

Digital Eye

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**DEPARTMENT OF COMPUTER SCIENCES
COMSATS UNIVERSITY ISLAMABAD,
ATTOCK CAMPUS**

SESSION 2017-2021

Digital Eye

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A DISSERTATION SUBMITTED AS A PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER
SCIENCE

**DEPARTMENT OF COMPUTER SCIENCES
COMSATS UNIVERSITY ISLAMABAD,
ATTOCK CAMPUS**

SESSION 2017-2021

UNDERTAKEN

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FA17-BCS-086

Dated: _____

CERTIFICATE OF APPROVAL

It is to certify that the final year project of BS (CS) “Digital Eye” was developed by **Syed Aaqil Abbas (CIIT/FA17/BCS/059/ATK)** and **Abdul Basit Khan (CIIT/FA17-BCS-086/ATK)** under the supervision of “MR. REHAN TARIQ” ; it is fully adequate, in scope and quality for the degree of Bachelors of Science in Computer Sciences.

Committee:

1. External Examiner

(Examiner Name)

Designation
COMSATS ATTOCK

2. Supervisor

(Mr. Rehan Tariq)

3. Chairperson

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4. Dean/Director

(Dean/Director Name)

Dedication

To my Loving Parents and Teachers

Acknowledgement

By the grace of Allah almighty; who is the most gracious and most merciful by which we are able to complete our project. We are thankful to Allah almighty who make us able to complete our task timely. All praises are for Him.

First, we would like to express profound tribute to our parents who always motivate us and never let us down morally and financially. What we are now is only due to their prayers.

“Mr. Rehan Tariq” is a continuous source of motivation, guidance and inspiration. He is a complete institution, our trainer; our supervisor has guided us in a way that we learnt many things. We are grateful to him for making us able to achieve our goal.

We are grateful to our institution who gave us opportunity to complete our task. Some special thanks to those who are always there for boosting up, their support and their prayers who encouraged us at certain phases.

May Allah Almighty keep providing us with all the resources and the guidance to help the humanity. Ameen.

Abdul Basit Khan

Syed Aaqil Abbas

PROJECT BRIEF

PROJECT NAME	DIGITAL EYE
ORGANIZATION NAME	COMSATS ATTOCK
OBJECTIVE	TO LEARN APP DEVELOPMENT
UNDERTAKEN BY	SYED AAQIL ABBAS (FA17-BCS-059) ABDUL BASIT KHAN (FA17-BCS-086)
SUPERVISED BY	SIR REHAN TARIQ LECTURER COMPUTER SCIENCE COMSATS ATTOCK
STARTED ON	15 NOV 2020
COMPLETED ON	15 AUG 2021
COMPUTER USED	CPU: CORE I5 GPU: RX 580 8GB
SOURCE LANGUAGE	JAVA, PYTHON
OPERATING SYSTEM	ANDROID
TOOLS USED	ANDROID STUDIO, JUPYTER, PYCHARM

Executive Summary

The visually impaired's abilities to explore in a specific spot and to arrange their everyday exercises are of essential significance for their wellbeing and prosperity. Sorting out any sort of basic day by day movement can be particularly troublesome; it is difficult for the oblivious to recognize the various things, for example, bundled nourishments and medication compartments just by contacting with their hands. As indicated by world health statistics 285 million out of 7.6 billion populace endures visual hindrance; consequently 4 out of 100 individuals are visually impaired. Nonappearance of vision confines the versatility of an individual to articulated degree and thus there is a need to fabricate an express gadget to vanquish managing help to the possibility.

It is troublesome life for handicap individuals without visual faculties. Life has been so mind boggling for the visually impaired individuals along these lines, it is exceptionally hard to get by in the public eye for daze individuals. In the public arena, there are a few people who couldn't see the excellence of this universe and carrying on with their life so hard. The visually impaired individuals are generally observed approaching individuals for help or all in all, they are consistently reliant on somebody. We saw parcel of individuals attempting to battle in the public arena with their inabilities.

The main issue is the manner by which we can make life of visually impaired people simpler utilizing the present advancements. So the solution for this issue is to develop an automated application to recognize hindrances utilizing camera sensor. It helps the blind people to be independent of guardian or caretaker regarding their disability. It leads to simplify the life of blind people, to give effectively identifiable climate to the watchmen of clients, to give individual partner to daze individual and to serve the mankind.

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Abbreviations

DE	Digital Eye
DFD	Data Flow Diagram
ERD	Entity Relation Diagram
SD	Sequence Diagram
OD&R	Object Tracking and Recognition
Open-CV	Open Source Computer Vision

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Chapter 1

Introduction

1. Introduction

As we all know technology increase day by day thus with advances in new technologies, mobile devices have fully grown in quality to become one amongst the foremost helpful and common shopper devices. Currently, Cell phones / mobile devices square measure important a part of fashionable life. Several of the United States of America got to create a decision or send a message at anytime from anyplace. For blind and motion- impaired individuals this issue is additional obvious its troublesome life for disable individuals while not visual senses, however others additionally typically face this downside, i.e : once driving or employing a smart- phone underneath bright sunshine. Life has been thus complicated for the blind individuals thus, it's terribly troublesome to survive in society for blind individuals. In society, there square measure thus me persons UN agency couldn't see the sweetness of this universe and living their life so onerous. The blind individuals square measure principally seen asking individuals for facilitate or in alternative words, they're perpetually obsessed with somebody. We to tend to saw heap of individuals attempting to struggle in a society with their disabilities. For acting the additional task it 1st translate the voice into text. Then produces output within the variety of voice. The applying is developed for visually impaired individuals. When unlocking the movable the applying are going to be launched with none voice command. The systems settle for voice command and perform the operations per it. For acting the additional task it 1st translate the voice into text. Then produces output within the variety of voice. This application detects obstacles exploitation mobile camera and provides voice command to the blind man or user of “Digital Eye.” This application effects the lifetime of blind man in sense (easing and simplifying the lifetime of blind person). Our proposed application “Digital Eye” is a personal assistant for a blind man. This application can improve everyday activities, and create blind community freelance and boost their confidence. This application doesn't, need any external gizmo it's a value effective resolution to the community. Like (White will, Glasses) these square measure tools that square measure utilized by each blind man and haven't any reference to our planned application.

1.1. Aim

Aim of this project is by using this application the blind persons are not dependent to other peoples means they are independent. This application will helps to rehabilitated blind to become a active part of society . By using this application it is the personal assistant for application user or blind person who use the application.

1.2. Relevance to Course Modules

1.2.1. Report Writing Skills (RWS) through which we are able to write our documentation, able to know how to select format and structure to meet formal needs, ensuring that document sequence is logical, meaningful and presentable. Presenting information differently through text, graphs, tables and diagrams.

1.2.2. Human computer interaction (HCI) is a multidisciplinary field of study that focuses on the design of computer and technology and especially interaction between human and computers. The design principles to improve human interaction with computer. Through this subject, we are able to make interactive and user friendly interface.

