Bilkent University

Department of Computer Engineering

CS491 Course Project

Visp

Project Analysis Report

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1. Introduction

Since its emergence after the World Wide Web became mainstream, social media has been changing our lives in every imaginable way. In a short time span, countless social media platforms emerged and so many of them are still in use by many people of various demographics. As of 2020, it is estimated that 3.6 billion people use social media platforms worldwide [1]. Social media has become one of the most prominent ways in which people spend their time. It revolutionized the way we share information, ideas, memories and to this day, it still does. In addition to that, social media itself grows and evolves as new ideas and technologies emerge. One of the recent and exciting technologies that social media has not completely intertwined with is augmented reality. Augmented reality technology is an excellent way to enrich the environment around us to be used by people in interactive ways. Our aim in this project is to bring these two concepts together and integrate the perks of augmented reality to a platform of sharing and storing ideas. We are also very familiar with the idea of corporations using various technological platforms to engage with their audience and customers. Therefore we believe that augmented reality can also change how corporations and customers interact, bringing a new perspective to running advertisements. One of the promises of this project is creating a bridge between the digital world and real-life while allowing people to share an idea with others or save a memory related to a real-life object. We believe that introducing augmented reality to the interactivity amongst people will be the most innovative aspect of this project. A successful implementation would not only be a modern take on social media, but also influence various technologies to be evolved in similar fashion.

2. Proposed System
2.1. Overview

The project will be a social media application based around Augmented Reality technology. People will be using this application to socialize with other people by attaching texts, animations, pictures, videos, sounds, and even some mini-apps to unique objects, products and places that they introduced to the app and also interact

with the previously attached media using their phone cameras. People can save any kind of attachment, photo or video to their phone's storage. Moreover, you can add your friends in the application and send them any attachment, photo or video you saved. If there are more than one attachment for one object or place, attachments will be displayed like a list which people can iterate through them. We believe that our location based idea will be prominently used in areas such as campuses, offices, shopping centers where people visit regularly.

Strongest aspect of our application will be its extensibility since its main source is the imagination of its users. We believe that the medium we provide to the users will enable them to find their own purposes of using this application. While the ability to attach any kind of media or connection to any object or place will primarily be useful for people; shop owners and businesses can also benefit from our features for a more interactive way of advertising their products.

Various use cases that come to our mind except the social media aspect:

- Assigning 3D graphics, objects, or small interactive applications to visuals on education books,
- Attaching to a physical location desired media file (like virtual graffiti)
- Companies and small businesses can benefit from interactive and different advertisements with mini games, 3D animations and more meaningful descriptions that are attached to products.

2.2. Functional Requirements

2.2.1. Scanning Mode Requirements

- Application is able to recognize objects and places that are previously registered into the system.
- Application displays related attachments of recognized objects.
- Application displays a list of attachments if there are more than one for a specified object.
- Application allows users to share videos and photos from the application to share in other social media platforms(Instagram, whatsapp, etc).
- Application can scan QR codes.

2.2.2. Registration Mode Requirements

● In registration mode, new objects can be introduced to the system.

● In registration mode, new places can be introduced to the system alongside with their GPS information.

● System gives positive or negative feedback about the registration process to users.

2.2.3. User Functionality Requirements

● Users can save the media files or moments from recognized objects to their phone storage.

● Users can attach media files(video, sound, image ,gifs), texts, links to the objects or places.

● Users can take a picture or video of any moment in the scan mode.

● Users can swipe between attached files if there is more than one for an object.

● Users can add their friends to their friends list inside application

● Users can send any attachment or file from our application to their friends from friend list

● Users can see nearby memories if their gps is active.

● Users can open the application without authentication.

● Users can only use scan mode without authentication.

● Users can like other people's attachments to objects or places.

2.2.4. Server Functionality Requirements

● Server tries to recognize scanned objects by application and return a positive or negative message. If the server recognizes the object or place it will send attached items to application.

● Server saves new registered objects to the database, and also sends positive or negative feedback according to the registration process' success. If a place registered and registration process is successful, servers will save also gps data to the database.

● Server saves attached all types of files to the database.

2.3. Nonfunctional Requirements

2.3.1. Performance

- The application should not consume the battery so the processes that require high computing power should be done in the server side.
- The application should be able to display the attached media within 3 seconds.
- The user should be able to display and interact media without any interruption so the content to be displayed should be downloaded and displayed.

2.3.2. Scalability

- The prototype of the application should be able to handle 10.000 users and 500 concurrent users.

2.3.3. Usability

- The interface of the application should be easy to adapt and use in 2 minutes for a new user.

2.3.4. Security

- The sensitive information of the user such as passwords should be sent to stored in the encrypted format.
- The ordering products process should be secure.

2.3.5. Availability

- The system should be available 24 hours 7 days and 365 days in a year.

2.3.6. Modifiability

- Further implementations should be added without a difficulty to the current system if needed. For that the project should be modular.

2.3.7. Legal and Regulatory Requirements

- The terms of service and privacy should be accepted by the user before the usage of the application.

2.3.8. Accessibility

- The application should be accessible in at least 60% of Android and Apple devices.

2.4. Pseudo Requirements

- We plan to develop the application for both Android and iOS, therefore we will use a hybrid codebase.

- Server-side of the application, where the machine learning part will run, is expected to be written mostly in Python to make use of Python libraries.

- We will be using Github in order to keep our codes clean and compatible with each other so there is no desynchronization between coders.

- For animations and mini-game that will be displayed with AR, we will use Unity3D. In Unity we will use C#.

- The application will use GPS along with user info in order to keep track of the AR media that is left. Therefore users need a good internet connection for GPS to properly work.

- For this app to function properly in outdoor areas, users need to have a decent cellular connection since public Wi-Fi may not be present everywhere.

- The objects should be static while getting recognized by the app. Moving objects such as cars could prove difficulties.

- We plan to use open source libraries.

- For cloud computing we will make use of Google Collab since we are familiar with Google Collab from our machine learning courses, and they offer free GPU usage which is enough for building the prototype of our app.

- The language of the application interface will be English. However, since the application content is mostly created by users, we will have no control over the content language.

2.5. System Models
2.5.1. Scenarios

This section discovers the different use case scenarios of Visp.

2.5.1.1. Scenario 1

Name: Object Registration Mode
Participating Actor: User
Entry Conditions: The app is open
Exit Conditions: An object is registered
Flow of Events:

1.   User pushes the "register" button to open the camera.
2.   User orients camera towards the object to be scanned.
3.   User pushes the "register" button to scan an object.
4.   Visp scans the object and registers it to the user's registered objects list.
5.   User selects images from the attach list.

6.   User selects an image for attaching to this object.

2.5.1.2. Scenario 2

Name: Place Registration Mode
Participating Actor: User
Entry Conditions: The app is open
Exit Conditions: A place is registered
Flow of Events:
1.   User pushes the "register" button to register a new place to the Visp application
2.   User orients camera towards the place to be scanned
3.   Visp register a new place and the system and ask the user to open its gps in order to associate this place with gps location.
4.   Visp registers the location to the user's registered locations list
5.   User selects images from the attach list.
6.   User selects an image for attaching to this object.

2.5.1.3. Scenario 3

Name: Object Scanning Mode
Participating Actor: User
Entry Conditions: The app is open
Exit Conditions: The business card is scanned
Flow of Events:
1.   User push the "scan" button to scan an object to the Visp application
2.   User puts the camera of his/her phone towards the business card.
3.   Visp recognizes the card and creates an augmented space over the card.
4.   Visp displays attached files to this place in it's UI, there is a list.
5.   User can swipe between attached photos, texts, videos and files.

