

The SUPERIOR College LAHORE



Faculty of Computer Science & IT

Final Year Project PROJECT REPORT

[Facial Recognition Door]

Project ID: **FYP-BITM-S19-004**

Project Team

Student Name	Student ID	Program	Contact Number	Email Address
Muhammad Fahad Ali	Bitm-S-16-005	BSIT	0300-7411133	fahadali74.fa@gmail.com

[Project Supervisor]
Sir Fahad Sabah
(Lecturer)

Project Report

Facial Recognition Door

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PROJECT SUPERVISOR

Comments: _____

Name: _____

Date: _____

Signature: _____

PROJECT MANAGER

Comments: _____

Date: _____

Signature: _____

HEAD OF THE DEPARTMENT

Comments: _____

Date: _____

Signature: _____

Dedication

We dedicated our dissertation to our beloved parents, who taught us that even the largest task can be accomplished if it is done with sincerity and devotion and given us all of their resources for our study. We want to dedicate this to our teachers also who enlightened us with knowledge.

Acknowledgements

First of All, we are very grateful to our Allah Almighty who gives us strength and guidance to carry out our research report. We take immense pleasure in thanking our supervisor “MR FAHAD SABAH” for having permitted us to carry out this project work.

We should like to express our heartfelt to our beloved parents for their blessing. Our friends for their help and wishes for the successful completion of this project.

Executive Summary

This project is providing security system to overcome the unauthorized access which is based on facial recognition algorithm.

Home story system are a growing field of projects for makers. A self-built system not only less expensive than a bulky professional installation, but it also allows for total control and customization to suit your needs. This project utilizes IOT to create a door that unlock it self via facial recognition. If the visitor at the door the camera will take snap of visitor and compare with the database image set, check if the person is authorized then the door will unlock.

There are several ways to unlock the door but we use by adding manually and generating text code to unlock the door.

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Chapter 1

Introduction

Chapter 1: Introduction

A Facial recognition system is a technology capable of identifying or verifying a person from a digital Image Source. Here are multiple methods in which facial recognition systems work, but in general, they work by comparing selected facial features from given image with faces within a database. It is typically used as access control in security systems and can be compared to other biometrics such as fingerprint or iris recognition systems. It is a type of project that provide the security and to overcome the security issues.

1.1. Background

Security is most important for every organization and institutes. In security purposes facial recognition is the best way to check authorized or unauthorized persons. Facial recognition is an advanced technology that helps in discerning and identifying human faces from an image or video. A system employed to perform facial recognition uses biometrics to map facial features from the photo or video. It compares this information with a large database of recorded faces to find a correct match. Facial recognition is touted to be one of the top 3 methods of biometric recognition to identify people by measuring some aspect of individual physiology or anatomy.

Facial recognition is the fastest-growing biometric technology and is expected to grow to \$7.7 billion by 2022. This is because facial recognition has a wide range of commercial applications and is relatively simple to set up. It can be used for everything from surveillance to targeted marketing. Facial recognition technology gained popularity in the early 1990s when the United States Department of Defense was seeking a technology that could spot criminals who furtively crossed borders. The Defense Department roped in eminent university scientists and experts in the field of facial recognition for this purpose by providing them with research financing.

Facial recognition made bold headlines in early 2001 immediately after it was first used in a public space—at Super Bowl XXXV in Tampa—by the law enforcement authorities to search for criminals and terrorists among the crowd of thousands of spectators. Soon after

that, facial recognition systems were installed in other sensitive parts of the US to keep track of felonious activities [1].

1.2. Motivations and Challenges

Fast growing Technology Motivate about the security issues. Now we are working on facial recognition biometric system because it is more securable to the previous system. Our main perspective is to prominent our country name and product in the world. Providing the best to the world from Pakistan to serve humanity is the biggest motivation to do anything in this world.

Challenges:

Our biggest challenge is to compete the existing system in the market. We have to make it one off the best security system from all over the world

- Capital cost
- Acceptance
- Implementation
- Security

1.3. Goals and Objectives

Biometric authentication and their template security are increasing day by day over the past decade with challenging requirement in Automated Secured Personal Authentication System. The reason behind on this demand for the replacement of old-fashioned automatic personal identification tools by new one. The old-fashioned automatic personal identification tools used traditional approaches such as Personal Identification Number (PIN), Login Id, ID card, password etc. to verify the recognizance of a person, are no longer considered as credible adequate to gratify the security concern for person identification system. A biometric scheme delivers automatic recognition of a person depending on some particular trait. The following are the objectives of this study.

- TO develop or improve existing algorithms to make the IRIS recognition accurately in possible on Noisy Iris Images.
- Performance Evaluation of proposed framework by comparing the performance of existing Iris recognition system.
- Design of a Security Template to secure Iris recognition system.

1.4. Literature Review/Existing Solutions

This lock is like other normal lock but it has functionalities to use it is automated, biometric and using through app it is efficient and modern to use with internet and Bluetooth. In Previous systems the security door Locks was Wi-Fi and Bluetooth Smart. Bluetooth and NFC (Near Field communication) can enable a door to unlock whenever an authorized user Smartphone approaches. Users can also remotely lock and unlock door or share access with any number of others, using mobile apps.

Finger print to unlock the door and it have small mini camera in it at top of its sensor who came in front of your house that you can see the person in your mobile phone with the help of internet connection. you can give authentication to any of your family member or friend they can access from application login and password [2].

1.5. Gap Analysis

(Table 1)

1	Target Item	Current State	Future State	Improvement Steps
	Project Requirement Specifications	Requirements of User Interface are Complete. Requirements Gathering for Facial Recognition Door System are partially complete.	Completing The Requirement Specification to be completed as soon as possible to start implementation.	We make some changes after testing the Project. Change only require when it needed.
	Use Case Analysis	Working on Use case model is in progress.	Complete Use case model and Fully Dressed Use case to clearly define the path for design and implementation	If these cases not go as our project requirements so we will improve or make some changes.
	System Design	Architecture diagram and use cases diagram done others are still in progress.	And it will be completed soon further work then start the implementation on it.	System design improve when user use this product and then when it need some changes we will make more better
	Implementation	Working on front end initial pages and front end in developing mode.	Project will be complete.	Improve design or functionality with the time.
	Documentation and Project Testing	Just gathering requirements through documentation and make documentation also.	When documentation are completed it will be timing to implementation.	Fixing the errors, flows and improve the project as per requirements.

1.6. Proposed Solution

Facial recognition is a biometric software application capable of uniquely identifying or verifying a person by comparing and analyzing patterns based on the person facial contours. Facial Recognition security door is mostly used for security purposes. There is increasing interest in others areas of use. The system store image of suggested person in database and accesses the person with 3D images. It also shows the previous alarm history record.

To add your close or family person you will take his picture and stored in system database after that he can easily open the door. After approving the Identity system will call the person please come in.

1.7. Project Plan

Basic aim is to secure the security and protect them from other users. Security Will command to the basic person to open the door and other will not be eligible to open the door for unauthorized person

We divide our project into some segments.

- Data gathering.
- Requirement engineering.
- Clarify the data to functional and Non-functional requirements.
- Key variables identification.
- Visualize the Interface.
- Making use cases for functional requirements.
- Software and hardware Architecture design.
- Module development.
- Modules integration.
- Testing (module, integration, load, stress, static, dynamic).

1.7.1. Work Breakdown Structure

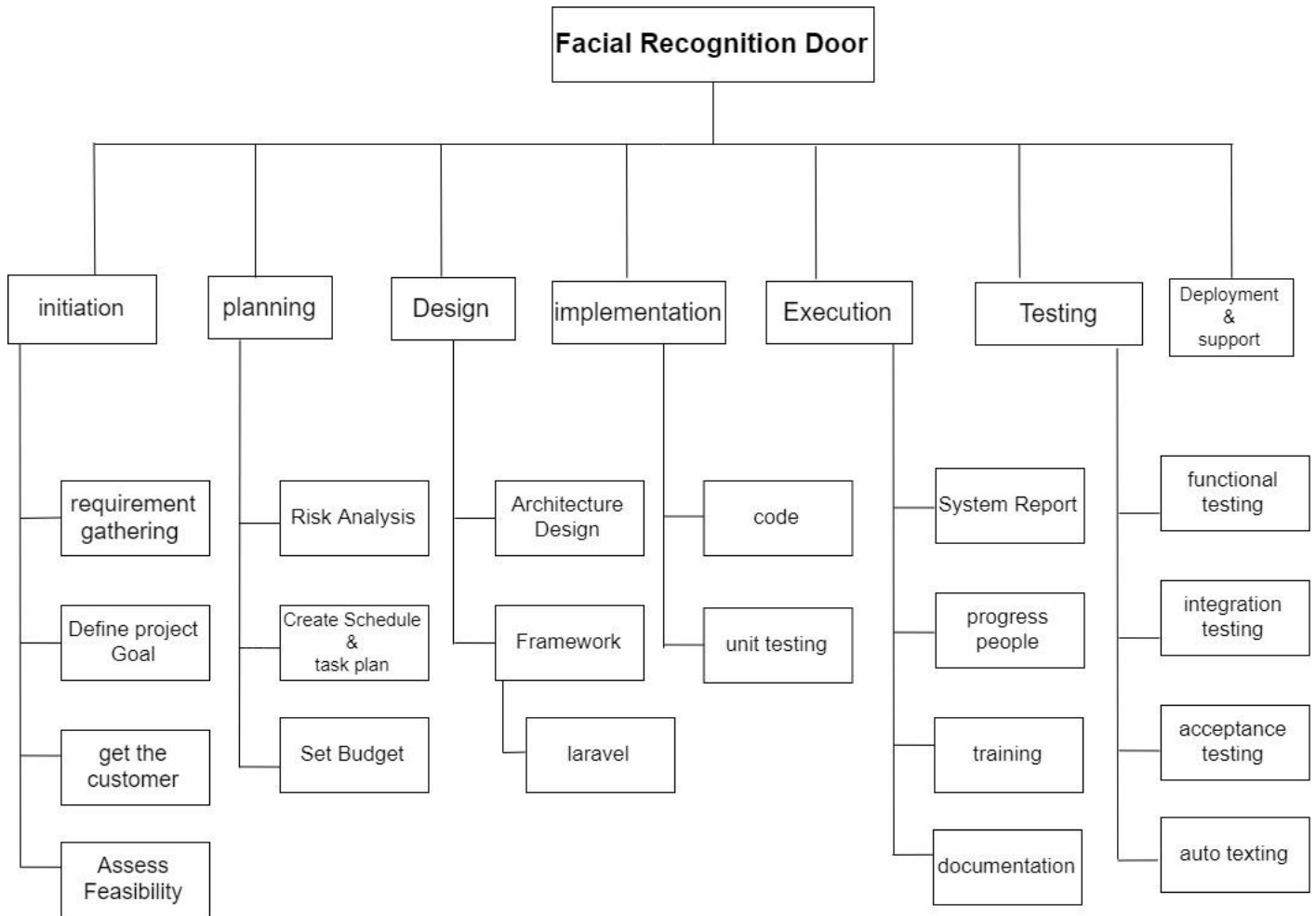


Figure 1 – work break down structure

1.7.2. Roles & Responsibility Matrix

Responsibility Matrix:

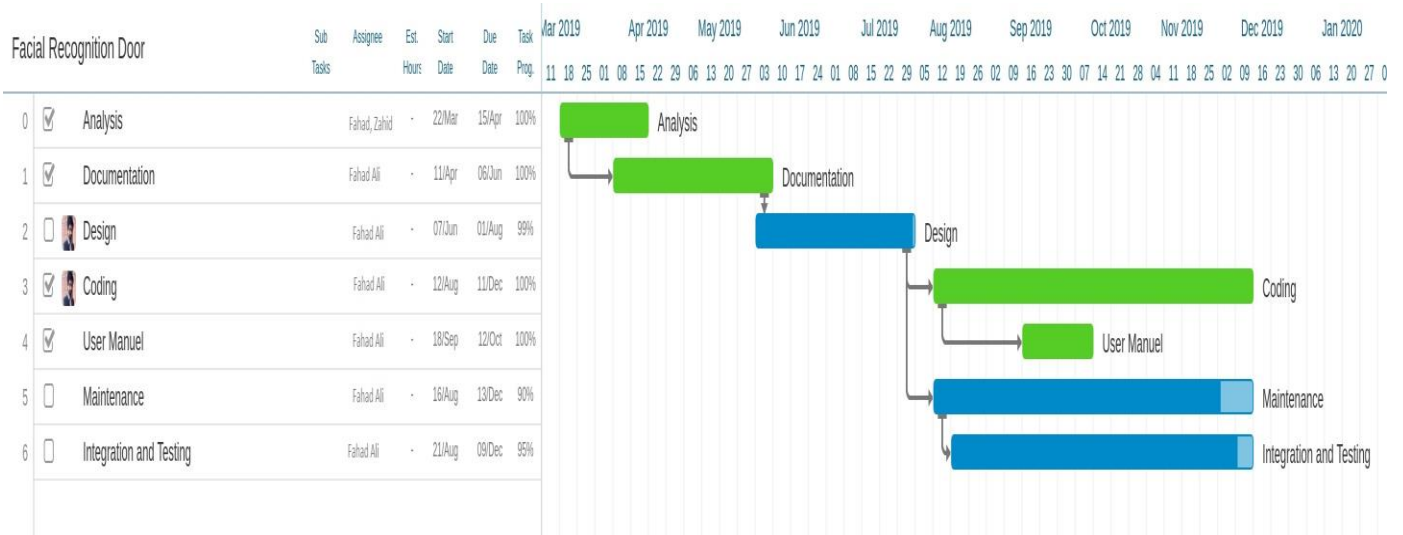
The purpose of roles & responsibility matrix is to identify who will do what.

(Table 2)

WBS #	WBS Deliverable	Activity #	Activity to Complete the Deliverable	Responsible Team Member(s) & Role(s)
1	Deliverable 1	<ul style="list-style-type: none"> Data Gathering Requirement Engineering 	Conducting survey and Data gathering from backward area people	<ul style="list-style-type: none"> Fahad Ali
2	Deliverable 2	<ul style="list-style-type: none"> Functional and non functional requirements Key variables Identification 	<ul style="list-style-type: none"> Requirement analysis 	<ul style="list-style-type: none"> Fahad Ali
3	Deliverable 3	<ul style="list-style-type: none"> Software And Hardware Architecture Design Module development1 	<ul style="list-style-type: none"> Architecture Design coding 	<ul style="list-style-type: none"> Fahad
4	Deliverable 4	<ul style="list-style-type: none"> Making use case for functional Requirements 	<ul style="list-style-type: none"> Creating Use cases 	<ul style="list-style-type: none"> Fahad

5	Deliverable 5	<ul style="list-style-type: none">• Module Development 2• Module Integration	<ul style="list-style-type: none">• Coding• Integrate	<ul style="list-style-type: none">• Fahad
6	Deliverable 6	<ul style="list-style-type: none">• Testing• Deployment	<ul style="list-style-type: none">• Use testing tools• Deploy in required Environment	<ul style="list-style-type: none">• Fahad

1.7.3. Gantt Chart



1.8. Report Outline

- **Analysis:** Analysis portion contain various methods to collect data. To identify the requirements of the Facial Recognition will be gathered by the questionnaires. Other Non-functional requirements are also mentioned next.
- **Design:** Design possessed all the design models of the Facial Recognition system which will afterword helpful for the developers and testers. This portion contains Use Case Diagram, activity diagram, ERD, domain model, class diagram deployment diagram. It will outline how each component interacts with each other.
- **Implementation and Testing:** it will provide the information about all the implementation techniques and tools. It also provides information about the software environment and hardware environment for the implementation. After implementation testing phase is start which will give information about the errors and faults in the project.
- **Maintenance:** In this phase we maintenance our product and check the different flows in the system. If system working not satisfied, we have to find the problem then develop the strategy to resolve this issue however its hardware or software issue. It also provides information about the software environment and hardware environment for the Maintenance. After Maintenance phase is start which will give information about the correct working or the project.

Chapter 2

Software Requirement Specifications

Chapter 2: Software Requirement Specifications

2.1. Introduction

2.1.1. Purpose

Purpose A facial recognition door entry access system that also keeps records of people coming and going could be the one accessory your high tech home is missing. The system works by taking a 3D image of people at the door via it by camera and matching them against your stored database [3].

2.1.2. Document Conventions

The following Document Conventions are used in our project:

- Database
- Admin who manages all the data and transactions
- Diagrams which describes the flow in our system
- Entity Diagram
- It specifies the external system behavior

2.1.3. Intended Audience and Reading Suggestions

This system requirement is intended for user who can review project, capabilities and more easily understand where their efforts should be targeted to improve or add more features to it. (Design and code the application)

Following are reading suggestions for the intended audience to read their respective portion to easily understand the document in each type.

(Table 3)

System analysts	Chapter 2: SRS Chapter 3: Use case Analysis
System Architects	Chapter 4: System Design
Developers	Chapter 2: SRS Chapter 4: System Design Chapter 5: Implementation
Project managers	Complete Document
Documentation writers	Complete Document
User Manuals	Appendix

2.1.4. Product Scope

This security system is combination of face recognition system and IOT. These two technologies are growing technologies and with the help of them, much advancement can be done. There are many face recognition algorithms developed. The system secures your security and you don't need to any kind of hesitation. In future you have a high level of privacy that cannot be breakdown [4].

2.1.5. References

Different Companies are working related to this project. Mostly famous companies are working on fingerprint and attendance base system.

Few of them are:

- h. kanchwala, "how does face recognition work," 5 Feb 2019. [Online]. Available: <https://www.scienceabc.com/innovation/facial-recognition-works.html>.
- P. A. Gaikwad, "Face Recognition System Using IoT," *International Journal of Advanced Research in Computer Engineering & Technology*, vol. 6, no. 11 November, 2017.

2.2. Overall Description

2.2.1. Product Perspective

Existing system has three features

- Existing system is more time consuming
- Existing system consumes more man power
- Existing system is more cheap
- Existing system can purchase easily because it will available in all over Pakistan
- **This product proposed the following:**
- It provides new way of security that cannot break down easily
- Provide access to user to add more persons by remotely to the database in case of any security issue it will generate a message to user.
- You can store more data of users in database

2.2.2. Product Functions

Functionalities of this project are

- It will provide high level security
- It will provide the facility to store any other user to the database of the system
- It gives the facility of voice note when door will open It will generate a message to user in case of any danger
- You can make any change from the panel
- Better storage capacity More intelligent by time It provide login for user
- It provides sign up for user

2.2.3. User Classes and Characteristics

Admin

Will be able to add or remove the user in database of the system. Additionally, admin can change the accounts of user. He will deal the issues regarding the system design and database

User

Will have access of panel system and can add or remove the other person. He can make any type of change just for the user not for admin. He will have the access of just user panel.

2.2.4. Operating Environment

A person's image should be provided by using camera. The Camera Transfer it to the face recognition system. Next an image is preprocessed for features of recognition and compared with an image which is in the system database and matched. The system User can do add and delete operations in the database only own profile related, can set appropriate match rate of accepting user and handle whole system.

2.2.5. Design and Implementation Constraints

- The system design (maintainability) will not be responsibility of user
 - It will be the responsibility of the admin in case of any mishap in the system the user will not be responsible for that lose
 - Admin gives a first trail of the system and after that they will not entertain their quires.
 - After delivering the project any increment in the system will be charged by admin rules
- Assumptions and Dependencies

2.2.6. User Documentation

The System provide security in case of home, offices and Shopping malls door. The System is easily to control. You can access to any person which you want to allowed. The system provides Quality of security. You have the remotely app by which you can control your system. The system will work through message to control the system.

2.2.7. Assumptions and Dependencies

Assumptions

- It is assumed that the requirements are in its completion phase.
- It is assumed that user is used to the internet when he will far away from the system
- It is assumed that user is familiar with system panel
- It is assumed that user has a decent connectivity with the system panel

Dependencies

- User's levels are previously determined for all the users
- Access to the system panel is restricted to the user name
- Admin have access to any user's account

2.3. External Interface Requirements

2.3.1. User Interfaces

- It will compete to the other computers in our surroundings
- It will maintain high contrasts
- It will have high visibility to get best results
- Layout of panel will be according to the display and scope of the existing system that is being used mostly
- User interface for the system will be simple that it will be easy to read

2.3.2. Hardware Interfaces

- Ttl module
- Face detector microcontroller
- Relay
- Arduino

2.3.3. Software Interfaces

- Software required are the requirements which are required for creating the website and which software the project is been made up.
- Sublime Text editor
- Language: HTML, CSS, JAVASCRIPT, PHP, LARAVEL

2.3.4. Communications Interfaces

The FACEPORT allows third-party developers to implement facial biometric technology within their own security applications.

It will provide

- Tracking
- Enrollment
- Verification
- Classification
- Database

2.4. System Features

- Features Fast face processing

- Live face detection
- Face image quality determination
- Tolerance to face posture
- Multiple samples of the same face
- Identification capability
- Compact face features template
- Features generalization mode System Feature

2.4.1. Security

2.4.1.1. Description and Priority

It compares the information with a database of known faces to find a match. That's because facial recognition has all kinds of commercial applications.

Priority:

High

2.4.1.2. Stimulus/Response Sequences

The face is identity matching task, face and house part to whole matching task, Neutral and Emotion face memory task have been previously described including figures of stimulus

2.4.1.3. Functional Requirements

REQ-SFI-1: Input is an image

REQ-SFI-2: The user should not move during face detection in order to obtain high quality results

REQ-SFI-3: System admin is the main actor

2.4.2. Admin

2.4.2.1. Description and Priority

Admin have all the control

Priority:

high

2.4.2.2. Stimulus/Response Sequences

Admin can do every thing

Add or remove users, check logs, reset system, access without authentication to the system.

