

Construction Application

(VIRTUAL SOLUTION FOR CONSTRUCTION)



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Construction Application

(VIRTUAL SOLUTION FOR CONSTRUCTION)

BS in Information Technology 2016-2020

A project submitted in partial fulfillment of the
requirements for the award of the degree of
BS in Information Technology

**Division of Science and Technology,
University of Education, Lahore
2020**

“I hereby declare that I have read this project documentation and in my opinion this project is sufficient in terms of scope and quality for the award of the degree of **BS in Information Technology**.”

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DECLARATION

I declare that this project “**Construction Application (Virtual Solution for Construction)**” is the result of my own research and development. This project has not been accepted for any degree and is not concurrently submitted in candidate for any other degree. At any time if this statement is found to be incorrect even afterwards of BS in Information Technology, the university has the right to withdraw my BS in Information Technology degree.

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under the supervision of “**Ansif Arooj**”. No part of this project has been submitted
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ABSTRACT

Create a map for our house, office or any other building cost us millions and an expert architecture. So, we come with this solution of VR construction app in which any user can create any type of map for any type of building without any prior knowledge of engineering or architecture engineering. In this mobile application user just need a VR box and smart phone. User will drag the walls with VR remote controller and make a room and then by combining rooms make a building after completing the building user can drag and place the furniture and then customize all the objects by changing its color and moving its place. Furthermore, user can measure the area in real world.

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CHAPTER NO. 1: Gathering & Analyzing Information

1 Introduction:

To construct home or any new infrastructure of building is very time consuming and toughest job. First, we have to consult an architecture to make maps which also cost a lot of money then to do any changing or add new idea we also have to do that under his supervision because the owner does not anything of this process. Our application fills this gap between architecture and the owner. we provide the facility to make 3D Maps of any infrastructure. Just by a mobile application and VR box. The application includes a basic onboarding which helps the user to go through the application and user just have to drag and drop the walls by moving his hand also drag and drop furniture. After that we can calculate its total cost. Our application is very feasible and customizable we can merge and split different infrastructures.

Problem Statement:

In this era making, 3d maps are too expensive and only experts can make it. To construct a new home, office or any type of building we have to consult an architecture or a firm. also, we don't have any knowledge regarding maps so, to make any changing or implement new designs we have to consult again with architecture or a firm. this whole process is too expensive and time taking. Also, only the architects verify that our idea is implementable in the real-world or we have to make some changing to implement them.

1.1 Goals and Objectives:

- Create a building using 3D walls with Mouse Input
- Move and place the furniture within the building by using Mouse Input
- Change color and tiling of walls and furniture by using Mouse Input
- Calculate the building area in real time
- Customize the existing building and furniture
- Merge and split the building

Research Questions:

RQ1: - How can user create 3D buildings with our app? And how they interact with 3D walls?

RQ2: - How user can customize and interact with furniture in buildings?

RQ3: - How user can customize 3D walls in our application?

RQ4: - How user can calculate buildings area in real world?

RQ5: - How user can merge and split the existing buildings?

2 Methodology:

2.1.1 Available Methodologies:

The available methodologies are mentioned below:

- **Waterfall:**

The waterfall model is a breakdown of project activities into linear sequential phases, where each phase depends on the deliverables of the previous one and corresponds to a specialization of tasks. The approach is typical for certain areas of engineering design. In software development, it tends to be among the less iterative and flexible approaches, as progress flows in largely one direction ("downwards" like a waterfall) through the phases of conception,

initiation, analysis, design, construction, testing, deployment and maintenance. As an internal process, the Waterfall methodology focuses very little on the end user or client involved with a project. Its main purpose has always been to help internal teams move more efficiently through the phases of a project, which can work well for the software world.

- **Scrum:**

Scrum is an agile way to manage a project, usually software development. Agile software development with Scrum is often perceived as a methodology; but rather than viewing Scrum as methodology, think of it as a framework for managing a process.

1. Helps save time and money
2. Encourages teamwork
3. It is easy to use

- **Agile:**

AGILE methodology is a practice that promotes continuous iteration of development and testing throughout the software development lifecycle of the project. Both development and testing activities are concurrent unlike the Waterfall model. The agile software development emphasizes on four core values.

3 Chosen Methodology:

We will use the agile methodology for our project.

3.1.1 : Reasons for Chosen Methodology:

The **agile** method anticipates change and allows for much more flexibility than traditional methods. Clients can make small objective changes without huge amendments to the budget or schedule. ... This method saves the client money and time because the client tests and approves the product at each step of **development**.

CHAPTER NO. 2: Software Requirement Specification

2.1 Stakeholders Characteristics:

2.1.1 Primary Stakeholders:

Customer:

The customer will interact with our system to build 3D environments for their homes, offices and other buildings.

Admin:

The admin will look over the app, provide continuously updates to make application more user friendly, fast and act as customer support.

2.1.2 Secondary Stakeholders:

Architectures:

Architectures can also sell and buy maps and user can interact with them to approve their maps and for suggestions. They can also use this application to do their projects whenever they have to make a map for any type of infrastructure, they can make this in our application and then export on any other application or platform.

Civil Engineers:

Civil engineer can do their town planning and view maps in 3D view also they can do some amendments according to their requirements. Civil engineers can also give suggestion and verify that is it possible to construct it in real world.

2.3 Functional Requirements:

The main functional requirements of Construction Application are following: -

| No. | Requirement | Description |
|-----|---------------------|---|
| FR1 | User Authentication | <p>This process allows the user (especially child) to create an account in order to interact with the application. If any user has already account created, he/she can Login his/her account by providing the authentication credentials required that is</p> <ul style="list-style-type: none">• Login Id• Password <p>These credentials will be sent to the server to Match the data. Then access will be granted. Another functionality is the</p> <ul style="list-style-type: none">• Forgot Password <p>Forgot password functionality will recover the user forgotten password by some verification code.</p> |
| FR2 | Choose Terrain | <p>To start construction user, have to choose the area and terrain in which he/she wants to make a building. User can choose area of different types like forest, hills, grassy road etc.</p> |
| FR3 | Drag & Drop | <ul style="list-style-type: none">• Walls <p>In this module user can drag the existing walls to make a room and then combine rooms to make a building</p> |

| | | |
|-----|---------------------|--|
| | | <ul style="list-style-type: none"> Furniture <p>After making the building user can drag and place the furniture with in the rooms. Some of the 3D models for furniture will be available such as lamps, Bed, table, chairs, Sofa, Mirrors, Books, cutlery etc.</p> |
| FR4 | Customize Buildings | <p>After making the building and placing the furniture user can also do customization like: -</p> <ul style="list-style-type: none"> Merge and Split Buildings <p>In this portion user can merge and split the existing buildings to make new one.</p> <ul style="list-style-type: none"> Customize Color and Tiling <p>Also, user can change color of wall and furniture. They can apply different type of tiling on them and place different textures to match the whole color scheme.</p> |
| FR5 | Calculate Area | <p>After completing the whole building and doing all the customization user can calculate the total area of his building. User can also do the sub-calculations like area of each room, each wall etc.</p> |
| FR6 | Admin Panel | <p>This interface will be designed for the Admin of that Application to control and monitor the activities and records of the users. Admin will Perform some tasks as:</p> <ul style="list-style-type: none"> Manage user accounts Managing user's record Updates |

2.4 Non-Functional Requirements:

| No. | Requirement | Description |
|-----|---------------|---|
| FR1 | Response Time | The response time be minimum and performance will be fastest of the application. The response time depend on the GPU of device because it is responsible of rendering 3D models on screen. And the VR remote is responsible for moving objects around. To get maximum performance and lowest response time we recommend GPU of snapdragon and VR remote of a international brand (Samsung, Google, Huawei). |
| FR2 | Scalability | The application will manage all the scalability automatically. For starting it can store 1k user data and as the user increase the space will also be increased. Because we are storing it on clod and using "Pay as you Go" policy so scalability will be handled by the google cloud itself |
| FR3 | Reliability | We are adding analytics on each module which will report all the crashes and ANR's so we can handle it on each upgrade making our application most reliable and useful. |
| FR4 | Maintenance | We will upgrade our application on monthly bases also we will resolve the client issues in each upgrade depending on the reviews and analytics report. |

| | | |
|-----|-----------|--|
| FR5 | Integrity | The terms and policies will be defined and customer have to accept these to start using the application. The customer data will be secured and confidentiality will be maintained. |
| FR6 | Recovery | There will be two copies of customer data and customer can retrieve them anywhere and anytime. The application will be connected to cloud and each infrastructure will be saved. In case customer deleted the app they just have to install app and connect it with google play account and then all the data will be automatically recovered. |

Chapter No. 03: Analysis

3.1 Use Case Diagrams:

3.1.1 Customer:

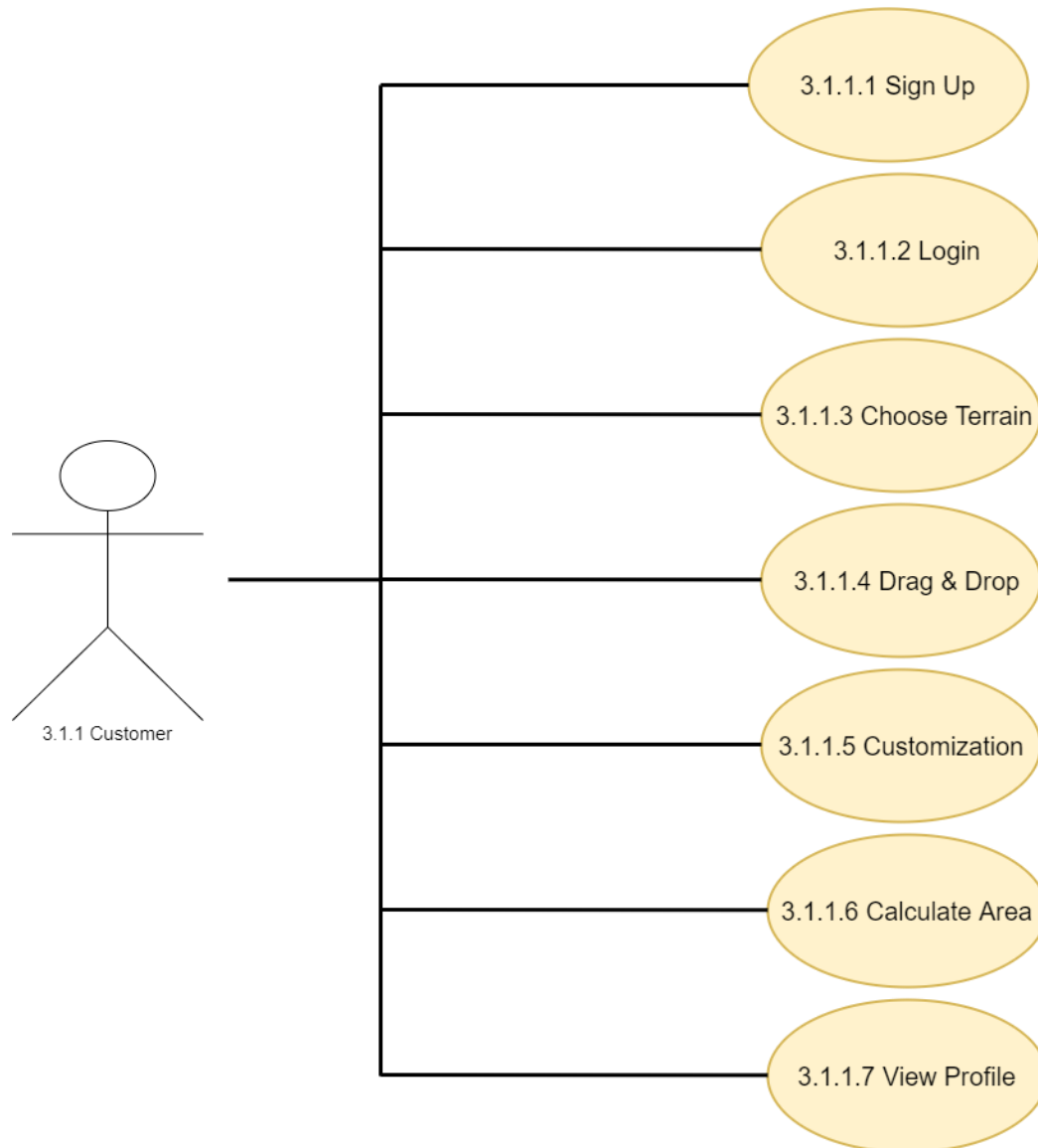


Figure 3.1.1 Customer Use Case Diagram

3.1.2 Admin:

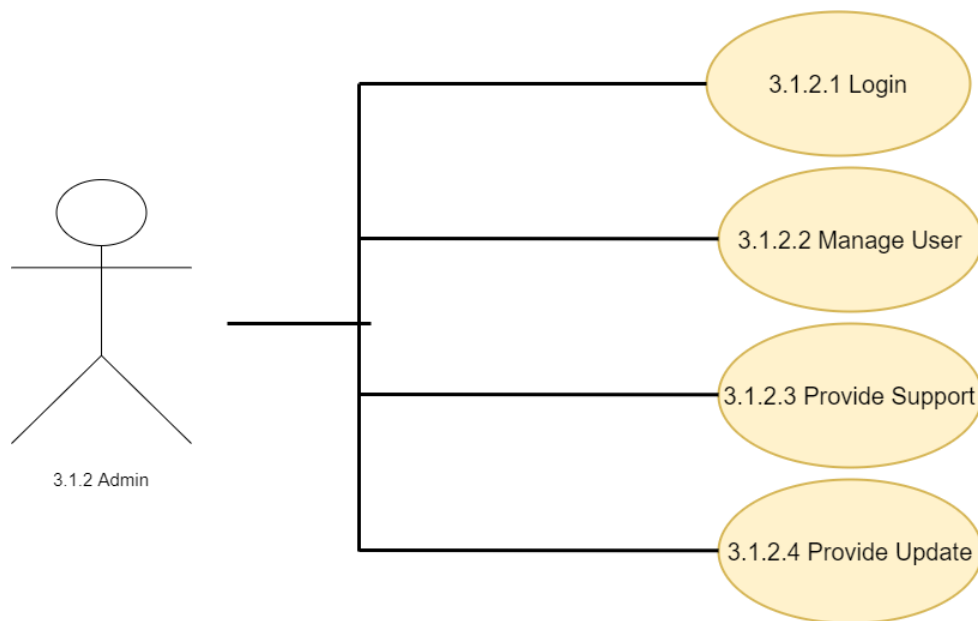


Figure 3.1.2 Admin Use Case Diagram

3.2 Use Case (UC) Scenarios:

UC Number: 1.1

UC Name: Signup

Actors/Stakeholders: Customer

Goals: The Customer can connect to the system and can create their account.

