BSCS-S23-010

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Bahria University Augmented Reality

In partial fulfilment of the requirements for the degree of

Bachelor of Science in Computer Science

Supervisor: Dawood Akram

Department of Computer Sciences

Bahria University, Lahore Campus

January 2024

C e r t i f i c a t e

We accept the work included in the named report

"Bahria University Augmented Reality"

Written by

KHAWAJA MUSTAFA SHAHID

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as a confirmation of the required standard for the partial fulfilment of the degree of Bachelor of Science in Computer Science.

Approved by:

Supervisor: Dawood Akram

_____ (Signature)

January 10, 2024

DECLARATION

We hereby declare that this project report is based on our original work except for citations and quotations which have been duly acknowledged. We also declare that it has not been previously and concurrently submitted for any other degree or award at Bahria University or other institutions.

Enrolment	Name	Signature
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Date: January 10, 2024

Specially dedicated to

My Supervisor, beloved Grandparents, Parents, and Siblings

(KHAWAJA MUSTAFA SHAHID)

My Supervisor, beloved Grandparents, Parents, and Siblings

(AHTASHAM UL HAQ AWAN)

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We would like to thank everyone who contributed to the successful completion of this project. We would like to express our gratitude to my research supervisor, Mr Dawood Akram for his invaluable advice, guidance, and his enormous patience throughout the development of the research.

In addition, we would also like to express our gratitude to our loving parents and friends who had helped and encouraged us.

KHAWAJA MUSTAFA SHAHID
AHTASHAM UL HAQ AWAN

Bahria University Augmented Reality

ABSTRACT

The primary purpose of Bahria University Augmented Reality (BUAR) app is to offer visitors, instructors, and students an interactive and interesting experience at the university. Traditional strategy usually involves static maps and prospectuses, which can however be troublesome and inadequate to convey the required details. To address the issue of navigation and indoor tracking, the BUAR application uses AR technologies like AR Foundation and AR Core [7]. This is critical in an academic setting because navigating a campus may be difficult for visitors and students. The BUAR application would enable them to find their way around the university buildings quickly and easily, providing them with the necessary information. Additionally, the BUAR program comes with an AR Prospectus, which relies on Vuforia for depicting images and videos of the university's facilities as well as 3D models. This feature gives users a more realistic understanding of the university's staff, schedule, facilities, and ongoing activities.

The BUAR application is developed using AR Foundation [8], AR Core, and Vuforia, advanced technologies. It uses the smartphone's camera sensors to facilitate indoor position tracking and navigation. The AR Prospectus feature is composed of Vuforia enables the application to see image targets and displays 3D models of university buildings, faculty, staff, and facilities images and/or videos, and current events. The BUAR application is user-friendly and provides an intuitive interface that can be easily navigated by the users. The application can be accessed by downloading it from the app store (In the future) and is compatible with Android, but in the future, we would consider making it compatible with IOS devices. The BUAR application is expected to enhance the user's experience at Bahria University by providing them with a more interactive and engaging way of accessing information about the university.

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LIST OF SYMBOLS / ABBREVIATIONS

BUAR	Bahria University Augmented Reality
AR	Augmented Reality
3D	Three Dimensional
2D	Two Dimensional
SRS	Software Requirement Specification
IOS	iPhone Operating System
API	Application Programming Interface
SDK	Software Development Kit
Fig	Figure
GPU	Graphic Processing Unit
RAM	Random Access Memory
GB	Gigabyte
SSD	Solid State Drive
VS	Visual Studio
AD	Activity Diagram
GPA	Grade Point Average
CGPA	Cumulative Grade Point Average
FB	Firebase
SD	Sequence Diagram

CHAPTER 1

INTRODUCTION

1.1 Background

Within the realm of education, augmented reality offers the promise of revolutionizing the learning experience. The capacity of AR to introduce interactivity, engagement, and immersion into educational contexts has ignited significant interest. AR's ability to provide contextual and real-time information enriches learning in ways that traditional methods often fall short.

Augmented reality can be of great help in two specific areas. These are AR prospectus and campus navigation at universities. Universities' campuses are typically intricate, multifaceted spaces containing diverse buildings, offices, and resources. Guests and new people at these campuses find them to be challenging and hard to makeover. This indicates the need for a simple navigational system that could reduce irritability and inefficiency.

There has been an increasing competition among universities in the modern education market and the universities are always inventing new means for drawing and keeping potential students. It would be a good value proposition to give a comprehensive, holistic review of departments, classrooms, and campus amenities. However, this idea of the augmented reality-created prospectus can be applied in this scenario. AR prospectus may make the prospective students the ones who would examine the university's facilities and academic offerings, thus, becoming the best and the most efficient.

The project utilizes modern technology as a means of solving the challenges of students in prospect and campus navigation. This is aptly named the Bahria University Augmented Reality (BUAR) application. It applies the flexible Unity game engine, AR Core, AR Foundation, and Vuforia powers to develop a solution that improves Bahria University's educational program.

Indoor navigation with AR Foundation and AR Core and the users' mobile devices. This tool is simple and engaging for visitors, teachers, and students to use as a guiding mechanism while exploring and navigating the campus.

The augmented reality prospectus will utilize image targets and Vuforia to render 3D models of the university building. The prospectus will also display information about departments, past events, and varied university facilities. The feature is to enable prospective students to see the university's facilities and infrastructure before deciding on enrolling.

The success of the project requires proficiency with Unity, C#, AR technologies understanding, and 3D modelling tools. The BUAR project's final output will be a full-function mobile application compatible with Android. It may add even support for IOS to make it successful.

There are other beneficiaries of the BUAR, who are apart from the project team. These are students, staff, faculty, and the administration of the university. They also refer to prospective students. The application makes campus navigation much easier with its simple navigational feature.

The BUAR initiative is located at the junction of technical innovation, education, and user experience engineering. This is a thrilling effort not only to solve real-life problems but at the same time, it shows an image of the future of higher education.

1.2 Problem Statements

Technology is transforming the way students are educated and changing the state of education. Augmented reality, or AR, is a major tool in this change as it can create compelling and engaging learning spaces. However in the context of higher education, one issue still exists: students, potential students, and the requirement for improved campus navigation.

University campuses are highly complex and multi-dimensional settings, with many departments, buildings, and facilities. Such large campuses are intimidating to a stranger or a newcomer who tries to wander across. Static signage and paper do not provide immediate and intuitive guidance in the dynamic education environment.

Competition is high in the education market as schools seek the same students. A walk-through of all the departments, buildings, and classrooms could help in this

regard. Brochures and campus tours are traditional methods of marketing for education, and they do not fully cover the breadth and depth of university education.

The capability of augmented reality to address these problems is acknowledged in this problem description. The problem of potential student involvement in university activities and their movement through the campus could be solved using augmented reality technology.

The purpose of the Bahria University Augmented Reality (BUAR) application is to provide the whole solution. The application focuses on developing an immersive educational tool that will enable users to explore the campus and its facilities in an attractive and captivating fashion. Classrooms, departments, and other campus areas can be easily found because BUAR alternative to static 2D maps and traditional navigation methods.

The goal of the BUAR project is to incorporate augmented reality into a contemporary space while also considering the complexity of the task. The targets are achieved through enhanced campus mobility, reducing annoyance, and exciting prospective students. Building, deploying, and demonstrating the effectiveness of the BUAR application using AR to address practical problems in education.

The solution should, therefore, include the technical knowledge, creative design, and educational understanding of Bahria University. Therefore, Bahria University will be the first to use augmented reality (AR) in educating and recruiting new students in the cutthroat competitive educational market. Present students, teachers, and visitors to the university campus.

This problem statement addresses possible solutions for navigating university campuses among individuals who are blind or visually impaired. This is particularly emphasized in the role of augmented reality. The BUAR project is to address these issues with an emphasis placed on the goals and objectives of the project.

1.3 Aims and Objectives

The objectives of the BUAR are shown as follows:

i) To enhance campus navigation and wayfinding

ii) To elevate prospective student engagement

iii) To showcase the potential of augmented reality in education

iv) To Bahria University as a technological innovator

v) To improve the information about faculty for the ease of students

1.4 Scope of Project

BUAR project at Bahria University intends to address the problem of possible student involvement by designing a smartphone application that incorporates AR technologies. The objective of this project is to create a mobile app that is fun and easy to use, which tracks interiors indoors using 3D modelling, helping visitors, personnel and students navigate around campus. In addition, BUAR will have an AR Prospectus that will be distributed using Vuforia. This would enable prospective students to tour university buildings and academic spaces. The project utilizes Unity, AR Foundation, AR Core, and Vuforia hence prior mobile app development and 3D modelling experience is required.

The BUAR app will include interactive AR experiences, user-friendly navigation, indoor tracking, and an entertaining AR Prospectus. The project will be considered a success when a fully functioning mobile application that is compatible with Android has been delivered. The future may include iOS compatibility that would be based on user feedback.

Bahria University and its benefactors include the management of the university and current and potential students. The application will increase the competitive advantage of the university, facilitate campus navigation, and be a great tool to attract prospective students. Through working closely with the project team, we will also obtain practical knowledge in 3D modelling, mobile app development, and augmented reality technology.

CHAPTER 2

SOFTWARE REQUIREMENTS SPECIFICATIONS (SRS)

2.1 Overall Description

The project of Bahria University Augmented Reality (BUAR) aims to enhance prospective students' engagement and navigation of the campus at Bahria University with an AR-based smartphone application.

BUAR will use AR Foundation, AR Core, Vuforia, and Unity game engine to provide interior location tracking and an AR Prospectus feature. For now, the app will be developed only for Android smartphones, whereas at a later stage, it may be supported by iOS devices.

Some of the objectives are improving campus navigation, attracting new students, highlighting the educational potential of augmented reality, and establishing Bahria University as a leader in the use of technology.

2.2 User Classes and Characteristics

It is assumed that users understand how to use mobile phones and applications.

- **User Classes**
  - Students
  - Faculty
  - Visitors

2.3 Operating Environment

BUAR is designed to function on Android-based devices, predominantly tablets and smartphones. The application will require:

- Android Smartphone Phone
- Android 10 or above
- Stable Internet Connection

2.4 Development Environment

Table 2.1: Development Environment

Name	Description
Operating system Environment	Windows
Support Devices	Android-based devices
Language	C#
Framework	Unity
Tools and Technologies	• GPU at least 4 GB • RAM 8/16 GB • SSD 256GB • Unity • VS Code • Blender
Database	Firebase

2.5 Assumption and Dependencies

The following are the assumptions and dependencies:

- **Assumptions:**
  - Users will have access to Android smartphones or tablets.
  - The availability of relevant APIs and SDKs for AR integration.
- **Dependencies:**
  - Integration with AR Foundation, AR Core, and Vuforia libraries.
  - Access to 3D modelling software and assets for the AR Prospectus feature.

2.6 Non-Functional Requirements

The non-functional requirements of the project are as follows:

2.6.1 Performance Requirements

BUAR is expected to perform efficiently under the following conditions:

- **Responsiveness:** The application should provide real-time location tracking and responsive interaction with 3D models and image targets.
- **Scalability:** The application should be capable of handling a growing user base and increasing data load efficiently.

2.6.2 Security Requirements

- **Data Security:** User data, such as location information, should be stored securely and protected from unauthorized access.
- **Privacy:** Users' personal information should be handled by privacy regulations.

2.7 Software Quality Attributes

2.7.1 Maintainability

BUAR should be designed for easy maintenance, updates, and future enhancements. This includes well-documented code, modular design, and a straightforward structure for adding new features and addressing issues.

CHAPTER 3

DESIGN AND METHODOLOGY

3.1 Diagrams

This chapter provides an overview of the Bahria University Augmented Reality design. The overall view of the system is provided by the system's architectural design. Developers and clients can examine and check the design plan of the project. This Chapter includes the following objects.