2.4.2.3. Functional Requirements

REQ-SF2-1: the system shall allow admin to deal with any user

REQ-SF2-2: can remove or suspend the profile of user

2.4.3. User

2.4.3.1. Description and Priority

Have access to all user which are added in database

Priority:

high

2.4.3.2. Stimulus/Response Sequences

Unlock the system with face recognition and other aspect of authentication.

2.4.3.3. Functional Requirements

REQ-SF2-1: authentic users can access the system

REQ-SF2-2: user can access the system with the permission of the admin

2.5. Other Nonfunctional Requirements

2.5.1. Performance Requirements

- Its performance should be accurate
- It should be available all the time for users
- The detector should never be down
- To get best speed face should be at accurate angle in front of the detector (camera)
- It should be providing accurate result
- System should not be slow on having load on system.

2.5.2. Safety Requirements

- System should be placed in hidden place
- System should have a backup way to unlock the door it can be key
- System should have a backup database in case of any loss or damage
- System should be updated

2.5.3. Security Requirements

- Security should be of fool proof

- Admin should have logins
- Admin should have a password
- Admin check the logs who want to access the system and when they try to enter or pass the door.
- User should have face id.
- User profile should be integrated with user FACE ID

2.5.4. Software Quality Attributes

Quality Service Requirements are the Requirements which are necessary to maintain your product quality for the sake of your reputation

Quality service requirements are as follow

- First select the test factor and rank them
- Identify the phase of development
- Identify the business risk

2.5.5. Business Rules

The software design (maintainability) will not be responsibility of developer or company.

- It will be the responsibility of the admin
- In case of any mishap in the software the developer or company will not be responsible for that loss
- Developer or company gives a first trial of the software and after that they will not entertain their queries
- After delivering the project any increment in the software will be charged by per hour

2.6 Availability

System should be available all the 24 hours so that it could not be have any difficulty in having access to the door, locker it can by any thing where you deploy this security system.

2.7 Reliability

System should be reliable so that user can give their personal information to the system easily and trust that their information is not leaked out for any purpose

Chapter 3

Use Case Analysis

Chapter 3: System Analysis

This document takes input from previous chapters and refines the functional requirements by passing through use case modeling. This document also contained the use case model. Use case is a procedure, which is used to determine, define and set up the system requirements. The use case should consist of all system activities that is related to users. Use case should organize the functional requirements, actors (users) and Records paths from trigger events to goals.

A template matching based technique was implemented for face recognition. This was because of its increased recognition accuracy when compared to geometrical features based techniques and the fact that an automated geometrical features based technique would have required complex feature detection pre-processing

Principal Component Analysis, the segmented frontal view face image is transformed from what is sometimes called 'image space' to 'face space'. All faces in the face database are transformed into face space. Then face recognition is achieved by transforming any given test image into face space and comparing it with the training set vectors. The closest matching training set vector should belong to the same individual as the test image. Principal Component Analysis is of special interest because the transformation to face space is based on the variation of human faces (in the training set). The values of the 'face space' vector correspond to the amount certain 'variations' are present in the test image.

3.1. Use Case Model

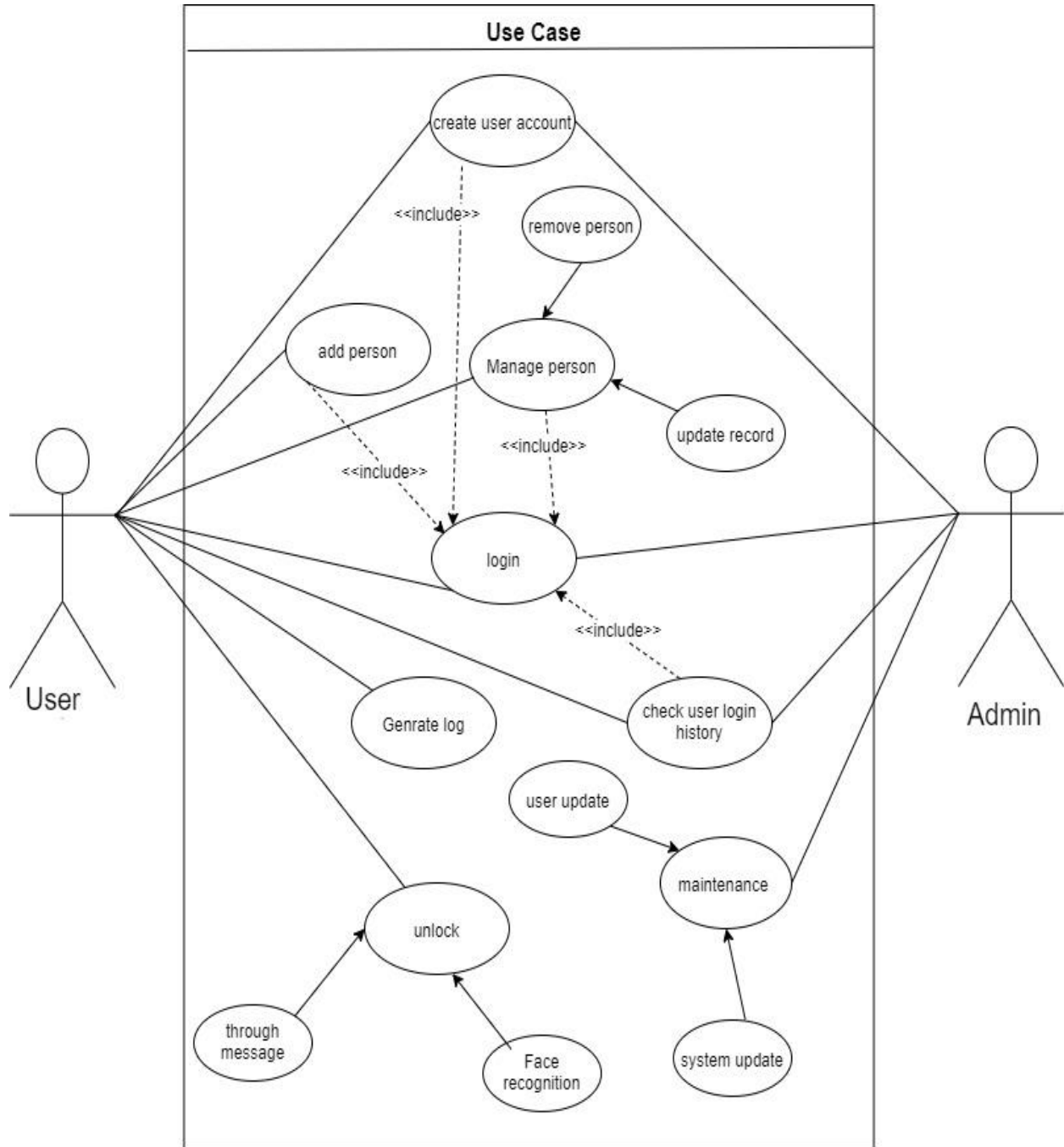


Figure 3 - Use Case

3.2. Use Case Descriptions

(table 1)

Reference:	Use Case 1
Use Case Name:	User Registration
Priority	
Actor	User
Precondition	Fill the signup form for registration
Basic Path	<ul style="list-style-type: none"> • User should enter valid information • Make sure user not exit in database • System will refuse to add the user incase already exit
Alternate Path	<ul style="list-style-type: none"> • User fill all the field of form in case any field left system generate a message please fill this field • Only valid information will accept from the system side.
Post Condition	<ul style="list-style-type: none"> • Redirect to login activity

(table 4)

Reference:	Use Case 4
Use Case Name:	User authorization.
Priority	5
Actor	User
Precondition	User is logged in and unauthorized. User is in a private account. User's session is missing, then it will expired.
Basic Path	<ul style="list-style-type: none"> • The User send a request message to the system, required about login request. • The system answers please provide valid user name and password, system need authentication. • The user send request by opening the web page and submitting the data in the form of picture in database. • The user sends the request again. • System answers according to the request.
Alternate Path	<ol style="list-style-type: none"> 1) The system does not match the User request: "user Unauthorized" and the scenario ends. 2) The user provides the user name and password system responds "Login successfully".
Post Condition	System answers according to the request

(table 5)

Reference:	Use Case 3
Use Case Name:	Manage Person
Priority	5
Actor	User
Precondition	User logged in, authorization mode. User can manage person records.
Basic Path	<ul style="list-style-type: none"> • The user adds person record manually. • System reply “added person record successfully” • User want to update person record and try to update it. • System reply “update person record successfully” • User remove person from database and declare unauthorized person. • System reply “User deleted”.
Alternate Path	<ol style="list-style-type: none"> 1) System does not find the person in database person may exist or not in the database base but system can't find it. 2) System reply “person not find or person can't exit in database, please check record and provide correct person record”.
Post Condition	System responds “updated database”.

(table 6)

Reference:	Use Case 5
Use Case Name:	Maintenance
Priority	5
Actor	User, Admin
Precondition	Actor is logged in and authorized. Actor is in maintainability mode.
Basic Path	<ul style="list-style-type: none"> • System show the message update user account. • User send request to admin for updating of user personal account • Admin generate request to the system for user profile. • System responds “Updated User account successfully”
Alternate Path	<ul style="list-style-type: none"> • User add 15 people in data base from initially assigned account to the user. • System work properly with this account but if the user need to add more people in data base. • System responds “you have account limit 15 please send request for update your account”. • User generate request to the admin.
Post Condition	System responds “now you can add people more then 15”.

(table 7)

Reference:	Use Case 4
Use Case Name:	Unlock
Priority	5
Actor	Person and User
Precondition	Authorized person, user can unlock door.
Basic Path	<ul style="list-style-type: none"> • Person can unlock the door through facial recognition if person at the door and have authorized access. • If unauthorized and try to get access of system, then system stop responding. • System will generate a message in case of emergency to the user.
Alternate Path	<ul style="list-style-type: none"> • User generate text code to unlock door. • System replies “unlock door successfully through text code log generated and added to the data base”
Post Condition	<ul style="list-style-type: none"> • System responds “Welcome Sir (by name) and call please come in”.

Chapter 4

System Design

Chapter 4: System Design

This portion of the documentation explain the system by UML diagrams. In this section each diagram has its own properties and way to showing the system working in development of project. These diagrams help to implementation of the project.