1.2.3. Software Design and Architecture enables us to learn the Unified Modeling Language Diagrams. How to design a software system based on requirement. This course helps in our project that how to design a system. We learn following diagram from this course.

- Activity Diagram
- Use Case Diagram
- Sequence Diagram
- Class Diagram
- Communication Diagram

1.2.4. Database Management System is one of the core courses of our program that we have studied so far. This course helps in interacting with the relational databases that uses by most of the applications nowadays. It helps us in understanding queries, joins, constraints, stored procedures, function etc. These all are the techniques that we have used in this project.

1.2.5. Mobile Application Development According to the latest figures Android has more than 82% of the market share in the smartphone market. In this era, almost every person has a android mobile phone. The huge market creates many opportunities for businesses. Because android is open source and allows user to overcome their needs of life.

1.2.6. Artificial Intelligence it provide vast knowledge about how we secure our data in efficient way. How we produce best software with the use of machine learning / artificial intelligence which help the society or to serve humanity.

1.3 Project Background

It is difficult for the disable or dependent persons to survive in the society without a vital senses. As we know life has been so complex for disable persons to survive without vital senses. Navigate around the places this is also a biggest problem or challenge for a blind person. This application will provide easiness and tracking means tell path to their destination. This application works like a personal assistant of blind person.

1.4. Literature Review

There are some applications for visually impaired persons. Smart applications have been developed for helping the blind person to solve their problems. Some of currently running applications are as follows.

- Be My Eyes
- Blind Square

1.5. Analysis from Literature Review

Application Name	Weakness	Proposed Project Solution
Be My Eyes	The app is to be used at your own risk, i.e., you are depending on “helpers” to navigate the world around you. In this one person is bound for you they tell you path with the help of video calling.	In our proposed application, only once you need a person who will made you login to system and open camera, after that blind person can use this application by self.
Blind Square	This application is only supported in IOS. It is not free If blind person want to use this app then you buy this app this app is not free. Its price is \$39.99.	The main difference between Blind Square and our app is (Free). Our application is free for user.

Table 1.1 Comparison

1.6. Methodology and Software Lifecycle

Methodology selection is as important as first building block for development of application. After designing of this system, the methodology selected should be flexible so that it can be molded as user requirement or user need (blind person need). Our project will follow agile process model. It can be changed and upgrade with new upcoming technology (future technology).

Camera will check the environment whether the blind person having obstacles in front of him if yes, then the App will notifies the person by speaking using earplugs or speakers. Camera is the main sensor in our App. Camera is used as a sensor to analyses the environment.

Map is also used in this App to give two functions. One, Used for tracking person from another device. Secondly, Used to tell the routes of destination to person which is being set.

Chapter 2

Problem Definition

2. Problem Definition

2.1. Problem Statement

As we know It is difficult for disable persons and the dependent persons to survive in the society without vital senses. Life has been so complex and every place turns into mob. Guardians not able to monitor their respective relatives' current location. The main problem is how we can make life of blind persons easier using today's technologies.

- When we will start working we have following questions in mind,
 - Q.1 How to trace obstacles through sensors and sending response fast to the person using voice with app?
 - Q.3 What if there is no light in room?
 - Q.4 What if blind person what help how he tells his/her guardians?

2.2. Deliverables and Development Requirements

Our project delivers only on one platform i.e. Android. Our application uses Artificial Intelligence / Machine Learning to trace obstacles by using camera.

At the end of 8th semester, we will present the following outputs:

- Dataset
- Application For Blind Persons
- Documentation

2.2.1. Tools

- Open-CV
- MS Word
- MS PowerPoint
- Pycharm
- Jupyter notebook

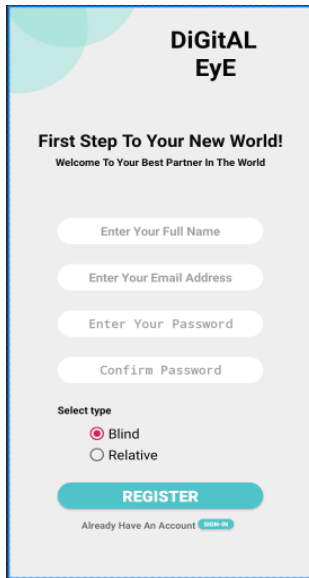
2.2.2. Languages

- Java
- Python

2.3 Current System

2.3.1 Signup Page

As shown below, signup page contains fields like Name, Email, Password, Confirm Password and at last where you can select whether you are signing up for blind or relative.

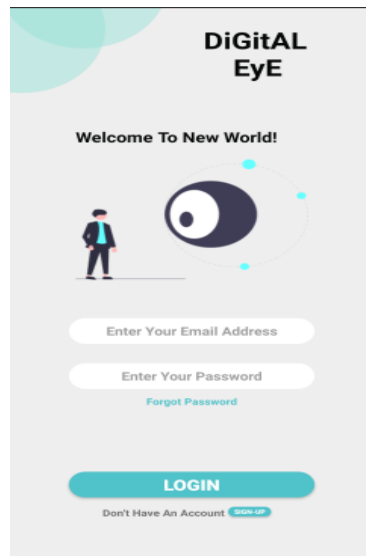


The screenshot shows the 'DiGitAL Eye' signup page. At the top, it says 'DiGitAL Eye' and 'First Step To Your New World!'. Below this is a welcome message: 'Welcome To Your Best Partner In The World'. The form contains four input fields: 'Enter Your Full Name', 'Enter Your Email Address', 'Enter Your Password', and 'Confirm Password'. Below these fields is a 'Select type' section with two radio buttons: 'Blind' (selected) and 'Relative'. At the bottom of the form is a large teal 'REGISTER' button. Below the button is a link: 'Already Have An Account' followed by a smaller teal 'SIGN IN' button.

Figure 2.1 Signup page

2.3.2 Login Page

As shown below, Login page contains two fields Email, Password. It will first check for both fields as they are empty or filled. If filled then sends data to database for matching whether the user is registered or not. If registered then checks its type which is entered during signup process i.e. Blind or Relative. According to type the app will move to further activities.



The screenshot shows the 'DiGitAL Eye' login page. At the top, it says 'DiGitAL Eye' and 'Welcome To New World!'. Below this is an illustration of a person standing next to a large eye graphic. The form contains two input fields: 'Enter Your Email Address' and 'Enter Your Password'. Below the password field is a link: 'Forgot Password'. At the bottom of the form is a large teal 'LOGIN' button. Below the button is a link: 'Don't Have An Account' followed by a smaller teal 'SIGN UP' button.

Figure 2.2 Login page

2.3.2 Blind Person's First Page

As shown below, Blind's page contains two Buttons Open Camera and Open Location. Open location is optional feature as blind cannot see his location. Relative must have responsibility to help blind to open camera further on app will guide Blind about items Infront of him/her.

