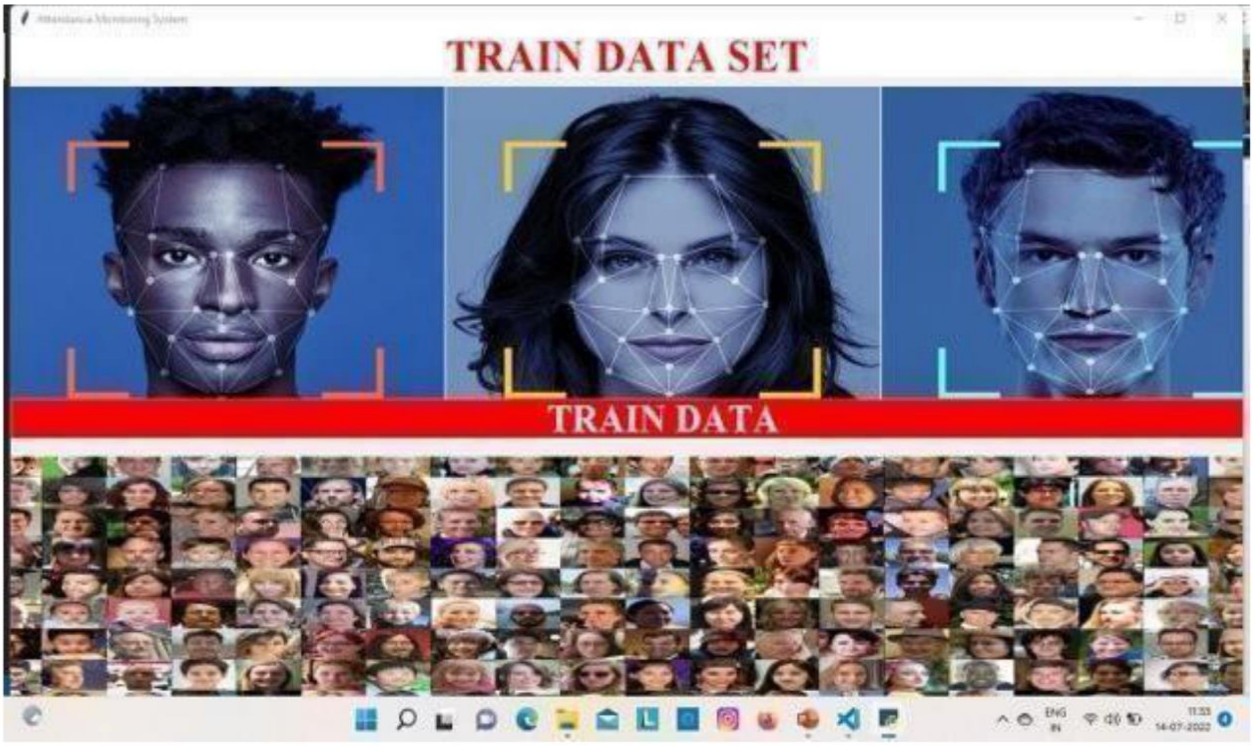

Fig. 4.4 Train Button Interface

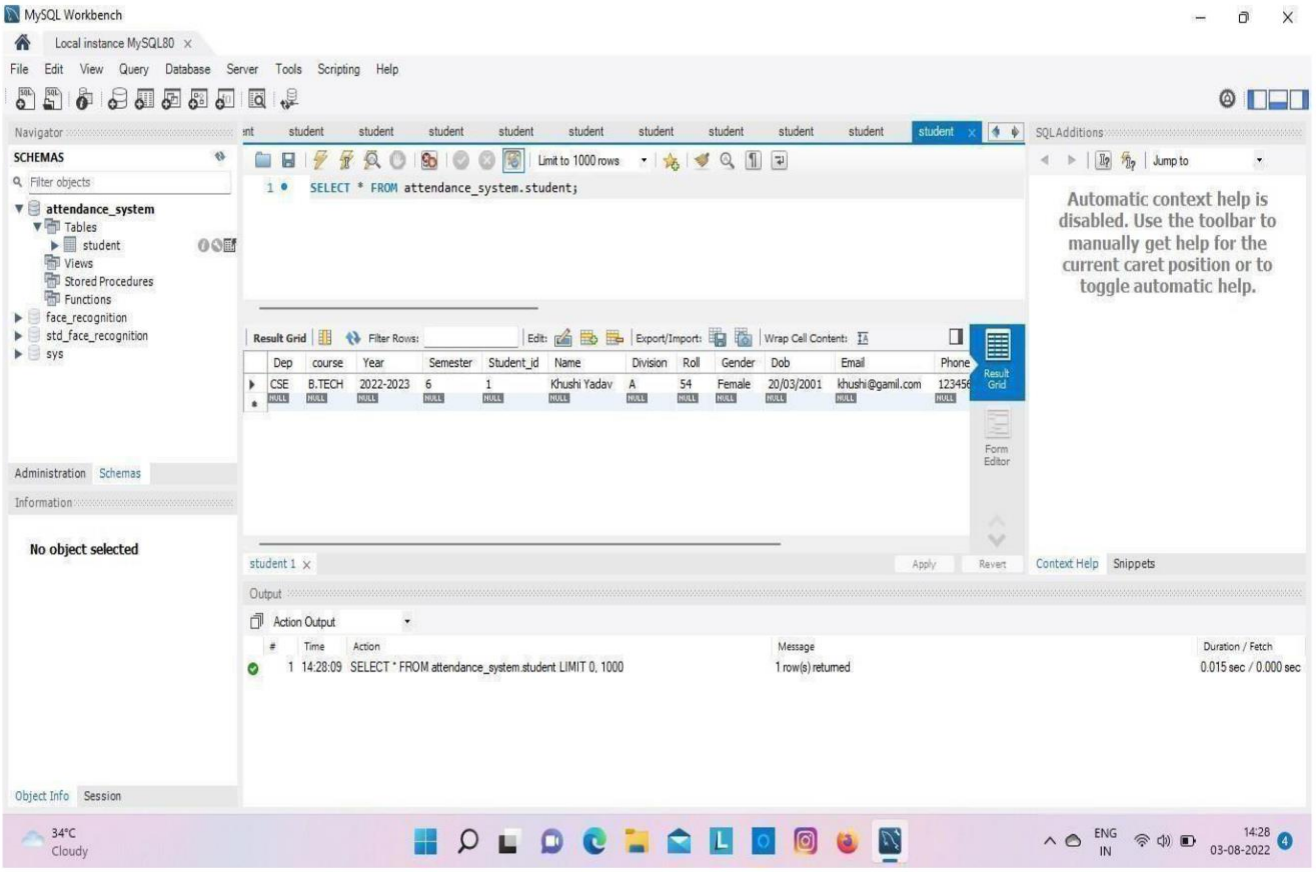

Fig. 4.5 Database Table

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Chapter V

CONCLUSION

5. Conclusion

This system aims to build an effective class attendance system using face recognition techniques. The proposed system will be able to mark the attendance via Student Name and Student Branch. For Detection, Haar-cascade algorithm is used and for recognition LBPH algorithm is used. It will detect faces via webcam and then recognize the faces. After recognition, it will mark the attendance of the recognized student and update the attendance record.

The result of the project was a successful prototype of a facial recognition system where the admin can create a teacher account and add students and their information to the database. Teachers then can log in to the system and take attendance of the student. The student's face is detected by a camera and attendance is recorded in the database. Teachers and admin could see the attendance report of the students. Overall, the project was successful in its showcasing how LBPH can be implemented to create a web application. Once implemented, it can be used to take attendance of students and keep track of their attendance records. This project has the potential for further development in the future by adding more features for students and teachers. More features such as assignments, results, and grades could be added.

The Automated Classroom Attendance System helps in increasing the accuracy and speed ultimately achieve the high-precision real-time attendance to meet the need for automatic classroom evaluation**.** The face recognition-based attendance system is an efficient method of automatic attendance in the classroom which would replace the traditional method.