4.1. Architecture Diagram

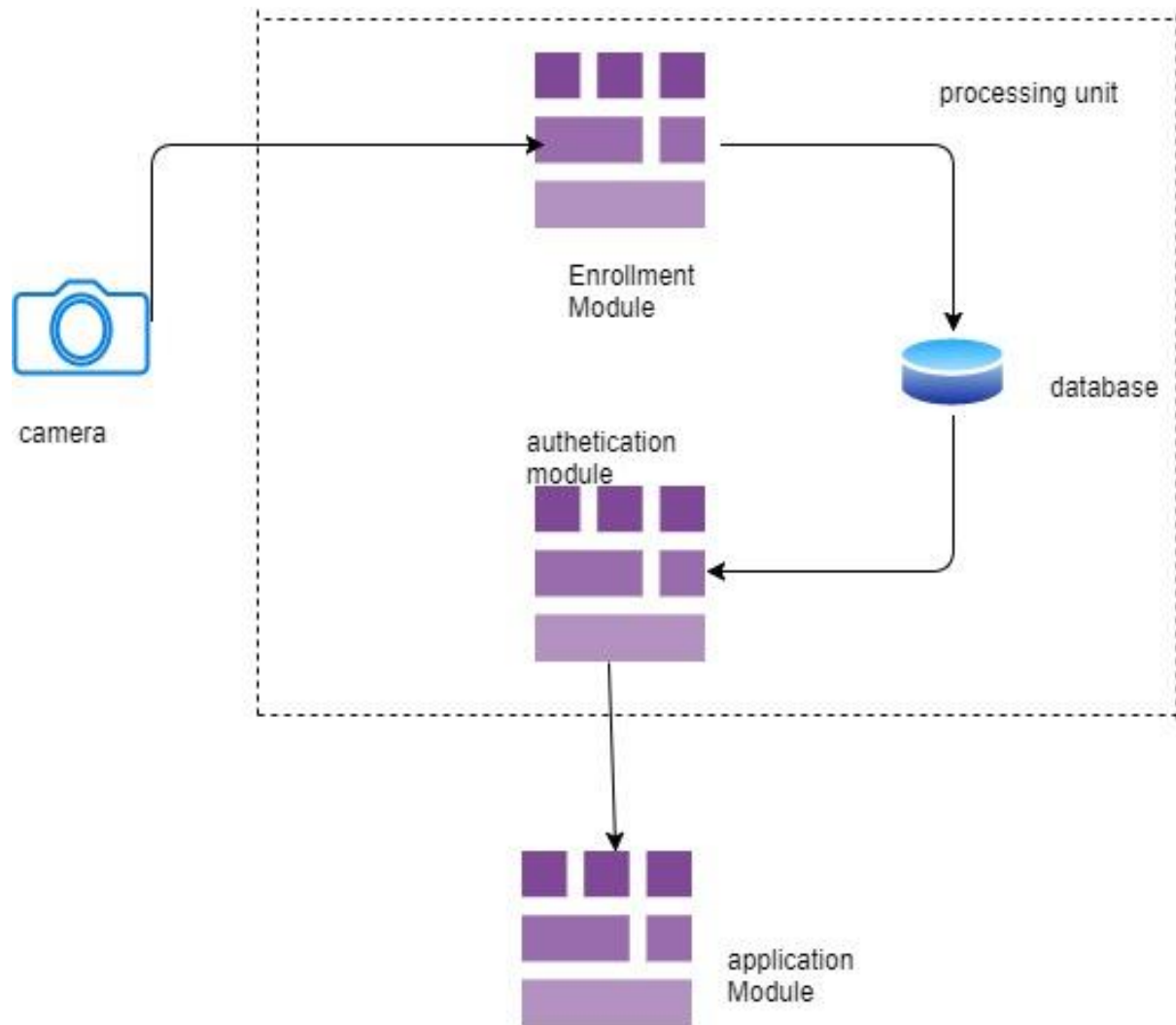


Figure 4 - Architecture Diagram

Enrollment Module:

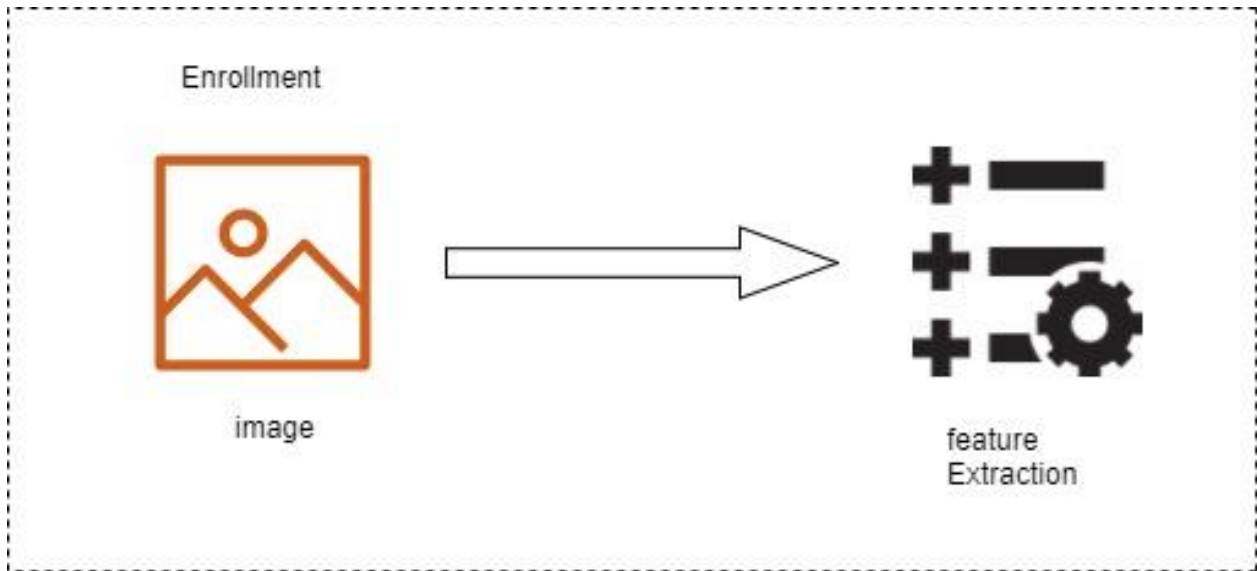


Figure 5 (Architecture diagram EM)

Authentication module:

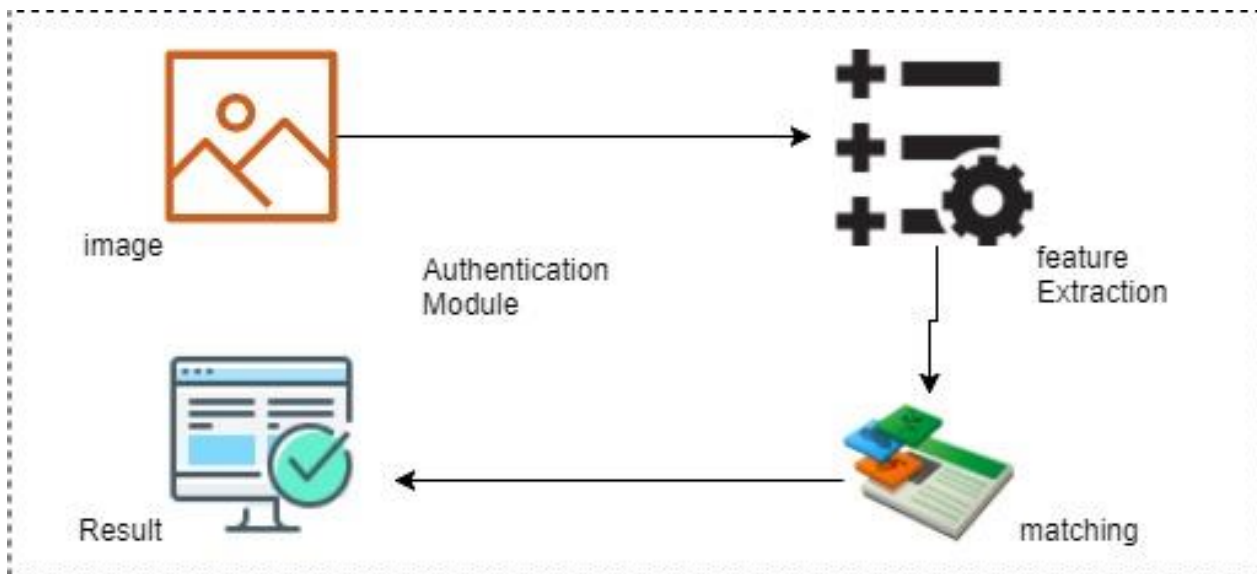


Figure 6 - Architecture Diagram Authentication Module

Application module:

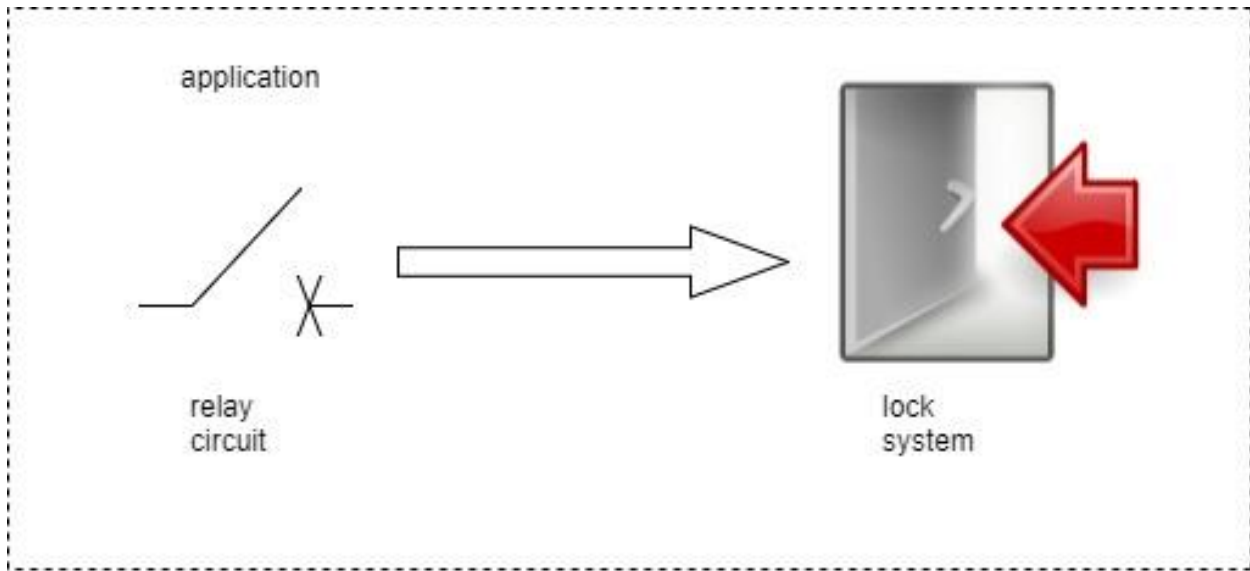


Figure 7 – Application Module

4.2. Domain Model

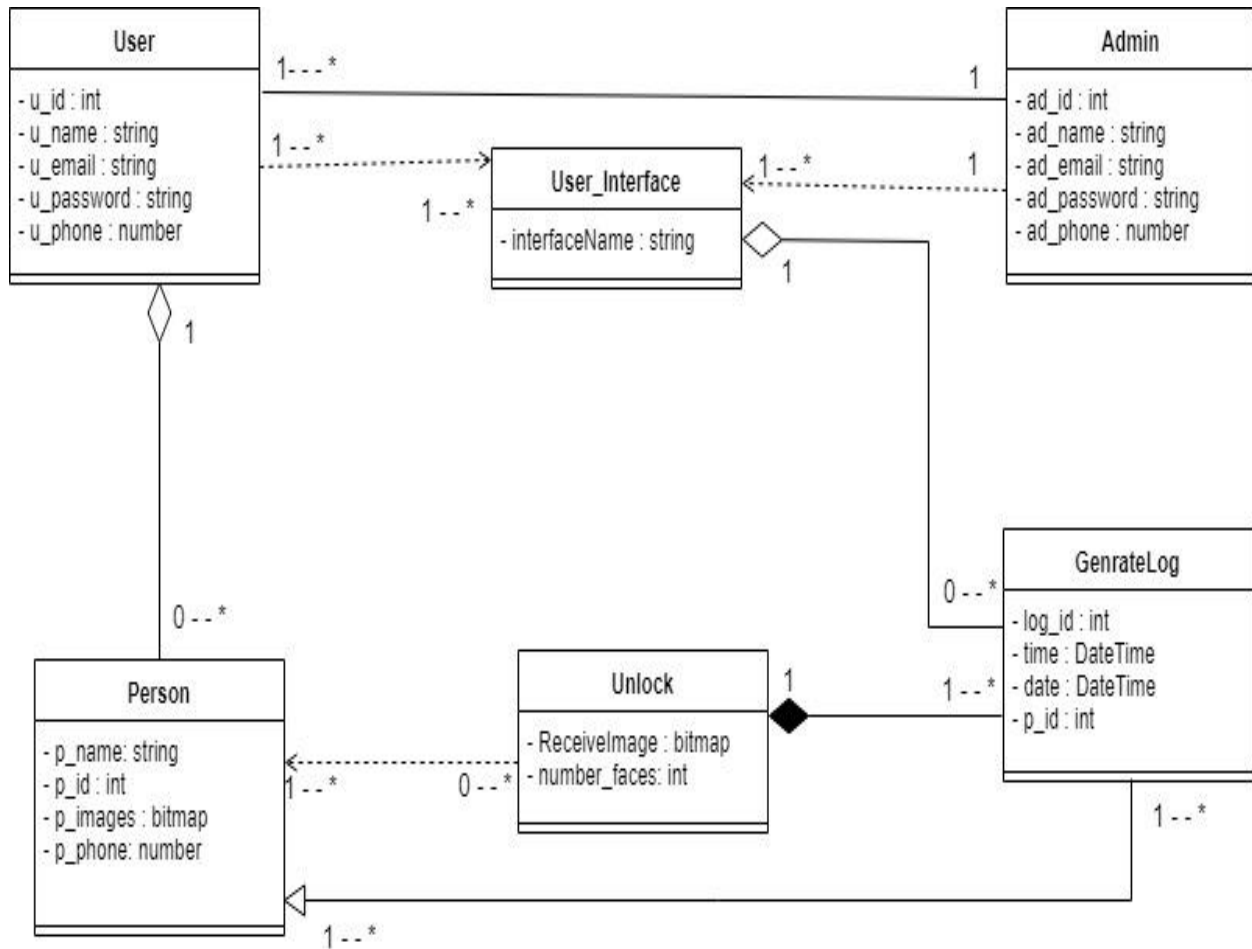


Figure 8 - Domain Model

4.3. Entity Relationship Diagram with data dictionary

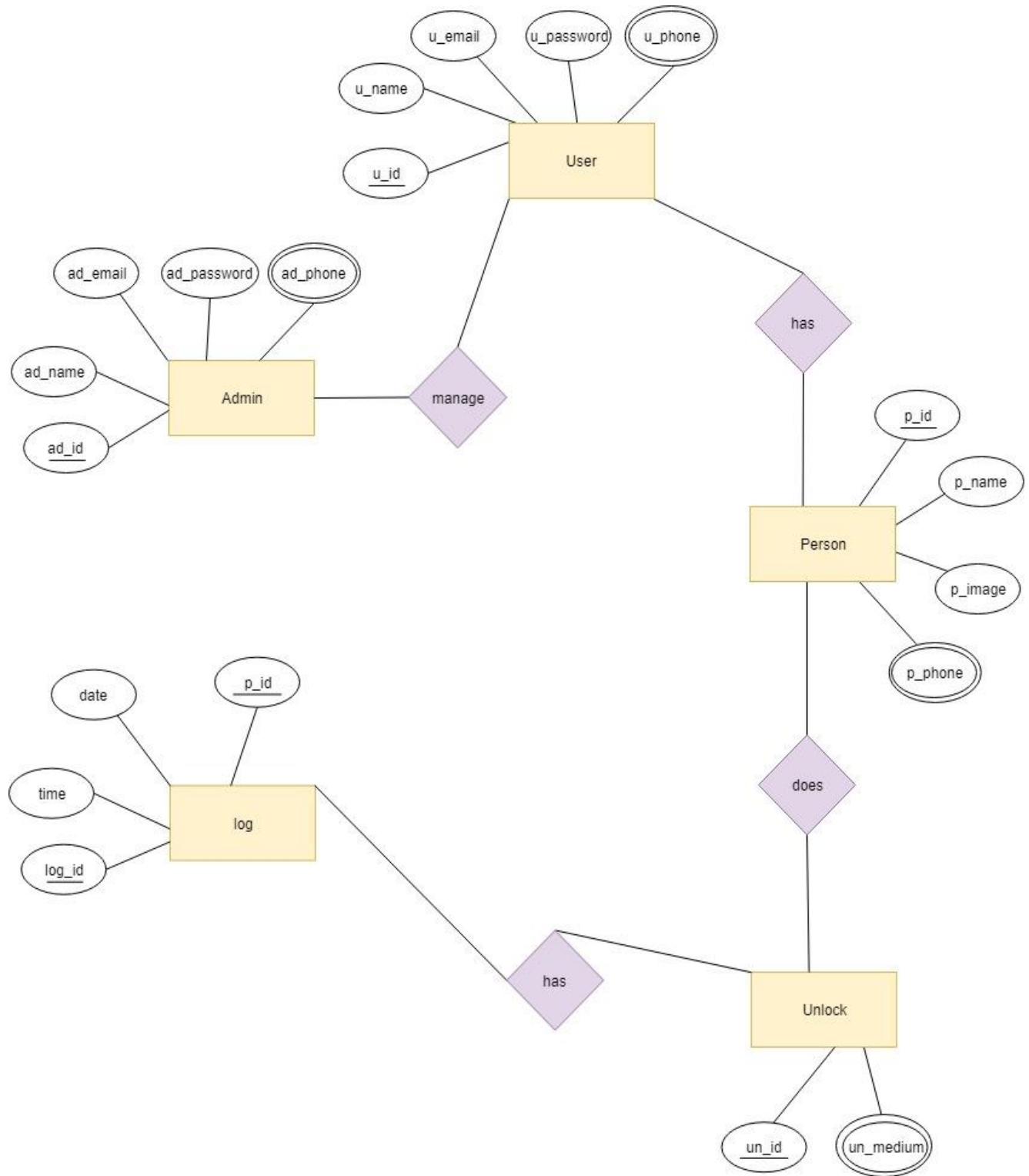


Figure 9 - ER Diagram

4.4. Class Diagram

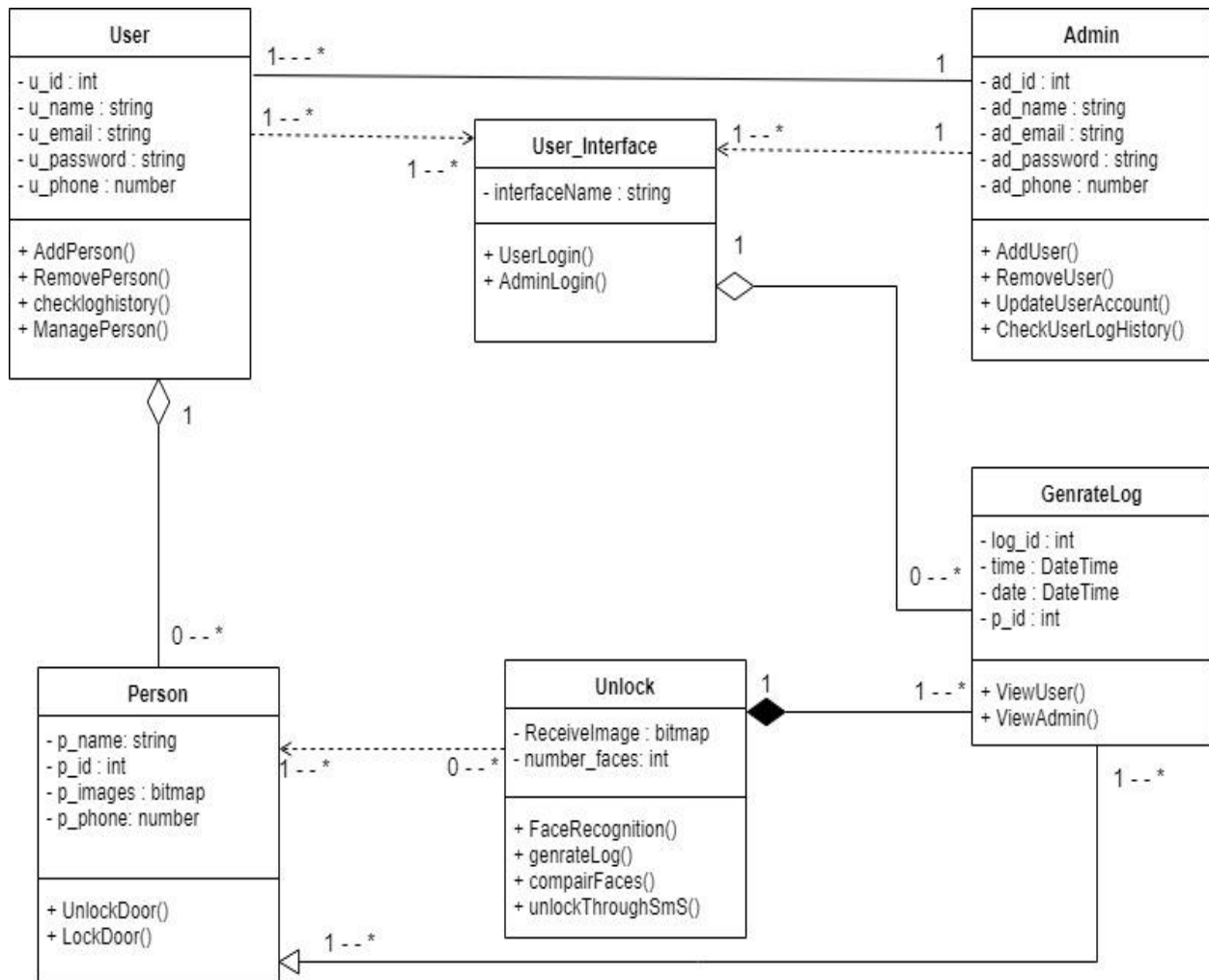


Figure 10 - Class Diagram

4.6. Operation contracts 1

Name: Register.

Responsibilities: To register the new user.

Exceptions: None.

Preconditions: Register interface must be opened and user must enter valid information.

Post conditions: Message pop-ups that you are successfully signed up.

4.7. Operation contracts 2

Name: Login.

Responsibilities: A user is logged in.

Exceptions: Invalid Email and Password.

Preconditions: User must have account.