- Use Case Diagram
- Sequence Diagram
- Activity Diagram
- Data Flow Diagram
- Class Diagram

3.1.1 Student Use Case

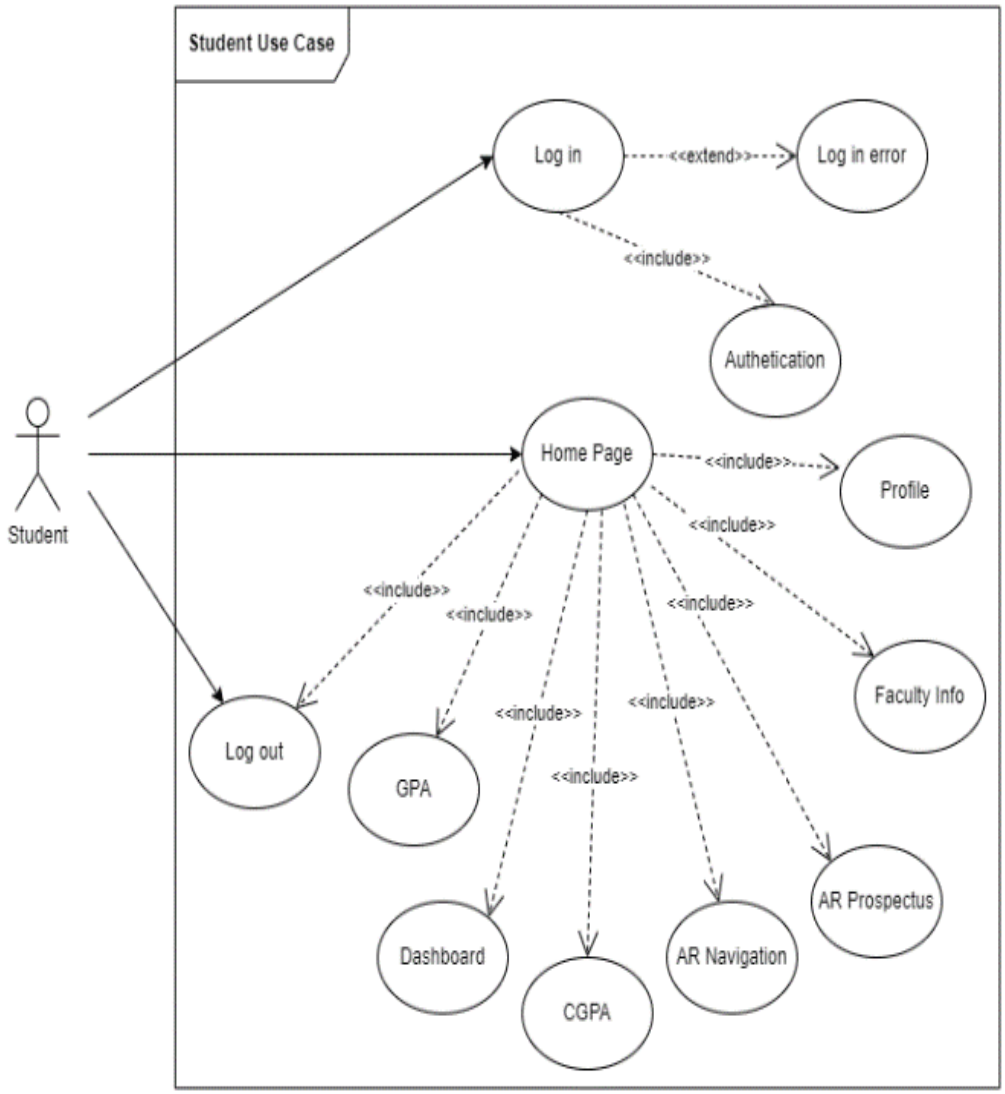

Figure 3.1: Student Use Case Diagram

Fig 1 shows a high-level view of a system's functionality from a student perspective, identifying the student, their interactions with the system, and the use cases that meet their needs.

3.1.2 Faculty Use Case

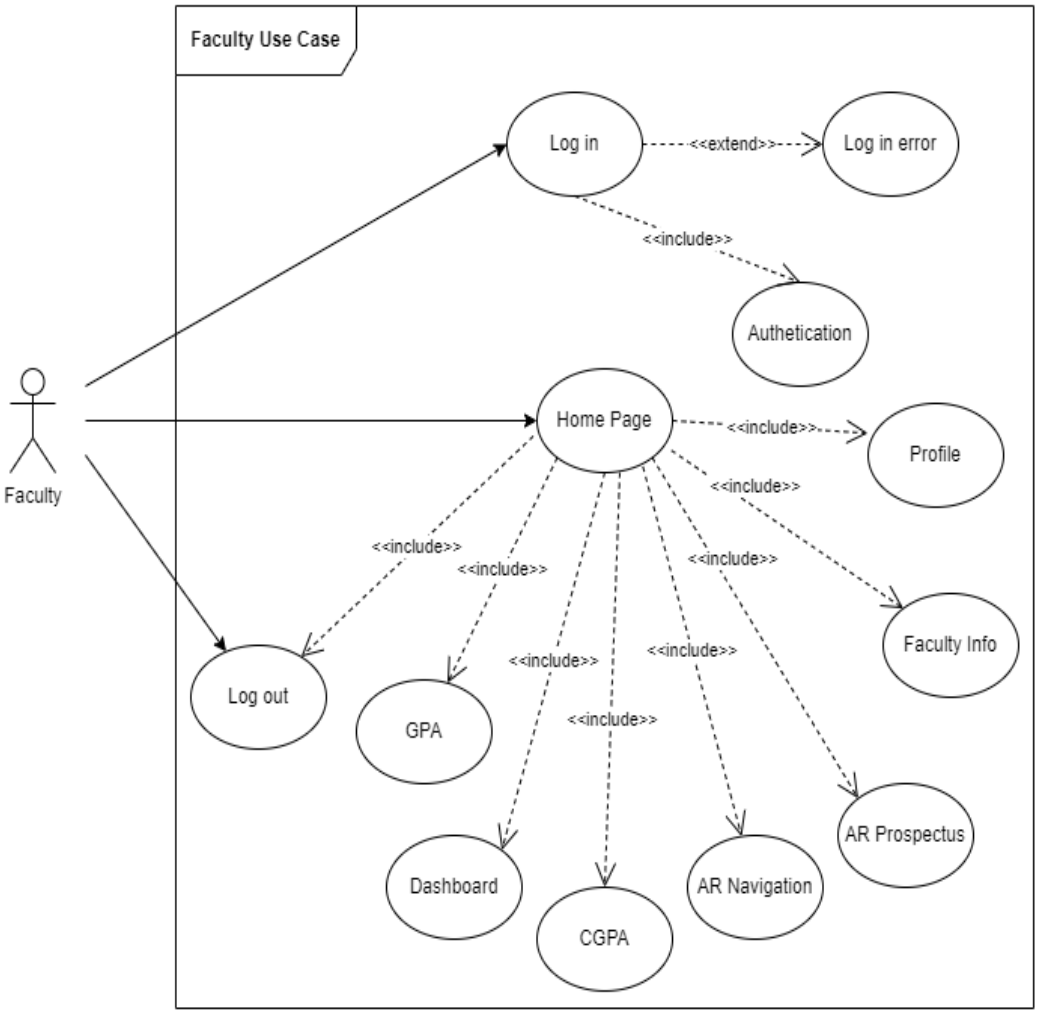

Figure 3.2: Faculty Use Case Diagram

Fig 2 shows a high-level view of a system's functionality from a faculty perspective, identifying the faculty, their interactions with the system, and the use cases that meet their needs.

3.1.3 Admin Use Case

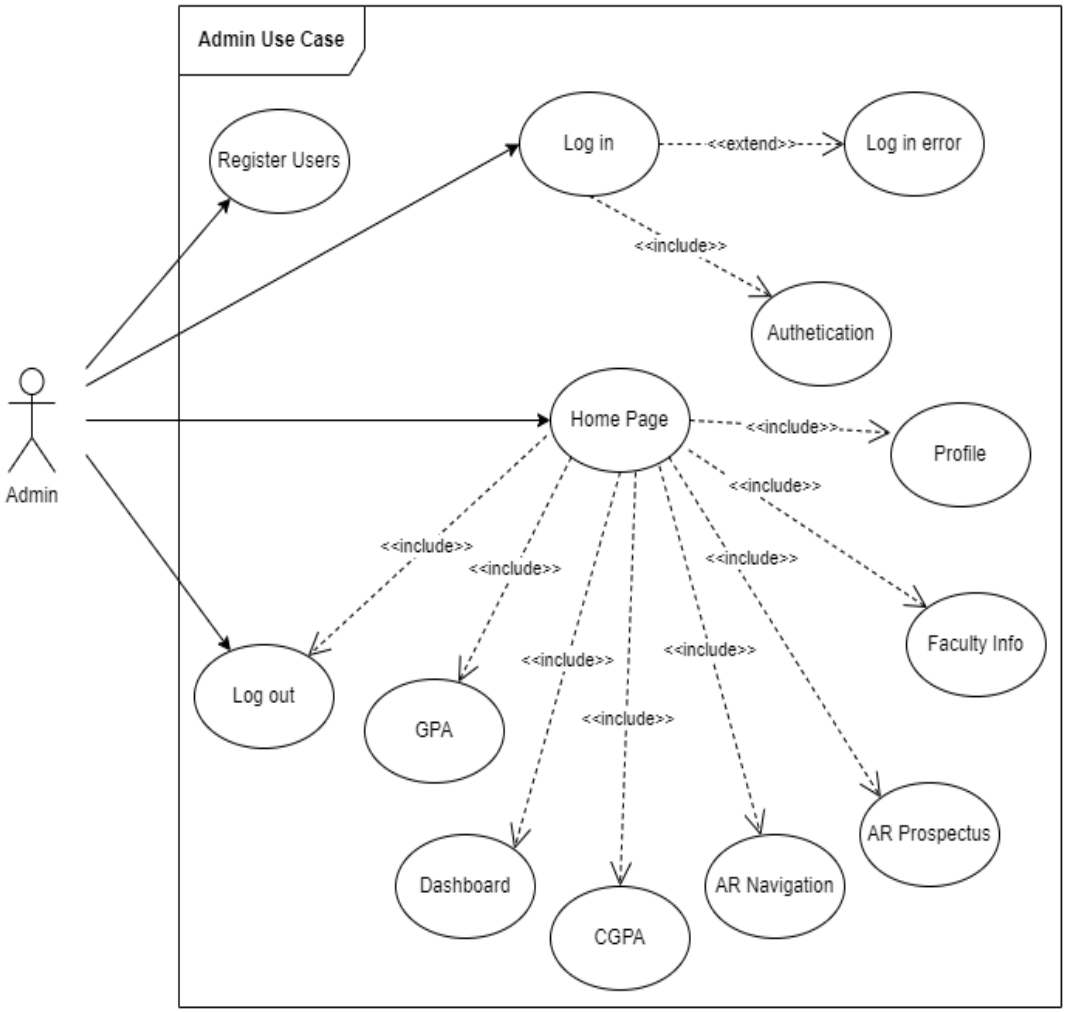

Figure 3.3: Admin Use Case Diagram

Fig 3 shows a high-level view of a system's functionality from an Admin perspective, identifying the admin, their interactions with the system, and the use cases that meet their needs.

3.1.4 Visitor Use Case

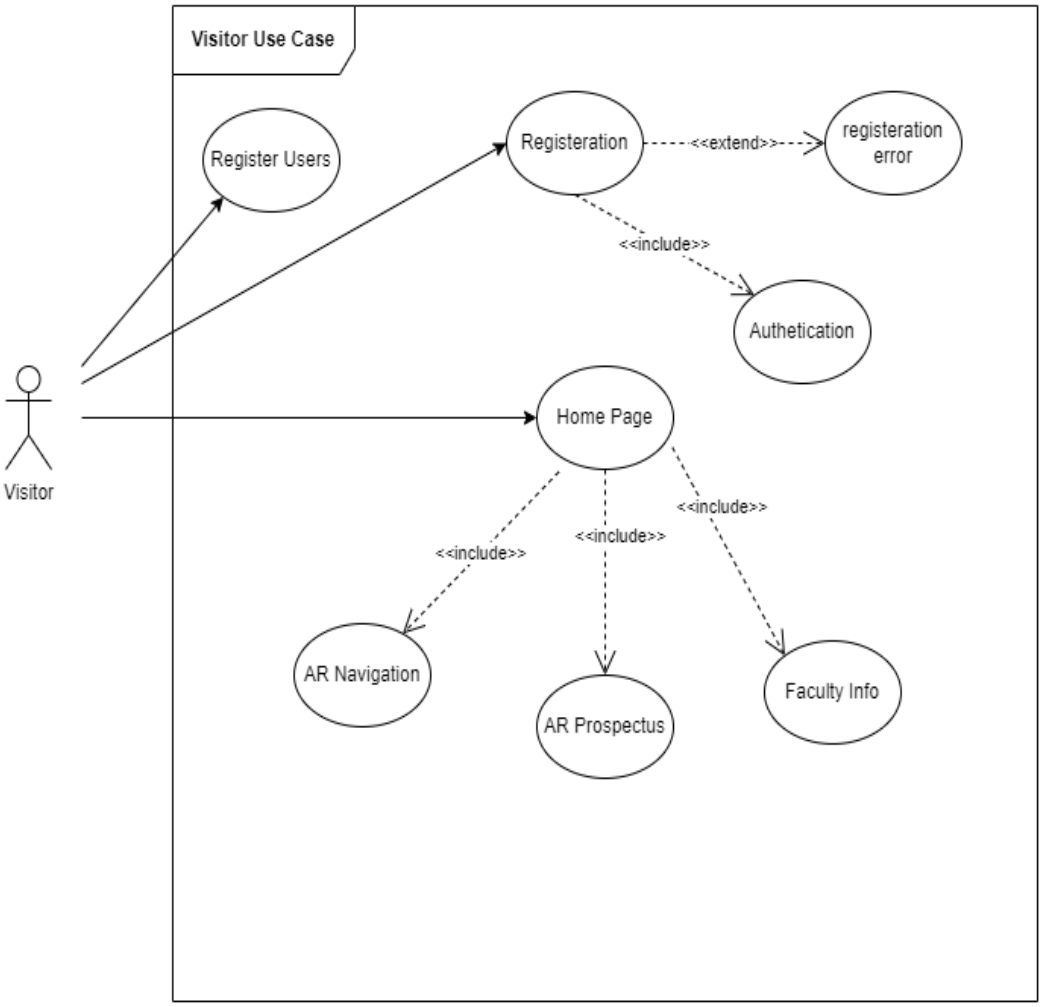

Figure 3.4: Visitor Use Case Diagram

Fig 4 shows a high-level view of a system's functionality from a Visitor's perspective, identifying the visitor, their interactions with the system, and the use cases that meet their needs.