2.5.1.4. Scenario 4

Name: Location Scanning Mode
Participating Actor: User
Entry Conditions: App should be open.
Exit Conditions: App is closed.
Flow of Events:
1.   User puts the camera on the phone towards the place.
2.   User pushes the "scan" button to scan recognized objects and places.
3.   Visp recognized the entrance of Bilkent Library.
4.   Visp displays attached files to this place in it's UI, there is a list.
5.   User can swipe between attached photos, texts, videos and files.
6.   User likes one of the videos and leave a comment.

2.5.1.5. Scenario 5

Name: Sending a Visp to a friend
Participating Actor: Alptekin
Entry Conditions: App should be open.
Exit Conditions: Visp sended to a friend.
Flow of Events:
1. User moves the camera towards a place.
2. User pushes the "scan" button.
3. User sees attached Visps to that place in a list.
4. User selects the second Visp and pushes the share button.
5. User selects a friend from the share list
6. User pushes the "send" button.

2.5.1.6. Scenario 6

Name: Friend added in Application Scenario
Participating Actor: Alptekin
Entry Conditions: App should be open.
Exit Conditions: New friend added to the list.
Flow of Events:
1. User pushes the "social" button in the application.
2. User selects the "add friend" button from the new UI that shows up.
3. User enters the name of the friend "Bertram Gilfoyle" to search-bar.
4. User selects the "add" button next to the name.

2.5.1.7. Scenario 7

Name: Nearby Visp Notification Scenario
Participating Actor: Alptekin
Entry Conditions: App should be open.
Exit Conditions: User is notified about nearby Visps
Flow of Events:
1. User goes to a place where people left Visps.
2. User opens the GPS service on their phone.
3. App shows the number of Visps and their location to a certain precision
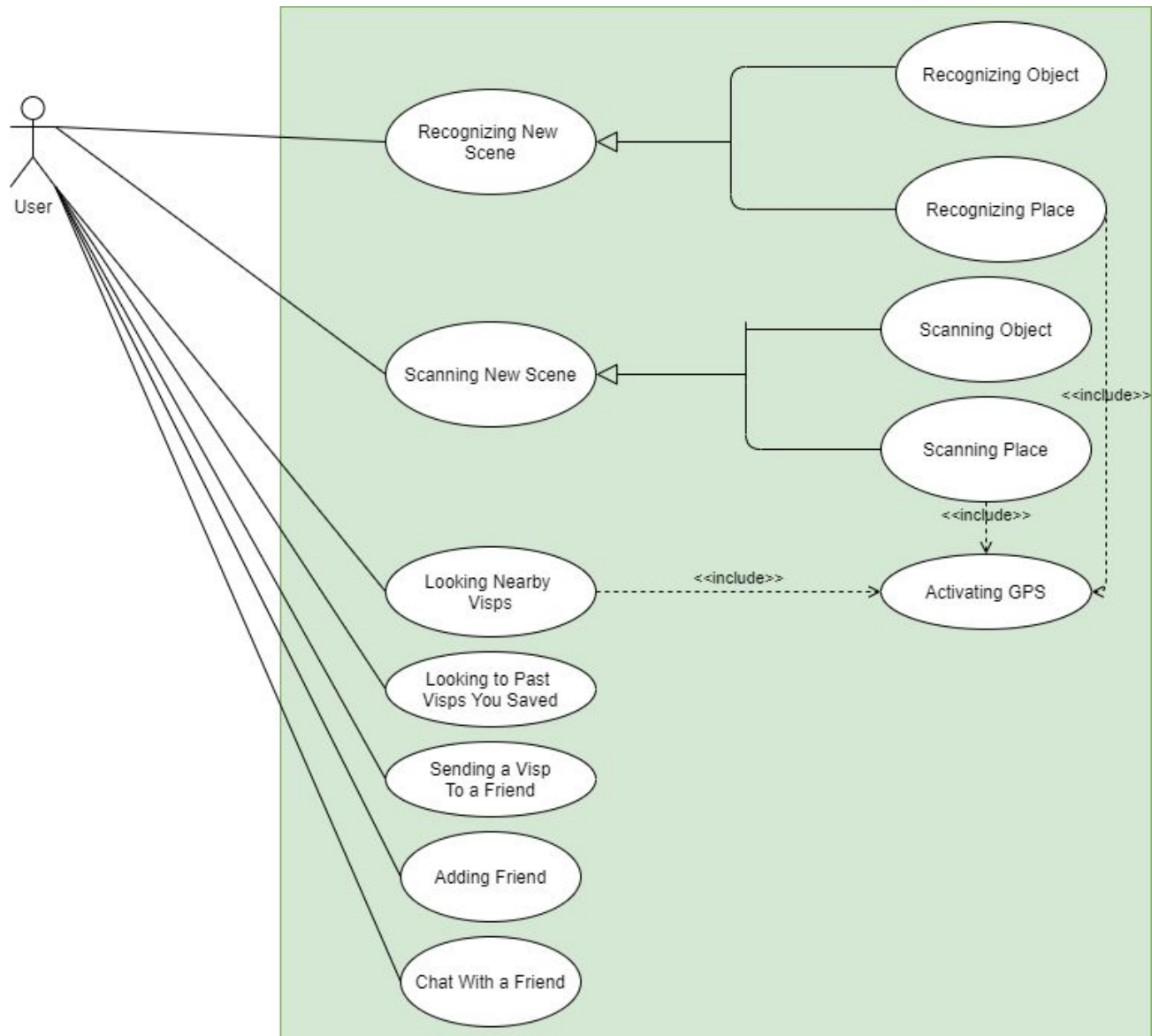
2.5.2.Use Case Model