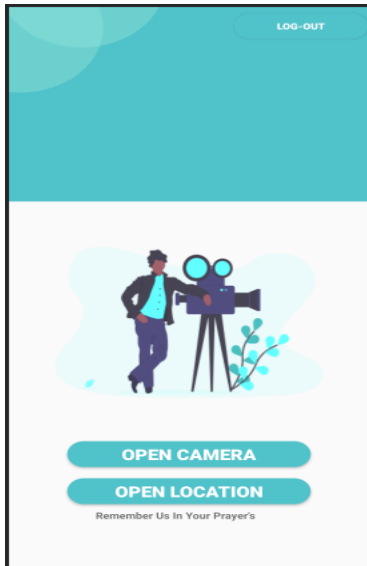


Figure 2.3 Blind's First page

2.3.2 Relative Person's First Page

As shown below, Relative's page contains two Buttons Track Location and Open Location. Open location contains the location of the relative. Relative can click on track button to see blind's location.

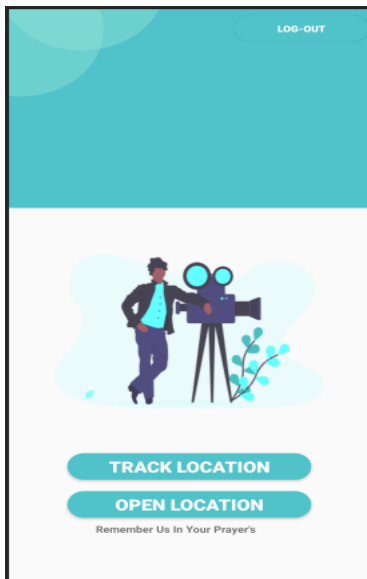


Figure 2.4 Relative's First page

Chapter 3

Requirement specification

3. Requirement specification

In this chapter, we are going to discuss requirements of the project. In the sub sections, we are going to discuss functional, non-functional requirements and use-case of project. Requirement elicitation and analysis is one of the important part of project development lifecycle. Software requirement specification defines the requirement that will be designed and then will be developed to make a working product.

3.1 Use Case Diagrams

3.1.1 Use case for Blind

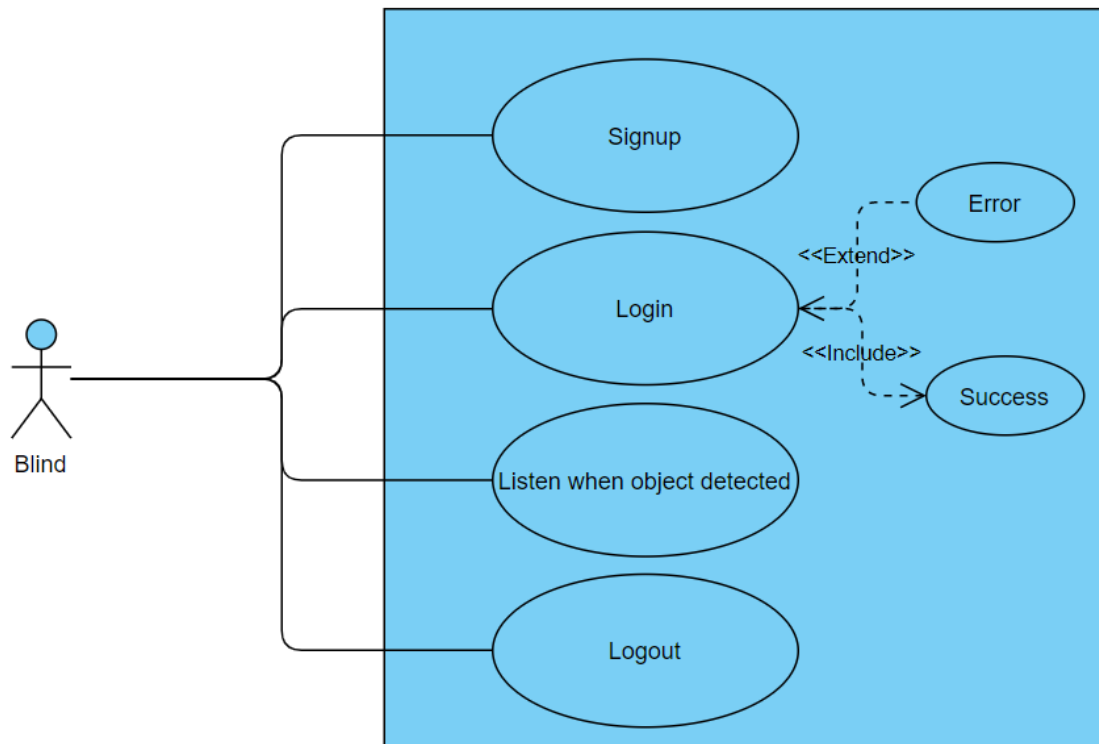


Figure 3.1 Use Case (Blind Prospective)

3.1.2 Use case for Relative

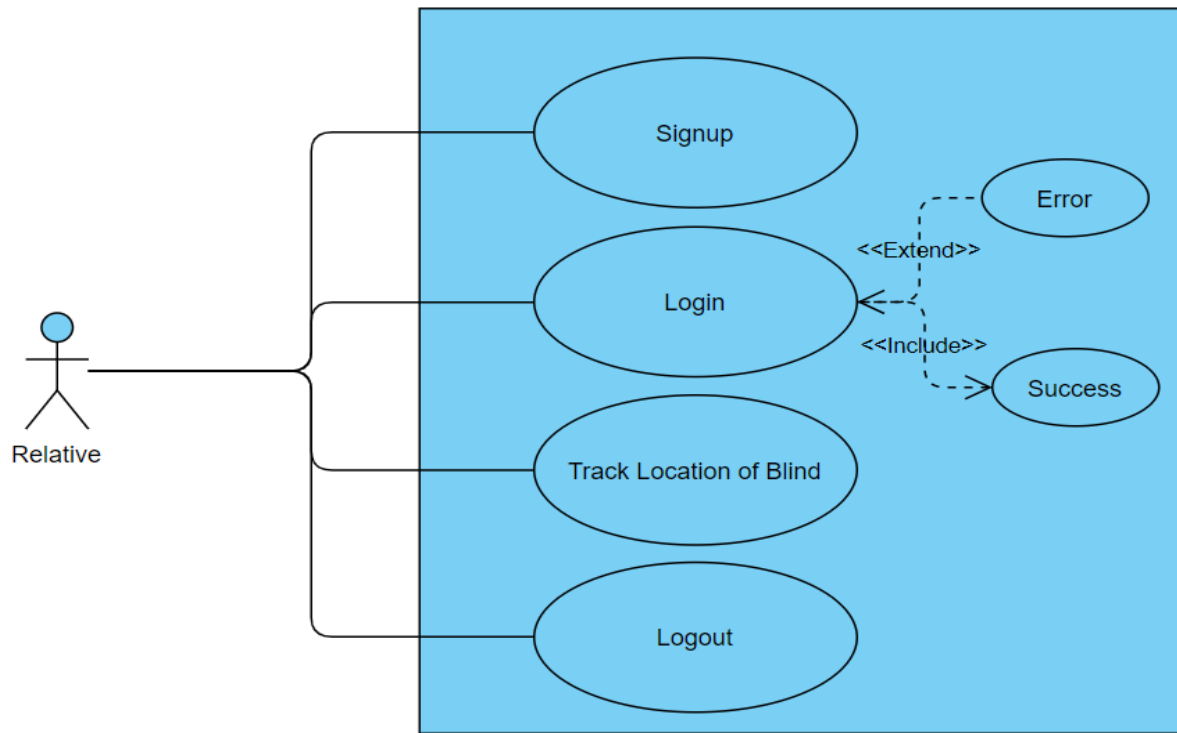


Figure 3.2 Use Case (Relative Prospective)