Related Use Case: None

Preconditions: The customer must have internet access.

Summary:

The customer who wants to create any type of 3d model must have an account, for this purpose he/she would have to sign up. The customer can sign up by

Steps/Success Story/Success Scenario:

1. The customer connects to the system.

2. Download and Install CA.
3. Click on the signup button to create account.
4. The customer adds his/her information.
5. The customer clicks on create account button.

Post Conditions:

1. The customer has access to the functionality of the Application.
2. Customer can choose terrain.

Alternative Scenario:

1. The customer already has an account.
2. Invalid customer account or password

Frequency of use: Every time the user wants to access the system as a registered user.

UC Number: 1.2

UC Name: Login

Actors/Stakeholders: Customer

Goals:

The primary goal of login is to authenticate the user as a customer by his/her unique Email/Password and given access to the system.

Related Use Case: Signup

Preconditions: The customer must have a valid account to login.

Summary:

Customer will be logged in the system and can check all available terrain categories and select category.

Steps/Success Story/Success Scenario:

1. The customer connects to the system.
2. Open Application
3. The customer enters his/her username and password.
4. Then press the login button.
5. The system validates the username and password.
6. The homepage will appear.
7. The customer has successfully logged in.

Post Conditions:

1. The customer can perform a list of actions.
2. The customer can choose terrain category.

Alternative Scenario:

1. Invalid account, username or password.
2. The User has no privilege to login.

Frequency of use: Every time the user wants to login and Learn.

UC Number: 1.3

UC Name: Choose Terrain

Actors/Stakeholders: Customer

Goals:

The primary goal of this use case is to facilitate the customer to choose terrain according to their need.

Related Use Case: None

Preconditions: The customer has logged into the system and his account.

Summary:

The customer has the view of all available categories and can choose the category according to hi need

Steps/Success Story/Success Scenario:

1. The customer logged into the system.
2. The customer views all the available categories of skills.
3. The customer selects the desired category.

Post Conditions:

1. The customer can drag and drop the 3D model on his chosen terrain.

Alternative Scenario:

1. Customer have not valid account.
2. The chosen terrain is not available.

Frequency of Use:

Every time customer wants to select hi desired terrain according to his need

UC Number: 1.4

UC Name: Drag & Drop 3D Models

Actors/Stakeholders: Customer

Goals:

The primary goal of this use case is to facilitate the customer to drop and drop any type of 3D models on the terrain he chosen.

Related Use Case: None

Preconditions: The customer has logged into the system, his account and chosen a terrain.

Summary: The customer can drag & drop the 3d models on his chosen terrain.

Steps/Success Story/Success Scenario:

1. The customer logged into the system.
2. The customer views all the available categories of terrains.
3. The customer selects the desired terrain.
4. The customer can drag and drop the 3D models by selecting them.

Post Conditions:

1. The customer can customize the available 3D infrastructures.

Alternative Scenario:

1. Customer have not valid account.
2. The chosen category is not available.
3. The chosen 3D model is not moving

Frequency of Use:

Every time customer wants to drag and drop the 3D models according to his need.

UC Number: 1.5

UC Name: Customization

Actors/Stakeholders: Customer

Goals:

The primary goal of this use case is to facilitate the customer to customize the available 3D buildings by merging of 2 or more building, splitting into 2 or more buildings, change color

and tiling of walls and available 3d models.

Related Use Case: None

Preconditions: The customer has logged into the system, his account, chosen a terrain and create at least one infrastructure.

Summary:

The customer can change merges and split buildings also, can change the tiling and color of 3d models.

Steps/Success Story/Success Scenario:

1. The customer logged into the system.
2. The customer views all the available categories of terrains.
3. The customer selects the desired terrain.
4. The customer creates an infrastructure by dragging and dropping 3d models on the terrain.
5. The customer changes the color and tiling also split or merge the buildings

Post Conditions:

1. The customer can calculate the area of the available 3D infrastructures.

Alternative Scenario:

1. Customer have not valid account.
2. The chosen category is not available.
3. The chosen 3D model is not moving
4. The building is not changing color or do any type of customization

Frequency of Use:

Every time customer wants to customize the 3D models according to his need.

UC Number: 1.6

UC Name: Calculate Area

Actors/Stakeholders: Customer

Goals:

The primary goal of this use case is to facilitate the customer to calculate the area of the infrastructure that he /she created in meters, square feet, foot or inches.

Related Use Case: None

Preconditions: The customer has logged into the system, his account, chosen a terrain and create at least one infrastructure.

Summary:

The customer can calculate the area of the infrastructure that he/she created.

Steps/Success Story/Success Scenario:

1. The customer logged into the system.
2. The customer views all the available categories of terrains.
3. The customer selects the desired terrain.
4. The customer creates an infrastructure by dragging and dropping 3d models on the terrain.
5. The customer calculates the area of the infrastructure that he/she created.

Post Conditions:

1. The customer calculates the area of 3D infrastructure in any desired unit.

Alternative Scenario:

1. Customer have not valid account.
2. No 3D infrastructure is available to calculate area

Frequency of Use:

Every time customer wants to calculate the area of 3D infrastructure according to his need.

UC Number: 1.7

UC Name: View Profile

Actors/Stakeholders: Customer

Goals:

The customer can visit his/her profile to view his/her history and make changes in his/her profile.

.

Related Use Case: None

Preconditions:

1. Customer must have login.

Summary:

Customer can view his/her profile and make changes in it.

Steps/Success Story/Success Scenario:

1. Customer must login.
2. Customer can check his/her profile.
3. Customer can view his/her record.
4. Customer can change password & name.
5. Customer can change his/her profile Picture.

Post Conditions:

1. Customer view his/her profile.
2. Change profile setting.
3. Change name and password.
4. Upload profile picture.

Alternative Scenario:

1. Customer has not a valid account.

Frequency of Use: Every time when user login and want to view his/her profile.

UC Number: 2.1

UC Name: Login

Actors/Stakeholders: Admin

Goals:

The primary goal of login is to authenticate the user as an admin by his/her Email/Password and given access to the system.

Related Use Case: Customer Login

Preconditions: The Admin must have a valid account to login.

Summary:

Admin will be logged in the system and can check and manage the overall application.

Steps/Success Story/Success Scenario:

1. The Admin connects to the system.
2. The Admin enters his/her password.
3. Then press the login button.
4. The system validates the username and password.
5. The homepage will appear.
6. The Admin has successfully logged in.

Post Conditions:

1. The system displays a relevant homepage.
2. The Admin can manage accounts of customers.
3. The admin can check profiles, results, feedbacks and make any changes/updates.

Alternative Scenario:

1. Invalid account, username or password.
2. The maximum attempts exceeded.

Frequency of Use: Whenever admin want to login.

UC Number: 2.2

UC Name: Manage Login

Actors/Stakeholders: Admin

Goals:

The goal of this UC is to enable admin to manage the login of all users.

Related Use Case: None

Preconditions:

1. The admin must log into the system.
2. The customer is logging into the system.

Summary:

The admin will manage the login of all the users interacting to the system.

Steps/Success Story/Success Scenario:

1. The admin opens the system in web.
2. The admin logged in to the system.
3. The users logged in the system.
4. Admin manages the login.

Post Conditions:

1. The login is successful.
2. The login is denied.

Frequency of Use: All the time when users are logging in.

UC Number: 2.3

UC Name: Block User

Actors/Stakeholders: Admin

Goals: The admin may be able to block the user if he suspects unauthorized access.

Related Use Case: None

Preconditions:

1. The admin must log into the system.
2. The user is trying to login the system.

Summary:

The admin will block the user if he suspects the unauthorized access. After the 7 wrong attempts of Email or password the user account will be blocked.

Steps/Success Story/Success Scenario:

1. The admin will log in to the system.
2. The admin will manage the login.
3. If an unauthorized user is trying to access the system, he will block that user.
4. After 7 wrong attempts of password or Email the account will be blocked.

Post Conditions:

1. The user account is blocked.
2. The user can request again for a new account.

Alternative Scenario:

1. The user account is not blocked.

Frequency of Use:

Sometimes when the user will exceed the limit of entering wrong password or email.

UC Number: 2.4

UC Name: View Customer Profiles

Actors/Stakeholders: Admin

Goals:

This use case facilitates the admin to view customers' profiles. The admin can visit customer profile for the purpose of information about customer.

Related Use Case: None

Preconditions:

1. The customer must have profile.

Summary: Admin can visit\view customer profiles their infrastructures and history\record of customer.

Steps/Success Story/Success Scenario:

1. The admin will login to the system.
2. Admin can check customer profile.
3. Admin can view history of customer.
4. Admin can view Previous results of customer.
5. Admin can view customer feedback.

Post Conditions:

1. The admin can view customer profile.
2. Admin can view customer history/record.
3. Admin read feedback of customers.

Alternative Scenario:

1. Admin does not have privilege to view customer profile
2. The status of customer profile is not updated.

Frequency of Use: All time the user will log in.

UC Number: 2.5

UC Name: Provide Customer Support

Actors/Stakeholders: Admin

Goals: The Admin can provide any type of support that customers need.

Related Use Case: None

Preconditions:

Summary: Admin can provide any type of help that customer needs.

Steps/Success Story/Success Scenario:

1. Admin must login.

2. Admin check customer message.
3. Admin resolve customer issue either by replying in the form of email or by direct changing the customer records.

Post Conditions:

1. Admin resolve the customer issue.

Alternative Scenario:

1. Admin does not have privilege to user records
2. Customer issue is not resolved.

Frequency of Use: Every time when customer contact the customer support.

UC Number: 2.7

UC Name: Update Application

Actors/Stakeholders: Admin

Goals: The main goal of this UC is to facilitate admin in such a way that he/she can update the application.

Related Use Case: None

Preconditions:

1. Admin must login\must have privileges.

Summary:

Admin first login then update the application to remove any kinds of bugs, add more features and make application more user friendly.

Steps/Success Story/Success Scenario:

1. Admin login to application.
2. Admin update the application

Post Conditions:

1. Admin has successfully updated the application.

Alternative Scenario:

1. Application not updated.

Frequency of Use: Every time when there is need to update the application.

Chapter No. 04: Design

4.1 Use Entity Relationship Diagram:

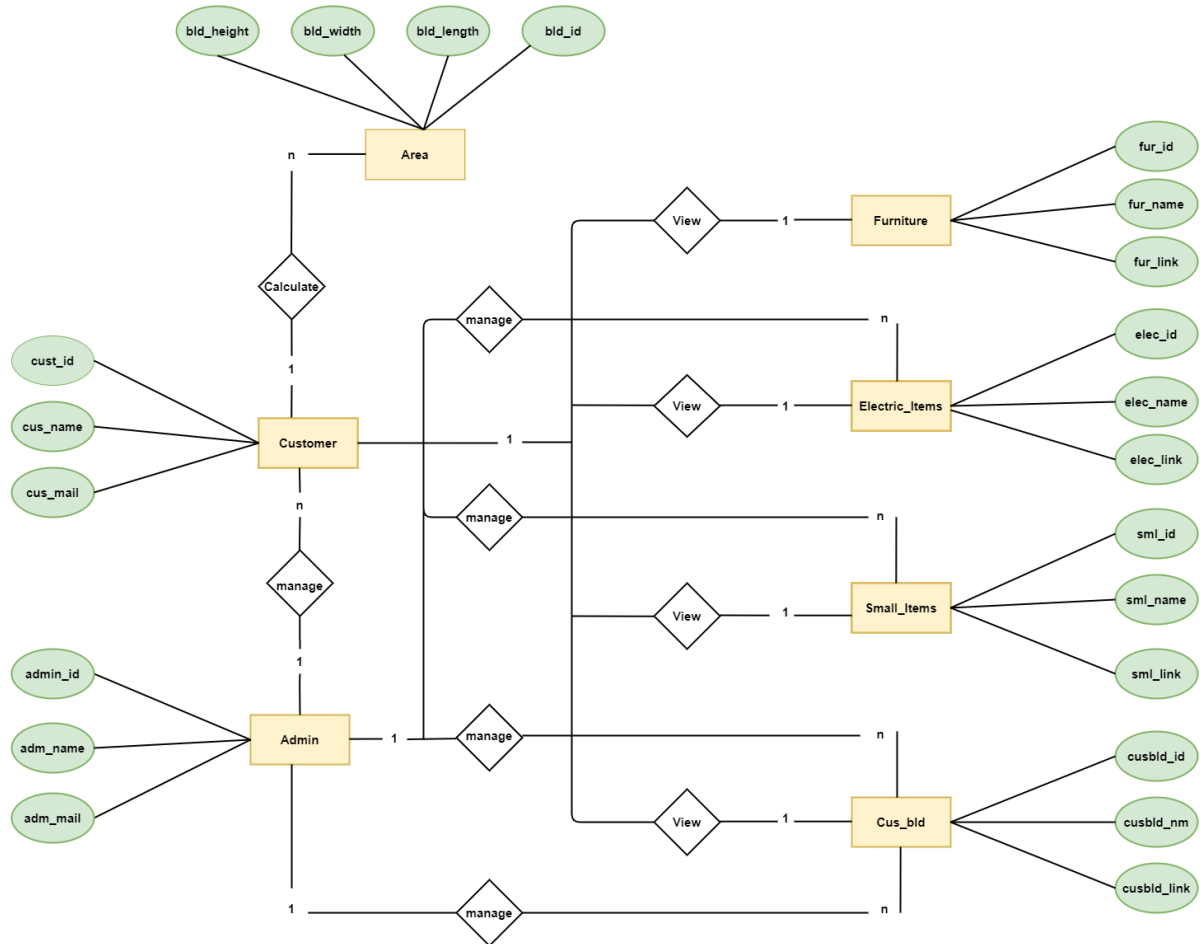


Figure 4.1 3Entity Relationship Diagram

4.2 Data Flow Diagram:

Context Level (Level 0):