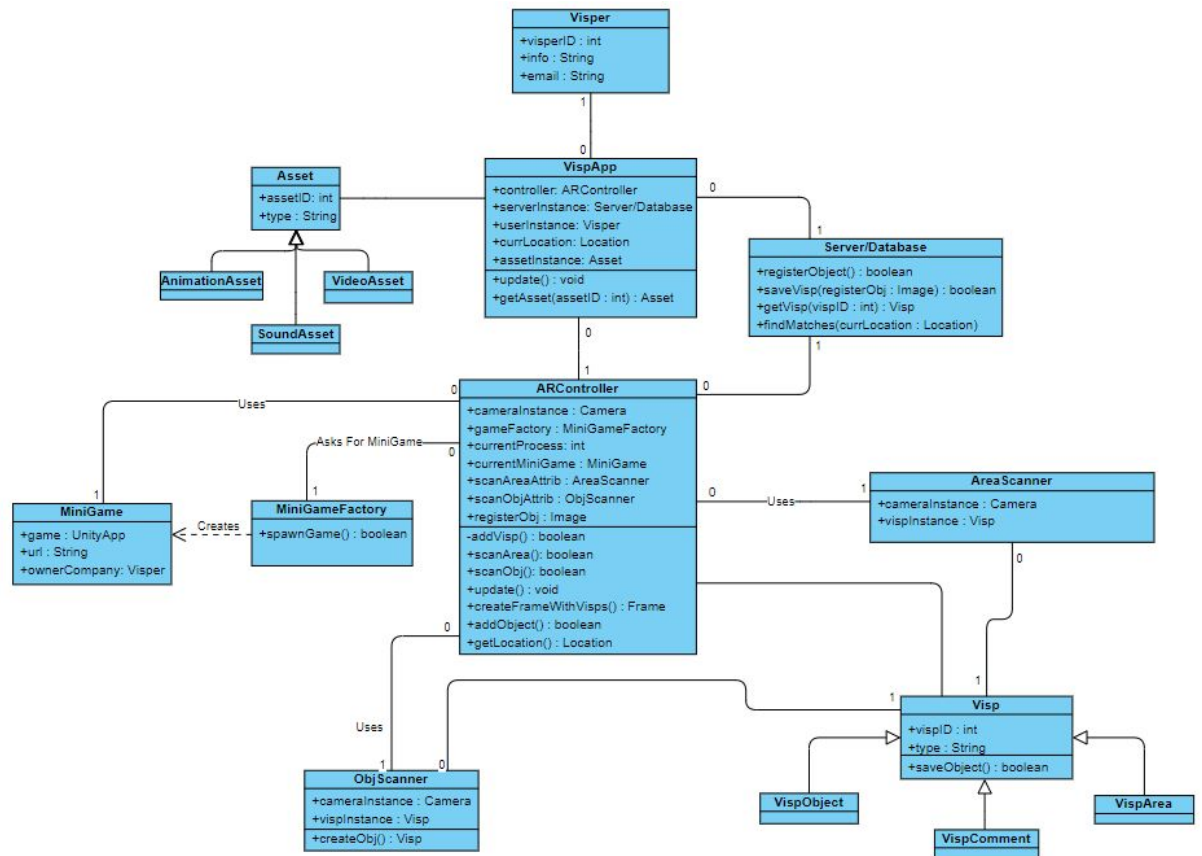Figure 1: Use case diagram of Visp

2.5.3.Object and Class Model

Figure 2: Class Diagram

For better view : https://ibb.co/6w3YWtL

2.5.4.Dynamic Models

2.5.4.1 Sequence Diagrams

Sequence diagram shown in Figure 3 explains the scenario where a user goes to a location and scans nearby visps left by other users and displays them on their screen.

Figure 3: Sequence Diagram for displaying nearby visps at a location
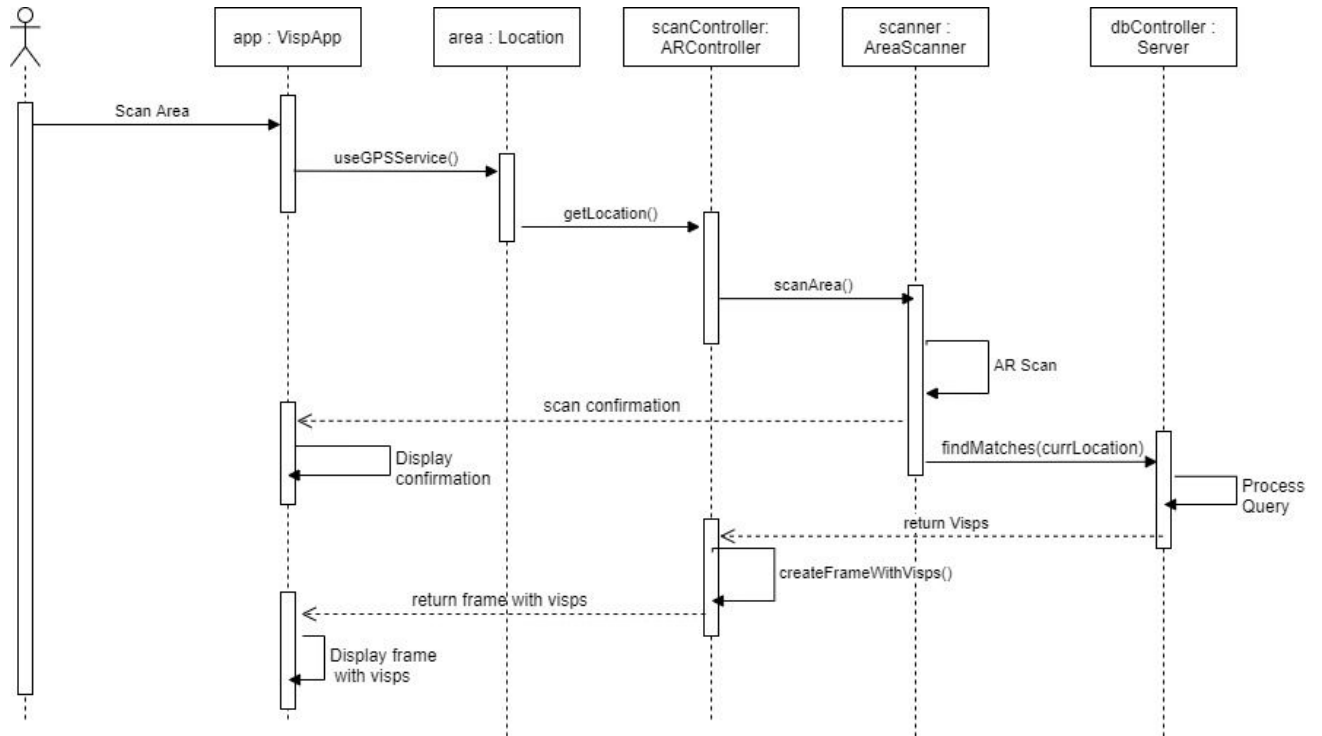
Sequence diagram shown in Figure 4 explains a unification of two use cases where the user scans an object that visps will be attached to, thus registering it to the system, and then adds visps to the registered object.
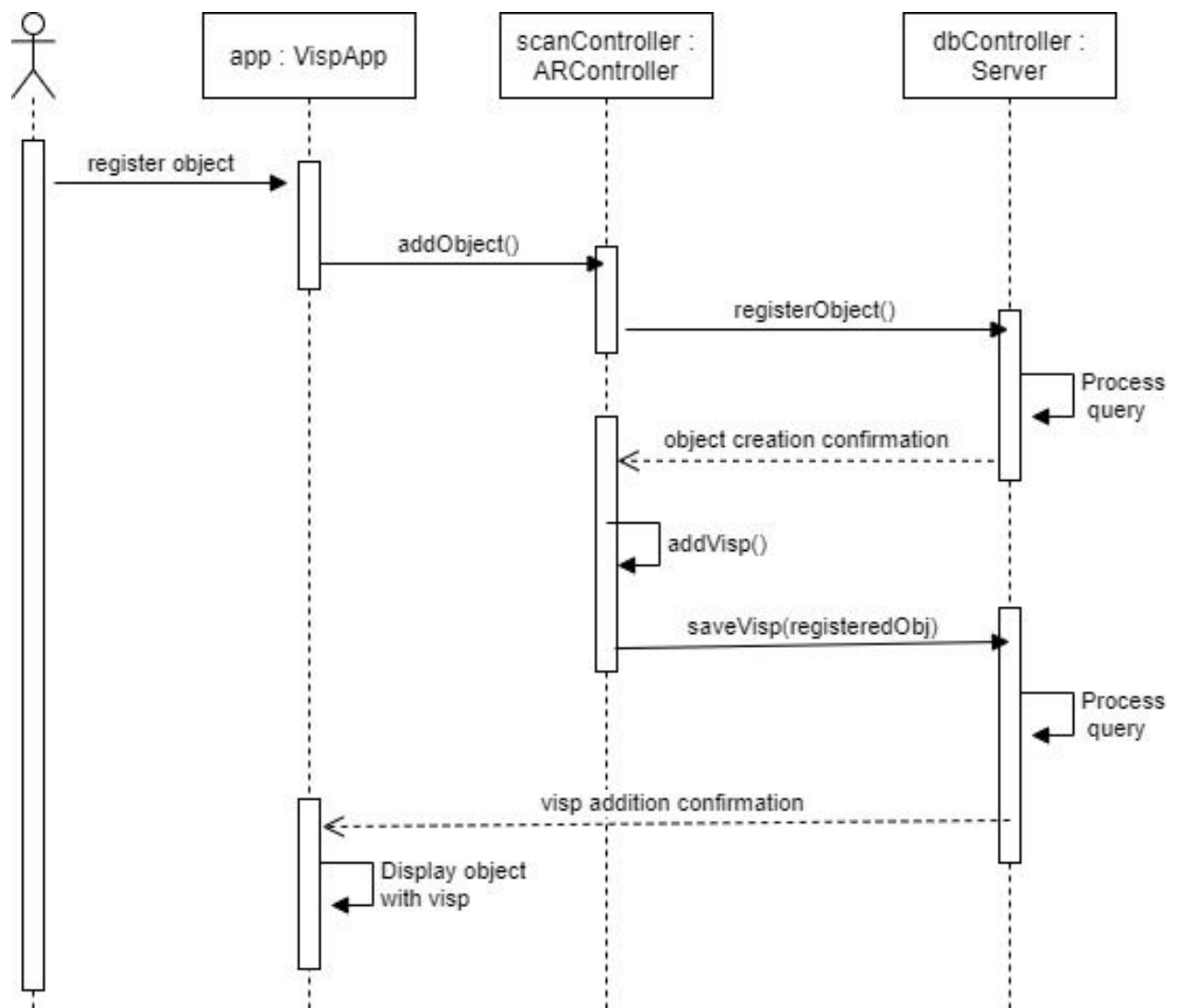
Figure 4: Sequence Diagram for registering objects and adding visps to them