3.1.5 System Use Case

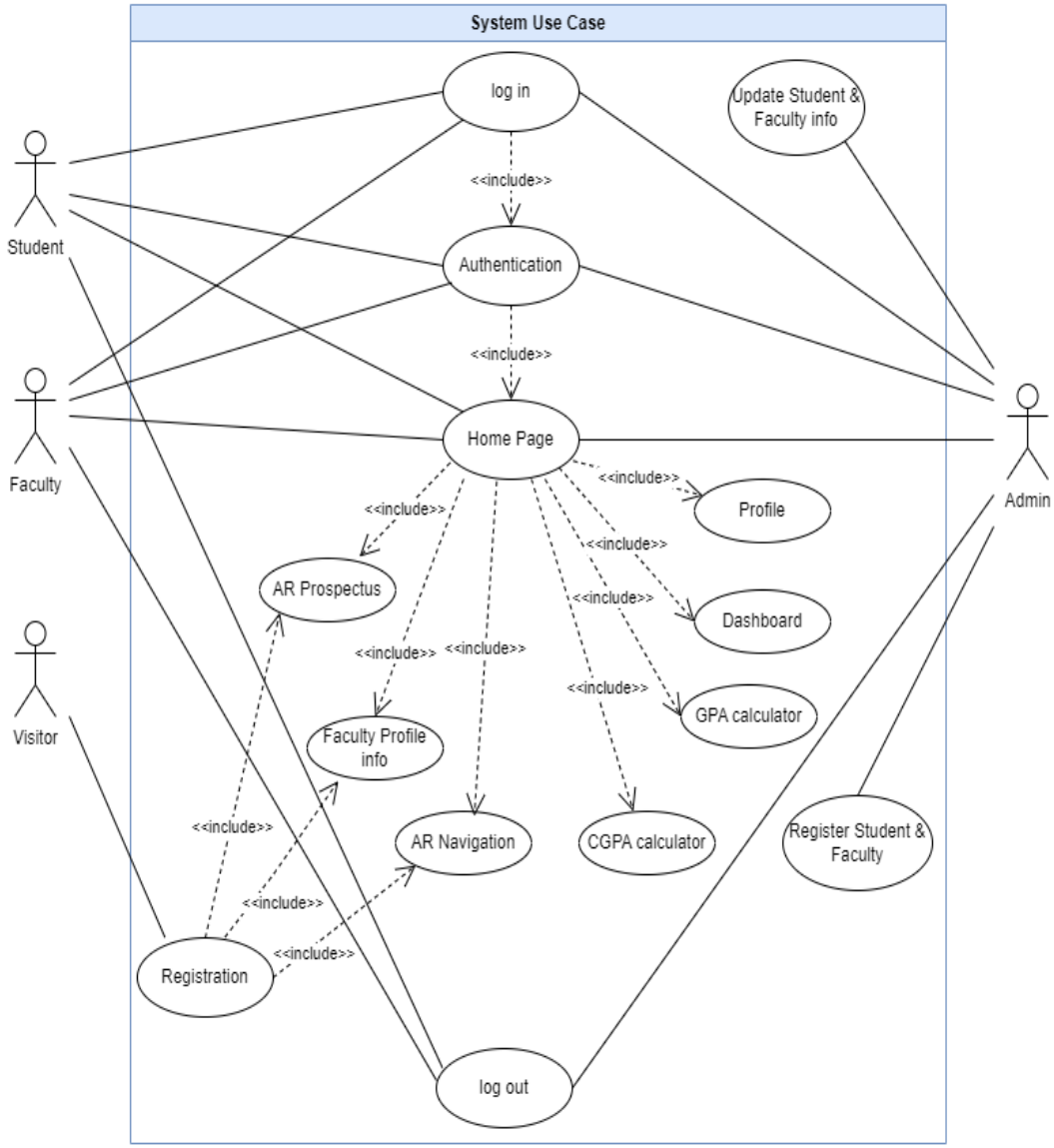

Figure 3.5: System Use Case Diagram

Fig 5 shows a high-level view of a system's functionality, identifying the actors, their interactions with the system, and the use cases that meet their needs.

3.1.6 Use Case Tables

3.1.6.1 Register Users Profile (U1)

Table 3.1: Register Users Profile - U1

	Name	**Create Profile**
1	**Use case ID**	U1
2	**Objective**	Admin register Users in the application through the Firebase database (store username and password)
3	**Priority**	High
4	**Initiating Actor**	Will be Admin
5	**Goal**	To Create/Register a new profile.
6	**Pre-Condition**	Admin register user via database(firebase)
7	**Post-Condition**	The User will log in after register
8	**Flow of Events**	1. User requests to Admin for registration. 2. Admin accepts requests and registers users. 3. The user can easily log in and use the application after registration.
8.1	**Basic Flow**	After success in creating the profile user goes to the login page U2
9	**Flow of Events for Extension (Alternate Scenario)**	No alternative flow must sign up to proceed further.
10	**Use case**	No other use case was used.

3.1.6.2 User Sign-In (U2)

Table 3.2: Sign in - U2

	Name	**Sign In**
1	**Use case ID**	U2
2	**Objective**	The user will sign in with the credentials
3	**Priority**	High
4	**Source**	Firebase
5	**Actor**	User
6	**Flow of Events**	1. Open Application 2. Enter sign in 3. Enter Username and Password 4. Click on Sign-in Button
6.1	**Basic Flow**	After successful sign in user will go to U3
6.2	**Alternate Flow**	No alternative flow must sign up to proceed further.
6.3	**Exceptional Flow**	Invalid Username Invalid Password
7	**Includes**	U1
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Taken to Homepage
10	**Notes/Issues**	If the User signs in with the right credentials no problem will occur.

3.1.6.3 Authentication (U3)

Table 3.3: Authentication - U3

	Name	**Authentication**
1	**Use case ID**	U3
2	**Objective**	To prove user identity by verifying username and password from the database(firebase)
3	**Priority**	High
4	**Source**	Firebase
5	**Actor**	User
6	**Flow of Events**	1. Open sign in page 2. Enter username and password. 3. Show authenticate error
6.1	**Basic Flow**	After authenticating the error user will re-enter credentials for sign-in
6.2	**Alternate Flow**	No alternative flow must sign up to proceed further.
6.3	**Exceptional Flow**	Invalid Username Invalid Password
7	**Includes**	U2
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Taken to Homepage
10	**Notes/Issues**	If the User signs in with the wrong credentials' an authentication problem will occur.

3.1.6.4 Homepage (U4)

Table 3.4: Homepage - U4

	Name	**Homepage**
1	**Use case ID**	U4
2	**Objective**	In this use case, users can view the main area of our app and access features from there.
3	**Priority**	High
4	**Source**	User
5	**Actor**	User
6	**Flow of Events**	Sign in to and view the application home screen with all the available features.
6.1	**Basic Flow**	After successful sign-in in Administrator can go to any of the succeeding flows.
6.2	**Alternate Flow**	No alternative flow.
6.3	**Exceptional Flow**	No exceptional flow
7	**Includes**	No other use case includes
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Use all application features
10	**Notes/Issues**	Network issue

3.1.6.5 AR Prospectus (U5)

Table 3.5: AR Prospectus - U5

	Name	**AR prospectus**
1	**Use case ID**	U5
2	**Objective**	In this use case, users can view the university prospectus through AR functionality.
3	**Priority**	High
4	**Source**	User
5	**Actor**	User
6	**Flow of Events**	Click the AR prospectus icon to open it which shows on the homepage.
6.1	**Basic Flow**	After successfully opening the AR prospectus users can use the functionality of the AR prospectus.
6.2	**Alternate Flow**	No alternative flow.
6.3	**Exceptional Flow**	No exceptional flow
7	**Includes**	No other use case includes
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Use all application features
10	**Notes/Issues**	Network issue

3.1.6.6 AR Navigation (U6)

Table 3.6: AR Navigation - U6

	Name	**AR Navigation**
1	**Use case ID**	U6
2	**Objective**	In this use case, users can navigate the university through the camera and with the help of AR objects.
3	**Priority**	High
4	**Source**	User
5	**Actor**	User
6	**Flow of Events**	Click the AR Navigation icon to open it which shows on the homepage.
6.1	**Basic Flow**	After successfully opening AR Navigation users can use the functionality of AR Navigation
6.2	**Alternate Flow**	No alternative flow.
6.3	**Exceptional Flow**	No exceptional flow
7	**Includes**	No other use case includes
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Use application features
10	**Notes/Issues**	Network issues and camera accessibility

3.1.6.7 Faculty Profile Info (U7)

Table 3.7: Faculty Profile Info - U7

	Name	**Faculty Profile Info**
1	**Use case ID**	U7
2	**Objective**	In this use case, users can view the Faculty Profiles of the Computer Science department
3	**Priority**	High
4	**Source**	User
5	**Actor**	User
6	**Flow of Events**	Click the Faculty Profile Info icon to open which is shown on the homepage
6.1	**Basic Flow**	After successfully opening the Faculty Profile info Page users can view the profile of the faculty of the Computer Science department.
6.2	**Alternate Flow**	No alternative flow.
6.3	**Exceptional Flow**	No exceptional flow
7	**Includes**	No other use case includes
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Use application features
10	**Notes/Issues**	Network issue

3.1.6.8 Profile (U8)

Table 3.8: Profile - U8

	Name	**Profile**
1	**Use case ID**	U8
2	**Objective**	In this use case, users can view our Profile
3	**Priority**	High
4	**Source**	User
5	**Actor**	User
6	**Flow of Events**	Click the Profile Info icon to open which is shown on the homepage menu panel
6.1	**Basic Flow**	After successfully opening the Profile info Page and user can view our profile.
6.2	**Alternate Flow**	No alternative flow.
6.3	**Exceptional Flow**	No exceptional flow
7	**Includes**	No other use case includes
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Use application features
10	**Notes/Issues**	Network issue

3.1.6.9 GPA/CGPA calculation (U9)

Table 3.9: GPA/CGPA calculation - U9

	Name	**GPA/CGPA calculation**
1	**Use case ID**	U9
2	**Objective**	In this use case, users can calculate GPA/CGPA
3	**Priority**	Medium
4	**Source**	User
5	**Actor**	User
6	**Flow of Events**	Click the Faculty Profile Info icon to open which is shown on the homepage
6.1	**Basic Flow**	After successfully opening the GPA/CGPA user can calculate it.
6.2	**Alternate Flow**	No alternative flow.
6.3	**Exceptional Flow**	No exceptional flow
7	**Includes**	No other use case includes
8	**Pre-Condition**	Must sign in
9	**Post-Condition**	Use application features
10	**Notes/Issues**	Network issue or Value error

3.1.7 Sequence Diagrams

3.1.7.1 User Registration

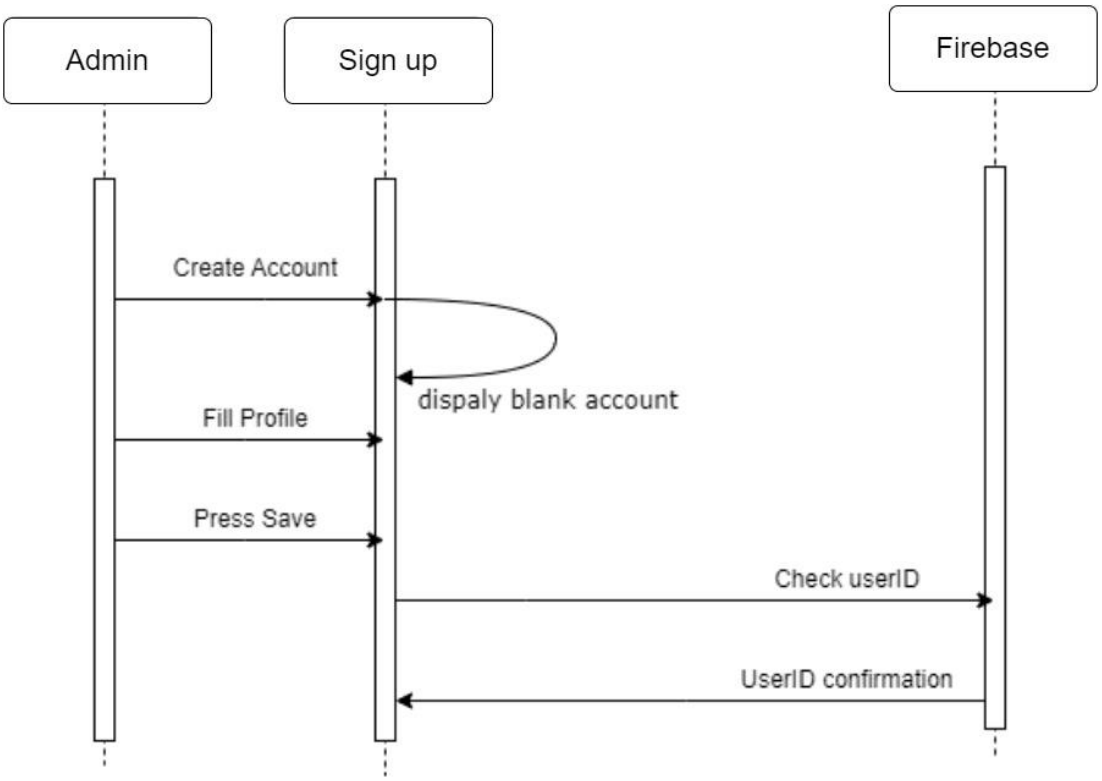

Figure 3.6: Sequence Diagram User registration

Fig 6 shows an illustration of the flow of interactions between the admin and the system during the User registration process.