3.2 Detailed Use Case

3.2.1 Blind Prospective Use Case

3.2.1.1 Signup

Use case name	Signup
Actor	Relative of Blind who is Normal
Description	Relative can register blind's profile in the system.
Pre-condition	Relative must not be registered with same username or email.
Post-condition	Blind's data will be added to database and redirect to login page.
Extend	Nil
Normal flow	<ol style="list-style-type: none"> 1. Go to Main Activity of Application which is login 2. Click on sign up button from below. 3. Fill all the fields. 4. Click on sign up button to get registered.

Table 3.1: Signup use Case

3.2.1.2 Login

Use case name	Login
Actor	Relative of Blind who is Normal.
Description	Blind can login to the system to perform related activities
Pre-condition	Blind's data already in the database.
Post-condition	To make Blind logged in successfully, you must have internet connection.
Extend	Error can be occurred like no data found.
Normal flow	<ol style="list-style-type: none">1. Go to Main Activity of Application which is login.2. Fill all the fields.3. Click on login button to get logged in.

Table 3.2: Login use case

3.2.1.3 Listen when object tracked

Use case name	Listen when Object tracked
Actor	Relative of Blind who is Normal.
Description	When object is being tracked, system will pronounce the object name.
Pre-condition	Nil
Post-condition	Listen Carefully.
Extend	Nil
Normal flow	<ol style="list-style-type: none">1. Just wait until object is being tracked.

Table 3.3: Listen use case

3.2.1.4 Logout

Use case name	Logout
Actor	Relative of Blind who is Normal.
Description	Blind can logout from his account.
Pre-condition	Must be logged in.
Extend	Nil
Normal flow	<ol style="list-style-type: none">1. Just click on back button.2. App will ask you to logout3. Then click on Ok button

Table 1.4: Logout use case

3.2.2 Relative Prospective Use Case

3.2.1.1 Signup

Use case name	Signup
Actor	Relative
Description	Relative can register his profile in the system.
Pre-condition	Relative must not be registered with same username or email.
Post-condition	Relative's data will be added to database and redirect to login page.
Extend	Nil
Normal flow	<ol style="list-style-type: none">1. Go to Main Activity of Application which is login2. Click on sign up button from below.3. Fill all the fields.4. Click on sign up button to get registered.

Table 3.5: Signup use Case

3.2.1.2 Login

Use case name	Login
Actor	Relative
Description	Relative can login to the system to perform related activities
Pre-condition	Relative's data already in the database.
Post-condition	To make Relative logged in successfully, you must have internet connection.
Extend	Error can be occurred like no data found.
Normal flow	<ol style="list-style-type: none">1. Go to Main Activity of Application which is login.2. Fill all the fields.3. Click on login button to get logged in.

Table 3.6: Login use case

3.2.1.3 Track Location of Blind

Use case name	Location Tracking
Actor	Relative.
Description	Track the Blind person by using Latitude and Longitudes.
Pre-condition	Internet Service
Post-condition	Must have longitudes and Latitudes

Extend	Nil
Normal flow	1. Just click on Track button you will get noticed about location.

Table 3.7: Tracking use case

3.2.1.4 Logout

Use case name	Logout
Actor	Relative.
Description	Relative can logout from his account by just pressing back button.
Pre-condition	Must be logged in.
Extend	Nil
Normal flow	<ol style="list-style-type: none"> 1. Just click on back button. 2. App will ask you to logout 3. Then click on Ok button

Table 3.8: Logout use case

3.3 Functional Requirements

First of all, functional requirements are the features of an application that it must have. Functional requirements include a specific task, technical details, calculations, logic, processing, and data manipulation of a system. In our project the following are the functional requirements,

3.3.1 Signup

Signup is the first step in our application. Signup is a form where user can add their information for login to the application. The signup page contains the fields like Full Name, Email Address, Password and type of user like Blind or relative.

3.3.2 Login

Login is also important part in this application. Login is a form through which user can login to application. The login page contains Email and password. The login will check the database to ensure the user is registered in database and also checks for the type of the user whether it is Blind type or Relative.

3.3.3 Object Tracking

The most important feature of this application is to track the objects in front of blind and recognize them and giving feedback to blind. This app has the purpose to tell blind what item is in front of him/her.

3.3.4 Feedback

Application gives feedback to Blind person in terms of voice. Voice is the result of the object tracking. It means that if Blind person has Mug in front of him application will tell blind through voice.

3.3.5 Tracking Location

Application has also another task to track the location of blind. Our project has two modules one is for blind and the other one is for relatives. In relatives module, we have option to track the location of blind.

3.4 Non-Functional Requirements

Non-functional requirements are the requirements which are helpful in making the quality good of the application. These requirements participate with Functional requirements to enhance quality of application.

3.4.1 Usability

Usability contains following,

- i) Digital Eye is responsive. Responsive means application will run better in any size of device/screen.
- ii) Digital Eye is easy to use. Easy to use in terms of error chances that error chances should be minimum.

3.4.2 Easy to use

The design of Digital Eye is not very complex, it is easy. Beginner can easily use this application.

3.4.3 Performance

Digital Eye will give best performance in terms of speed.

3.4.4 Security

Digital Eye is secure app. No one can logged in using other account until it have the information used to login.

3.4.5 Validation

Digital Eye ensures that when a user try to login the system, whether it should have account or not. On the other hand, in signup side, there is also verification process to check whether that user exists in database or not.