2.5.4.2. Activity Diagram
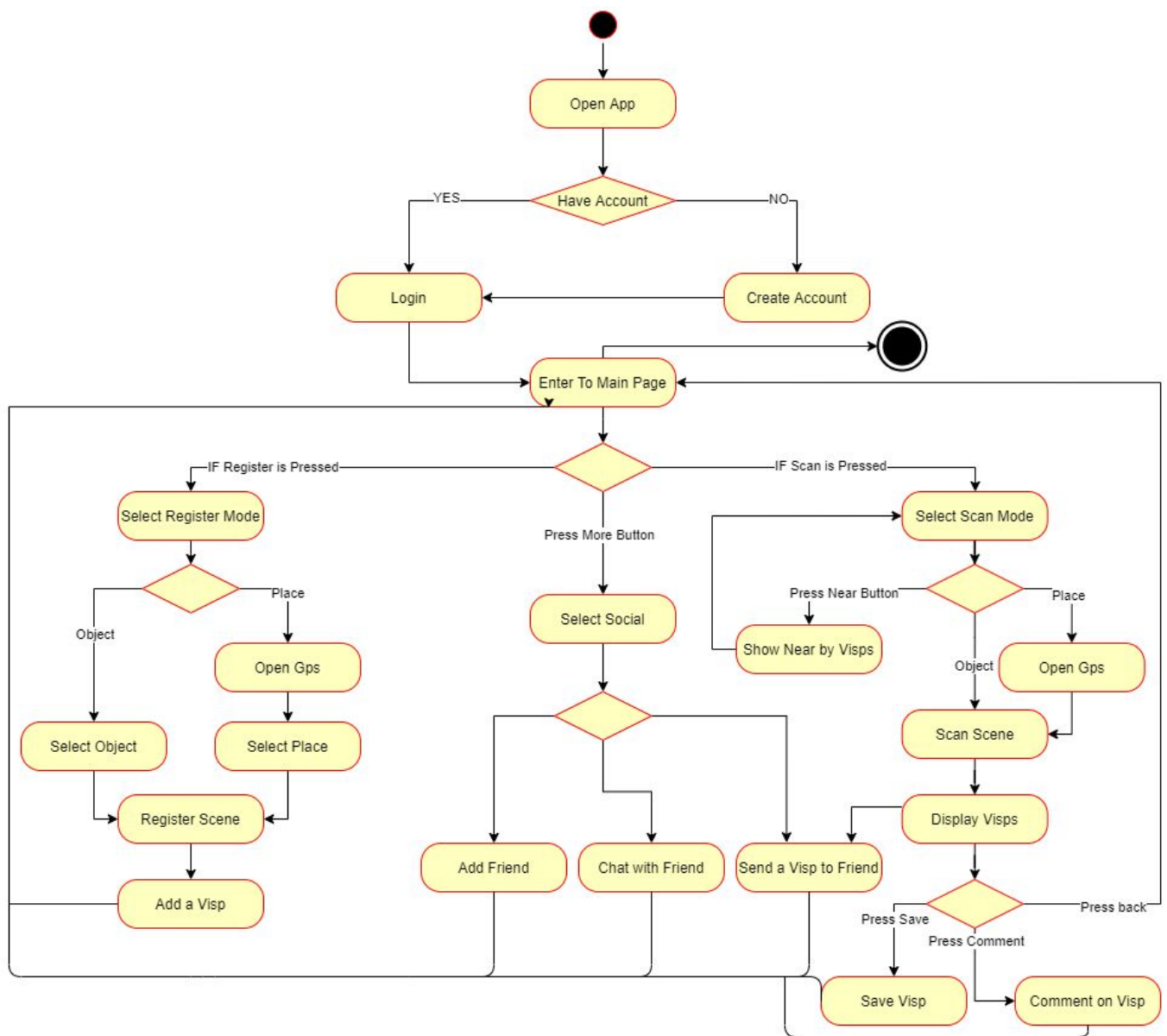
Figure 5: Main Flow Activity Diagram

2.5.5.User Interface - Navigational Paths and Screen Mock-ups
2.5.5.1. Login and Register Page
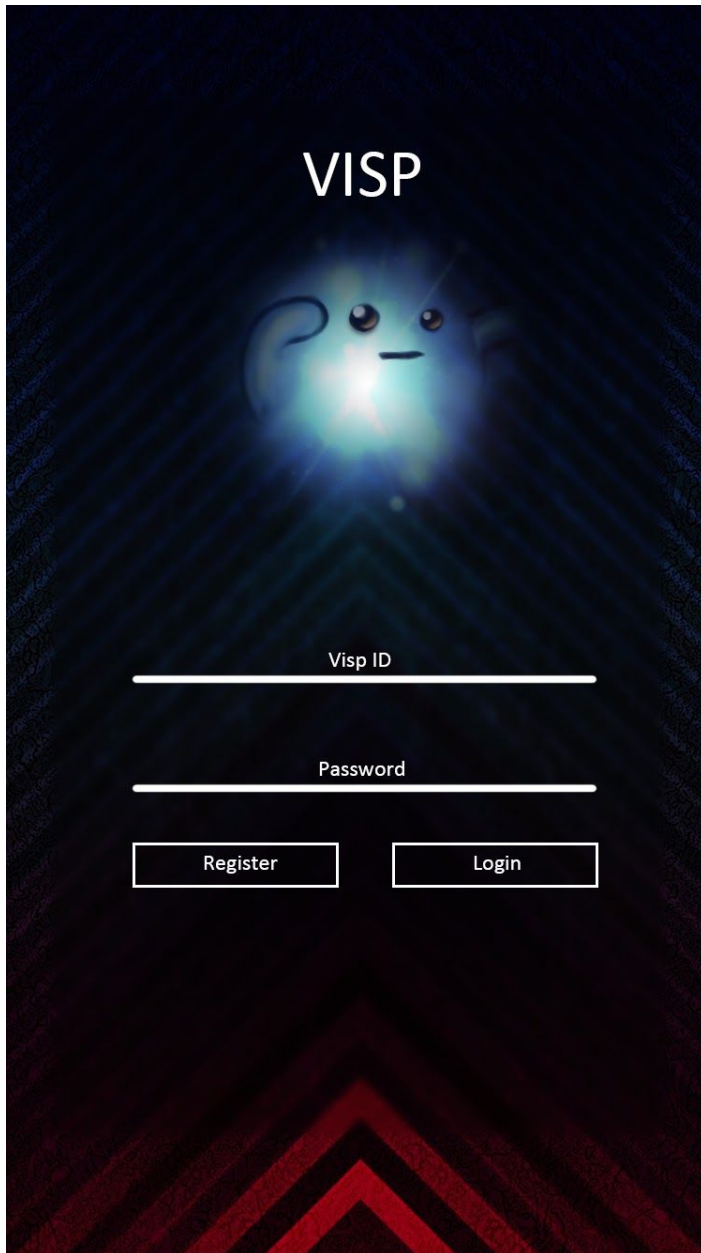
