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3D Map Maker

In partial fulfillment of the requirements for the degree of
Bachelor of Science in Computer Science

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July 28, 2021

Certificate



We accept the work contained in the report titled

“3D Map Maker”

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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.

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Specially dedicated to
my beloved grandmother, mother, and father
MUHAMMAD SANNAN UMER
my beloved grandmother, mother, and father
MUHAMMAD REHMAN UL ISLAM

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We would like to thank everyone who had contributed to the successful completion of this project. We would like to express our gratitude to my supervisor, MOUZNA TAHIR for her invaluable advice, guidance, and her enormous patience throughout the development of the project.

In addition, We would also like to express my gratitude to our loving parents and friends who had helped and encouraged me.

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3D Map Maker

ABSTRACT

2D diagrams in architecture and construction has been used for the purposes of presentation or visualization of the drawing maps and its function as an analytical tool during the design phase, design purpose communication, and for on-site work instructions. The big problem with 2D drawing is that trying to describe the 3D world in 2D drawing is a real challenge. This makes it a great trick to create a 2D design with precision.

In this android application we will generate a 3D model of an existing 2D map with the help of Unity C#. The user will give positions, rotations and scales of 3d objects as input which will be the coordinates of generated 3D model. User can apply the textures on the model by using button. User can also rotate and zoom the 3D model by using rotation and zoom slider to view model from different angles..

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CHAPTER 1

INTRODUCTION

1.1 Background

In the past, it was frequently challenging for individuals to completely follow what construction work would look like when completed. Advances in 3D modelling have enabled builders, engineers, and users to navigate the project's visual demonstration before it is constructed. The key focus of this application is to facilitate the users in visualizing their construction ideas before construction so that they can customize their ideas and turn it exactly into a real world. Despite verbal explanation of a 2D model, architect clearly demonstrate their 3D model of building to the clients. The 3D model will start with the location and be built by architects and engineers, until the closest simulation of the proposed project. At the beginning of a construction project, 3D modelling is typically used to mimic potential designs and to identify any flaws in architectural models. The most accurate 3D models are in the early stages of the project, the chances are that the construction project will need to undergo reconstruction.

1.2 2D image into 3D model

In this android application, we will be building a 3d model of a 2d map by using Json serialization. In order to build a 3d model of a 2d map, user will give positions, rotations and scales of 3d objects as input which will be the coordinates of generated 3D model. User will input positions, rotations and scales of every wall in json. Coordinates of each wall will be separated by ‘&’ sign. Each wall will be placed according to the given points of x-axis, y-axis and z-axis respectively. Angle of each wall depend upon the given points of rotation-x, rotation-y and rotation-z respectively. Size of each wall will be according to the given points of scale-x, scale-y and scale-z respectively. After giving all coordinates user will submit the input which will take user to next screen of model. A 3d model will be shown to user.

Coordinates given by the user will be sent to the function in which all values will be assigned to respective variables of 3d object. Each object will be given a tag named as ‘walls’. After the creation of 3d model user can apply textures on the walls by using tag assigned to them. User can also rotate and zoom the model by using sliders. This enhances presentation of the 3d model

1.3 Problem Statements

3D modelling is one of the ways in which the construction industry can benefit from the most advanced 3D technology. It involves the process of creating 2D images to life by using modern techniques and software. Comparisons can be made about the existing work and the intended target, and this will show whether the activity is consistent with speculation.

1.4 Aims and Objectives

The objectives of the project are shown as following:

- To provide a realistic, easy and quick platform for visualization or presentation of the building's design.
- To reduce the gap which is in between the architect and the clients. It will also help the builder in construction of buildings.

1.5 Scope of Project

The main aim of this application is to facilitate the architects in presenting the 3D model of a building's structure to clients. While construction is underway, 3D models can be used to ensure the construction is up to date. 3D construction projects benefit from better time management and cost saving. While construction is underway, 3D models can be used to ensure the construction is up to date. Comparisons can be made about the existing work and the intended target, and this will show whether the activity is consistent with speculation. 3D modelling is one of the ways in which the construction industry can benefit from the most advanced 3D technology

CHAPTER 2

SOFTWARE REQUIREMENT SPECIFICATION

2.1 User Classes and Characteristics

We have only one user in this project.

- User
- Admin

User: - User will be the person who will be able to perform the following activities.

- Signup
- Signin
- Build 3D Model
- Apply Texture
- Rotate Model
- Zoom in/ Zoom out
- Logout

Admin:- Admin will be the person who will be able to perform the following activities.

- Signup
- Signin

- Signout
- View Records
- Delete / Update

2.2 Operating Environment

Operating environment for 3D Map Maker:

Android-Based Requirements:

- Android version (minimum Android Marshmallow-6.0)

Database Management System

2.3 Design and implementation constraints

3D Map Maker is an android application. The front-end of application will be developed using C#. The application should give a response with in a time. Internet is very important for this android application.