Chapter 4

Design and Architecture

4. Design and Architecture

4.1 System Architecture

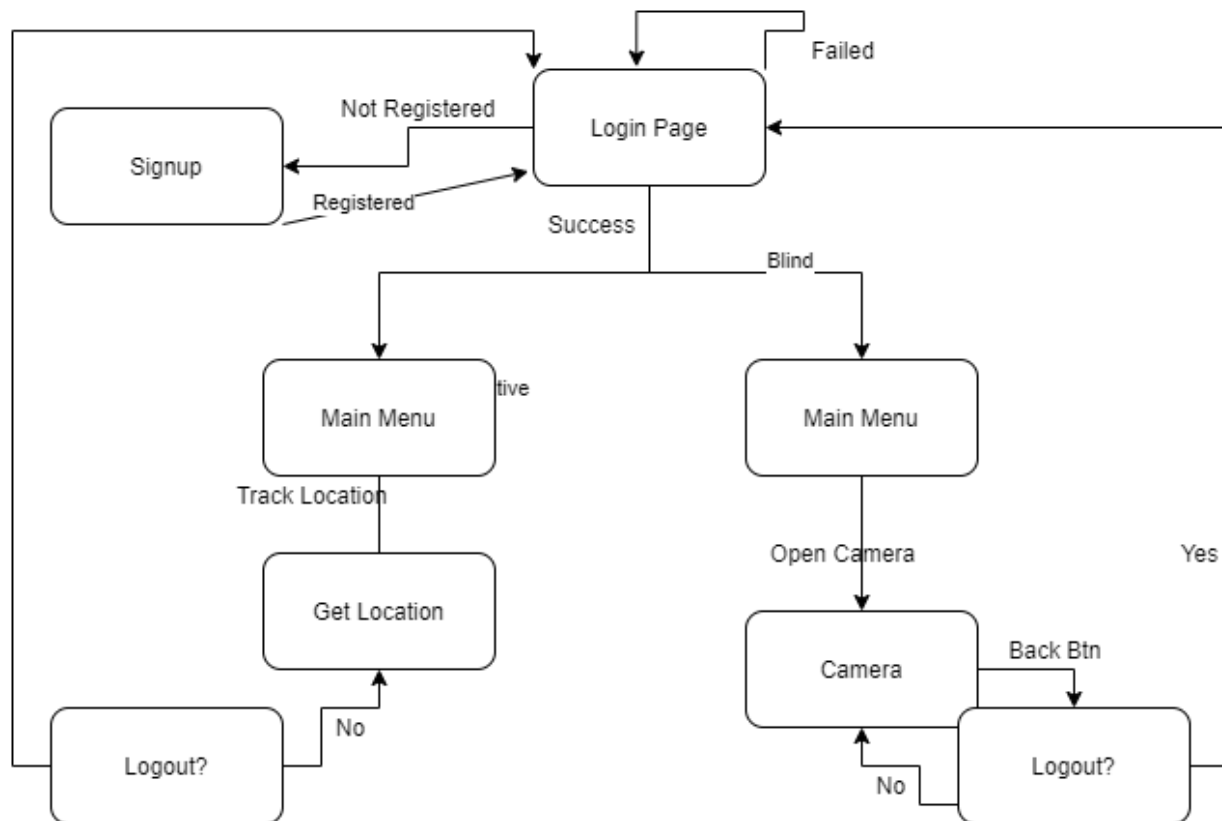


Figure 4.1 System Architecture

Description:

The above Flow chart show the architecture of our App i.e. Digital Eye. When you see the chart, it will give us information about how our app works. First user will login to system if user not registered then it will go to signup page and get registered itself and will back to login page. If user enter wrong credentials then it will stay on login page after successfully logged in it will check for the type of user whether it is Blind or Relative and according to this status app will move further. On Relative side, there will be the feature of tracking location of Blind person and a logout feature from where he/she can be logged of to his account. On the other hand, On Blind side, there will be the feature of detection items and recognizing them and telling the name of detected item through voice command.

4.2 Process Diagram

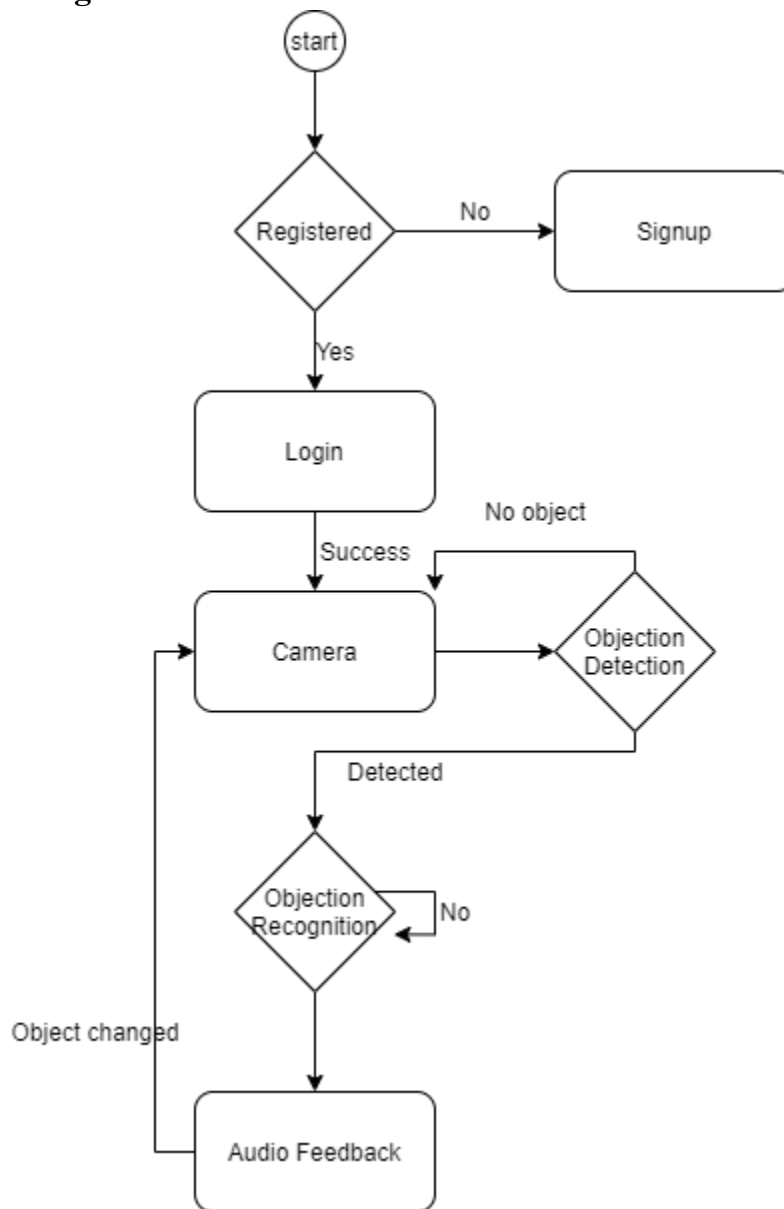


Figure 4.2 Process Flow

Description:

Process Diagram will show us about the process of functions used in Digital Eye application. First app checks whether the user is registered or not. If No then will go to signup page. If yes, then Go to camera, through camera app will get the input and detection starts. If no detection made then remains on camera otherwise go to recognition process if recognized then gives audio feedback to the User.