Figure 6: Login Page
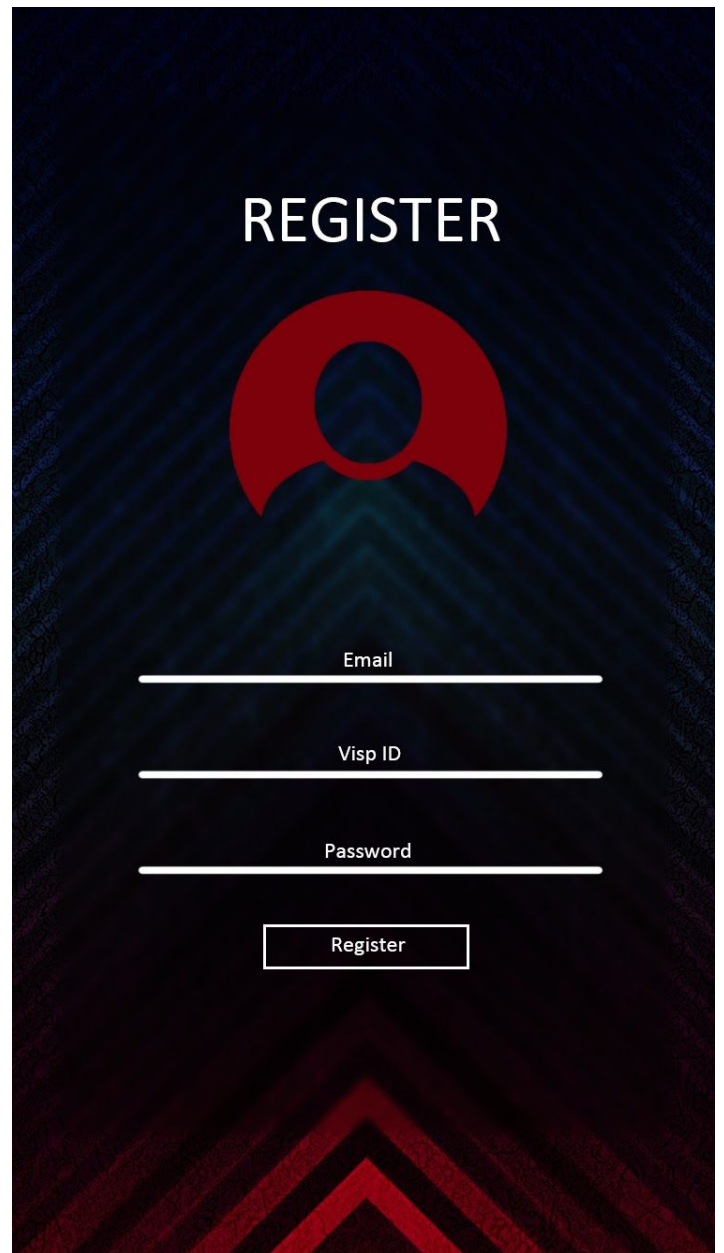
Figure 7: Register Page

2.5.5.2.Add Visp Page (Main Page)

Figure 8: Page for adding a Object Visp
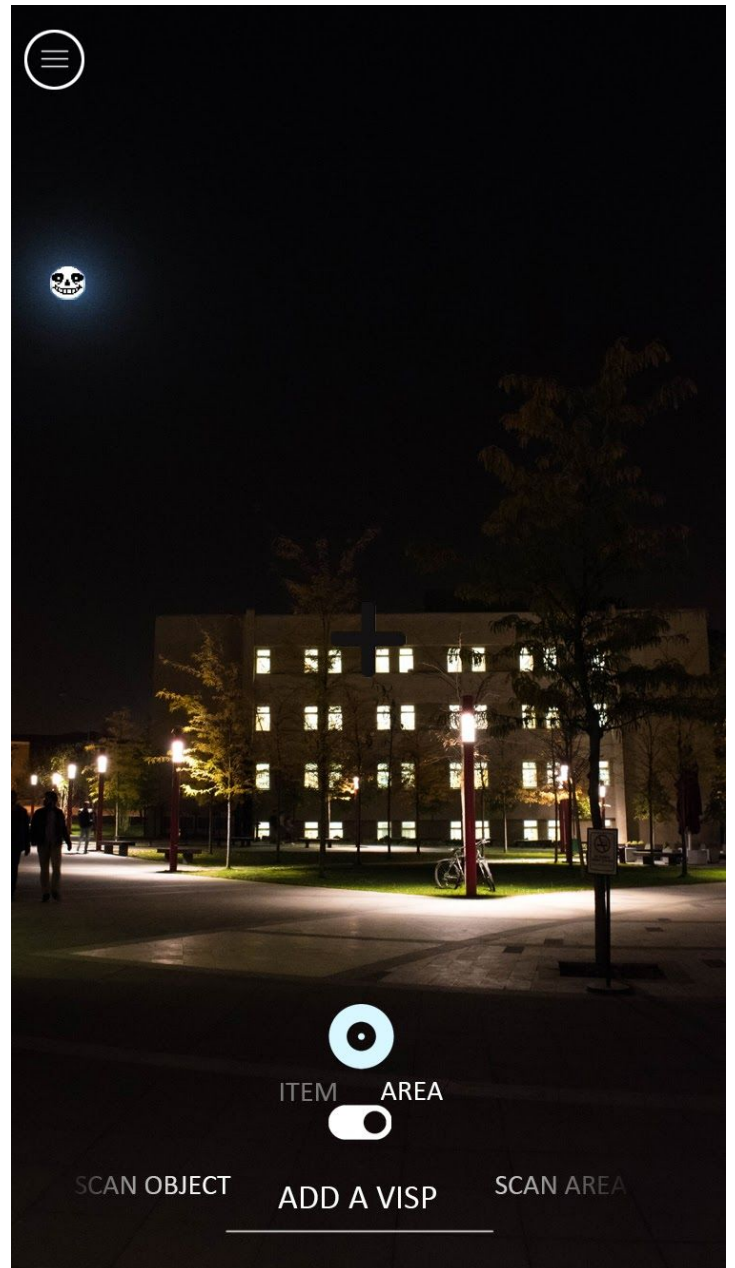
Figure 9: Page for adding a Area Visp