Post conditions: User successfully login.

4.8. Operation contracts 3

Name: Logout.

Responsibilities: User is logged out.

Exceptions: None.

Preconditions: User must be login.

Post conditions: Logout successfully.

4.9. Operation contracts 4

Name: Update User profile.

Responsibilities: User must login and goto the Update root.

Exceptions: .

Preconditions: Must be logged in.

Post conditions: Update Profile successfully.

4.10. Operation contracts 5

Name: Add Persons.

Responsibilities: User must add person which they allow to access the door.

Exceptions: None.

Preconditions: User must login.

Post conditions: Add person successfully.

4.11. Operation contracts 6

Name: update Person.

Responsibilities: User update person.

Exceptions: None.

Preconditions: persons added initially.

Post conditions: Update person successfully.

4.12. Operation contracts 6

Name: Delete Person.

Responsibilities: User update persons.

Exceptions: person not found in database.

Preconditions: persons added initially.

Post conditions: Update person successfully.

4.13. Operation contracts 7

Name: Check Logs.

Responsibilities: Open the log portal.

Exceptions: person not found.

Preconditions: person exist in database.

Post conditions: explore the logs.

4.14. Operation contracts 8

Name: Unlock though face_ID.

Responsibilities: Person should be at the front of camera.

Exceptions: Face not math.

Preconditions: Person should exist in database.

Post conditions: door will be unlocking.

4.15. Operation contracts 9

Name: Unlock though text message.

Responsibilities: Person or User generate a Text to the system.

Exceptions: Calling party number not added in system.

Preconditions: Number must be added in system.

Post conditions: door will be unlocking.

4.16. Operation contracts 10

Name: Lock the Door.

Responsibilities: door will be automatically lock after 10s.

Exceptions: technical error in system.

Preconditions: Door open initially.

Post conditions: Lock the Door Successfully.