An automatic attendance has many advantages, most of the existing systems are time consuming, our system seeks to solve these issues by using face recognition in the process to save time and labor [2].

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CHAPTER – VI

FUTURE SCOPE

6. Future Scope

The future scope of the project can be integrated with the hardware components for example GSM through which a monthly list of the defaulter students can be sent to the mentor.

Additionally, an application can be developed to help students to maintain a track of their attendance. It can also be used in offices where a large group of employees sit in a hall and their attendance will be marked automatically by capturing a video but for this the accuracy of the recognition needs to be improved.

The system can be extended to a greater number of students with freedom to change list of students according to class changes. The system can be made more flexible to allow updating of templates in case student incurs significant amount of change in his facial features. The system can also be extended to allow better face recognition algorithm in which even rotational features of face can be detected efficiently [3].

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FACE RECOGNITION ATTENDANCE SYSTEM

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Abstract:

In today's world of the latest technology, face recognition has become one of the best technologies for computer vision. It is a method to recognize a person's face from a still image or a video camera. In this paper, we have proposed a face-recognition attendance system. This application is based on facial extraction and face detection, which automatically detects a person's face through the camera. We are using the Haar-cascade algorithm for face detection and the LBPH algorithm for face recognition.

Keywords – Face Recognition, Face Detection, Automation

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