2.5.5.3. Scan Object and Area Page

Figure 10: Page for scanning an Object
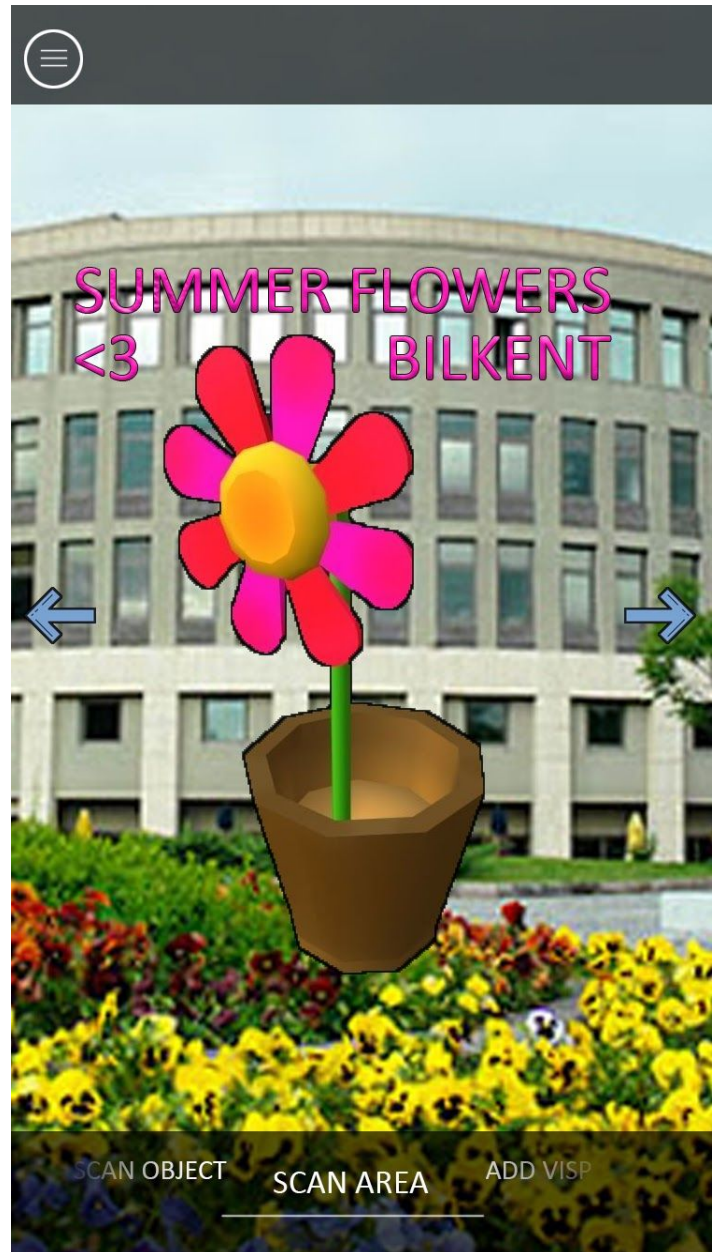
Figure 11: Page for scanning an area

2.5.5.4. Menu and Profile Page
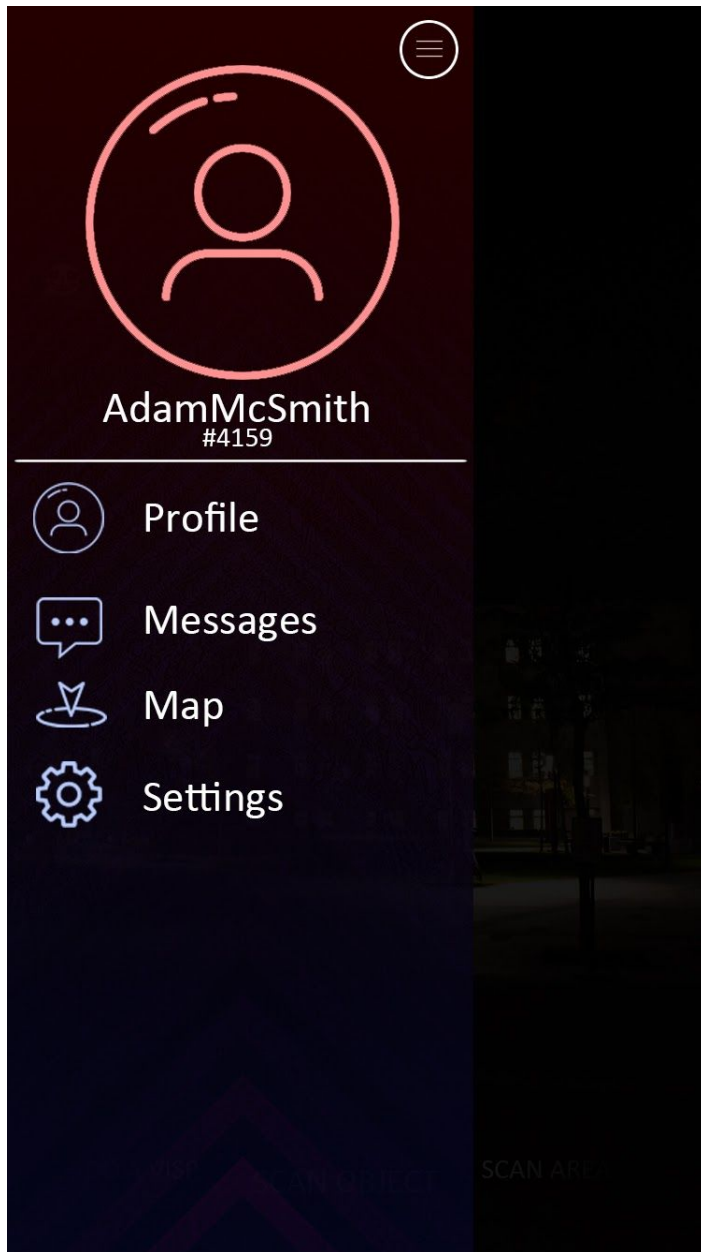
Figure 12: Menu Page/Pop up

AdamMcSmith
#4159

Profile

Messages

Map

Settings

Figure 13: Profile Page

AdamMcSmith
#4159

Info   Friends

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

2.5.5.6. Map Page

Figure 14: Menu Page/Pop up

3. Other Analysis Elements

3.1. Consideration of Various Factors in Engineering Design

Public Health

In terms of Public Health, the only effect that Visp may have is motivating people to go to near some locations on foot to see what other people have shared on specific objects or locations. That is, it may motivate them to walk.

Public Safety

In terms of Public Safety, the application may lead people to attach media files to some private locations or objects and it can make the people who own these properties uncomfortable. That is, it may disturb some people because it gives people to share any content by relating to any object or place.