3.1.7.2 Sign In

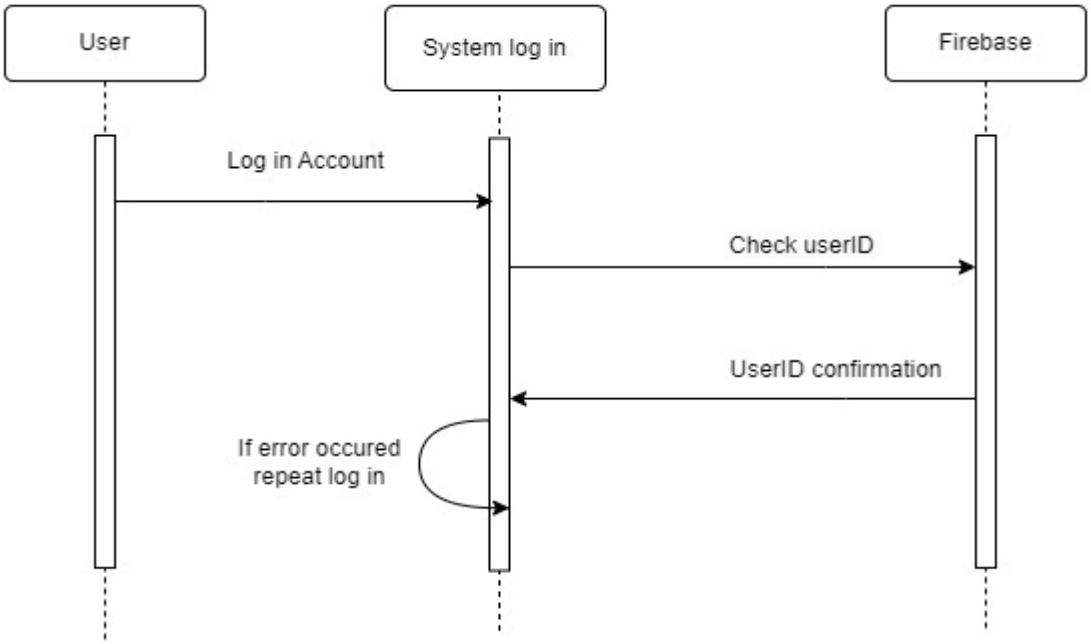

Figure 3.7: Sequence Diagram Sign in

Fig 7 shows a capture of the sequence of interactions between the user and the system while logging in. It visualizes the steps involved, including providing login credentials, verifying the information, and granting access to the user account.

3.1.7.3 Home Page

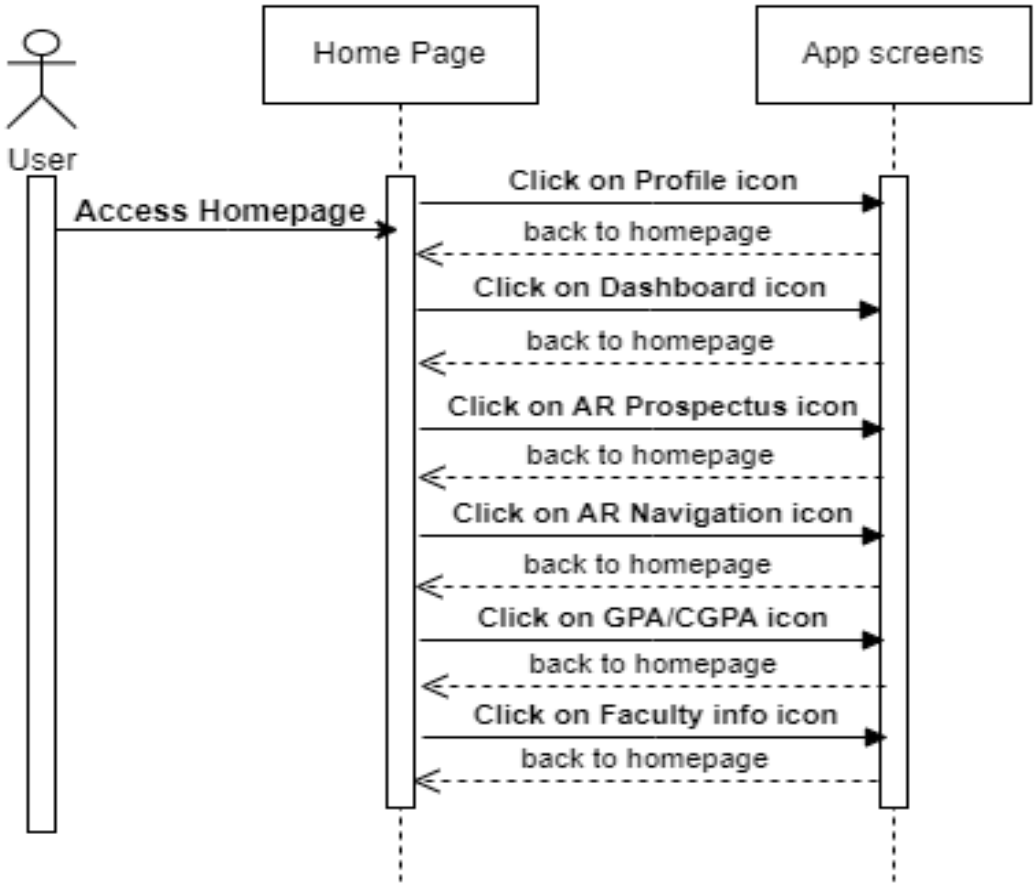

Figure 3.8: Sequence Diagram Homepage

Fig 8 shows a capture of the sequence of interactions between the user and the system after logging. It visualizes the steps involved in accessing different features or modules of the system.

3.1.7.4 Profile

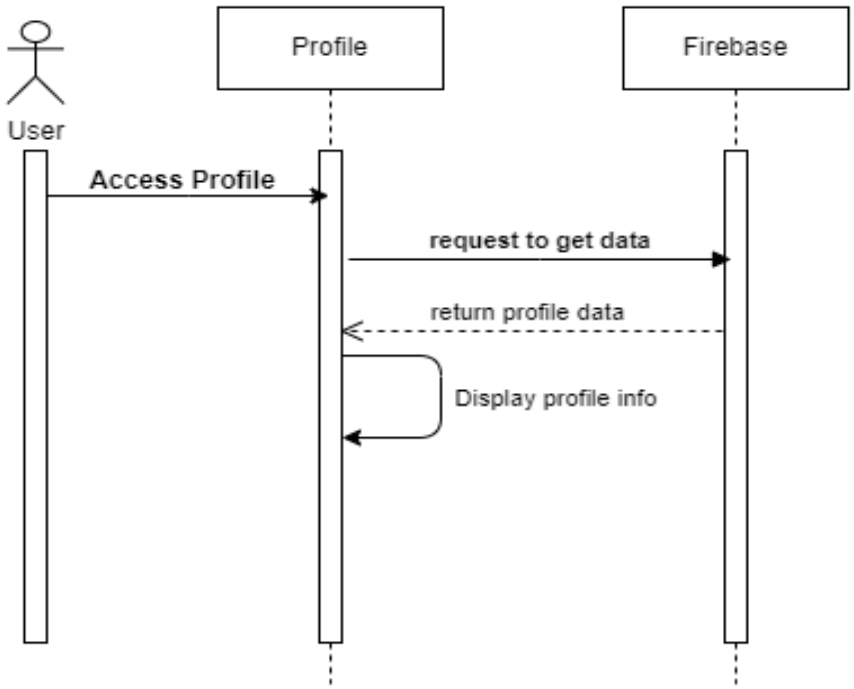

Figure 3.9: Sequence Diagram Profile

Fig 9 shows a capture of the sequence of interactions between the user and the system after accessing Profile info. It visualizes the steps involved in requesting Firebase to get data and then displays profile information after data fetching.

3.1.7.5 Dashboard

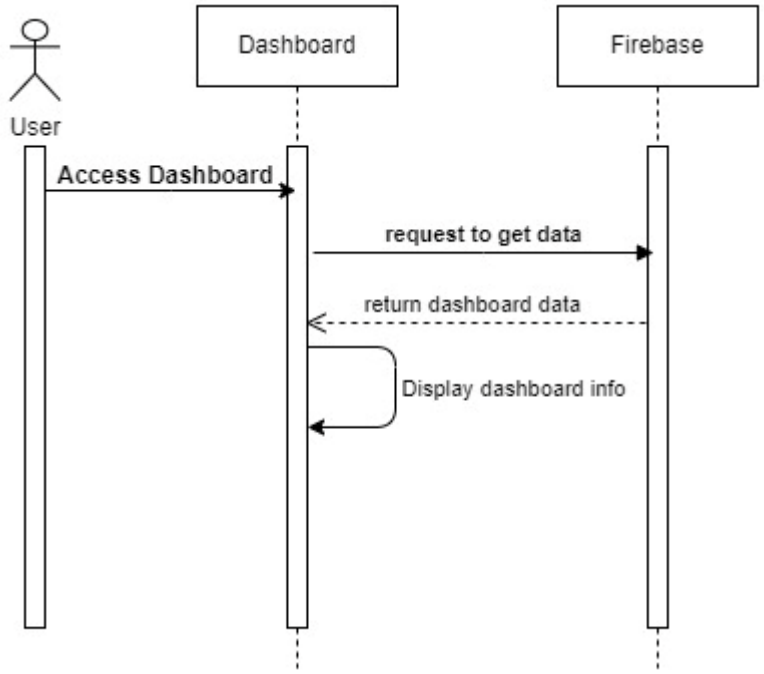

Figure 3.10: Sequence Diagram Dashboard

Fig 10 shows a capture of the sequence of interactions between the user and the system after accessing the Dashboard. It visualizes the steps involved in requesting Firebase to get data and then displays the Dashboard after data fetching.

3.1.7.6 AR Prospectus

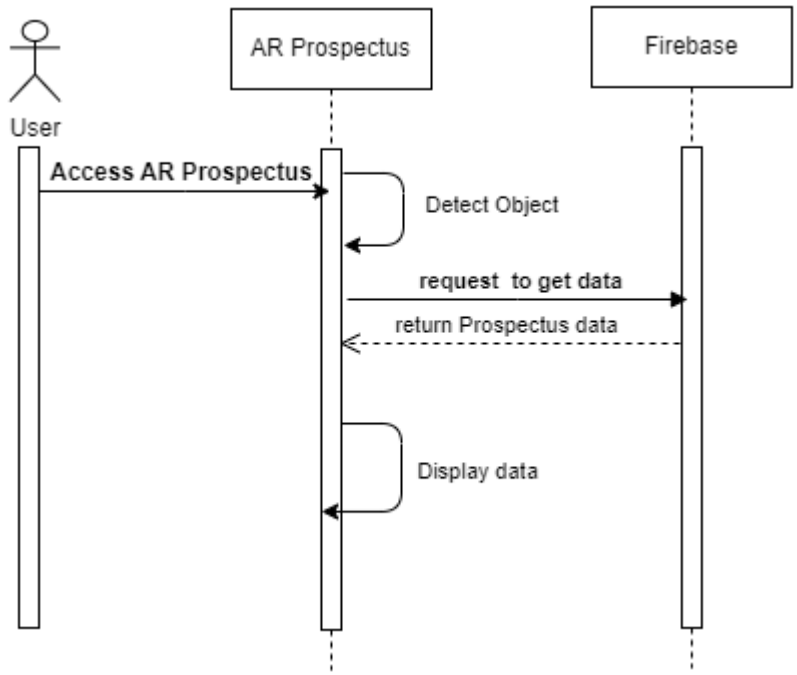

Figure 3.11: Sequence Diagram AR Prospectus

Fig 11 shows a capture of the sequence of interactions between the user and the system after accessing AR Prospectus. It visualizes the steps involved in detecting objects via camera request to Firebase to get data and then display Prospectus.