2.4 Assumption and Dependencies

3D Map Maker is an android application therefore it involves following features:

- User need to have good internet connection

2.5 User Interface

Every user should have Android smart phone with minimum of android version of 4.4 so that they can use our App. To use app minimum 2GB RAM is required with CPU ARMv7 Neon Support (32-bit) or ARM64. Supported hardware devices must meet or exceed Google's Android Compatibility Definition

2.6 Software Interface

Software interfaces are explained in the below table

Table 2.6-1: Software Interface

Software Used	Description
Android Version	Android Version 6.0+.
Tool	We will use Unity for this project.
Back End	We will use C# and Json

This app will run on mobiles that are running android version 6.0+ and minimum 2GB RAM is required. We will use Unity for this project. Unity is the development platform that'll be used to develop this application. C# with unity will be used to develop the application.

2.7 System Use Cases

Figure 2.7-1 shows the use case diagram of the application which shows how admin may interact with the system:

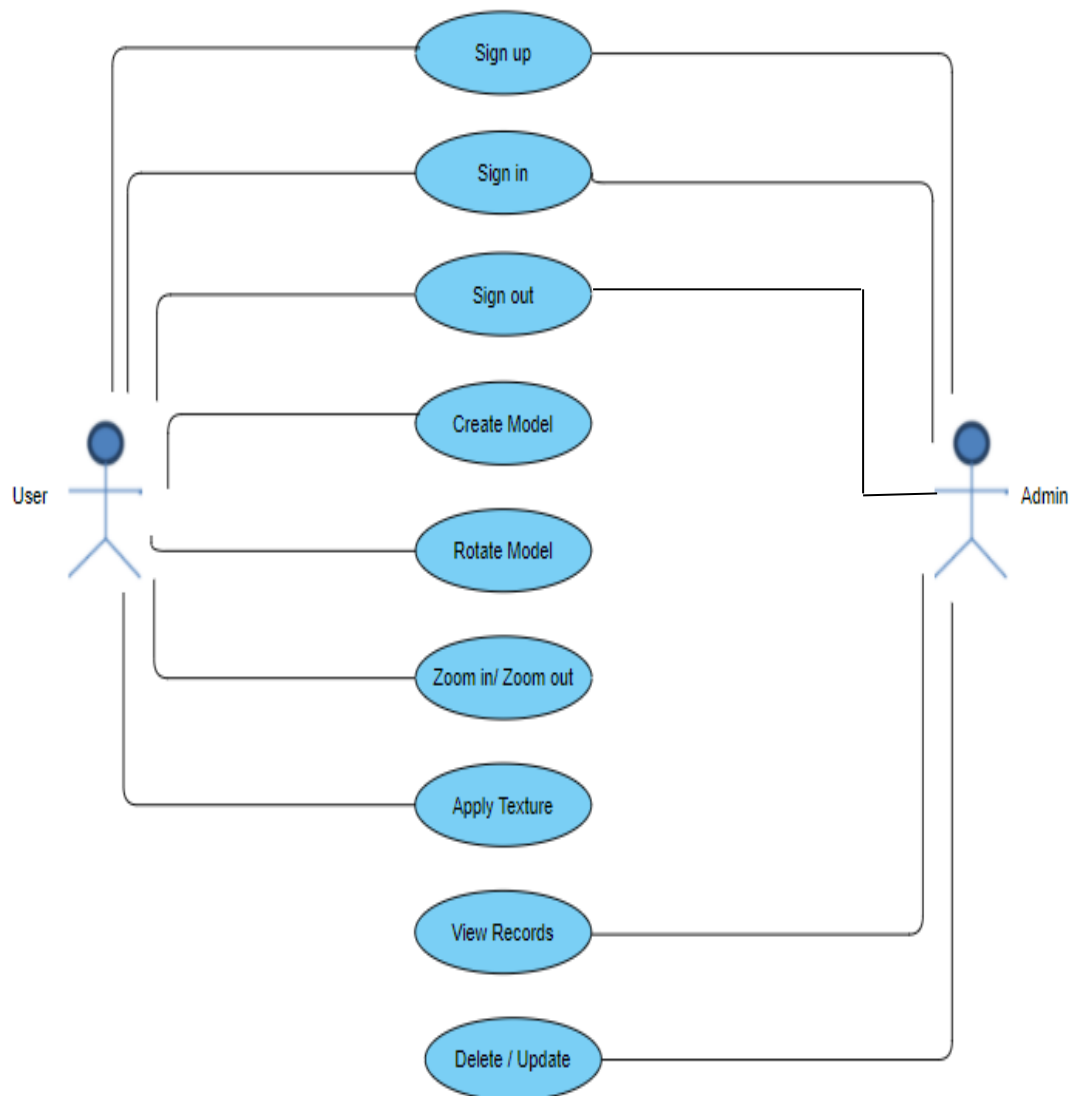


Figure 2.7-1: System Use Cases

2.7.1 Signup

It contains the description of our use case signup.