4.17. Activity Diagram

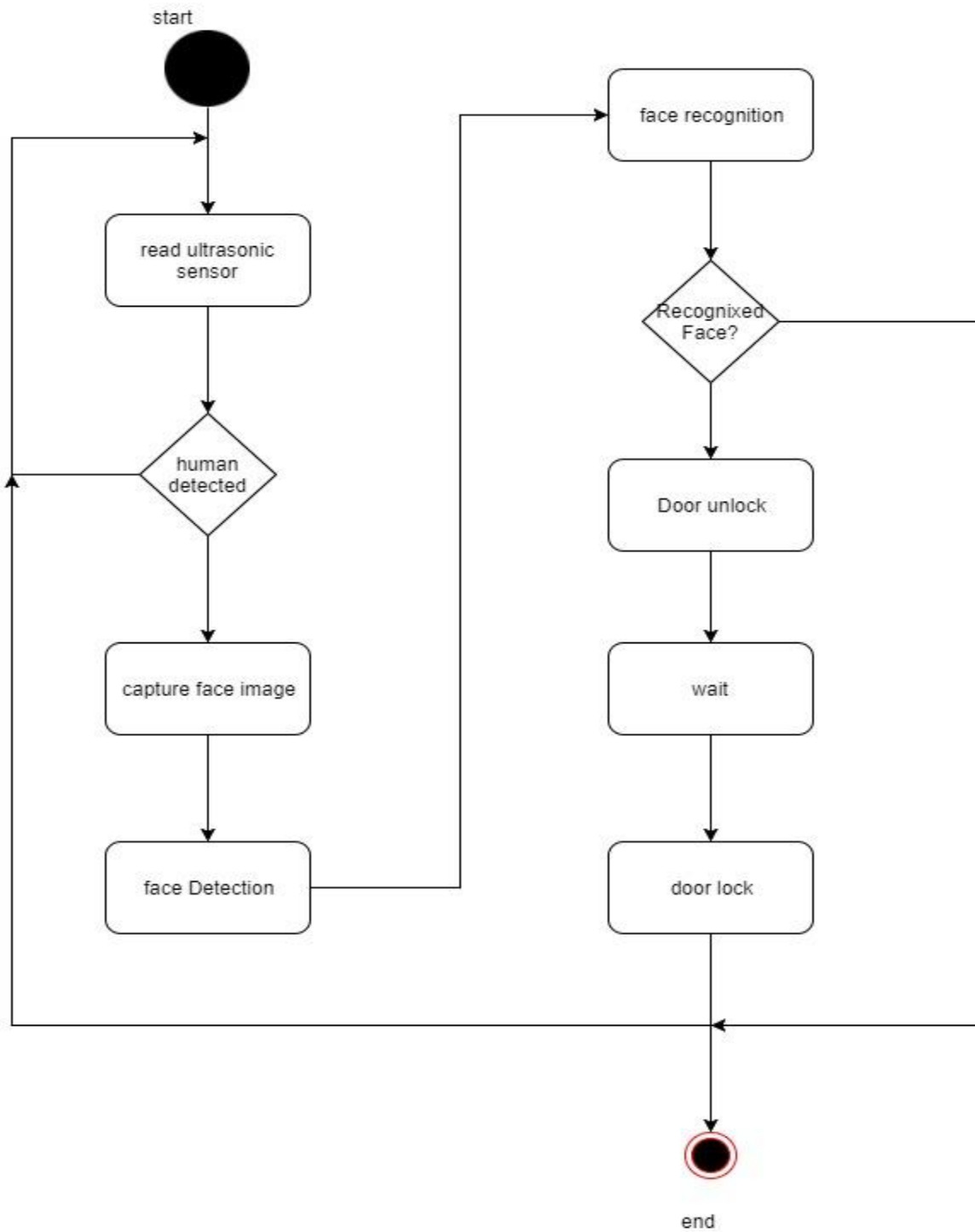


Figure 12 - Activity Diagram

4.18. State Transition Diagram

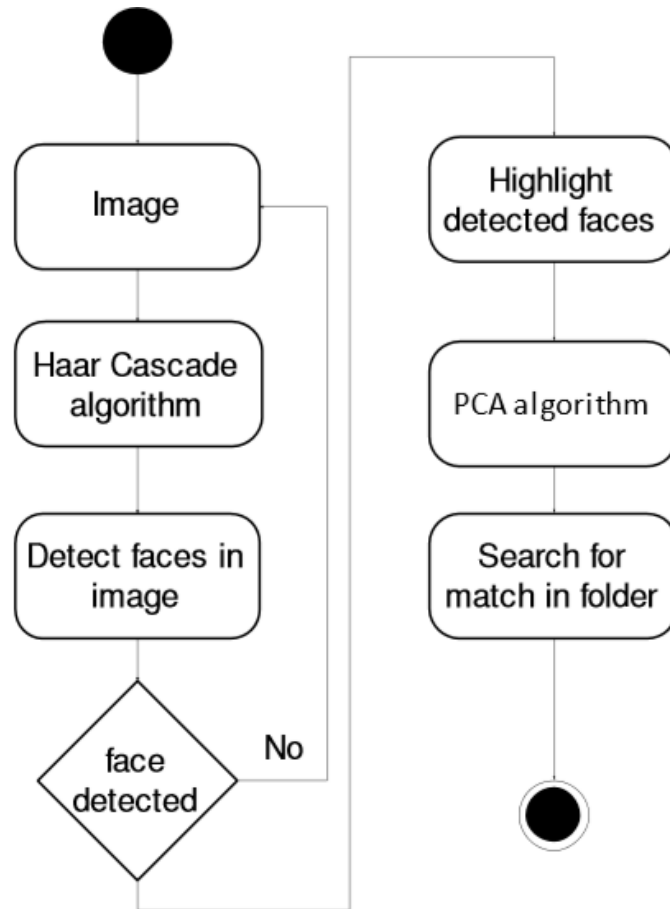


Figure 13 - State Diagram

4.19. Component Diagram

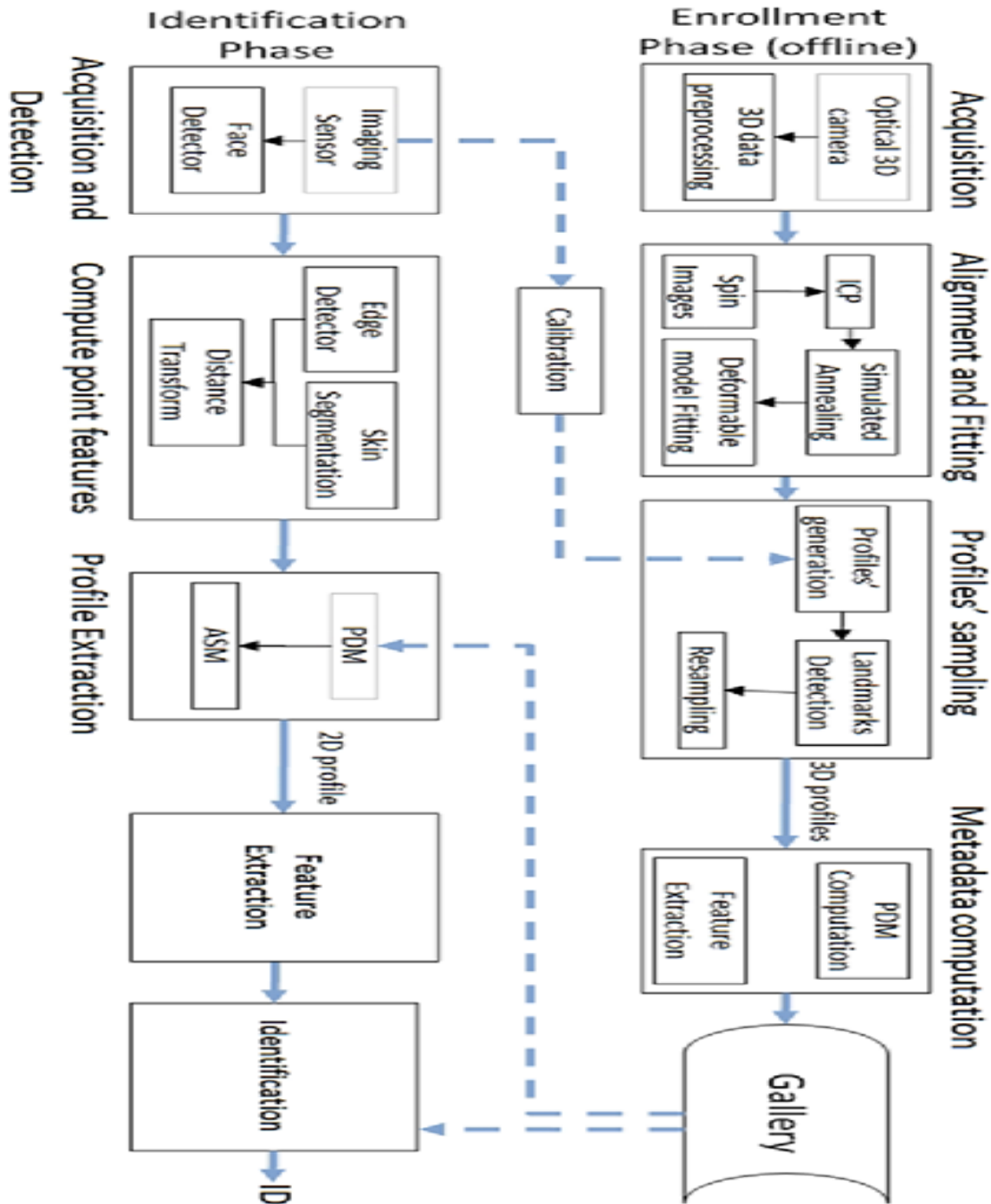


Figure 14 - Component Diagram

4.20. Deployment Diagram

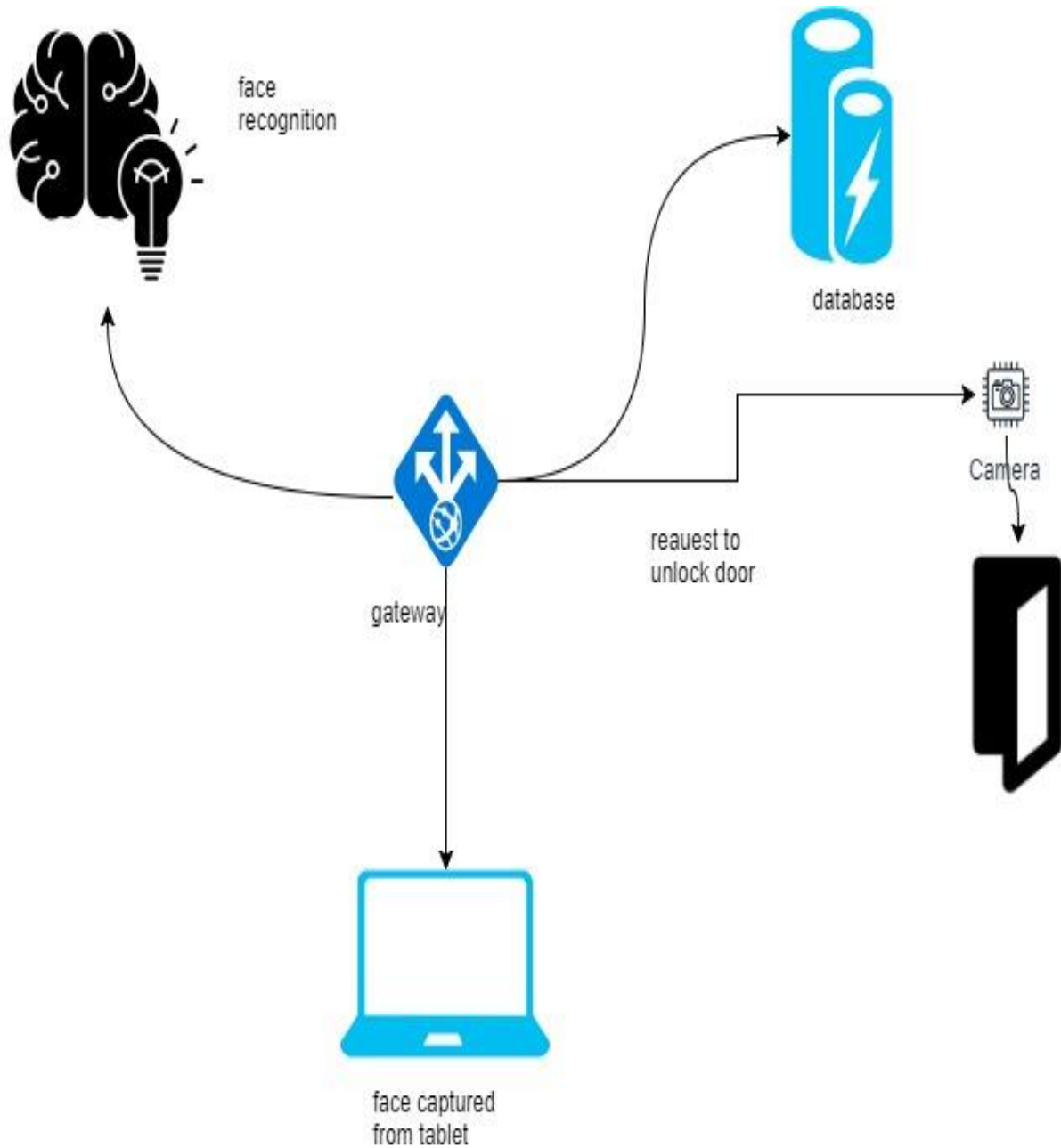


Figure 15 - Deployment Diagram

4.21. Data Flow diagram

Level 0:

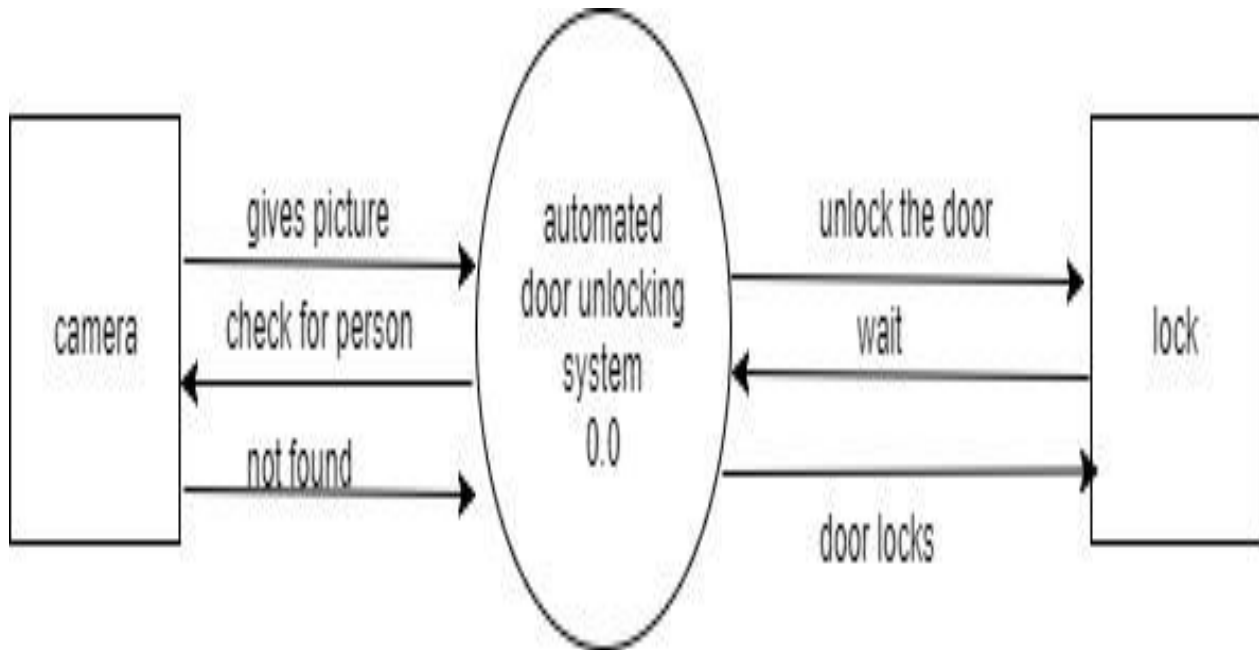


Figure 16 - Data Flow Diagram level 0

Level 1:

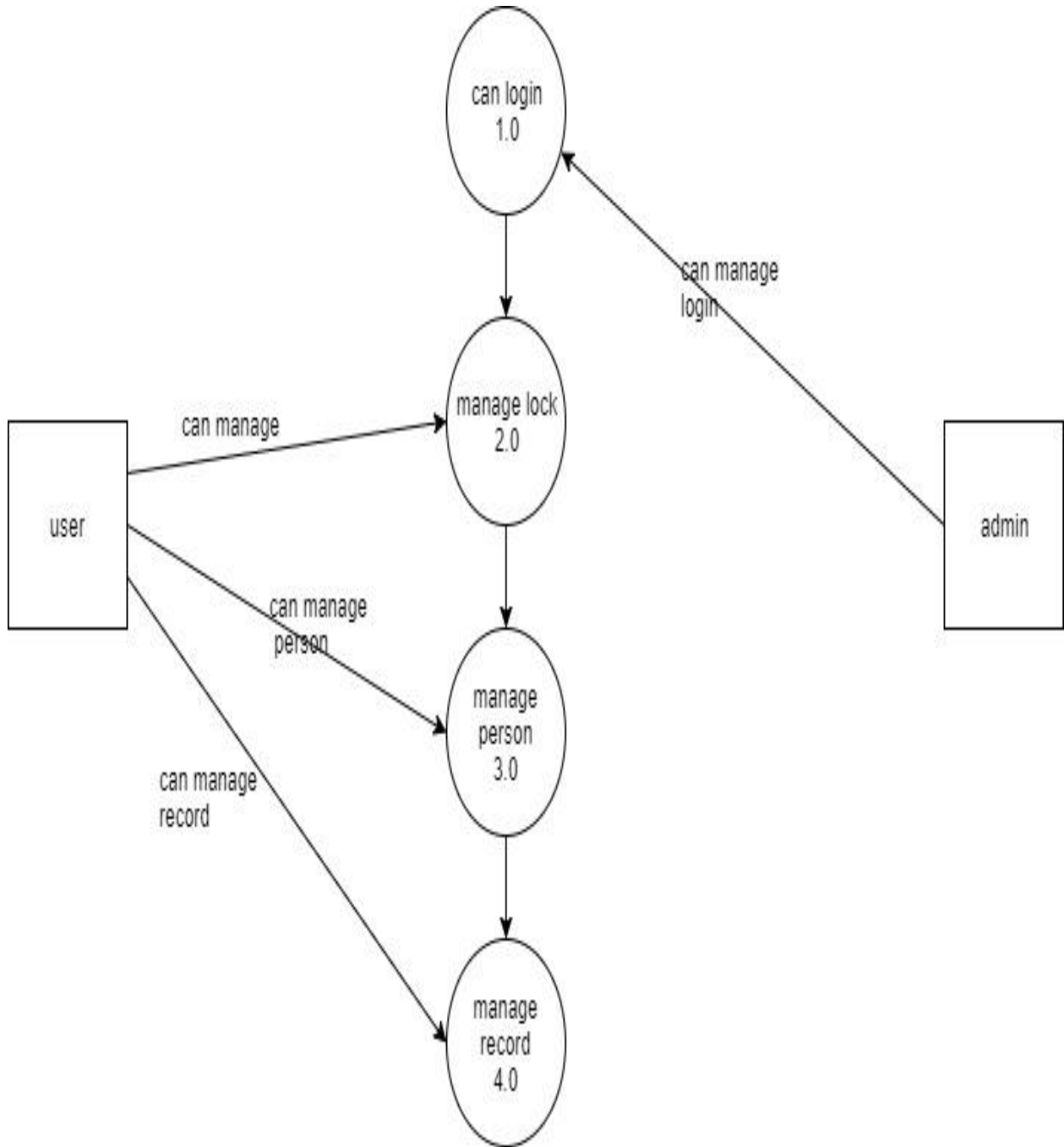


Figure 17 - Data Flow Diagram level 1

Chapter 5

Implementation

Chapter 5: Implementation

As all know about the implementation phase of any product is quiet difficult and this is the actual stage after that product have to deploy. In this chapter we will discuss about the components, libraries, and web services which we use in our project. We also discuss about the tools and techniques which we use in project and we discuss about the deployment environment where we can deploy our project.