3.1.7.7 AR Navigation

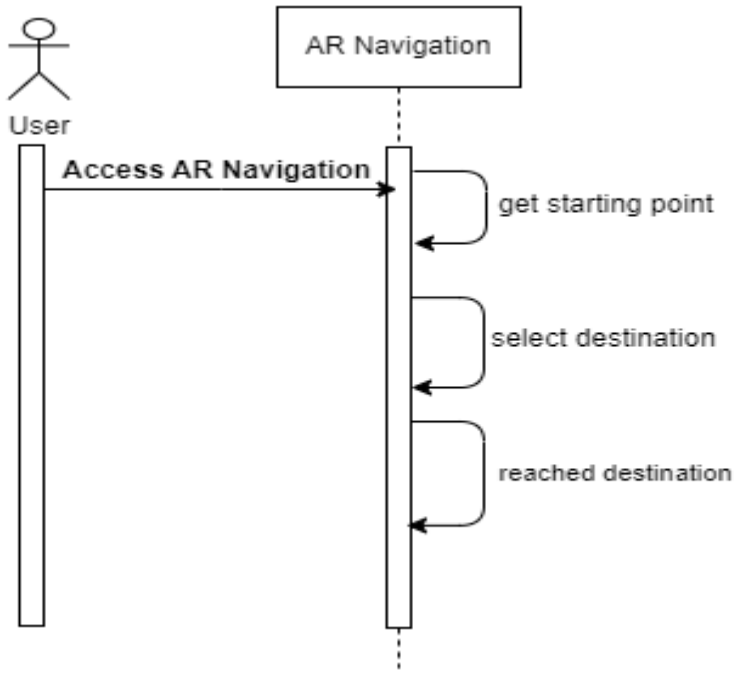

Figure 3.12: Sequence Diagram AR Navigation

Fig 12 shows a capture of the sequence of interactions between the user and the system after accessing AR Navigation. It visualizes the steps involved, to get a starting point and then select a destination for getting the path.

3.1.7.8 Faculty Profiles

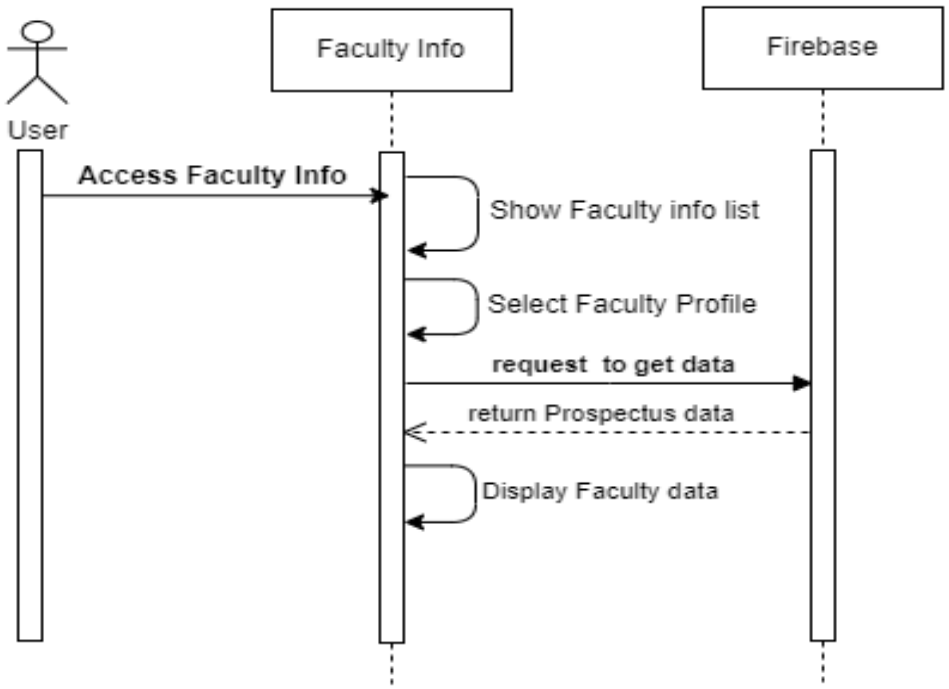

Figure 3.13: Sequence Diagram Faculty Profiles

Fig 13 shows a capture of the sequence of interactions between the user and the system after accessing Faculty Profile info. It visualizes the steps involved, to show the faculty profile list after selecting a profile, requesting Firebase to get data then displaying faculty profile information after data fetching.

3.1.8 Activity Diagram

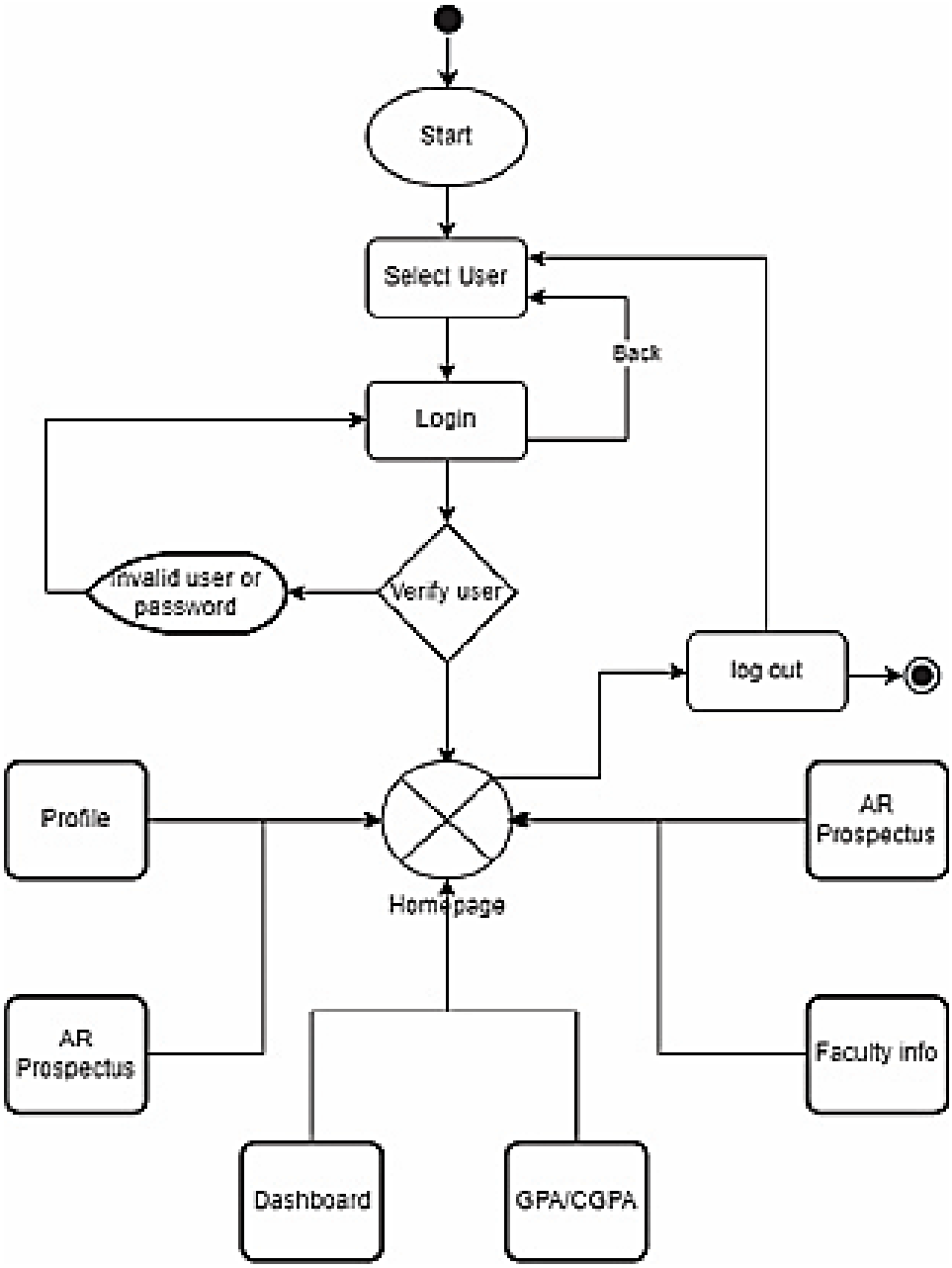

Figure 3.14: Activity Diagram

Fig 14 shows us illustrates the flow of activities, control flow, decision points, synchronization, and actors involved in a system or organizational workflow or process flow.

3.1.9 Data Flow Diagram

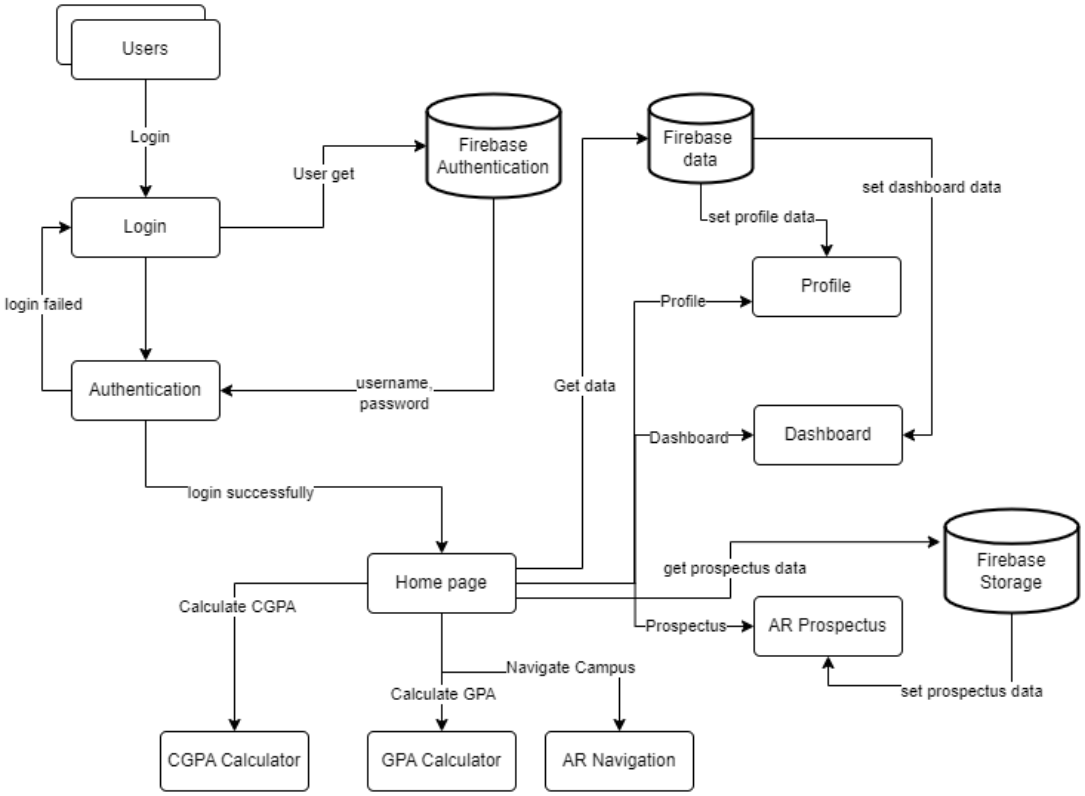

Figure 3.15: Data Flow Diagram

Fig 15 shows us illustrates the flow of Data, control flow synchronization and users involved in a system or organizational workflow or process flow of Data.

3.1.10 Class Diagram

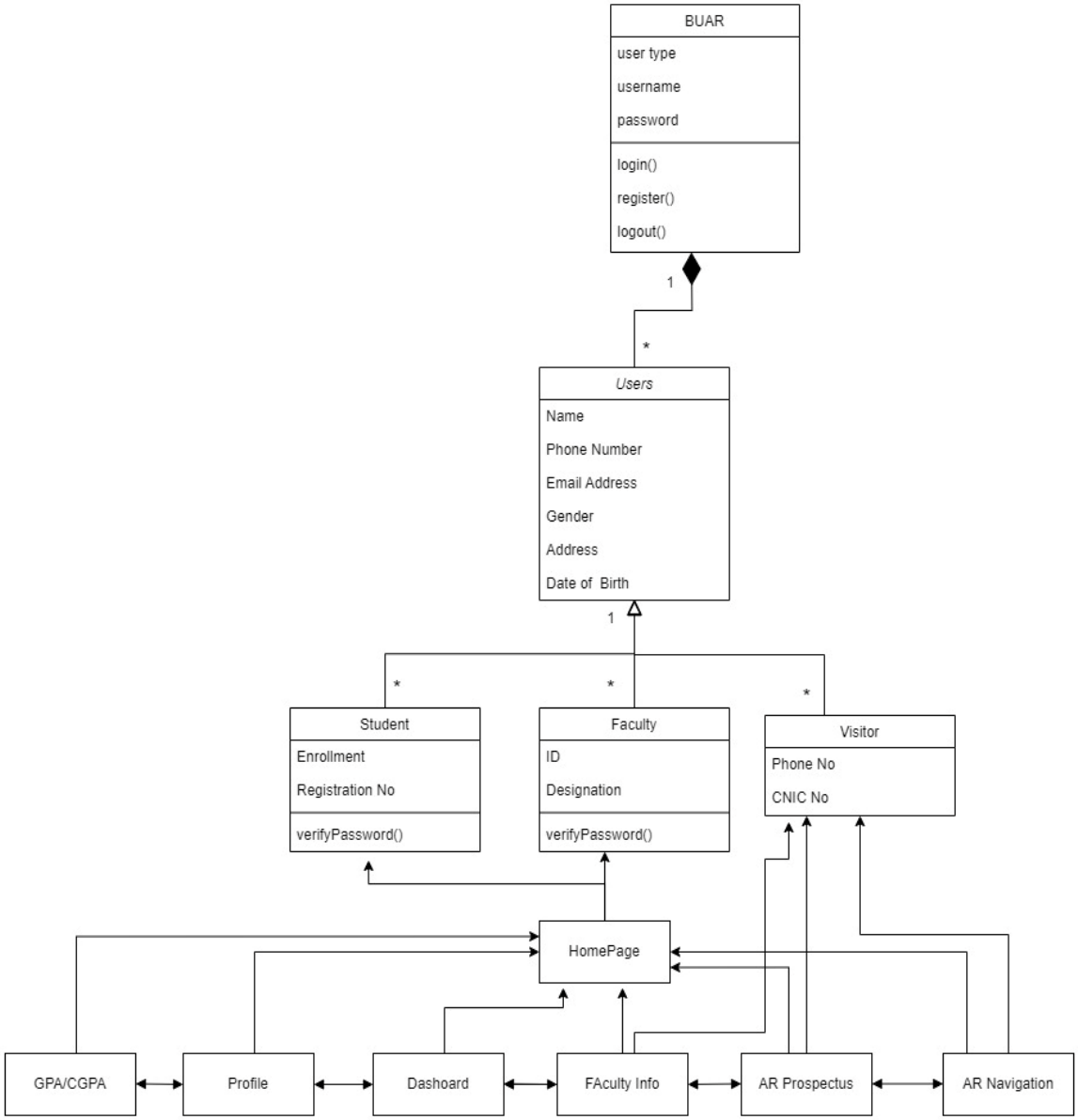

Figure 3.16: Class Diagram

Fig 16 shows us illustrates the class diagram and control flow synchronization also users involved in a system or organizational workflow or process flow of application functionality.