4.3 DFDs

4.3.1 DFD Level 0

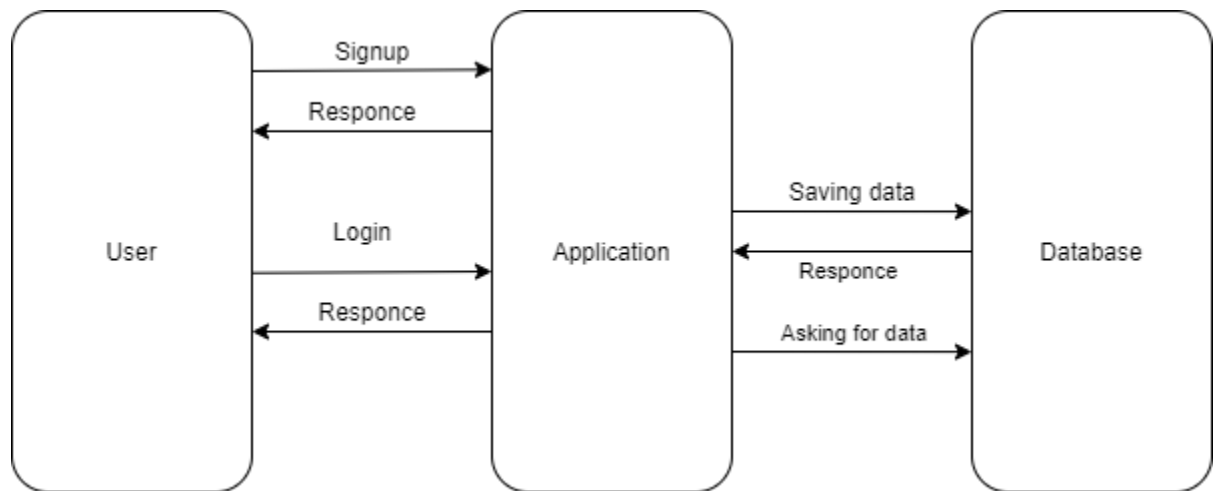


Figure 4.3 (a) DFD level 0

Description:

This DFD (0) shows the overall implementation of the system. The User can signup into the system and as a result of it the system will give the response in the form of confirmations. They can also sign in and the system will give response accordingly.

4.3.2 DFD Level 1

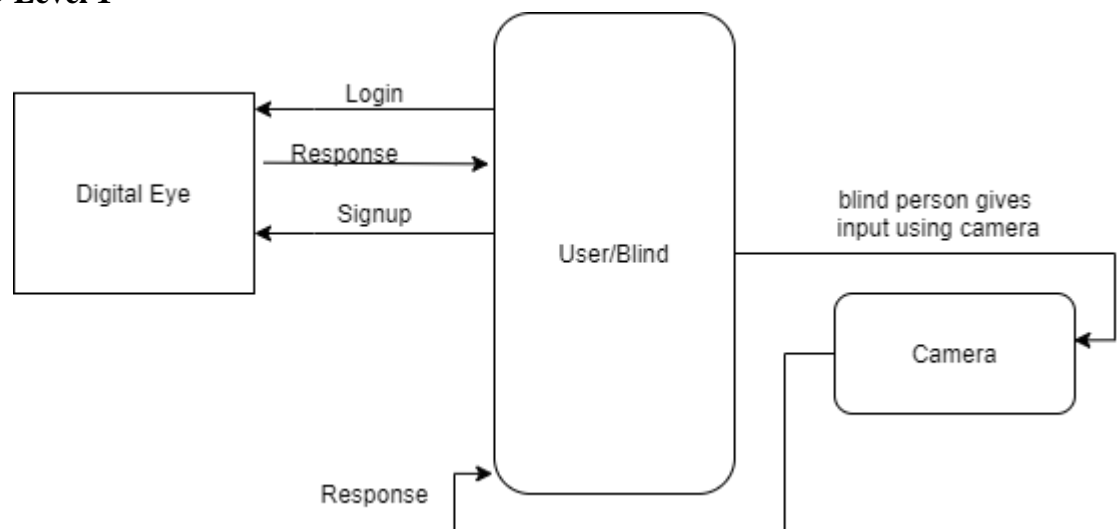


Figure 4.3 (b) DFD Level 1 for Blind

Description:

This DFD (1) for Blind shows the implementation of the system. The user will give the input to the system and system will give the response in form of audio. The User can signup into the system and as a result of it the system will give the response in the form of confirmations. They can also sign in and the system will give response accordingly.

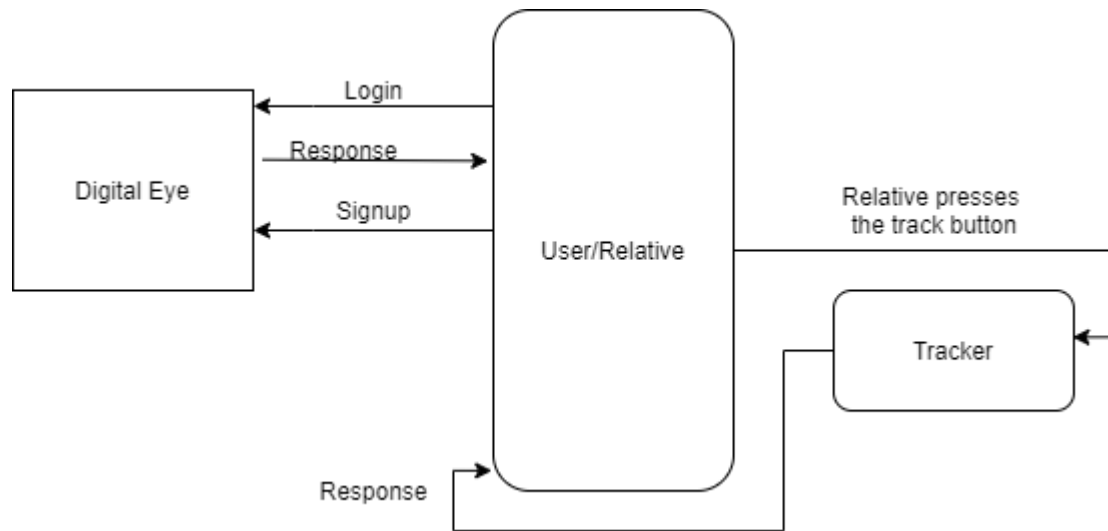


Figure 4.3 (c) DFD Level 1 for Relative

Description:

This DFD (1) for Relative shows the implementation of the system. The user will press the button of track location and system will give him response in terms of text. The User can signup into the system and as a result of it the system will give the response in the form of confirmations. They can also sign in and the system will give response accordingly.