Economic Factors

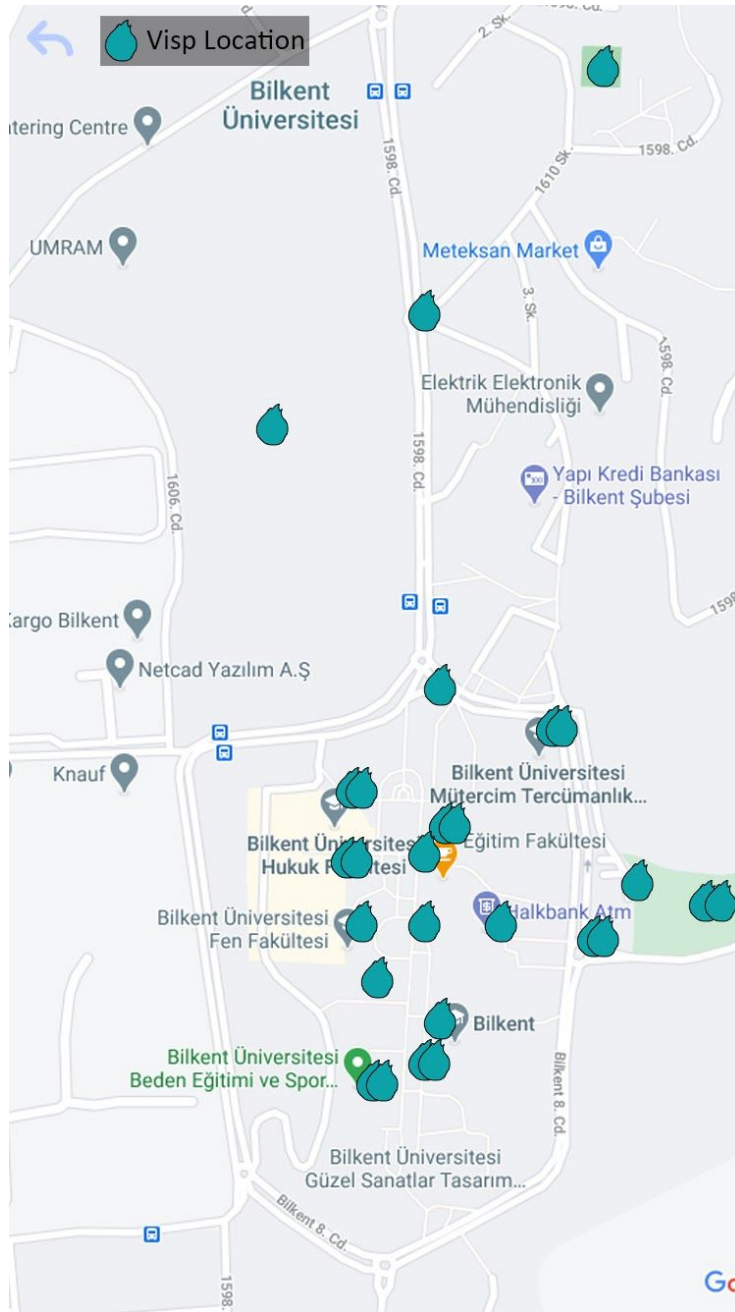In the next iterations of Visp, it is planned that the markets, restaurants and enterprises can use the AR feature of the application to advertise their products in a better way so it could increase the sales and so the economy will be affected positively.

Global Factors

In terms of globalization, Visp may have an effect on tourism in a way that people may travel to other cities or countries to view and share things on objects or places.

Cultural Factors

In terms of culture, because we are planning to enter the market first in Turkey, we have made some search about how Turkish social media users differ from other countries and found that the Turkish users are using social applications mainly to follow others in order to learn and interact socially [2]. Because Visp is a social platform that people share and view the media shared by people, we have a forecasting that Visp will be affected by the cultural factors strongly.

Environmental Factors

In terms of environment, Visp will not have any effect on the environment.

Factors	Effect Level	Effect
Public Health	Low	People can walk to near places to see the shared content but it is a low possibility so the effect is considered as low.
Public Safety	Medium	The application has a possibility to lead people to invade the privacy of other people.
Economic Factors	High	With augmented reality technology, the advertisements methods will evolve and the economy will be affected positively.
Global Factors	High	Visp may have a major impact on people to travel to other countries.
Cultural Factors	Medium	The culture of the users affects the direction of Visp strongly.
Environmental Factors	None	Visp will not have any effect on the environment.

Table 1: Factors Summarized

3.2. Risks and Alternatives

Risk	Likelihood	Outcome	Suggested Solution
Employee Turnover	Low	One or more than one of the employees may leave the project because of course withdrawal or any other reason.	An emergency meeting should be established and the work of the left employee should be distributed to the other employees because there is no chance to find new teammates.

Poor Productivity	Medium	Because of other courses' works or other problems the team may lose their productivity	Find ways to increase the motivation of the team by establishing some organizations such as online gaming nights
Lack of Sufficient Resources	Medium	We may need to invest some money to meet the requirements of the project and it may be more expensive than we expected.	The team should make their research on the expected expenses correctly and everyone should make their budget plan accordingly
Specification Breakdown	High	While implementing the project, it may show up that the specifications are incomplete or the requirements are conflicting.	The team should gather up immediately and solve the conflict.
Wrong Scheduling of Deliverables	Medium	Some team members may be late to complete some deliverables of the project for some reason.	These team members should contact the other team members and request their help to complete their tasks.
Lack of Communication between team members	Low	The team may forget to communicate with each other about the project for a	The team should always have communications set up through

		long time	Whatsapp and Discord channels.
Failing on integrating the components of the application	Medium	After completion of the components of the project, the team may fail to integrate these components.	The integration tests should be done consistently throughout the project. It shouldn't be left to the end of the project.
Wrong Choice of Technologies	Medium	The team may decide wrong technologies to use for the implementation of the project.	The team should begin the implementation early so that the advantages and disadvantages of using particular technologies become more clear and inevitable consequences may be prevented in the earlier phases of the project.

Table 2: Risks and Alternatives

3.3. Project Plan

In this part, we have defined the major deliverables of our project to keep track of our processes during the project. For that, first we have identified the main Work Packages and then we have divided them into pieces until they are small enough to manage individually. To show them, firstly we have created a table which shows the main deliverables of the project. Then there is a Work Breakdown Structure (WBS) which shows the subpackages of the deliverables.

3.3.1. Main Deliverables

Main Deliverables	Description	Code
Deliverable 1	Project Specification Report	1
Deliverable 2	Project Website	2
Deliverable 3	Analysis Report	3
Deliverable 4	High Level Design Report	4
Deliverable 5	Low Level Design Report	5
Deliverable 6	Mobile Application	6
Deliverable 7	Presentation and Demo (First Semester)	7
Deliverable 8	Final Presentation and Demo	8

Table 3: Main Deliverables Table

The main deliverables consist of the specification, analysis and design reports, the website, implementation and the presentation of the project.
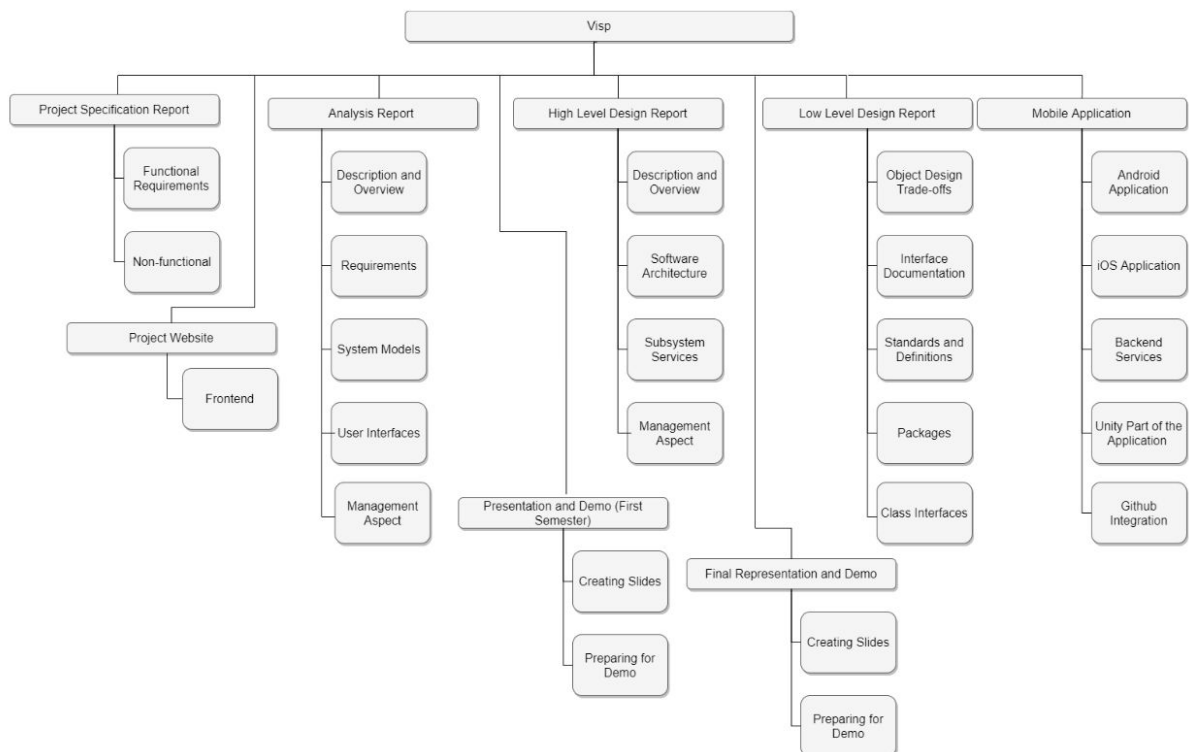
3.3.2. Work Breakdown Structure