CHAPTER 4

IMPLEMENTATION

4.1 Tools and Technologies

The tools and technologies used in this application are under the following:

4.1.1 Unity

Unity [1] is an open-source and powerful game development framework widely used in the creation of 2D and 3D interactive experiences across multiple platforms. Developed by Unity Technologies, it offers a user-friendly interface and supports a vast community of developers. Unity facilitates the seamless integration of assets, scripting in C#, and deployment to platforms like Windows, MacOS, Linux, Android, and iOS.

4.1.2 Visual Studio

Visual Studio [2] serves as a robust integrated development environment for scriptwriting in Unity, providing a seamless coding experience for game developers. With its powerful code editor, IntelliSense auto-completion, and debugging tools, Visual Studio enhances the efficiency of script development in Unity. Visual Studio's support for C#, the primary scripting language in Unity, ensures a smooth coding experience, making it a preferred choice for developers working on Unity projects.

4.1.3 Blender

Blender [3] is a free and open-source 3D modelling and animation program that is used to create animations, visual effects, video games, and more. It provides several capabilities, including 3D modelling, texturing, lighting, animation, simulation, rendering, compositing, and video editing. It is accessible for Windows, Mac, and Linux operating systems, and it has a big and supportive user and development community.

4.1.4 Vuforia

Integrated Vuforia for the AR Prospectus feature, enabling the recognition of the prospectus. Used Vuforia [4] image recognition capabilities to overlay 3D models onto real-world objects, enhancing the 3D visualization of the university prospectus.

4.1.5 Firebase

Firebase is a set of backend cloud computing services and application development platforms provided by Google. It hosts databases, services, authentication, and integration for a variety of applications.

Firebase [5] is used in the BUAR project to store user information and store material for AR prospectus like images, videos, and 3D models of Bahria University Lahore Campus.

4.1.6 Canva

Canva is a graphic design platform that allows users to create a wide range of visual content, including posters, flyers, social media graphics, presentations, and more. We used Canva [6] to make posters for faculty profiles and timetables.