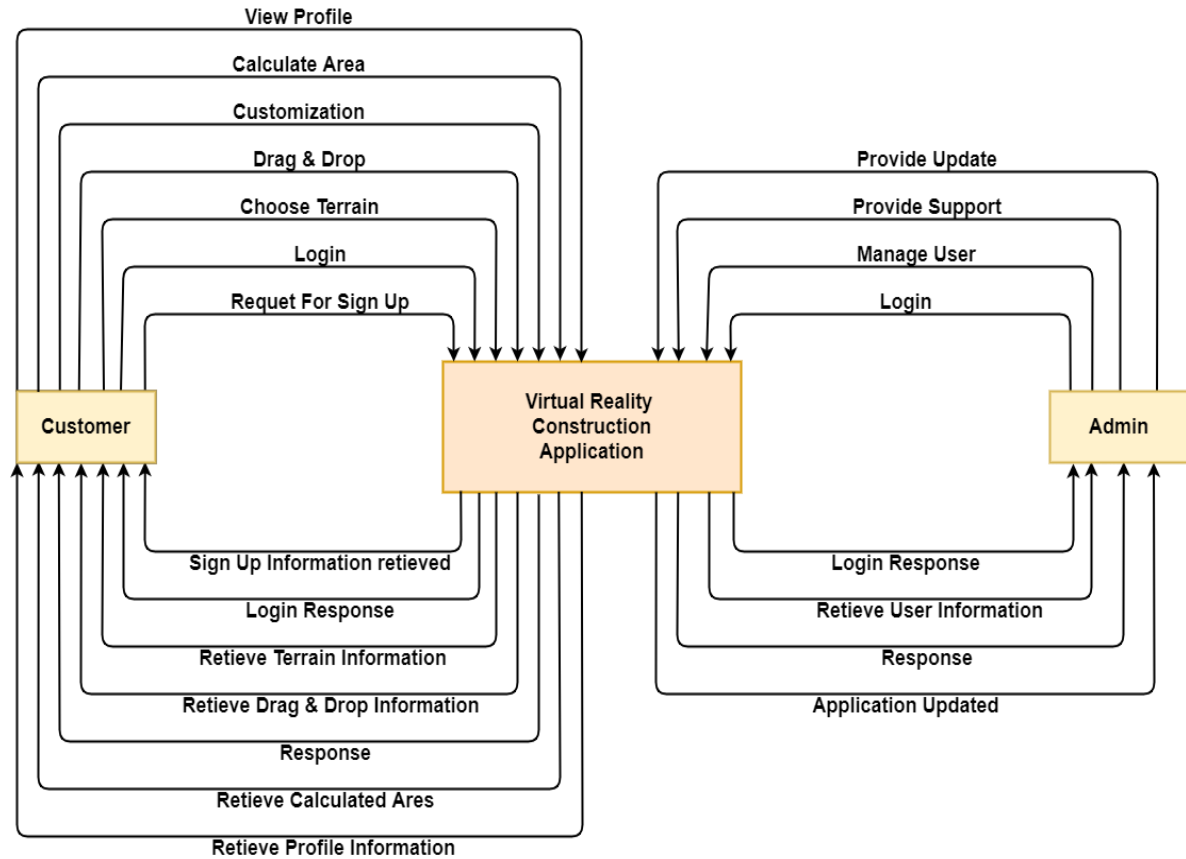


Figure 4.2.1 Context Level Data Flow Diagram

Level 1:

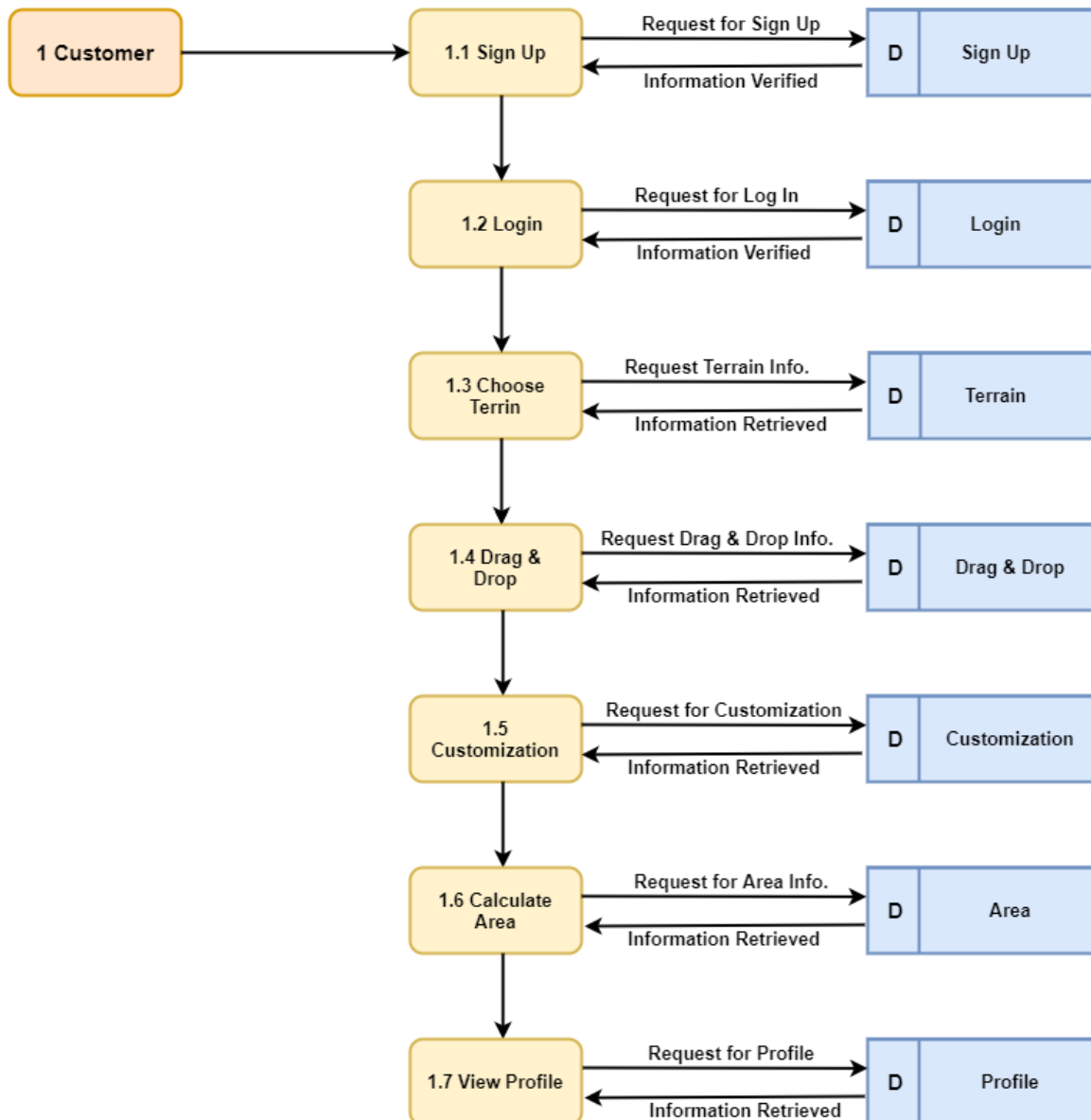


Figure 4.2.2 Customer Data Flow Diagram

Level 2:

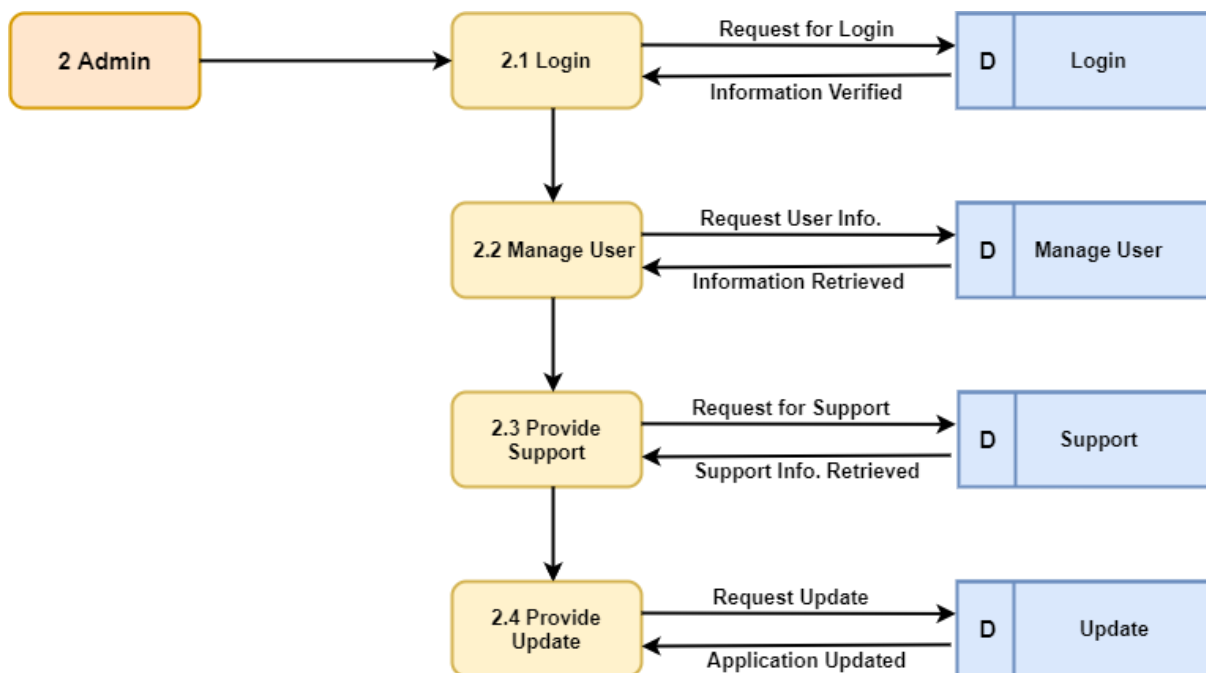


Figure 4.2.3 Admin Data Flow Diagram

4.3 Sequence Diagrams:

For Customer Sign Up

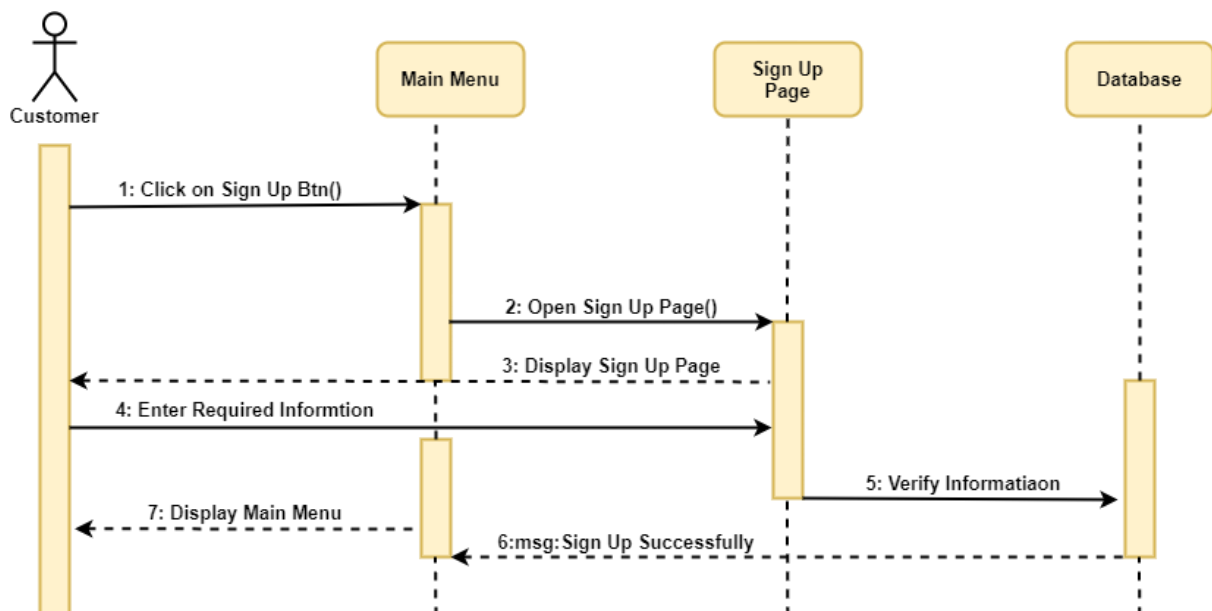


Figure 4.3.1 Customer Sign Up Sequence Diagram

For Customer Login:

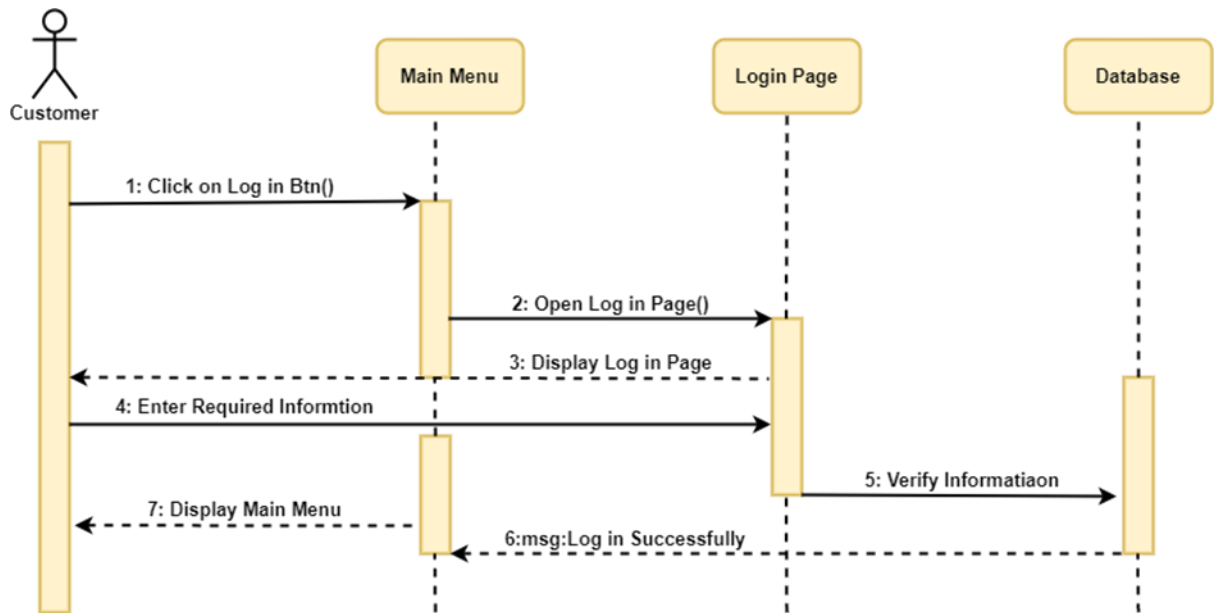


Figure 4.3.2 Customer Log in Sequence Diagram

Customer Choose Terrain:

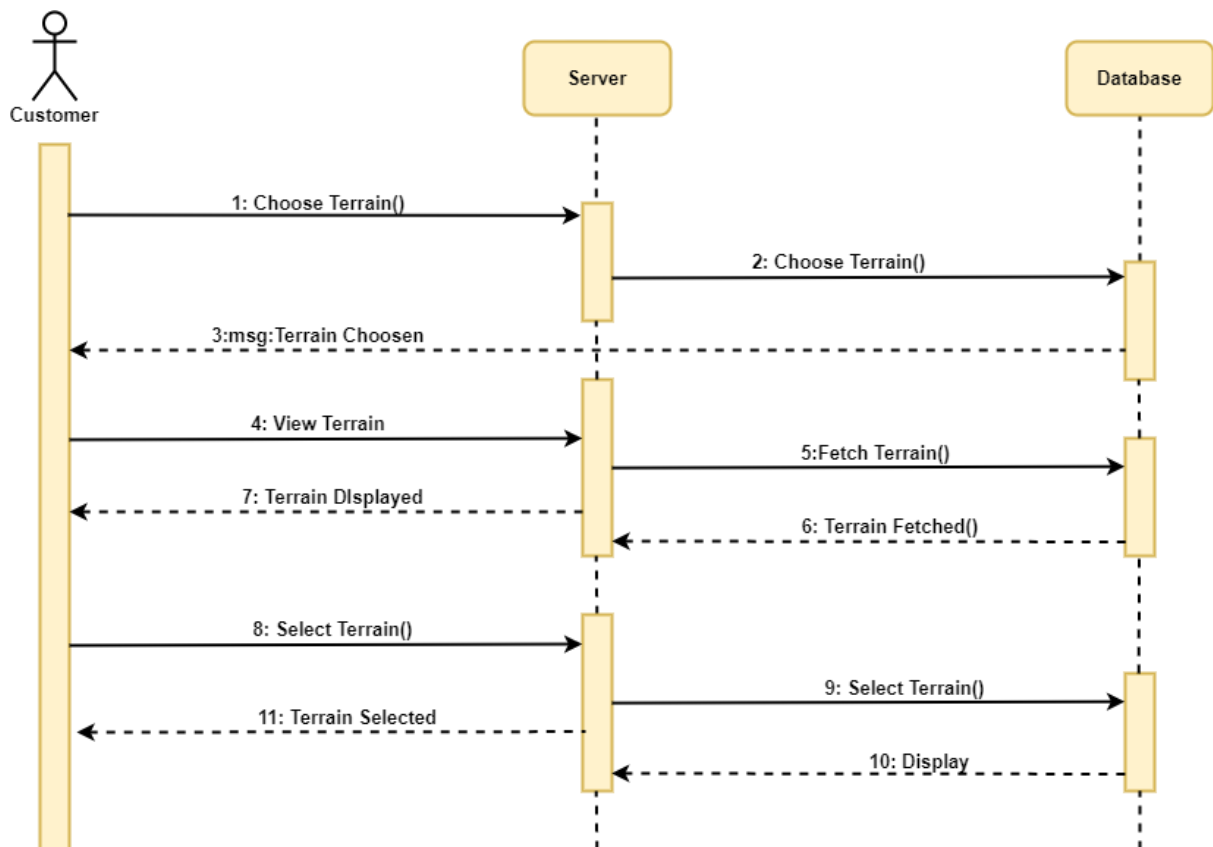


Figure 4.4.3 Customer Choose Terrain Sequence Diagram

Drag and Drop:

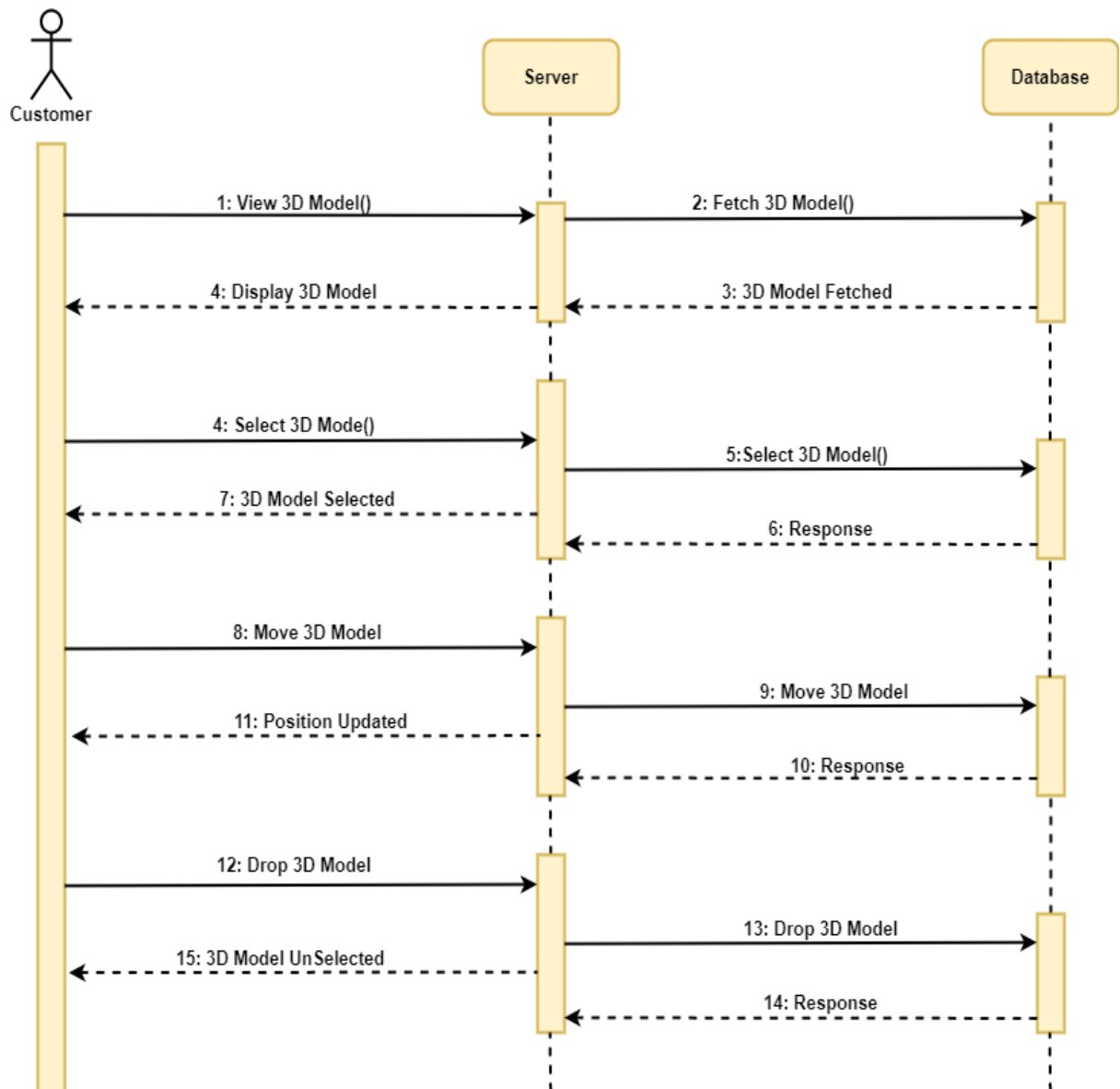


Figure 4.3.5 Customer Drag & Drop Sequence Diagram

Customization:

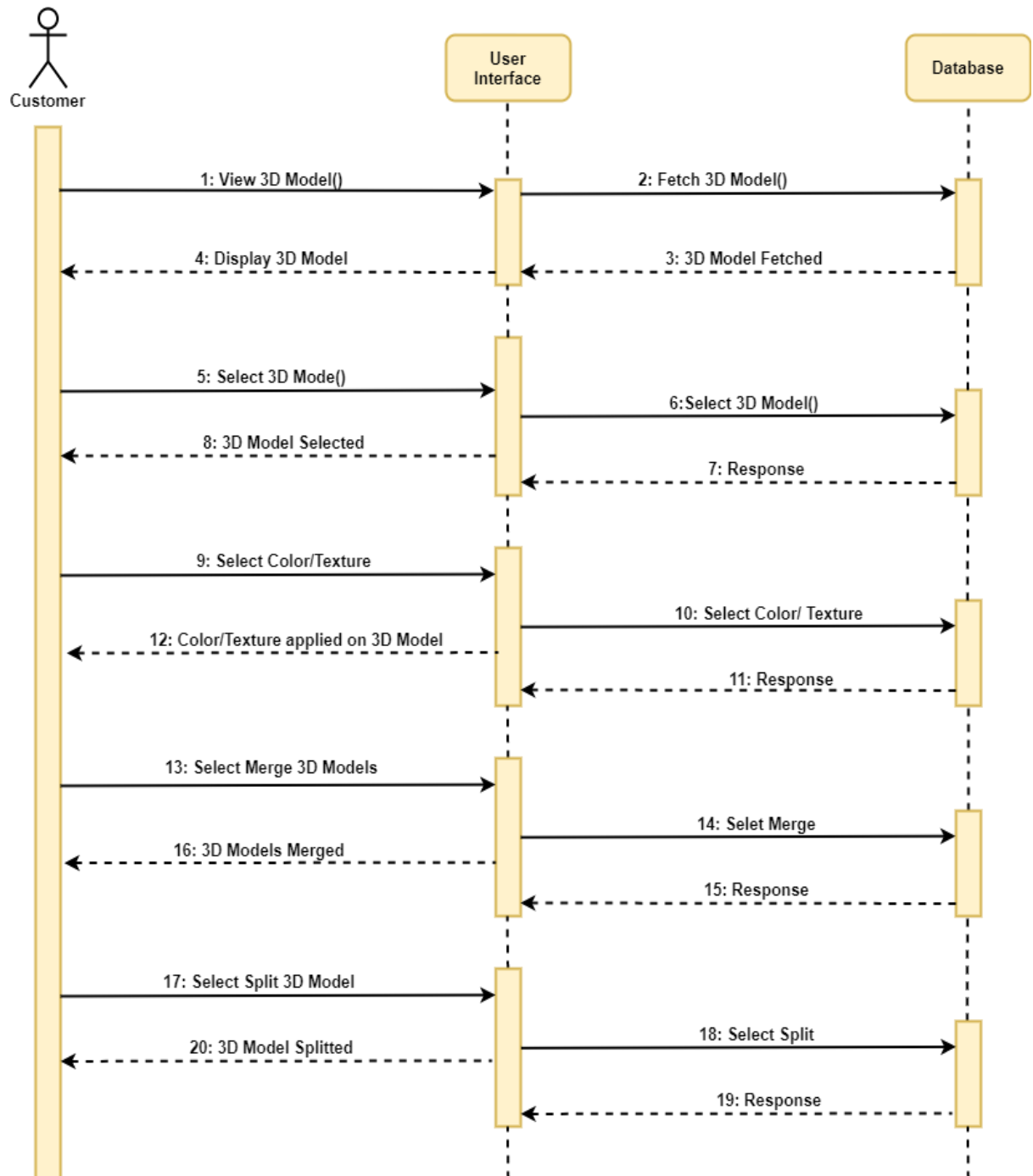


Figure 4.3.6 Customer Customization Sequence Diagram

Calculate Area:

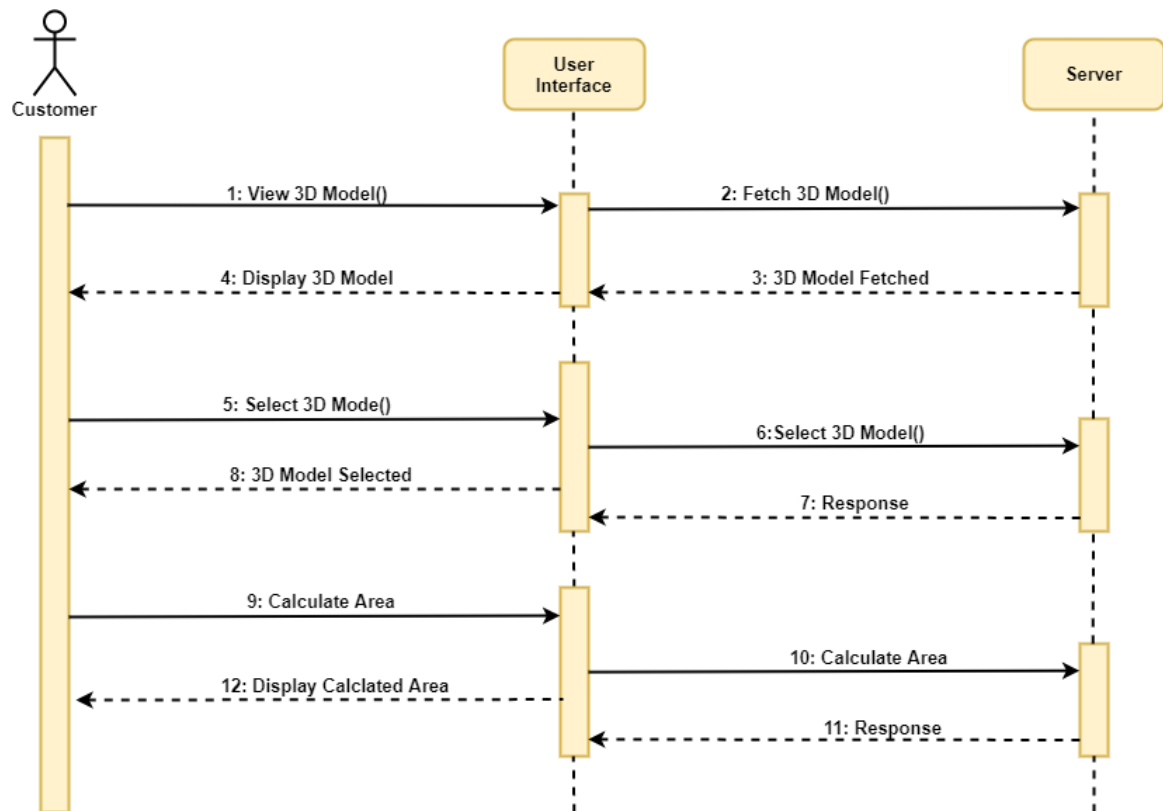


Figure 4.3.7 Customer Calculate Area Sequence Diagram

View Profile:

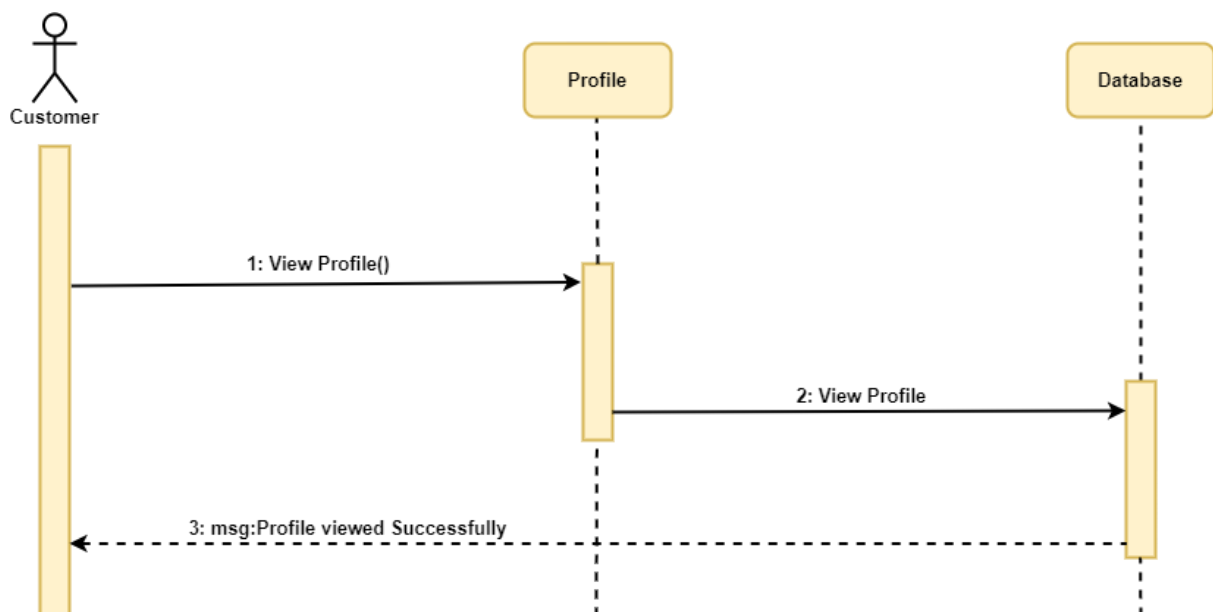


Figure 4.3.8 Customer View Profile Sequence Diagram

Admin Login:

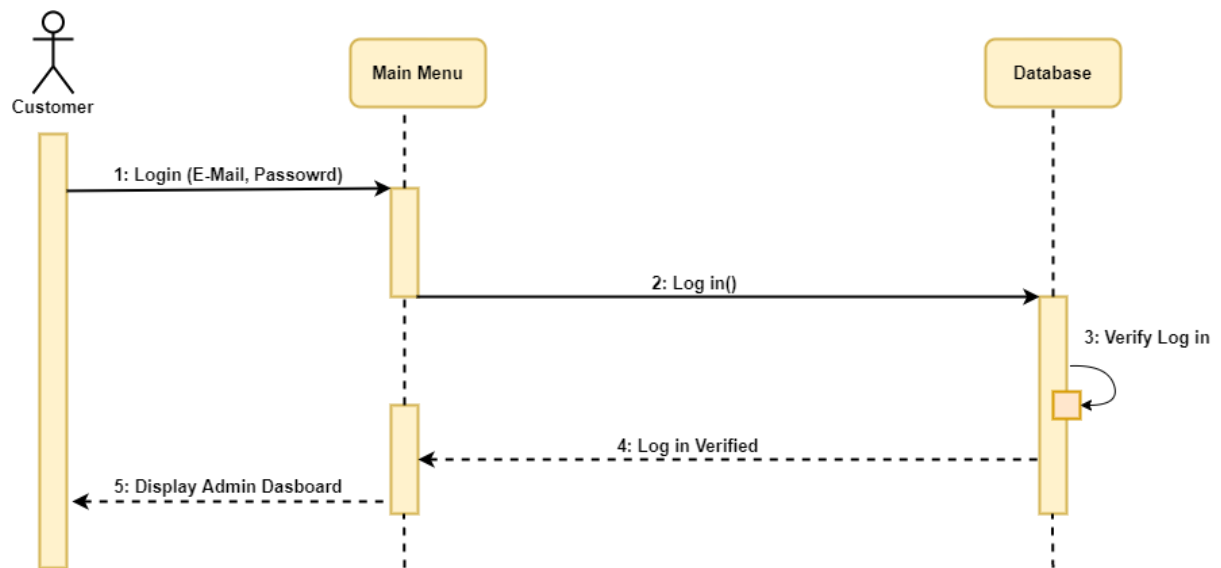


Figure 4.3.9 Admin Log in Sequence Diagram

Manage Users:

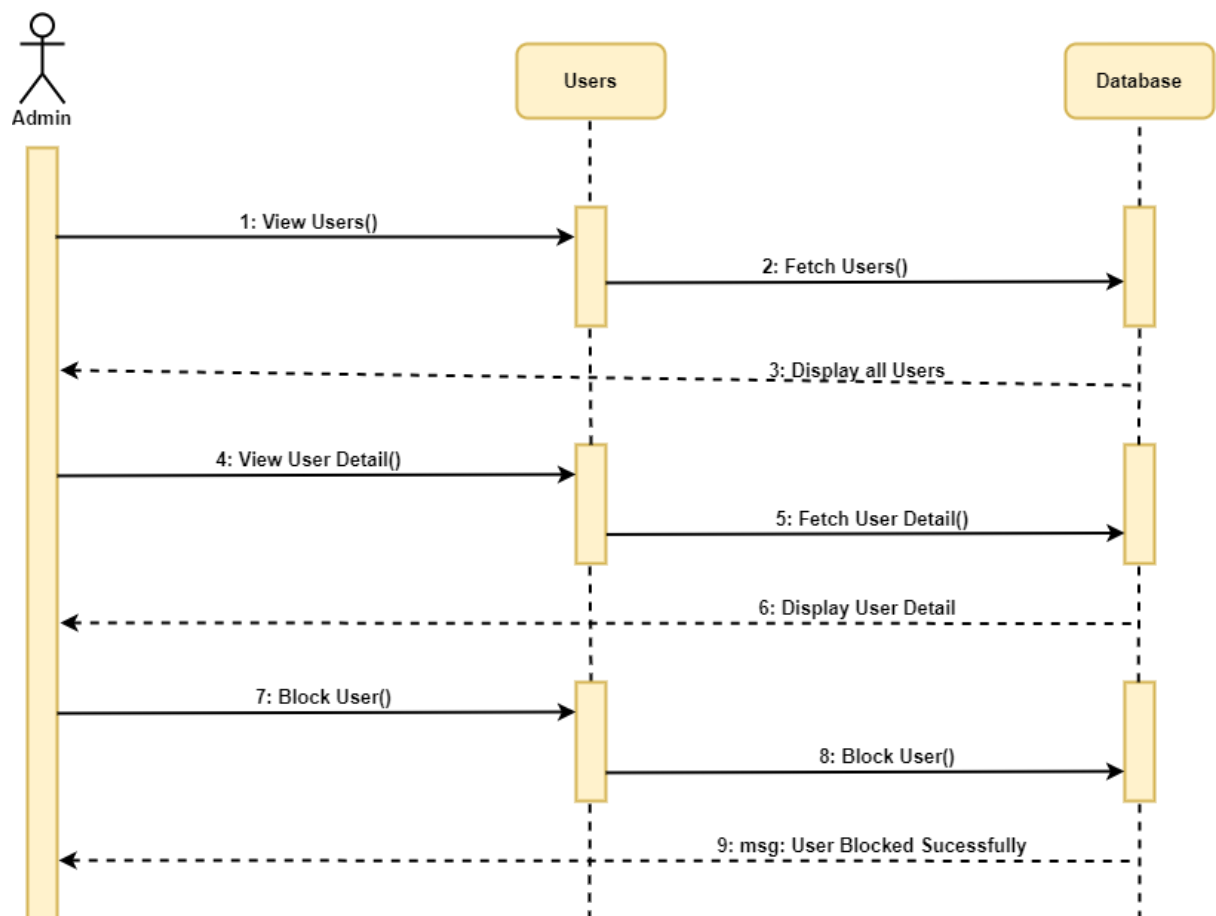


Figure 4.3.11 Admin Manage Users Sequence

Customer Support:

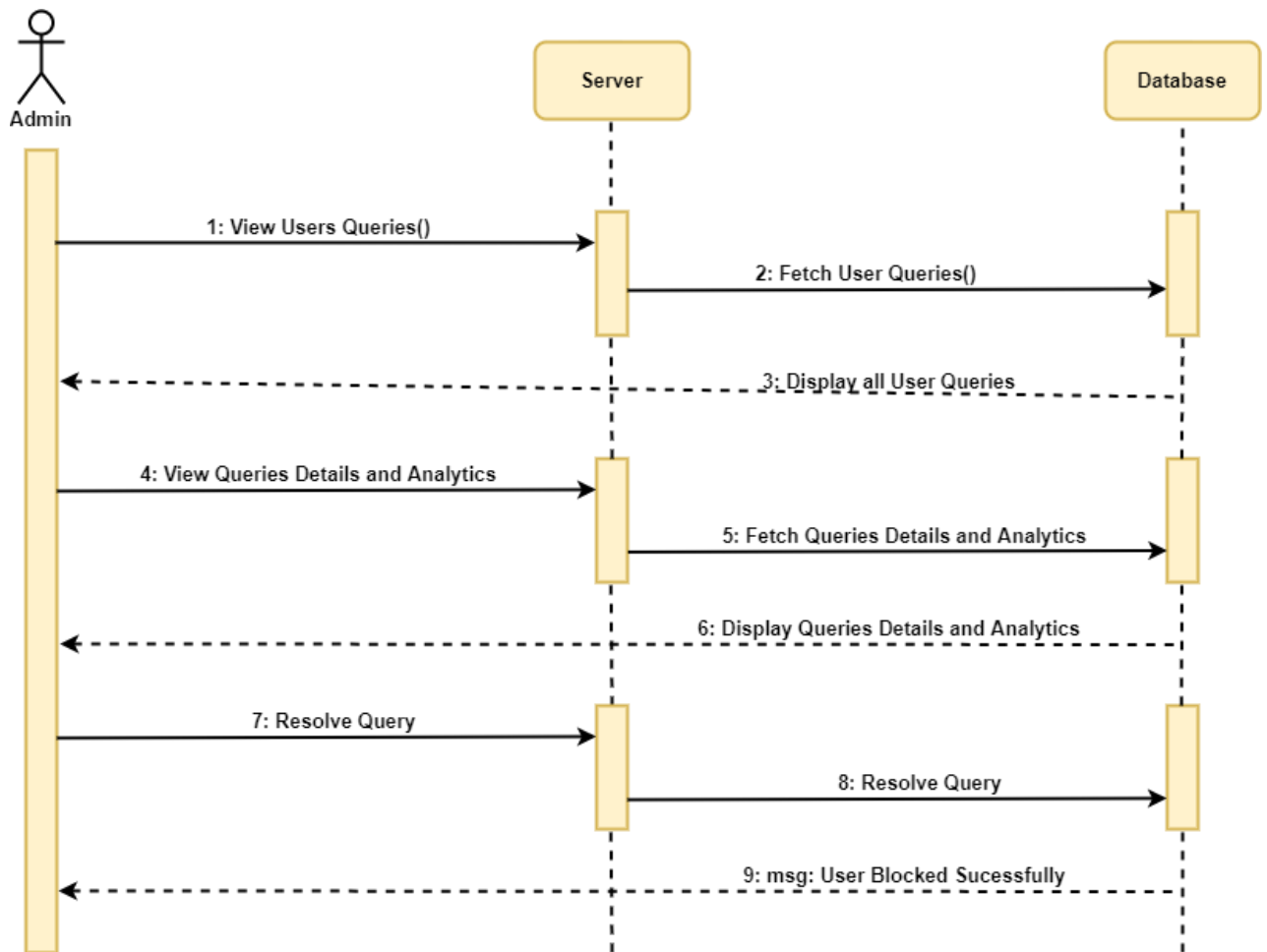


Figure 13 Admin Customer Support

Update:

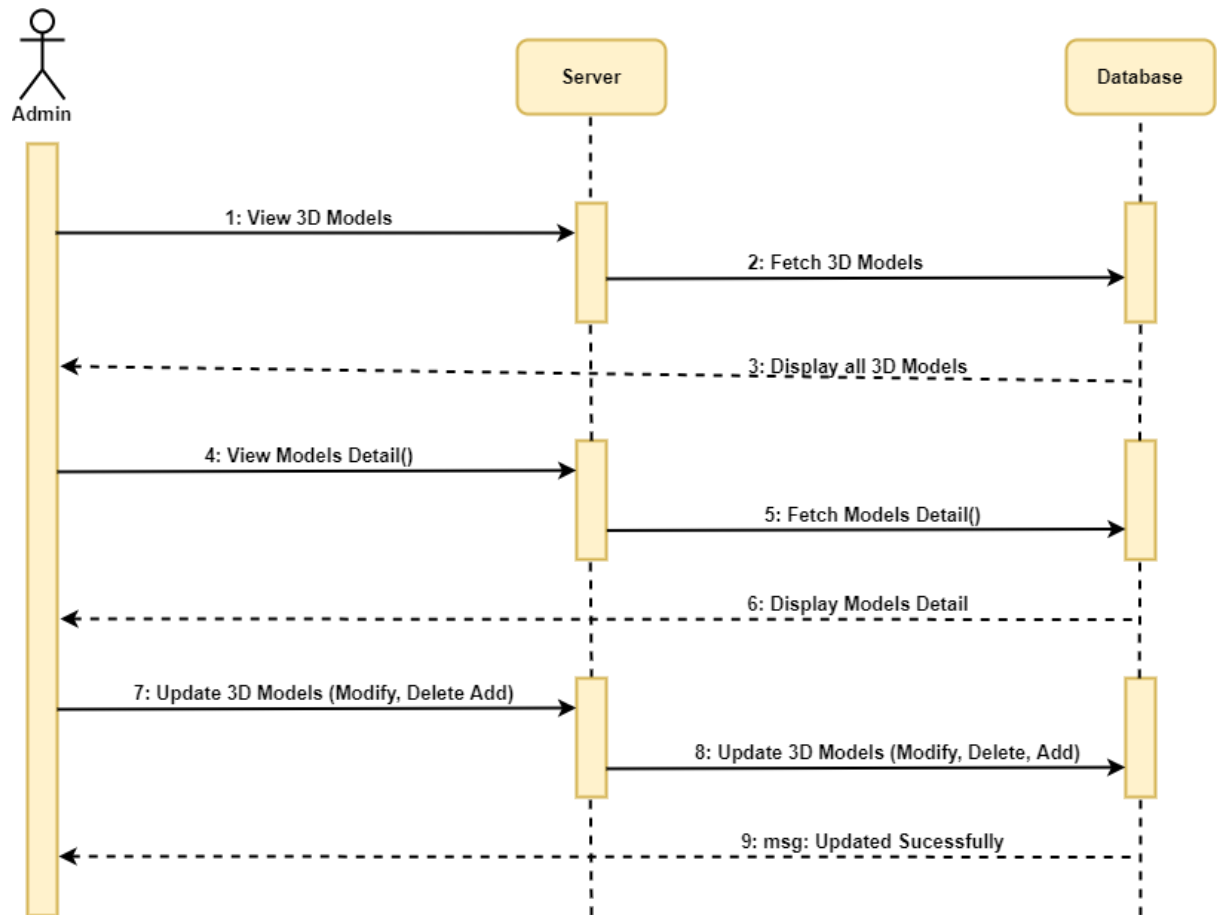


Figure 4.3.14 Admin Update Sequence Diagram

4.4 Architecture Diagram

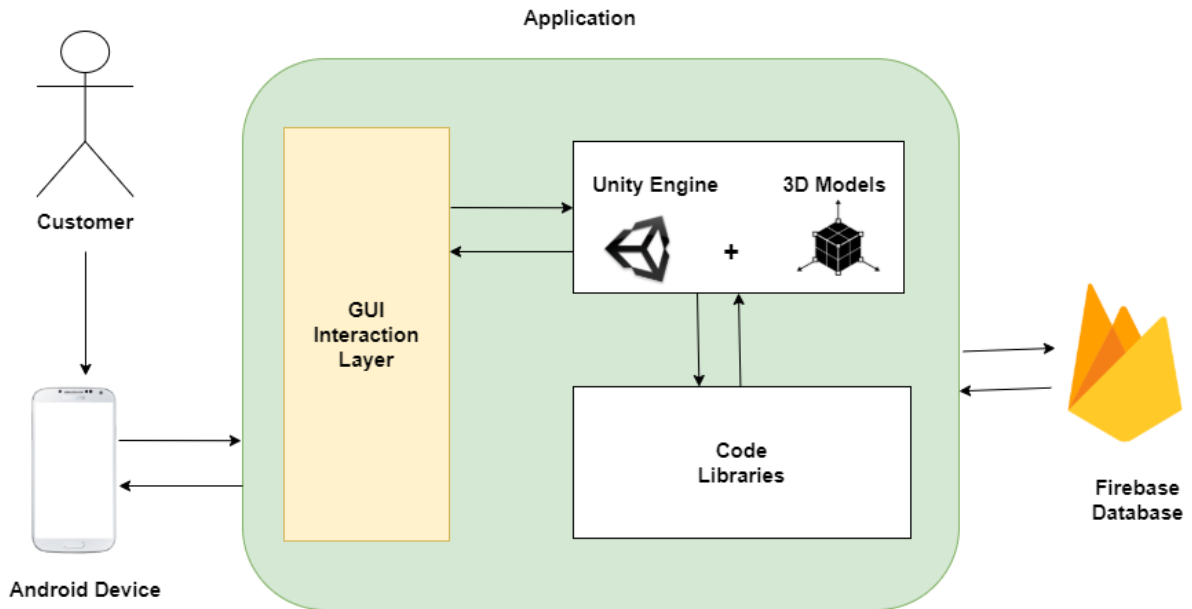


Figure 4.4 System Architecture Diagram

4.5 Class Diagram:

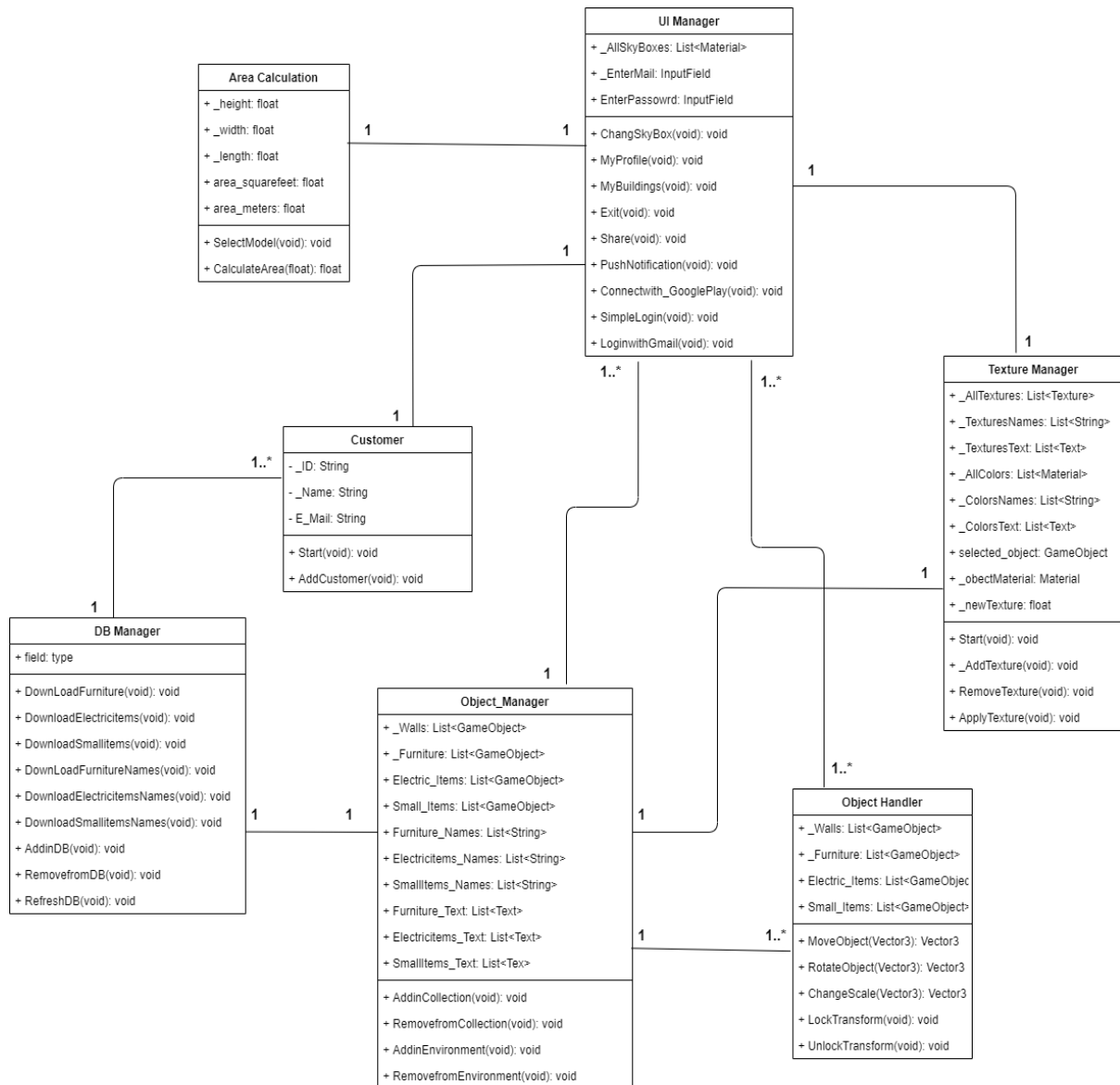


Figure 4.5 Class Diagram of CA

Chapter No. 06: Graphical User Interface



Figure 5.1 Main Menu



Figure 5.2 Character Selection



Figure 5.3 Terrain Selection

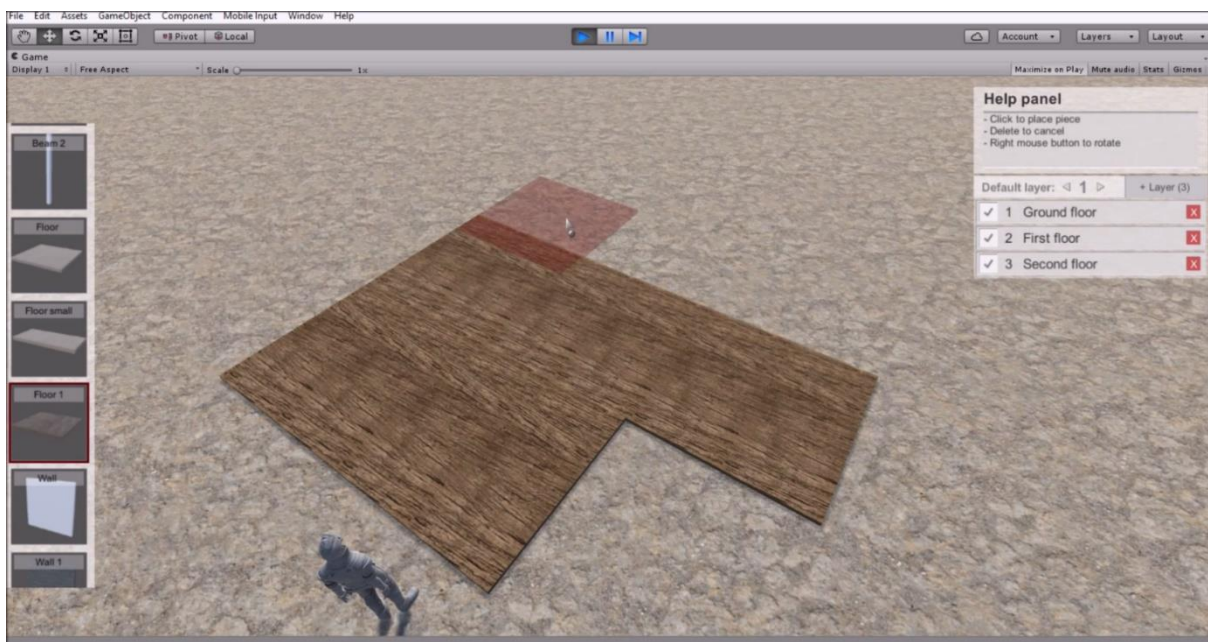


Figure 5.4 Place 3D Models

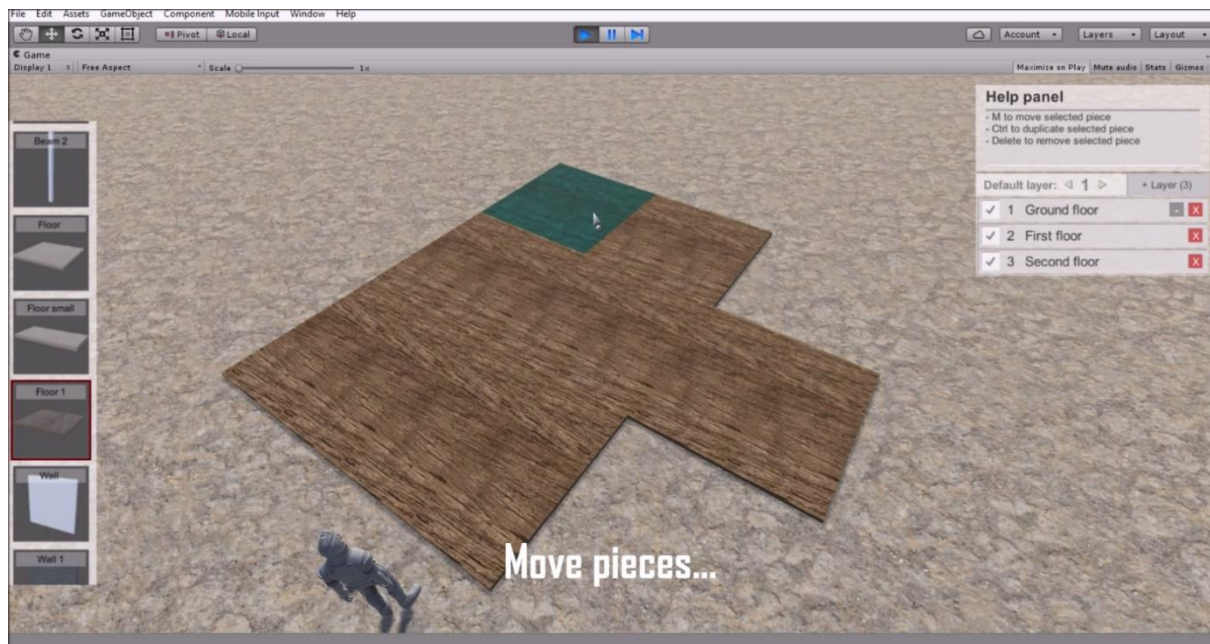


Figure 5.5 Move Pieces

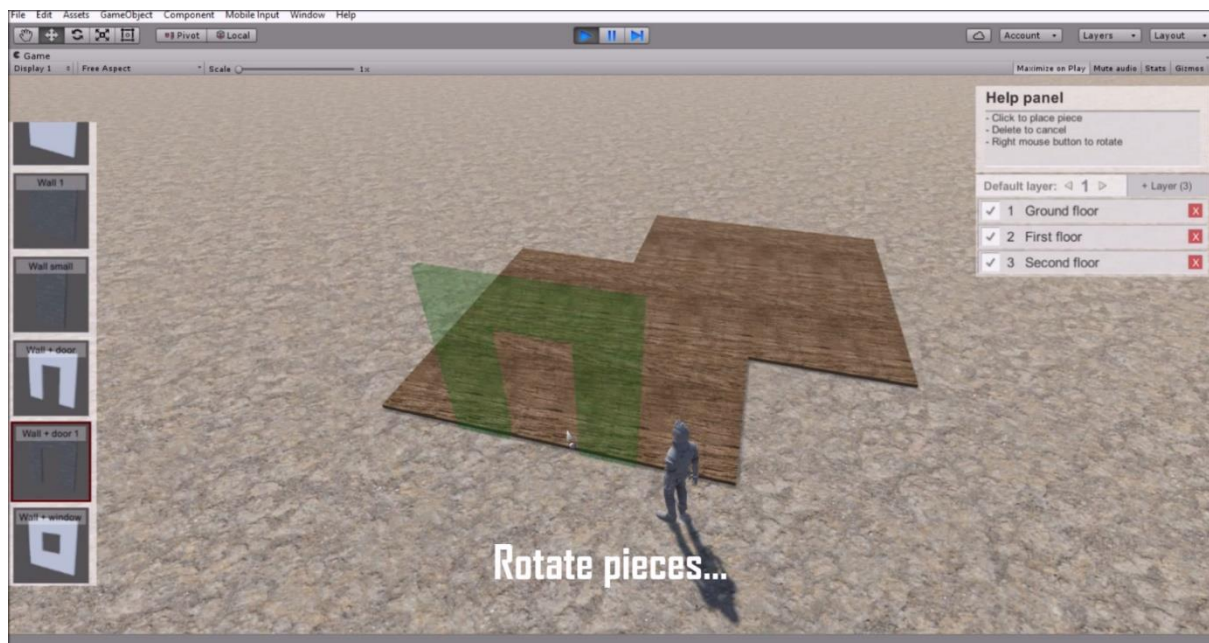


Figure 5.6 Rotate Pieces

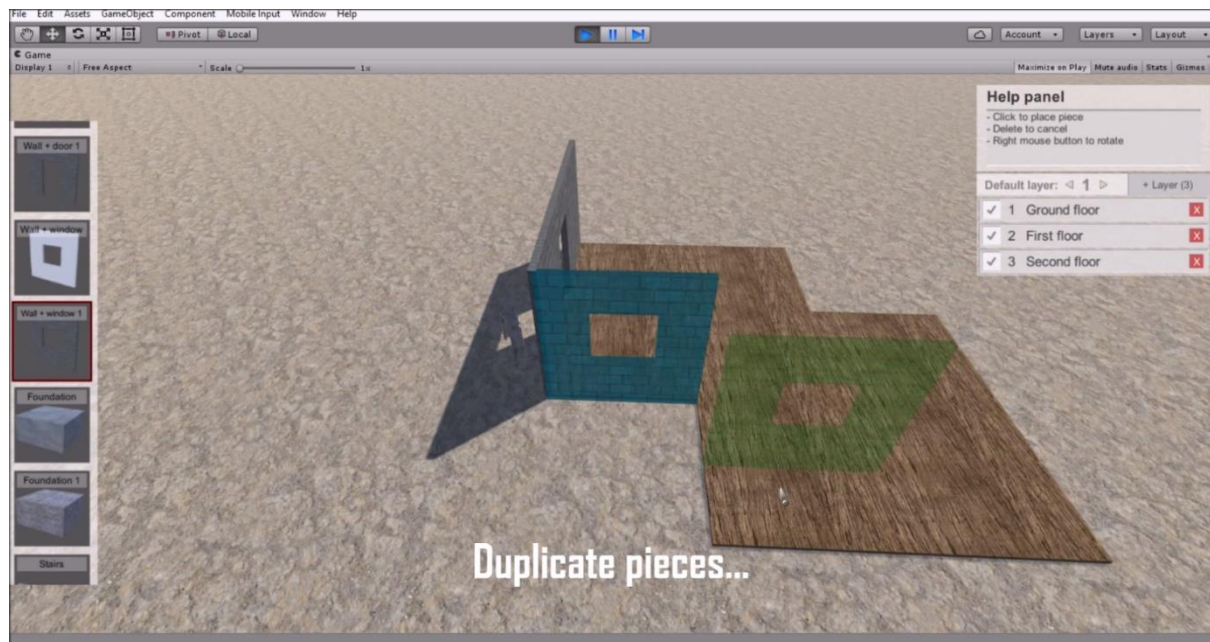


Figure 5.7 Duplicate Pieces

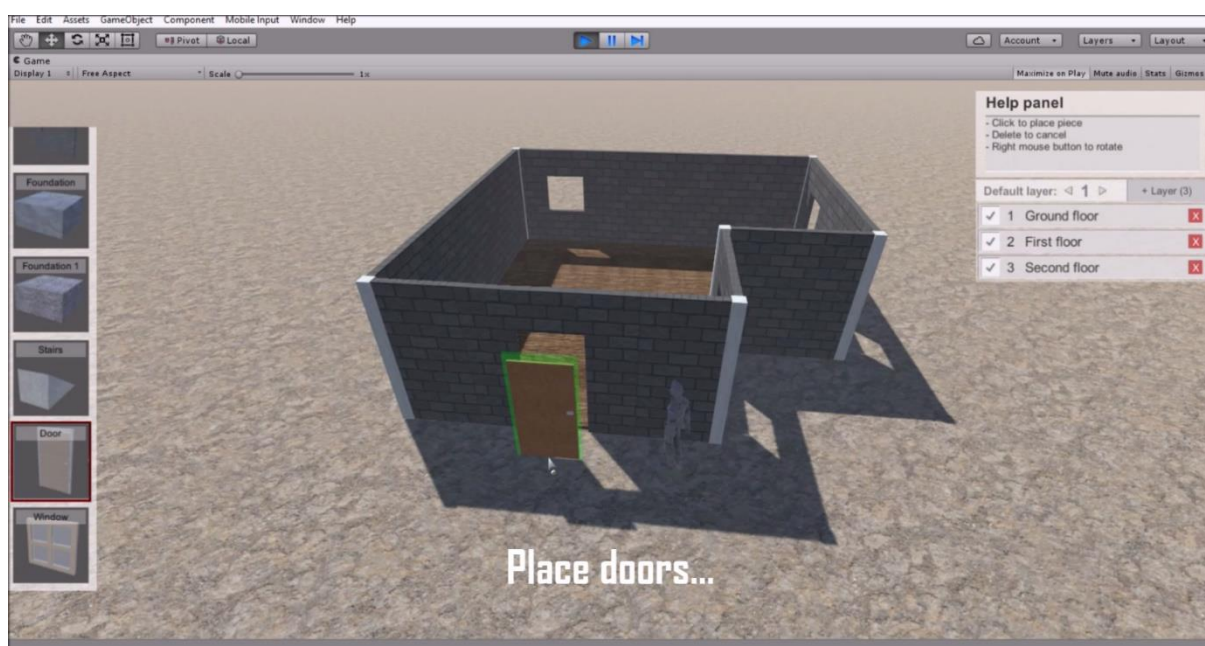


Figure 5.8 Place Doors



Figure 5.9 Place Windows

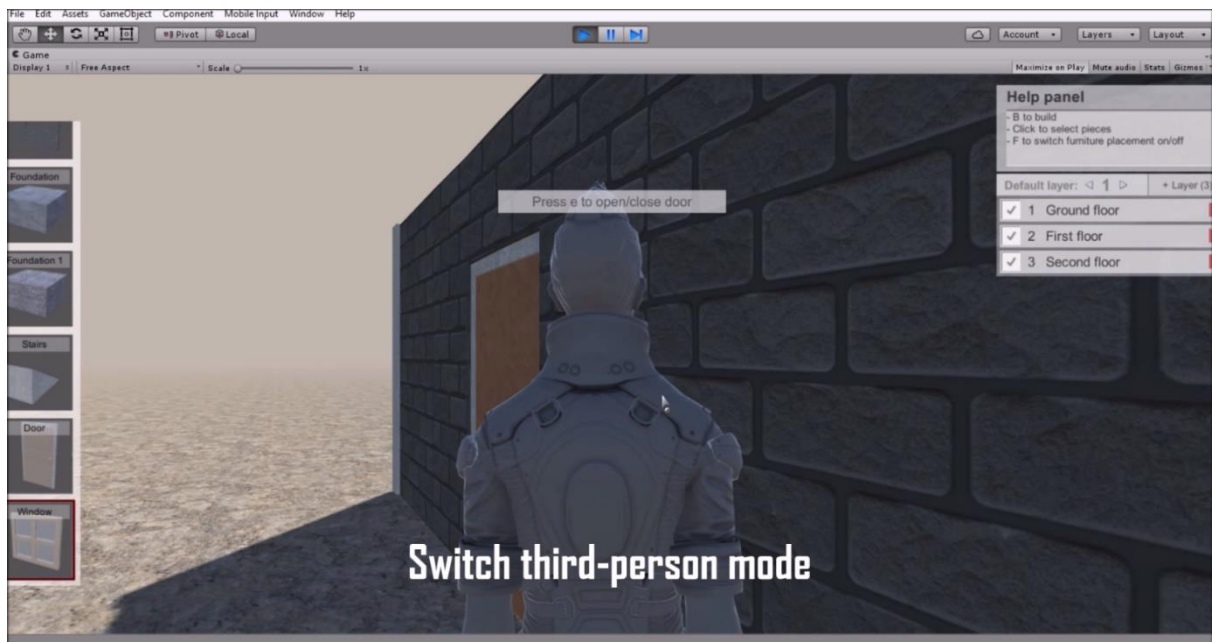


Figure 5.10 View in third Person Mode

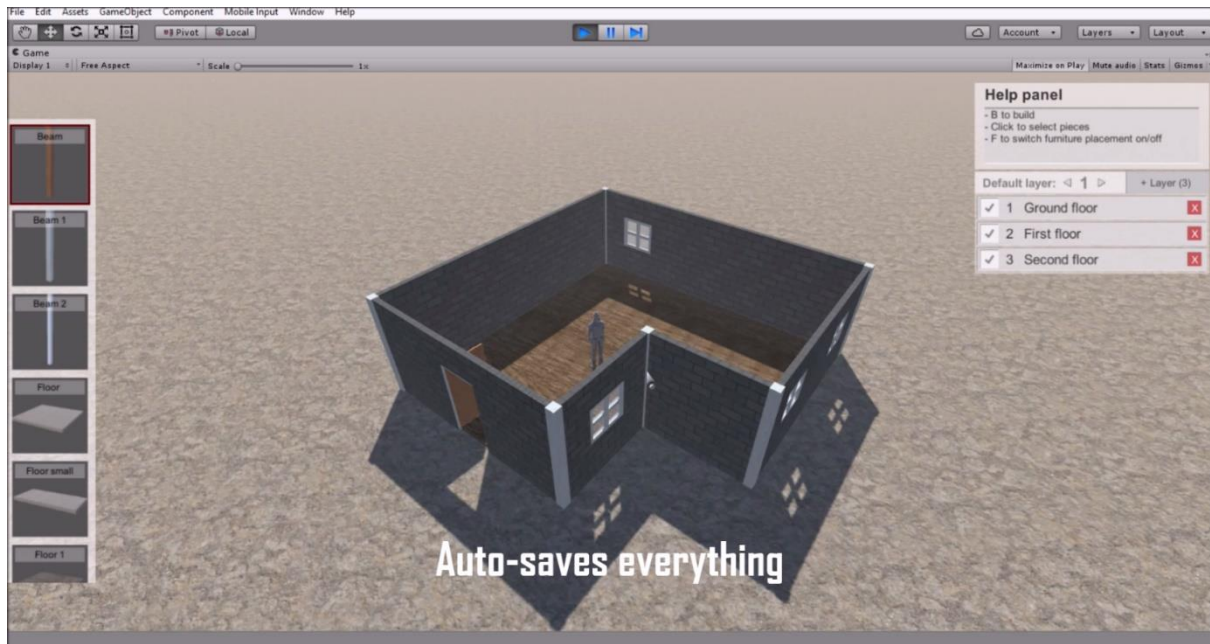


Figure 5.11 Auto Saves

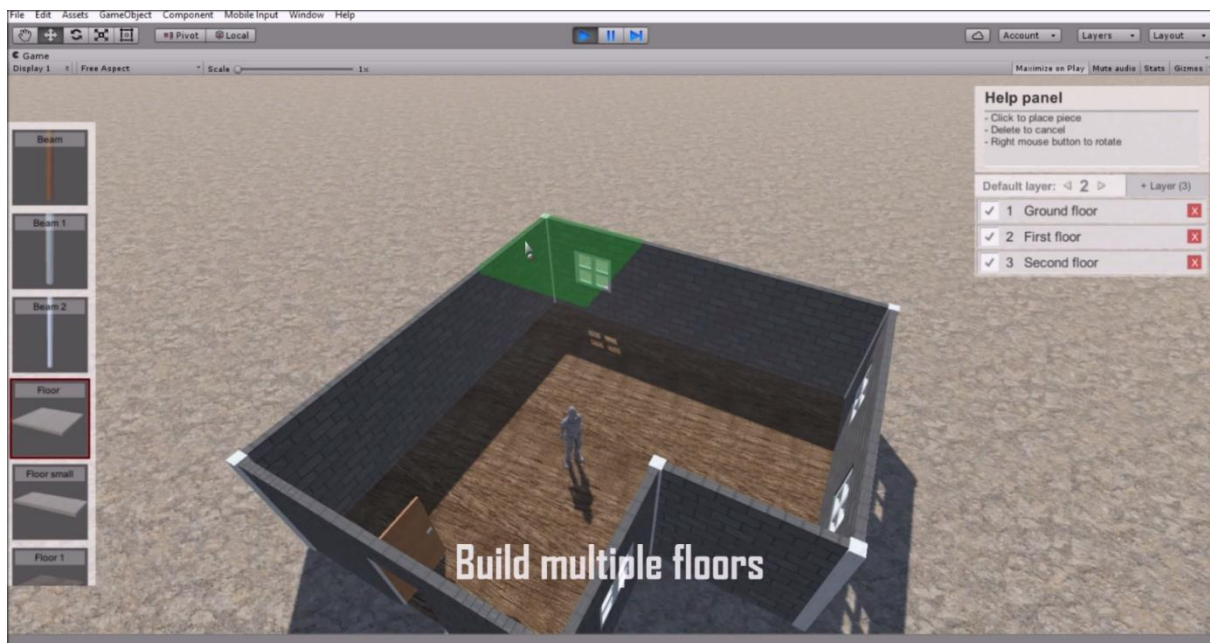


Figure 5.12 Build Roofs

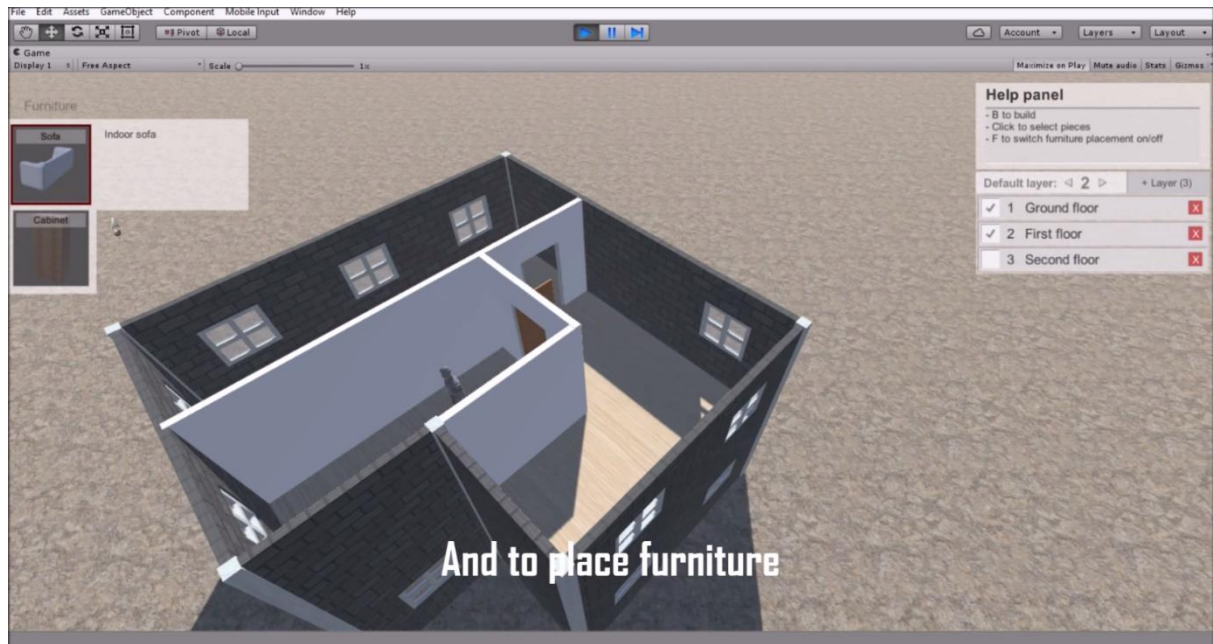


Figure 5.15 Place Furniture

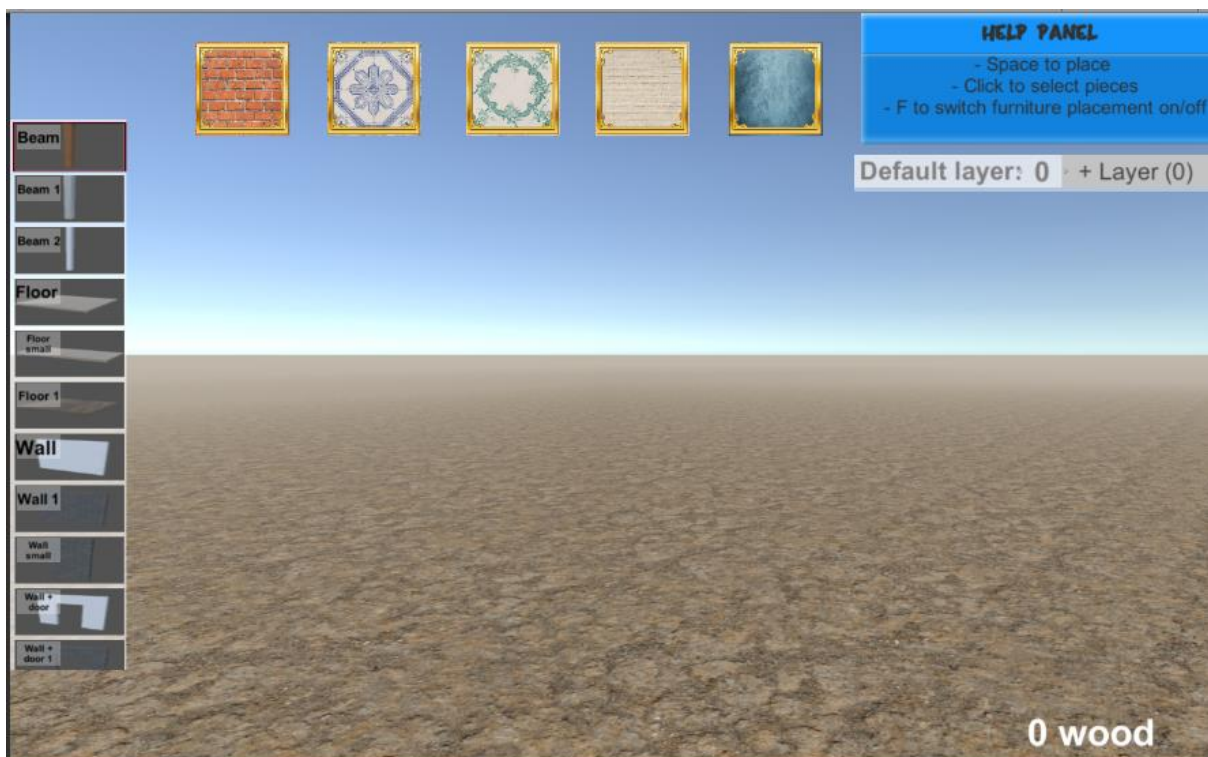


Figure 5.16 Change Texture

Chapter No. 06: Testing

6.1. Introduction

Software, in its most general sense, is a set of instructions or programs instructing a computer to do specific tasks. Software is a generic term used to describe computer programs. Scripts, applications, programs and a set of instructions are all terms often used to describe software.

Software testing is a task intended to detect defects in software by contrasting a computer program's expected results with its actual results for a given set of inputs. By contrast, QA (quality assurance) is the implementation of policies and procedures intended to prevent defects from occurring in the first place.

6.2. Test Scenario

Test Case ID: 01

Test Case Name: Login

Test Priority: High

Preconditions: The user must have valid account.

Post conditions

1. The user will log in to the system
2. The user will have access to the functions of the system

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|----------------------------------|---|----------------------|----------------------|------------------|-------------|-------------------------------------|
| 1 | Launch Application | press icon | Application Launched | Application Launched | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Enter correct email and password | Email ID: abc@gmail.com Password: **** | Login Success | Login Success | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 02

Test Case Name: Register

Test Priority: High

Preconditions: The user must have open application.

Post conditions

1. The user can log in to the system

2. The user will have access to his account

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|-------------------------|---|-----------------------|-----------------------|------------------|-------------|-------------------------------------|
| 1 | Launch Application | press icon | Application launched | Application Launched | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Click on create account | Email ID: abc@gmail.com Password: **** Accept terms and condition | Register Successfully | Register Successfully | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 03

Test Case Name: Select Terrain

Test Priority: High

Preconditions: The user must have login to his account.

Post conditions

1. The user can use the functionality of the application completely
2. The user now create infrastructures

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|----------------------|---|--------------------|--------------------|------------------|-------------|-------------------------------------|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Click on a terrain | select a desired terrain | Terrain Selected | Terrain Selected | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 04

Test Case Name: Drag and Drop

Test Priority: Medium

Preconditions: The user must have login to account and choose terrain.

Post conditions

1. The user can add different 3d models ss
2. The user will move the 3D models according to his desired position

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|----------------------|--|--------------------|--------------------|------------------|-------------|-------------------------------------|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Click on 3D model | Select 3D model and move to desired position | 3D Model moved | 3D Model moved | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 05

Test Case Name: Customization

Test Priority: Medium

Preconditions: The user must have login to his account and have an infrastructure.

Post conditions

1. The user can change the color and tiling of 3D models
2. The user can split and merge available infrastructures.