4.4 Sequence Diagrams

4.4.1 SD for Signup

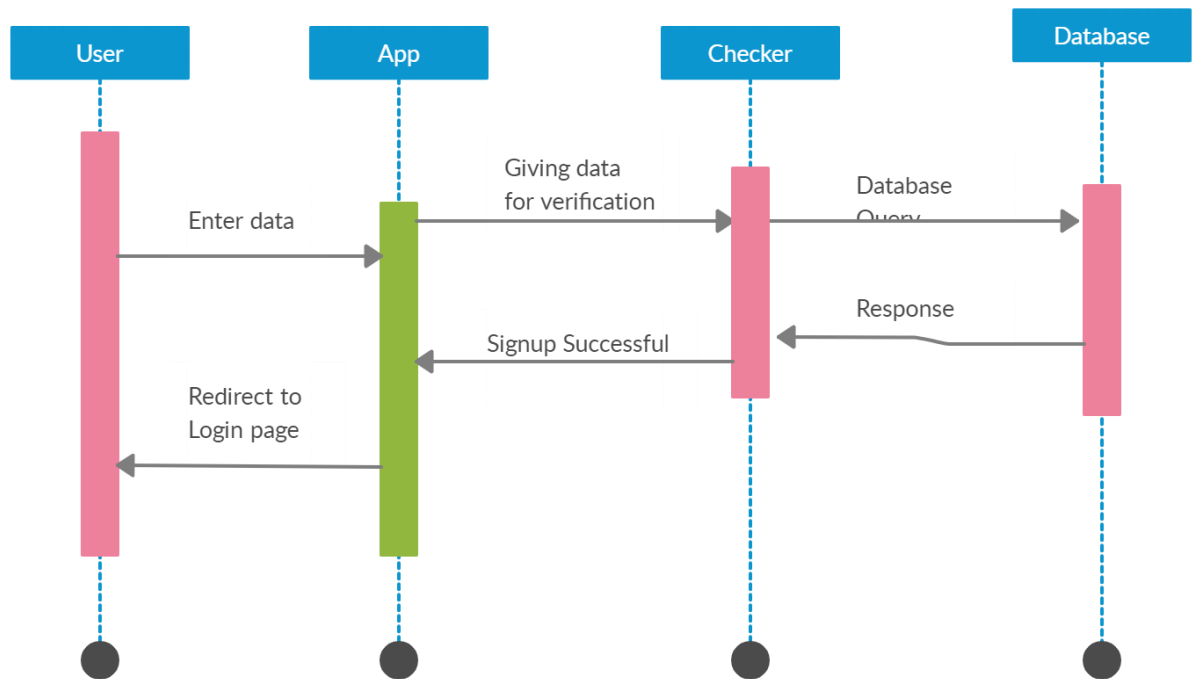


Figure 4.4 (a) SD for Signup

Description:

The Sequence Diagram for signup shows the path how process of signup is being done by the system.

4.4.2 SD for Login

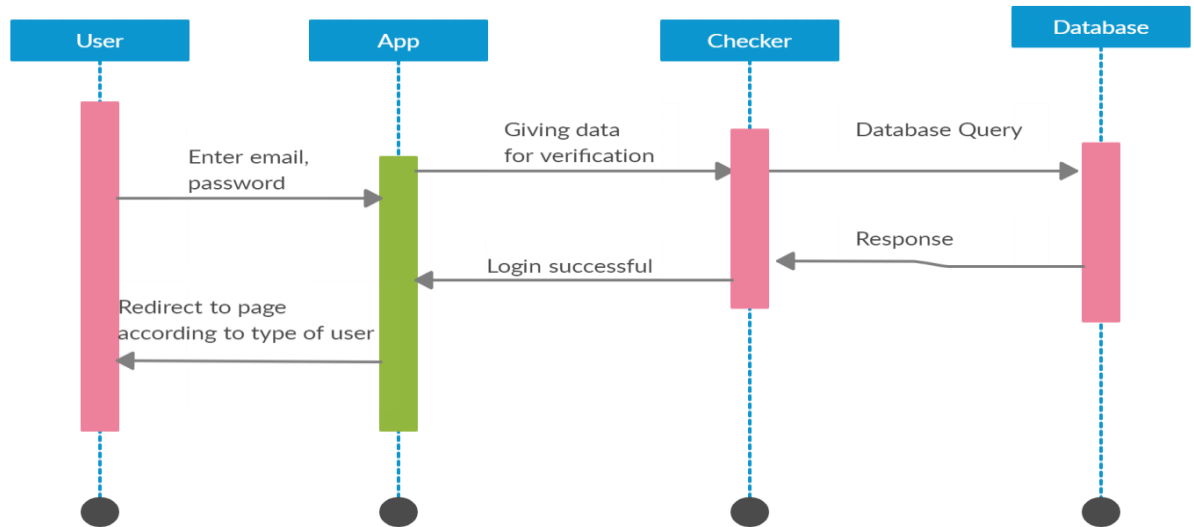


Figure 4.4 (b) SD for Login

Description:

The Sequence Diagram for Login shows the path how process of Login is being done by the system.

4.4.3 SD for Object Detection and recognition

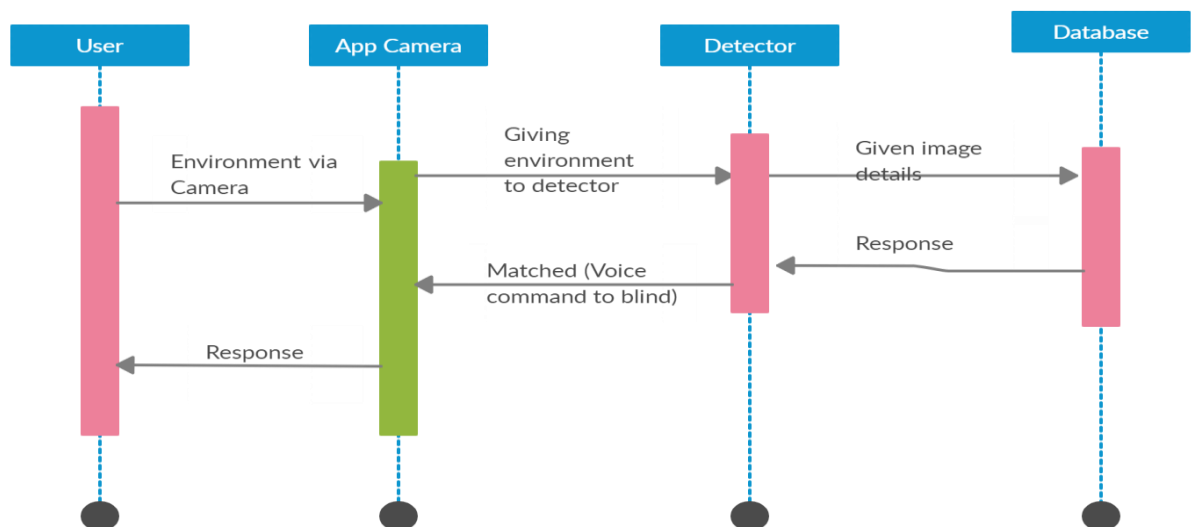


Figure 4.4 (c) SD for OD&R

Description:

The Sequence Diagram for Object detection and recognizing shows the path how process of Object tracking and identifying is being done by the system.