CHAPTER 5

USER MANUAL

5.1 Splash Screen

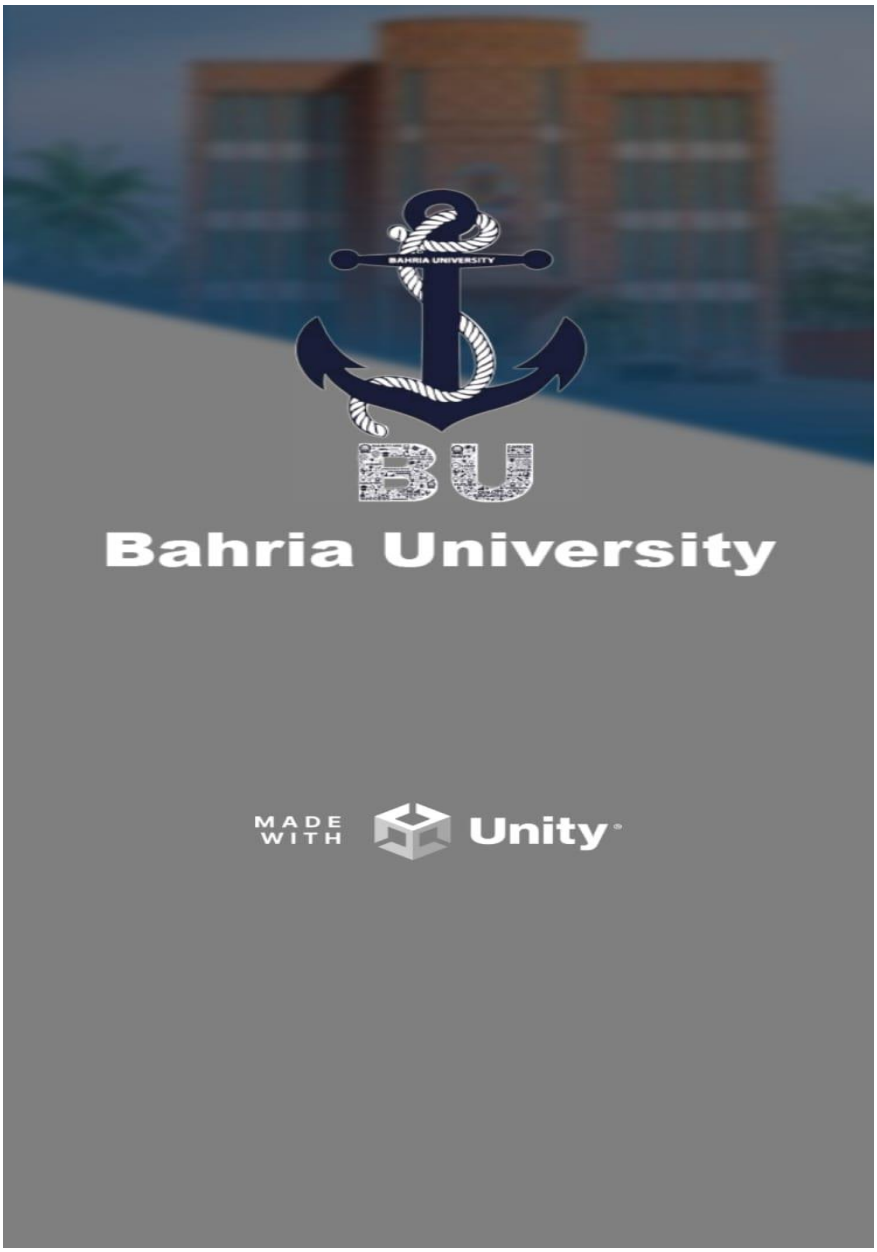

Figure 5.1: Splash Screen

5.2 Users Screen

Figure 5.2: Users Screen

5.3 Log-in Screen

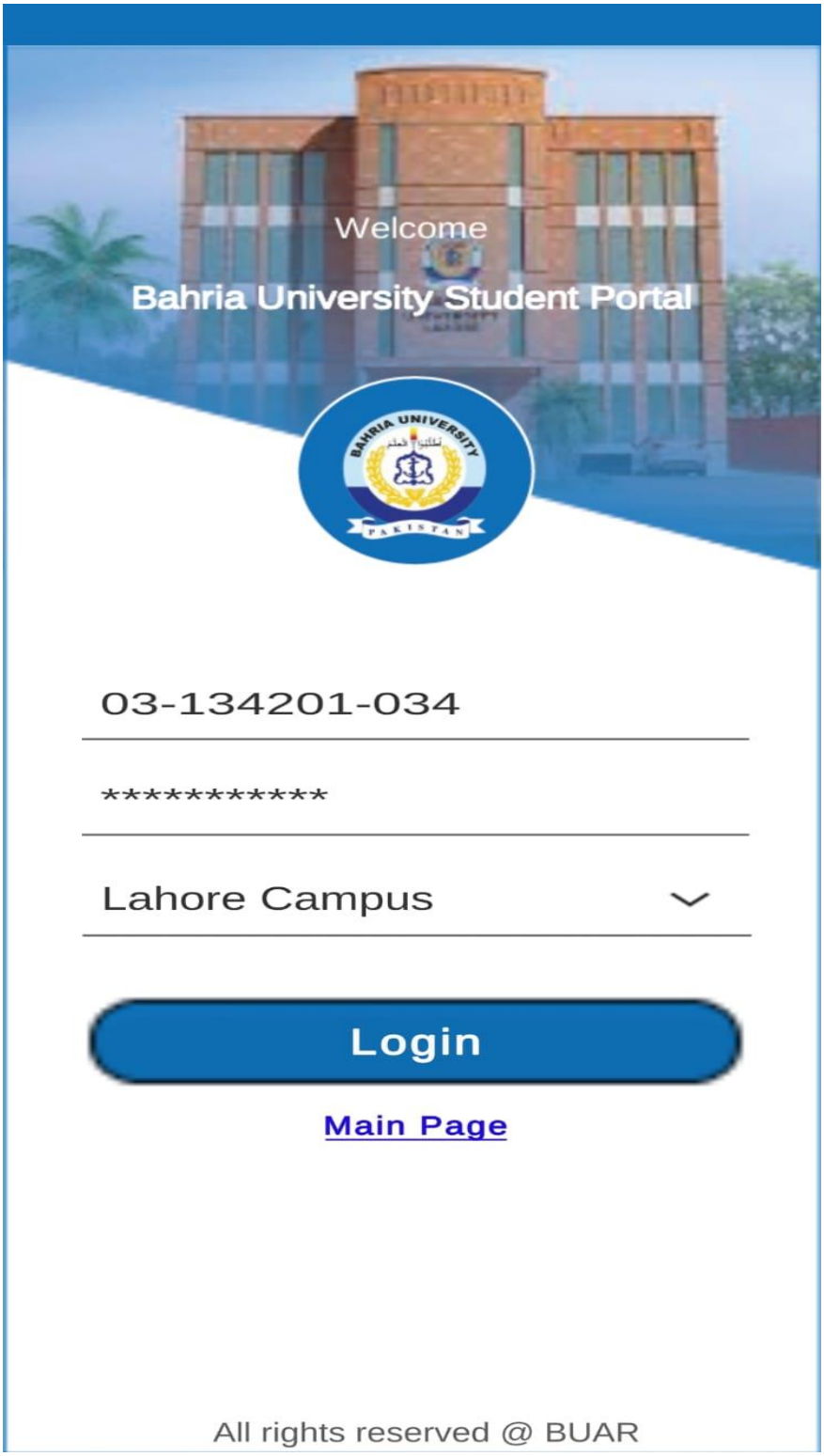

Figure 5.3: Log in Screen

5.4 Home Screen

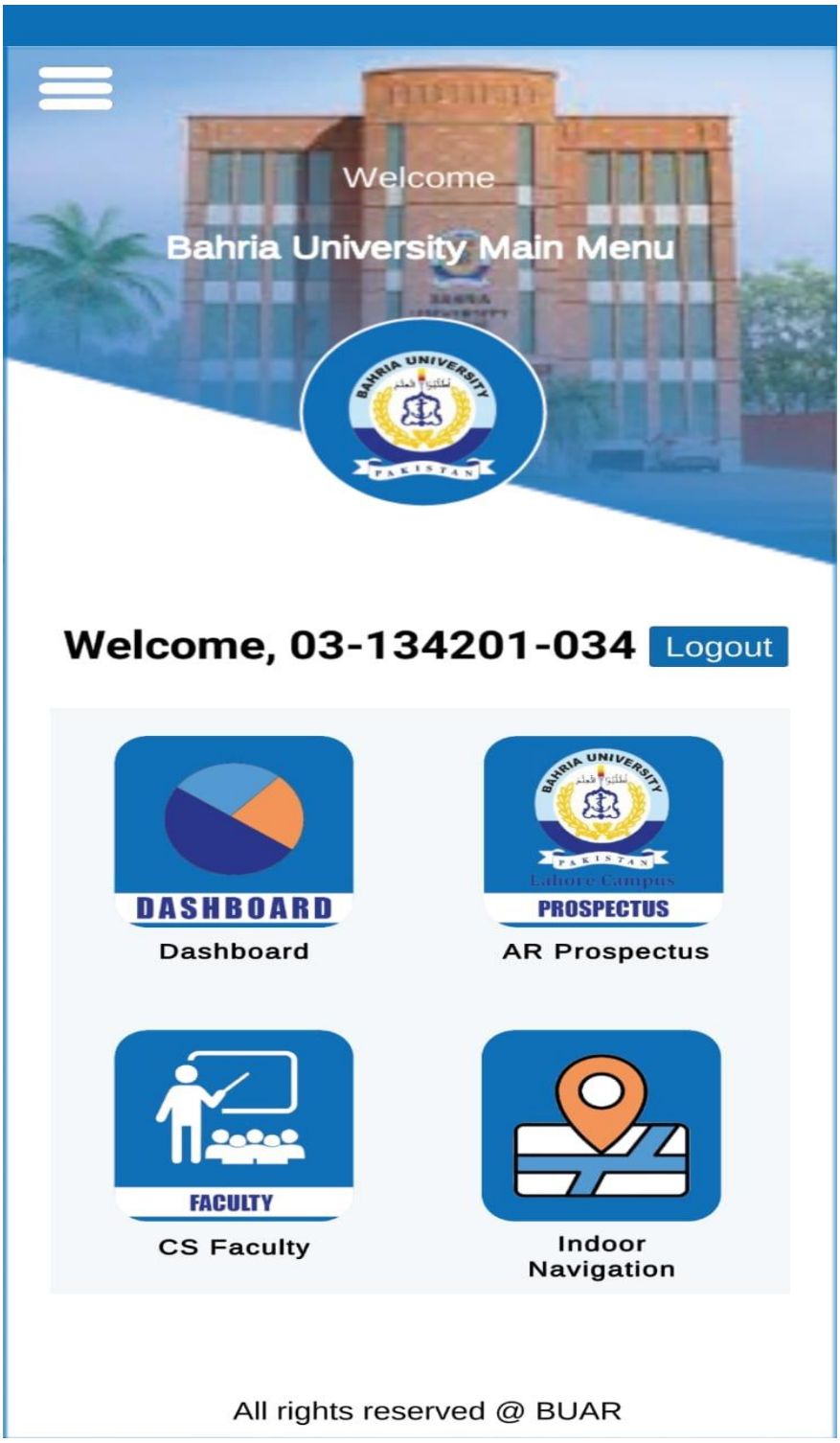

Figure 5.4: Home Screen

5.5 Home Screen

Figure 5.5: Home Screen

5.6 Dashboard Screen

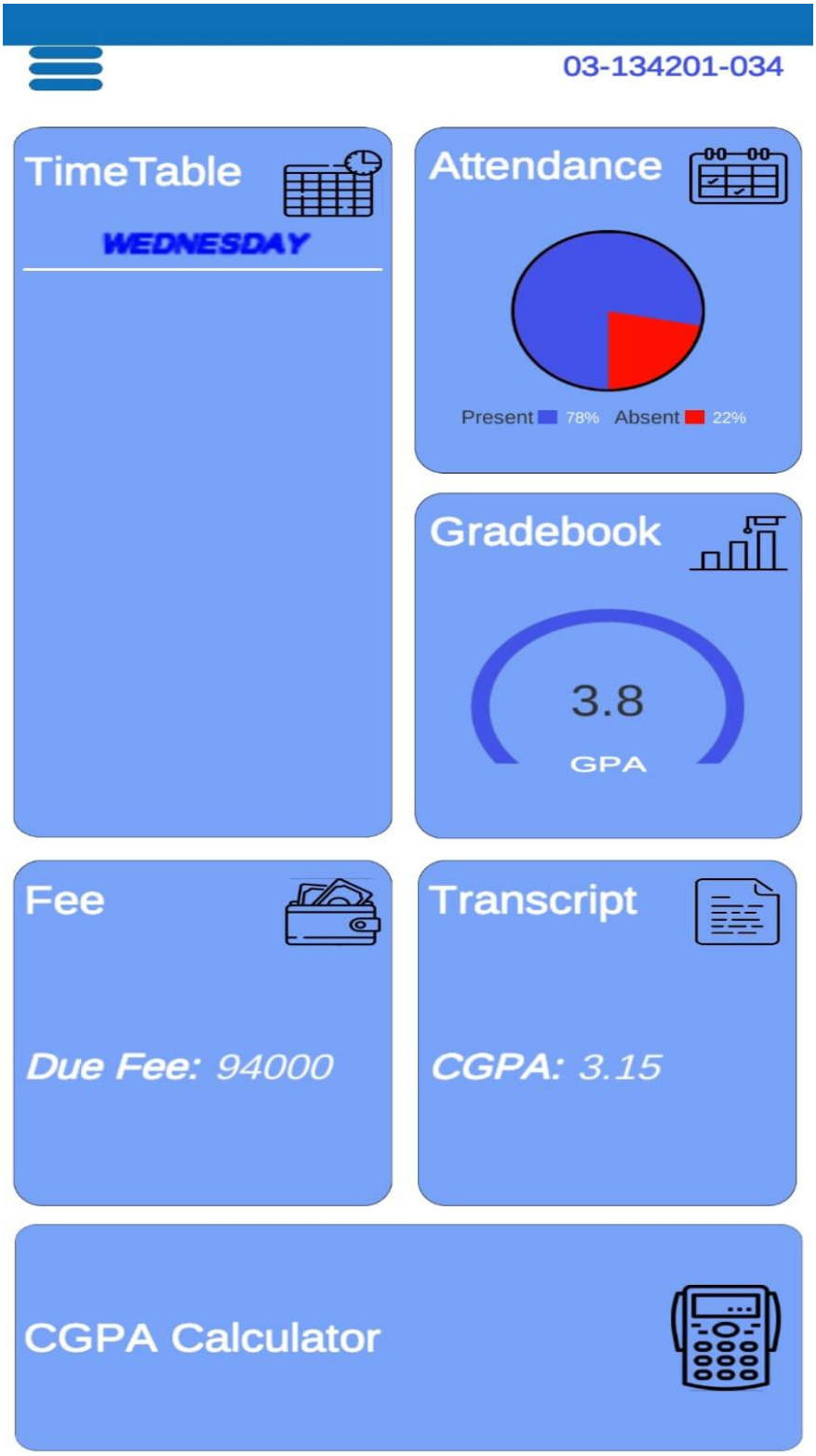

Figure 5.6: Dashboard Screen

5.7 CGPA Screen

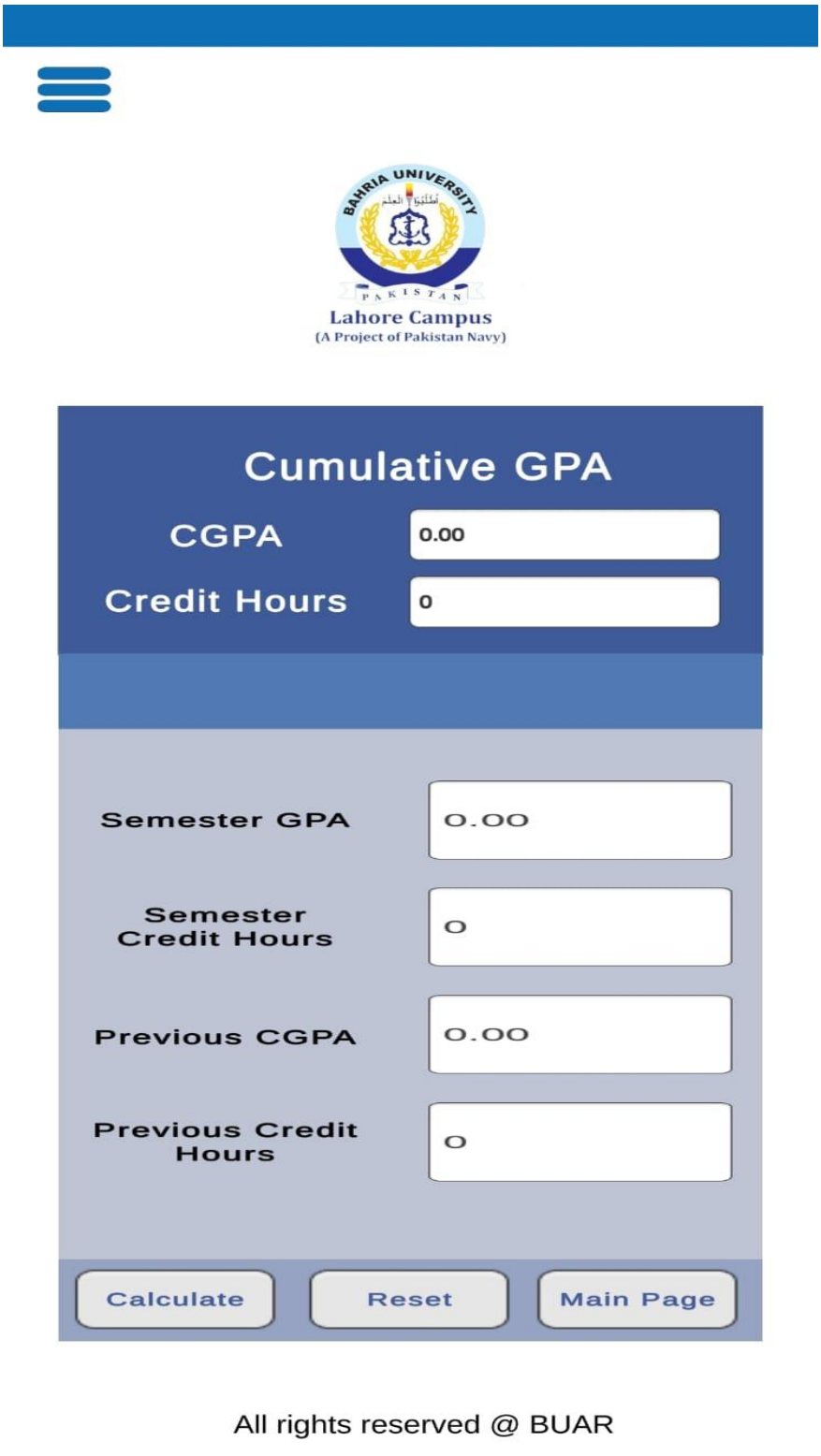

Figure 5.7: CGPA Screen

5.8 Faculty Info Screen

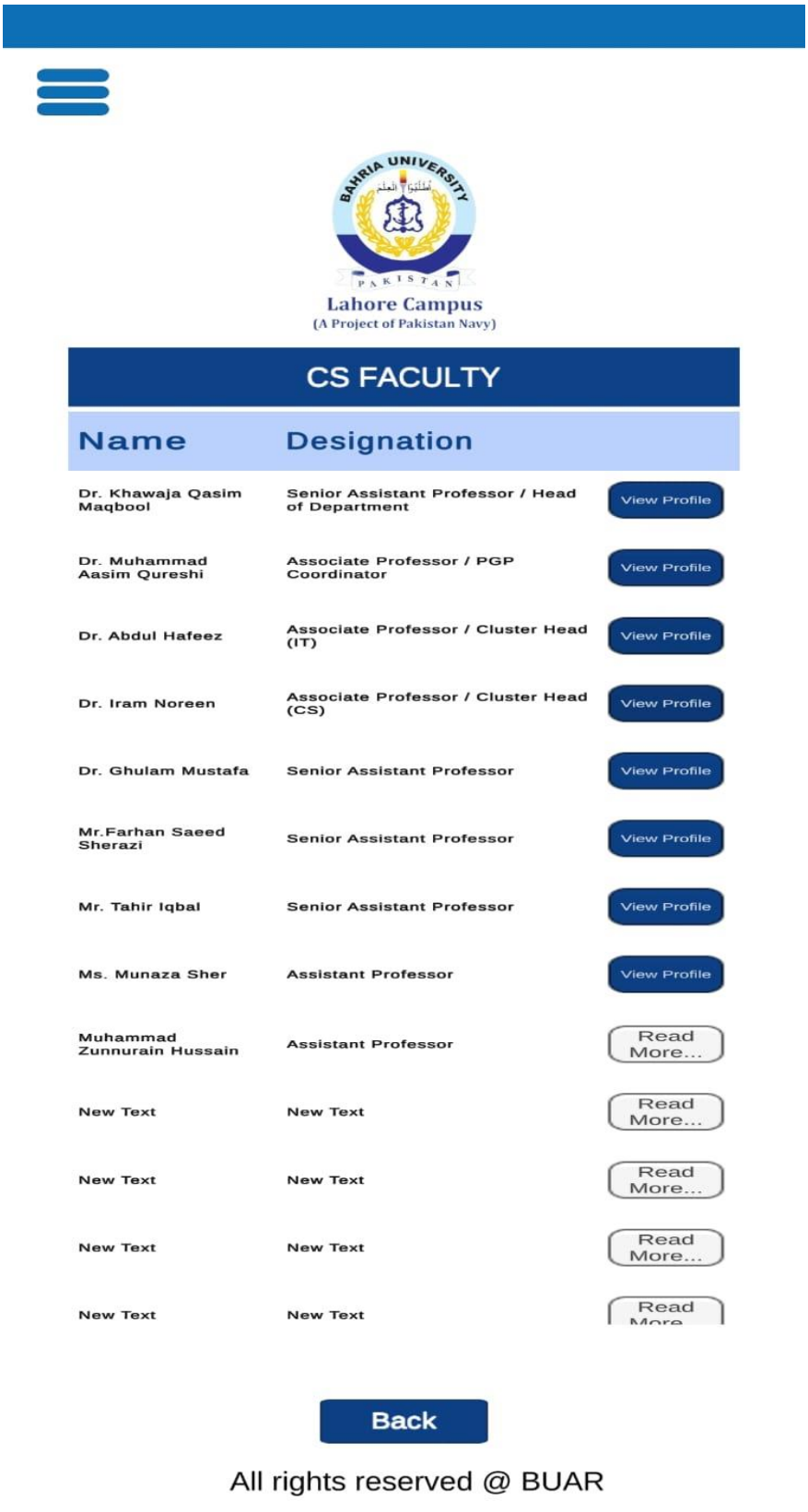

Figure 5.8: Faculty Info Screen

5.9 Faculty Profile Screen

Figure 5.9: Faculty Profile Screen

5.10 GPA Screen

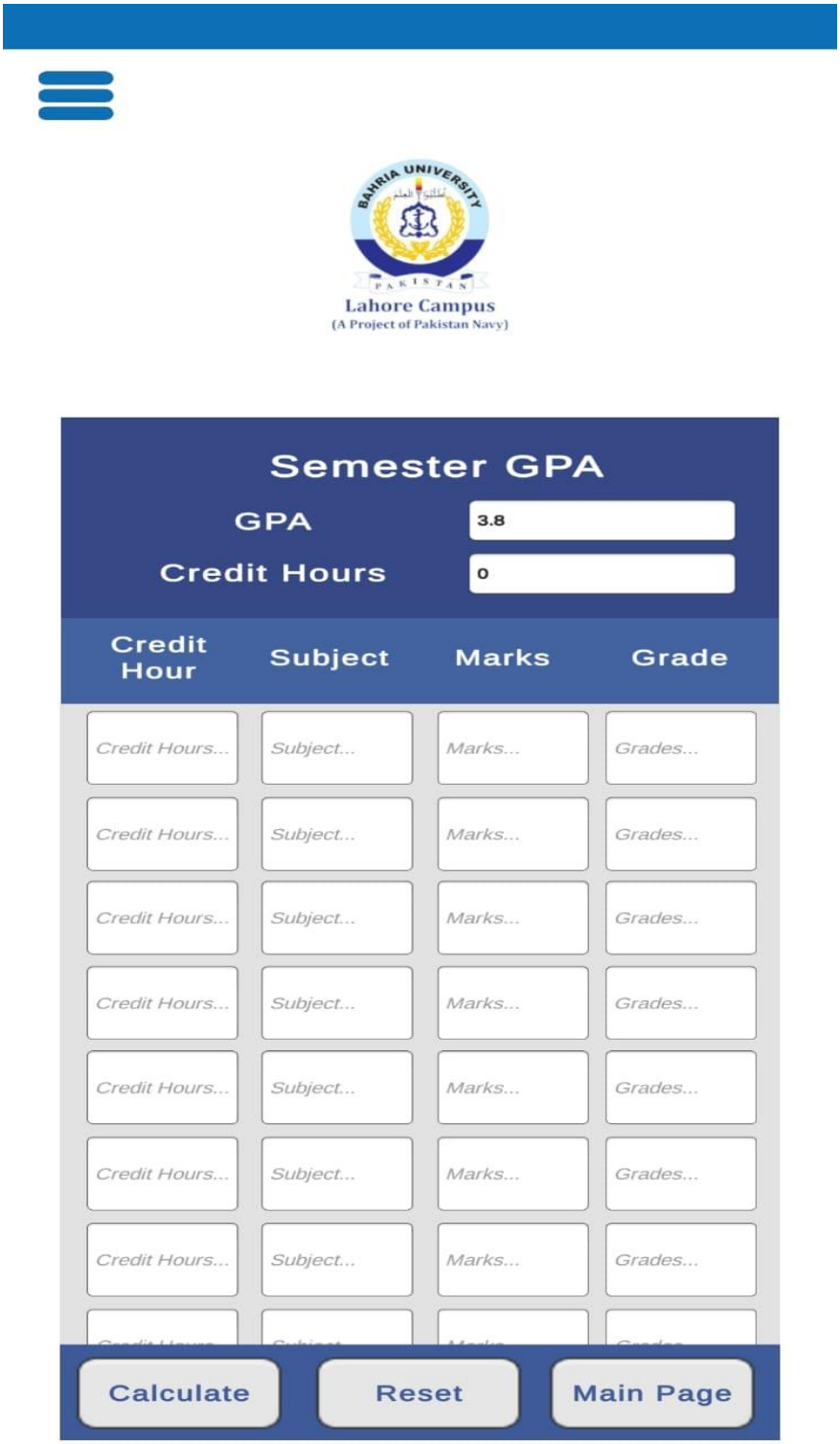

Figure 5.10: GPA Screen

5.11 AR Prospectus Screen

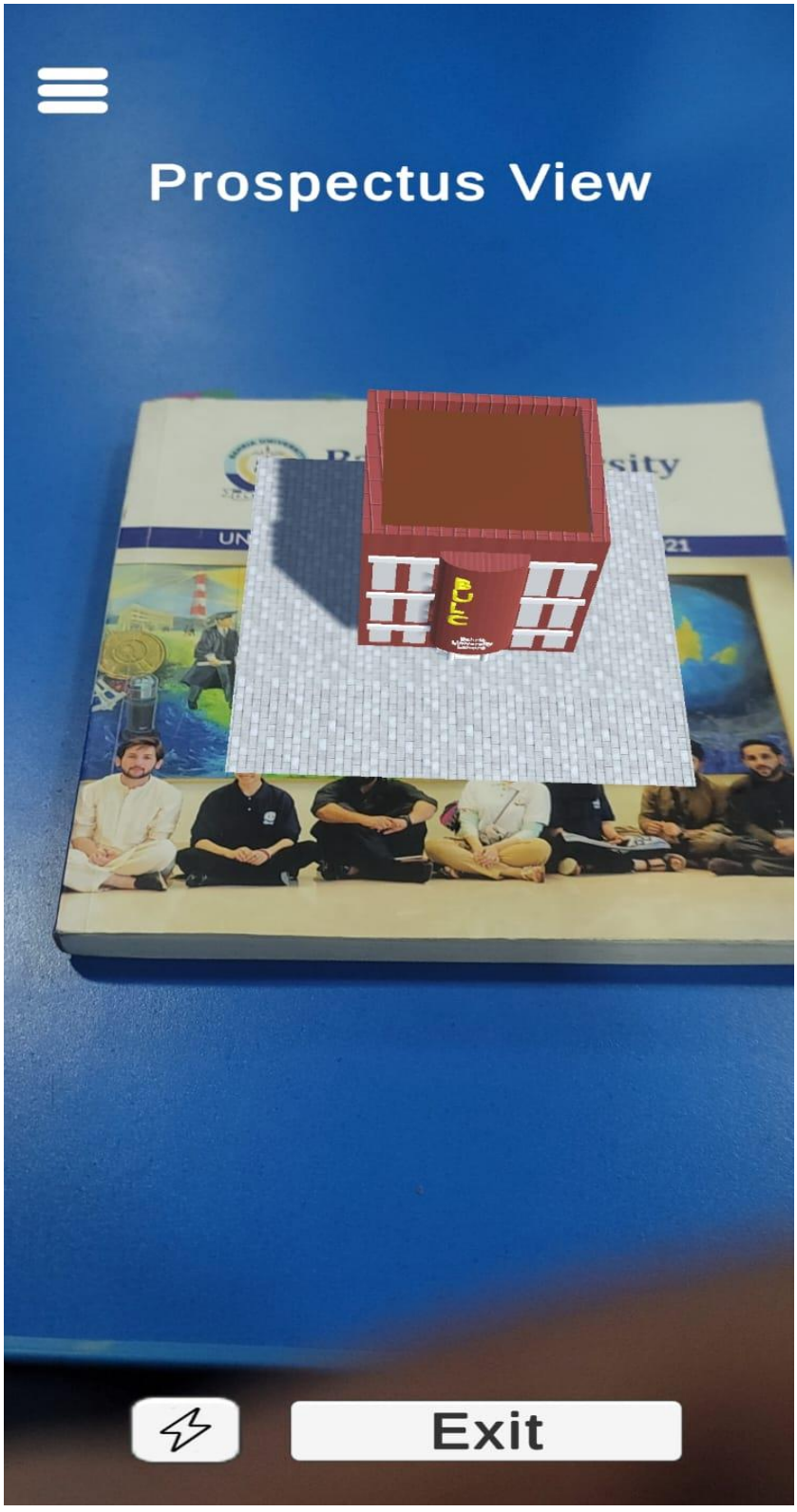

Figure 5.11: AR Prospectus Screen

5.12 Profile Screen

Figure 5.12: Profile Screen

5.13 AR Navigation Screen

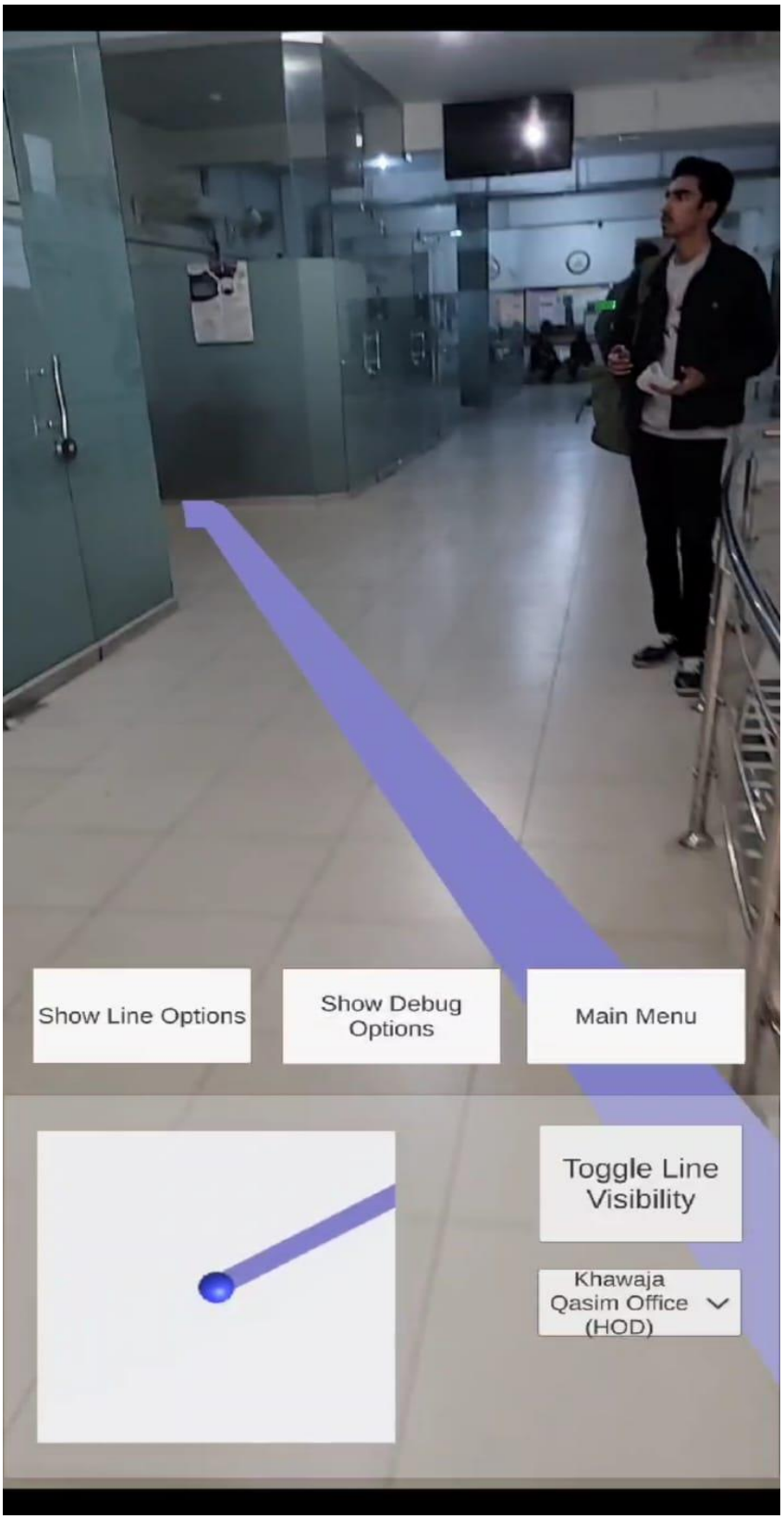

Figure 5.13: AR Navigation Screen

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The Bahria University Augmented Reality (BUAR) project has successfully achieved its objectives of enhancing campus navigation, and student engagement with an AR Prospectus, Students will stay connected through their profiles and improve information about faculty for the ease of students.

The implementation of AR technologies, including AR Foundation, AR Core, and Vuforia, within the Unity framework, has resulted in a fully functional mobile application compatible with Android devices. The indoor location tracking feature provides users with a convenient and interactive solution for navigating the university campus. The AR Prospectus feature, implemented through Vuforia, empowers potential students to explore university.

6.2 Limitation

While the BUAR project has achieved its primary objectives, some limitations should be acknowledged:

6.2.1 Hardware Requirements

The application's performance may be dependent on the hardware specifications of the user's device. Lower-end devices may experience reduced responsiveness and AR capabilities.

6.2.2 Data Security

Although data security measures have been considered, continuous monitoring and updates are essential to address potential vulnerabilities and ensure the protection of user data.

6.3 Recommendation and Future Use

It is recommended to conduct device compatibility testing to ensure optimal performance, particularly about gyroscope sensor functionality. User feedback should continue to be actively gathered, with a focus on refining gyroscope-dependent features based on iterative improvements. This evolution will position BUAR not only as a navigation tool but as a comprehensive platform for immersive and dynamic educational experiences.

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