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|----------------------|---|-------------------------|-------------------------|------------------|-------------|-------------------------------------|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Select 3D model | Choose desired color/tiling | Color or Tiling changed | Color or tiling changed | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 06

Test Case Name: Calculate Area

Test Priority: Medium

Preconditions: The user must have login to his account and have an infrastructure.

Post conditions

1. The user can calculate area of any desired 3D model
2. The user can convert calculated area in available units.

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|----------------------|---|-----------------------|----------------------|------------------|-------------|-------------------------------------|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Select 3D Model | Click on calculate area button | Ares shown of 3Dmodel | Area show of 3Dmodel | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 07

Test Case Name: Profile

Test Priority: Medium

Preconditions: The user must have login to his account.

Post conditions

1. The user can view his profile and records
2. The user can make changes to his profile and records.

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|----------------------------|---|-----------------------|-----------------------|------------------|-------------|-------------------------------------|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Click on my profile button | Click on view profile | Profile details shown | Profile details shown | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 08

Test Case Name: Manage Users

Test Priority: Medium

Preconditions: The admin must have login to his account.

Post conditions

1. The admin can add or remove users
2. The admin can check and make changes in users records.

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|-----------------------|---|-------------------------------|-------------------------------|------------------|-------------|--|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Click on manage users | Click on Add/Remove user | User add/removed successfully | User add/removed successfully | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 09

Test Case Name: Support

Test Priority: High

Preconditions: The admin must have login to his account.

Post conditions

1. The admin can check queries of users and answer them
2. The admin can resolve queries

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|-----------------------|---|---------------------------------|------------------------------------|------------------|-------------|--|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Click on user queries | Read user queries | User queries received correctly | User queries received successfully | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

Test Case ID: 10

Test Case Name: Update

Test Priority: High

Preconditions: The admin must have access to google play account.

Post conditions

1. The admin can update the application
2. The admin can remove bugs and add new features

| SN | Action | Inputs | Expected Outcome | Actual Output | Test Application | Test result | Test comments |
|----|-----------------------------|---|----------------------|----------------------|------------------|-------------|-------------------------------------|
| 1 | Login to his account | Email ID: abc@gmail.com Password: **** | Login Successfully | Login Successfully | Android Phone | PASS | [Awais 7/0/2020]: Launch Successful |
| 2 | Click on update application | Email ID: upload updated bundle | Updated successfully | Updated successfully | Android Phone | PASS | [Amir 7/0/2020]: Launch Successful |

6.3. Test Plan

A document describing the scope, approach, resources and schedule of intended test activities. It identifies amongst others test items, the features to be tested, the testing tasks, who will do each task, degree of tester independence, the test environment, the test design techniques and entry and exit criteria to be used, and the rationale for their choice, and any risks requiring contingency planning. It is a record of the test planning process.

6.4. Definition of Test Cases

A TEST CASE is a set of conditions or variables under which a tester will determine whether a system under test satisfies requirements or works correctly. The process of developing test cases can also help find problems in the requirements or design of an application.

6.5. Test Case Specifications

Test Case Specification document described detailed summary of what scenarios will be tested, how they will be tested, how often they will be tested, and so on and so forth, for a given feature. It specifies the purpose of a specific test, identifies the required inputs and expected results, provides step-by-step procedures for executing the test, and outlines the pass/fail criteria for determining acceptance.