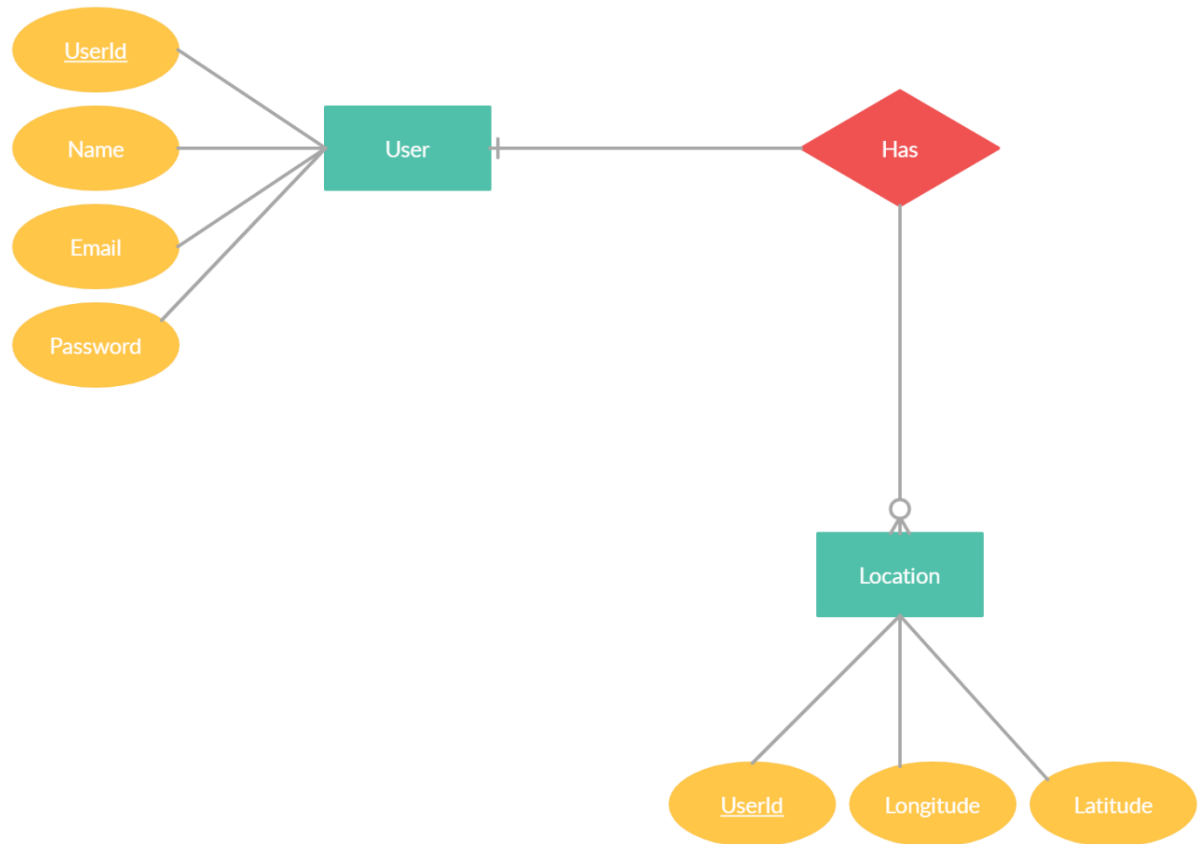
4.5 ERD

Figure 4.5 ERD

Description:

The ERD is the representation of the database that how tables are connected to each other and also shows that a table has how many attributes and their names as well.

4.6 Class Diagram

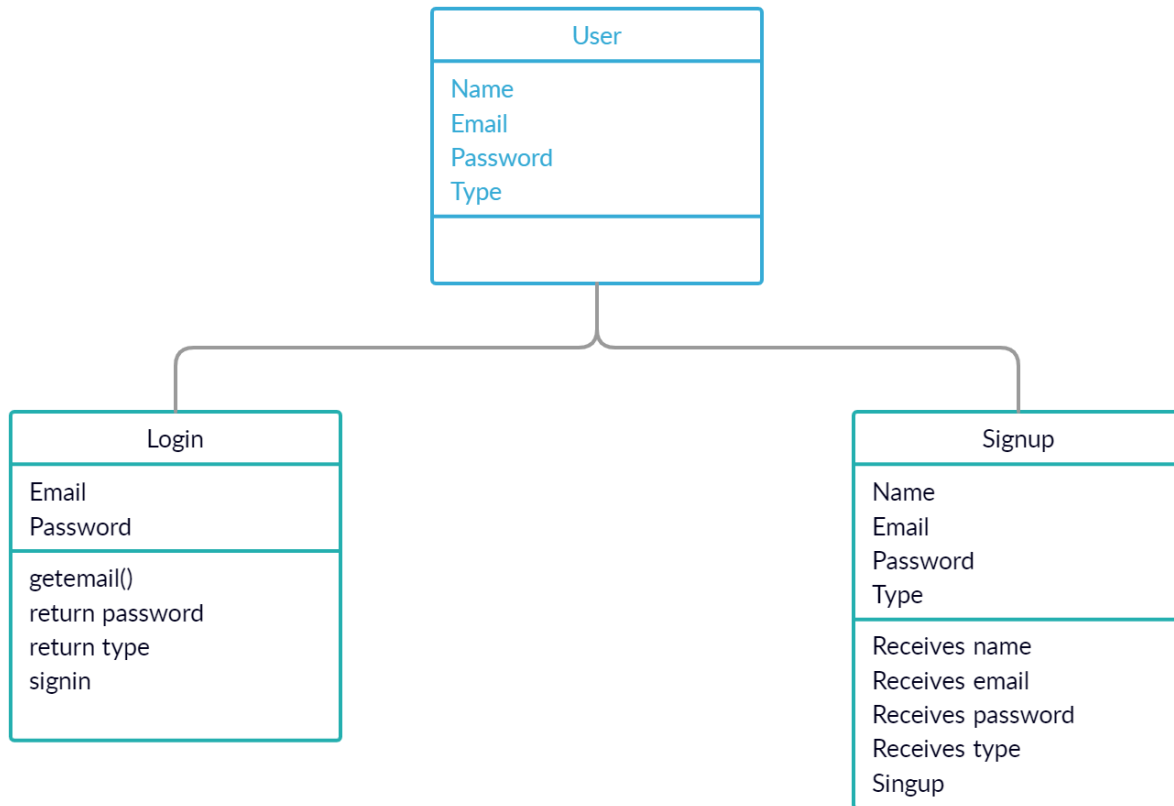


Figure 4.6 Class Diagram

Description:

The Class diagram is representation of classes used in project code. It is English description of code that how code works in project. Like Login is first getting email and if email exists then returns password and type after return to main class the entered password is being matched with the password return from login class if matches then Successfully logged in.