Figure 15: Work Breakdown Structure

3.3.3. Work Package Details

Work Package Name: Project Specification Report
Start date: 16.09.2020
End date: 12.10.2020
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: Creating a report that explains what the project is and what functionalities are planned to be included in the project.
Subtasks:
● **Functional Requirements:** That task includes defining the requirements that are related to the user side of the application.
Members Assigned: Alptekin, Muzaffer, Berk
● **Non-functional Requirements:** That task includes defining the requirements that are related to the performance side of the application.
Members Assigned: Enes, İsmail

Work Package Name: Project Website
Start date: 16.09.2020
End date: 12.10.2020
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: Creating a github io website that includes the group member names, project definition and project reports.
Subtasks:
● **Frontend:** That task includes the implementation of the frontend of the project website.
Members Assigned: Muzaffer

Work Package Name: Analysis Report
Start date: 12.10.2020
End date: 21.11.2020
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: Creating the analysis report of the project which includes the definition, explanations of requirements, UML models, interfaces and how the project is going to be managed throughout the year.
Subtasks:
● **Description and Overview:** That task includes the detailed definition and overview of the system.
Members Assigned: TBD
● **Requirements:** That task includes the detailed information about the functional and nonfunctional requirements of the project.
Members Assigned: TBD
● **System Models:** That task includes the system models such as user case models, dynamic models, activity diagram, object class model and some specific scenarios that the application should do.

Members Assigned: TBD

● **User Interfaces:** That task includes the creation of the user interfaces of the application.

Members Assigned: Berk, Alptekin

● **Management Aspect:** That task includes the identification and clarifications of the work packages, project plan, various factors to consider for the project, risks and alternative solutions suggested to these problems, distribution of work between team members and what will be the plan for new knowledge and learning strategies.

Members Assigned: Enes

Work Package Name: High Level Design Report
Start date: 13.12.2020
End date: 21.12.2020
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: The objective is to make the high level design of the project.
Subtasks:

● **Description and Overview:** That task includes the detailed definition and overview of the system.

Members Assigned: TBD

● **Software Architecture:** That task includes deciding on what software architecture to use for the project and clarifications on how to implement them on the project.

Members Assigned: TBD

● **Subsystem Services:** That task includes deciding the subsystem services and clarifications on how to implement them.

Members Assigned: TBD

● **Management Aspect:** That task includes the identification and clarifications of the work packages, project plan, various factors to consider for the project, risks and alternative solutions suggested to these problems, distribution of work between team members and what will be the plan for new knowledge and learning strategies.

Members Assigned: Enes Merdane

Work Package Name: Low Level Design Report
Start date: TBD (Second Semester)
End date: TBD
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: Objective is to make the low level design of the project.
Subtasks:

● **Object Design Trade-offs:** That task includes deciding what to be careful while implementing the project.

Members Assigned: TBD

- **Interface Documentation:** That task includes the clarifications of the interface designs.

Members Assigned: TBD

- **Standards and Definitions:** That task includes defining the standards of the project.

Members Assigned: TBD

- **Packages:** That task includes defining the external packages to be used in the project.

Members Assigned: TBD

- **Class Interfaces:** That task includes defining the interfaces of the classes to be implemented.

Members Assigned: TBD

Work Package Name: Mobile Application
Start date: TBD
End date: TBD
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: Objective is to implement the project specified in the reports.
Subtasks:

- **Android Application:** That task includes implementation and successful deployment of the project to Android platform.

Members Assigned: TBD

- **iOS Application:** That task includes implementation and successful deployment of the project to iOS platform.

Members Assigned: TBD

- **Backend Services and Database creation:** That task includes the creation of the database and backend services.

Members Assigned: TBD

- **Unity Part of the Application:** That task includes the implementation of the unity part of the application for 3D objects and interactions.

Members Assigned: TBD

- **Github Integration:** That task includes the integration of the project to Github to maintain the team collaboration and version control of the application.

Members Assigned: TBD

Work Package Name: Presentation and Demo (First Semester)
Start date: TBD
End date: TBD
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: Objective is to be ready for the first presentation and successfully present the progress in the implementation of the project.
Subtasks:

- **Creating Slides:** That task includes the creation of the presentation sides in which the general structure and applied functionalities are presented successfully.

Members Assigned: TBD

- **Preparing for Demo:** That task includes live presentation of the project functionalities implemented so far.

Members Assigned: TBD

Work Package Name: Final Representation and Demo
Start date: TBD
End date: TBD
Members involved: Enes, Alptekin, İsmail, Berk, Muzaffer
Objective: Objective is to be ready for the final representation of the project and have a successful presentation and demo sessions.
Subtasks:

- **Creating Slides:** That task includes creation of the presentation slides in which the functionalities of the application are successfully and completely presented.

Members Assigned: TBD

- **Preparing for Demo:** That task includes live presentation of the project functionalities.

Members Assigned: TBD

3.4. Ensuring Proper Teamwork

We are planning to use our Discord server that is created for our project team to keep the meetings in and to record the decisions that we have taken in the meetings. For the task management we are planning to use Trello to keep track of each task using Kanban [3] table which contains the sections "To be done", "In Progress", "To be reviewed", "Done" and "History" sections.

3.5. Ethics and Professional Responsibilities

Firstly, we have to be sure that the user information is not accessible by anyone so the information should be stored encrypted in the database. Secondly, the users should not be able to share any violent, racist, and sexual content in the application.

3.6. Planning for New Knowledge and Learning Strategies

The planning process will be agile [4] for our project, which means we will always revise our previous work plan according to the experiences that we have gained throughout the implementation of the project.

The learning strategy we are planning to use through the project is to start implementation early and helding consistent weekly meetings to share the experience we have gained personally with other people. The reason why we are planning to use that strategy is due to the complexity of the project and the experience of the project team on such projects.

We are planning to use YouTube [5] videos, Udemy [6] courses, Medium [7] articles, Unity tutorials [8] for the learning process of the project.

4. Glossary

Visp: Name of our application and the name of user created, scanned content.
Visper: Name we give to users of our.
Work Package: Smallest amount of project related work that we keep track of.
Work Breakdown Structure: The structure that defines our project in terms of our work packages and deliverables.

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