Test Case Specification has to be done separately for each unit. Based on the approach specified in the test plan, the feature to be tested for each unit must be determined. The overall approach stated in the plan is refined into specific test techniques that should be followed and into the criteria to be used for evaluation. Based on these the test cases are specified for testing unit.

6.6. Test Cases Results for:

6.6.1. Black Box Testing

Black box testing is defined as a testing technique in which functionality of the Application Under Test (AUT) is tested without looking at the internal code structure, implementation

details and knowledge of internal paths of the software. This type of testing is based entirely on software requirements and specifications. In Black Box Testing we just focus on inputs and output of the software system without bothering about internal knowledge of the software program

6.6.2. White Box Testing

White Box Testing is defined as the testing of a software solution's internal structure, design, and coding. In this type of testing, the code is visible to the tester. It focuses primarily on verifying the flow of inputs and outputs through the application, improving design and usability, strengthening security. White box testing is also known as Clear Box testing, Open Box testing, Structural testing, Transparent Box testing, Code-Based testing, and Glass Box Testing. It is usually performed by developers.

CHAPTER 7 CONCLUSION AND FUTURE WORK

7.1. Conclusion

This software documentation explains the whole processes and phases for development of system. Requirements are not told by primary client. It is a final year project for graduation level, so requirements are gathered by supervisor and on the basis of team members' ideas. These requirements are categorized in functional and non-functional requirements. Then these requirements and aspects related to these requirements are represented in graphical and pictorial manners. As it is a Construction Application so it is important to create its front-end in relevant manner. Team use azure software for designing front end designs. Designing phase also included DB designs and process designs. After designing, team move toward new phase of development and coding. It was the most time-consuming phase. Team required great skills and experience in this phase, they used C# its framework DotNet and Unity 3D for development of this system. This phase covered the development of front end, DB migrations and Back end Front end consists of DB portion means Data Layer and Business Layer. Migration has been created with the help of Firebase. The application has been coded with software Visual Studio. After the development of system, another important thing testing is also done by team. They have done both unit testing and system testing. Now system is in working state. The system was built in such a way that after deployment it will be easy to manage, make changes, bug fixies and provide upgrades. The admin can login to firebase and can see all the user's data which includes their profile details and 3D infrastructures, also admin can edit or remove user data and add new data.

7.2. Future Work

After the acceptance of project, the future plan of team is that, this system will have the functionality to. Move 3D models with hand gestures which can be done by integrating the already available hand gestures detector in the market or team can make one dedicated to this application. Also, team can upload it on the google play and apple store so all customers can access it easily.to easily detect the bugs and ANR or application crashes team can add firebase analytic or unity analytics to get the status of the system. To make the application easier to use more beneficial for user team can integrate machine learning with the system and with the help of its api we can predict the prices of 3D infrastructures that customers will build. Last but not least team can add payment gateway in the system through which customers can purchase and sell 3D infrastructures they can also posts request for a specific 3D infrastructure with their specific requirements Team will provide a strong theme to advertise the System all over the scope. Some things might be there which provide changes and alternation, so team will perform surveys and feedbacks to improve the quality and performance of System. This will tend to improve team skills as well as the system functionality. Team hopes that this project will achieve all the levels of success and their motto is to improve this system with the requirement of time and update the feature which will enhance the better working of system.

References:

<http://www.wikipedia.com>

<http://www.techopedia.com>

<http://www.samrtdraw.com>

<http://www.createely.com>

<http://www.webopedia.com>

<http://www.onlinevisualparadigm.com>