5.1. Important Flow Control/Pseudo codes

[Paragraph Text 12 pt, Calibri, 1.5 Line Spacing, Justified]

5.2. Components, Libraries, Web Services and stubs

- Specific face recognition
- Face detection
- Automated door access
- **Libraries**
- Bootstrap
- CSS
- Fontawesome
- **Web services**
- 24-hr active
- Ability to check logs
- Every user has individual privacy

5.3. Deployment Environment

Here we need a Web Domain and Web Hosting from vender which provides this services so every internet user can easily access this system. However, it can be a PC or a mobile phone a tablet it can be any medium from you access the internet and enjoy our services. User can easily add

person, manage record, delete persons, check the log history. This system required an administrator which can manage the login system of users.

5.4. Tools and Techniques

5.4.1 Sublime

Sublime is a text editor and source code editor for use with Microsoft Windows. In this, we will write the code of PHP Laravel and also manage the database file (.env) from this editor.

5.4.2 Xampp

XAMPP is a free and open-source cross-platform web server solution stack package developed by Apache Friends.

5.4.3 PHP

PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially design for the development of website and embed in HTML (hypertext markup language)

5.4.4 Server

Server required for the storage of data for now we use localhost as a server to store the whole website, database and other information.

5.4.5 HTML

Html is “hypertext markup language” this is tag base scripting language. Use for website development however, you can any other framework like PHP framework, .Net framework these embedded in HTML.

5.4.6 Bootstrap

Bootstrap is a library use for development of websites and many more. It can be used for the responsiveness of your web page, your website automatically fit every screen size.

- Open CV python

Hardware:

- Ttl module
- Leviton 12- volt DC Channel SV Relay Module
- Adafruit Female DC Power Adopter
- Adafruit 12V 5A Switching Power Supply
- Microsoft LifeCam 3000

5.5. Best Practices / Coding Standards

Indentation and readability of Code is particular subject in the world of programming. This is the best thing which I learnt as developer. Standards of coding is important to follow these. If you can't use these it's seems to be difficult to understand the existing code which develop from another developer. There are some standards which I use in my project.

- Comment
- Documentation
- Indentation
- Object oriented
- Code Grouping
- Consistent Naming Scheme
- DRY Principle.
- Segmentation
- Avoid Deep Nesting.
- Control Line Length.

5.6. Version Control

Working on the inner of the website so as the new version releases the user can be notified as is display notification to them to upgrade your account, so to enjoy the new feature of security implemented in the new version. Also, a new version can fix the bug and error and the review of UI from user to make it easier for the Users.

Chapter 6

Testing and Evaluation

Chapter 6: Testing and Evaluation

Testing documentation is usually associated with the documentation of artifacts that should be developed before or during the testing of software. This chapter includes various types of testing involved in software. Some are during software development and some are after the development of software.

6.1. Use Case Testing

UC1

Test case id	<i>TC01</i>
Test case Description	To check the registration procedure for users
Related Requirement	REQ-SF1-1
Test Procedure	Try to create account with correct information of the user and incorrect information (invalid data)
Test Data	First name, last name, email, password, city, country.
Expected Result	Successful registration on valid data, and unsuccessful on invalid data and if email is already registered
Actual Result	Successful on valid data Unsuccessful on invalid data
Status	Pass
Author	Fahad
Date	05-01-2020

UC2

Test case id	<i>TC02</i>
Test case Description	To check the process of login for the user .
Related Requirement	To check the process of login for the user .
Test Procedure	Open website and login by providing Email and password
Test Data	Email, password
Expected Result	Successful login if the provided credentials are valid and an account exists against them.
Actual Result	Successful on valid data Unsuccessful on invalid data
Status	Pass
Author	Fahad
Date	05-01-2020

UC3

Test case id	TC03
Test case Description	To check the process of adding the person in database from user account
Related Requirement	REQ-SF2-1
Test Procedure	Open add person form and add the data
Test Data	Name, gender, phone number, face ID
Expected Result	Person will be add successfully
Actual Result	Person added successfully
Status	Pass
Author	Fahad
Date	08-01-2020

UC4

Test case id	TC04
Test case Description	To check the process of managing the persons from user account
Related Requirement	REQ-SF2-2
Test Procedure	Once the persons added user can manage the person
Test Data	Name, gender, phone number, face ID
Expected Result	Person record will be updated
Actual Result	Record updated Successfully
Status	Pass
Author	Fahad
Date	05-01-2020

UC5

Test case id	TC05
Test case Description	To check the process of deleting person from user account
Related Requirement	REQ-SF2-2
Test Procedure	Simply find the person and trigger the delete button
Test Data	Non
Expected Result	Person deleted without interruption
Actual Result	Record deleted
Status	Pass
Author	Fahad
Date	05-01-2020

UC6

Test case id	TC06
Test case Description	To check the process of unlocking the door
Related Requirement	REQ-SF2-2
Test Procedure	Once the persons added check when's the person come at the front of camera.
Test Data	Face ID of authorized person
Expected Result	Door will be unlocked
Actual Result	Door unlock successfully
Status	Pass
Author	Fahad
Date	05-01-2020

UC7

Test case id	TC06
Test case Description	To check the process of unlocking the door by text message
Related Requirement	REQ-SF2-2
Test Procedure	Once the person at the door but he is not authorized by face ID door will be unlocked through text message
Test Data	Text message
Expected Result	Door will be unlocked
Actual Result	Door unlock successfully through text message
Status	Pass
Author	Fahad
Date	05-01-2020

6.2. Equivalence partitioning

Only registered user can login to their accounts otherwise system generate a message "Email and password is incorrect"

Equivalence Partition		
Incorrect	Correct	Incorrect
Bhityar123@gmail.com	Fahadali74.fa@gmail.com	Assim.ju32@gmail.com

6.3. Boundary value analysis

- Working face recognition
- Authorized user can login
- Unlock through text, working
- Data fetching working

6.4. Data flow testing

Data flow testing is a family of test strategies based on selecting paths through the program's control flow in order to explore sequences of events related to the status of variables or data objects. Dataflow Testing focuses on the points at which variables receive values and the points at which these values are used.

Data Flow testing helps us to pinpoint any of the following issues:

- A variable that is declared but never used within the program.
- A variable that is used but never declared.
- A variable that is defined multiple times before it is used.
- Deallocating a variable before it is used.

6.5. Unit testing

Unit testing is about testing the working of individual components of a site.

User Registration

Before entering, user is required to complete its registration on the site. This module is working according to the expectations.

Unlocking

Door unlocks automatically after the checking of the authorized person.

Face ID

Unlock through the Face ID is working. This module is working according to the expectations.

6.6. Integration testing

The performance of Facial Recognition Door is quick in response and updating the results. With Face ID this has been made achievable. As soon as the user or person interacts, the data is instantly uploaded to database and response according to the permission results based on the change.

6.7. Performance testing

Performance of a software is determined by three factors:

Speed

Scalability

Stability

Facial Recognition system has started working and its performance is according to the expectations, all the modules are working properly. Face ID are being stored into the server in categories and displayed on the home page. All the validations and verifications are working smoothly.

6.8. Stress Testing

Stress testing is defined as type of software testing that verify the stability and reliability of the system. This test mainly determines the system on its robustness and error handling under extremely heavy load conditions.

Facial recognition system working properly under stress condition and working correctly.

Chapter 7

Summary, Conclusion and Future Enhancements

Chapter 7: Summary, Conclusion & Future Enhancements

7.1. Project Summary

For security purpose my project will be able to secure a house hold by a face recognition system. When a person visits and is not authorized, the Face recognition system will not allow to unlock the doors until the person informs me and I allow the system to unlock whether where were I would be.

7.2. Achievements and Improvements

The main achievement in my project is to provide security.

- Security
- Controlled access
- Allow only authorized person
- Working Face ID

7.3. Lessons Learnt

I have learnt many new things like PHP and its framework laravel. I learnt database connectivity and also the connectivity of different vendor's products like GSM shield, Micro controller chips. I learnt the image processing algorithm for face recognition, data conversions from software to hardware components.

Team is very important for these kinds of projects but the grace of ALLAH almighty I have done alone.

7.4. Future Enhancements/Recommendations

- Cloud connectivity
- Unlock through text message
- User account limitation
- Online this project and provide security services

Appendices

Appendix A: User Manual

In this section we will discuss about the learning of this system from user side how it is work and how to operate it initially user access this website. User can review all the website before the “signup” after this step user login then add person and use the facial recognition door as for security purpose.

User registration

Initially user have to click on signup link user registration form will appear on screen put the first name, last name, email address, password, country, and also enter the city then mark the term and condition checkbox then click on register button. User created successfully make sure user already not register.

User login

User have to click on login button then enter the valid email address and password in the given fields then click on login button after that user access portal for manage person record.

Add Person

User can add person after put the valid login credentials after login click on add person button put the person detail, enroll the person face id system will take five samples of face id then added person successfully.

Manage Person

User can manage person recode after the login add person, delete person, edit person record, block person User just have to click on the delete or edit button a form will open on the screen which is initially shown when the person added. Now there is data of person you can easily change it.

Appendix B: Administrator Manual

Initially admin access the admin portal by enter route “localhost/test1/public/admin” then login here by enter valid credentials. After login admin can manage the user account and update all user.

Admin registration

Initially admin have to click on signup link admin registration form will appear on screen put the first name, last name, email address, password, Secret Code then click on register button. Admin created successfully make sure admin already not register.

Admin login

Admin have to click on login button then enter the valid email address and password in the given fields then click on login button after that admin access portal for manage User record.

Add User

Admin can add person after put the valid login credentials after login click on add User button put the User detail, each and everting put which is required in fields then added User successfully.

Manage User

Admin can manage User recode after the login add User, delete User, edit User record, Admin just have to click on the delete or edit button a form will open on the screen which is initially shown when the User added. Now there is data of User you can easily change.

Reference and Bibliography

References

- [1] h. kanchwala, "how does face recognition work," 5 Feb 2019. [Online]. Available: <https://www.scienceabc.com/innovation/facial-recognition-works.html>.
- [2] K. P. Tripathi, "A Comparative Study of Biometric Technologies with," *International Journal of Computer Applications (0975 – 8887)*, vol. 14, 2011.
- [3] j. salton, "Use your face to unlock the door," 14 december 2009. [Online]. Available: <https://newatlas.com/facial-recognition-keyless-entry/13599/>. [Accessed 2019].
- [4] P. A. Gaikwad, "Face Recognition System Using IoT," *International Journal of Advanced Research in Computer Engineering & Technology*, vol. 6, no. 11 November, 2017.
- [5] V. Patel, "AIRPORT PASSENGER PROCESSING TECHNOLOGY," Embry-Riddle Aeronautical University, Florida, 2018.

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