Table 2.7-1: Signup Use Case

	Name	Sign Up
1.	Case ID	U1
2.	Objective	In this use case, the admin will be able to create an account
3.	Priority	High
4.	Source	Admin/User is the main source of this use case
5.	Actors	Admin/User
6.1	Flow of Events	1. Open the Application 2. Enter Credentials 3. Click on Create account button to create an account
6.2	Basic Flow	After Signup Admin/User can go to U2.
6.3	Alternate Flow(s)	No
7.	Preconditions	Admin/User must have an internet connection
8.	Notes/Issues	No

2.7.2 Sign In

It contains the description of our Login use case.

Table 2.7-2: Login Use Case

	Name	Sign In
1.	Case ID	U2
2.	Objective	Admin/User will sign in with the credentials.
3.	Priority	High
4.	Actors	Admin/User
5.1	Flow of Events	<ol style="list-style-type: none"> 1. Select Sign in 2. Enter Username and Password 3. Click on Sign in button to access the admin panel.
5.2	Basic Flow	After successful sign in Admin/User will go to U2, U3
5.3	Alternate Flow(s)	No alternative flow, Admin/User must sign in to proceed further.
6	Preconditions	No
8	Notes/Issues	If the Admin/User will sign in with the right credentials no problem will occur.

2.7.3 Sign Out

It contains the description of our Sign Out use case.

Table 2.7-3: Sign Out Use Case

	Name	Sign Out
1.	Use-Case ID	U3
2.	Objective	In this use case Admin/User will able to sign out

3.	Priority	High
5.	Actors	Admin/User
6.1	Flow of Events	Must be fulfilled U1
6.2	Basic Flow	Sign out from Admin/User panel.
6.3	Alternate Flow(s)	No
7.	Preconditions	Admin/User must be signed in to application.
8.	Notes/Issues	No

2.7.4 Create Model

It contains the description of our Create Model use case.

Table 2.7-4: Create Model Use Case

	Name	Create Model
1.	Use-Case ID	U4
2.	Objective	User can Create 3D Model of 2D Map
3.	Priority	High
4.	Actors	User
5.1	Flow of Events	1. Input coordinates of wall/walls 2. Press submit button
5.2	Basic Flow	User enter correct values
5.3	Alternate Flow(s)	No
6.	Preconditions	U2
7.	Notes/Issues	No

2.7.5 Rotate Model

It contains the description of our Rotate Model use case.

Table 2.7-5: Alert Use Case

	Name	Rotate Model
1.	Use-Case ID	U4
2.	Objective	User can rotate the created Model
3.	Priority	High
4.	Actors	User
5.1	Flow of Events	Drag the slider to change the rotation speed of Model.
5.2	Basic Flow	Flow of Event
5.3	Alternate Flow(s)	No
6.	Preconditions	U4
7.	Notes/Issues	No

2.7.6 Zoom in / Zoom out

It contains the description of our Zoom in/Zoom out use case.

Table 2.7-6: Zoom in/Zoom out Use Case

	Name	Zoom in/Zoom out
1.	Use-Case ID	U6
2.	Objective	User can Zoom in and Zoom out the created Model
3.	Priority	High

4.	Actors	Admin
5.1	Flow of Events	Push the slider to Zoom in and Zoom out
5.2	Basic Flow	Flow of Event
5.3	Alternate Flow(s)	None
6.	Preconditions	U4
7.	Notes/Issues	No

2.7.7 Apply Texture

It contains the description of our Apply Texture use case.

Table 2.7-7: Apply Texture Use Case

	Name	Apply Texture
1.	Use-Case ID	U7
2.	Objective	User can change the texture of walls and Model.
3.	Priority	High.
4.	Actors	User
5.1	Flow of Events	1. Press change texture button 2. Texture change
5.2	Basic Flow	Flow of Event
5.3	Alternate Flow(s)	No.
6.	Preconditions	U4
7.	Notes/Issues	No.

2.7.8 View Records

It contains the description of our View Records use case.

Table 2.7-8 View Records

	Name	View Records
1.	Use-Case ID	U8
2.	Objective	Admin can view all the previous records.
3.	Priority	High.
4.	Actors	User
5.1	Flow of Events	1. Admin Sign in 2. Admin can see records
5.2	Basic Flow	Flow of Event
5.3	Alternate Flow(s)	No.
6.	Preconditions	U4
7.	Notes/Issues	No.

2.7.9 Delete and Update

It contains the description of our Delete and Updates use case.

Table 2.7-9 Delete and Update

	Name	Delete and Update
1.	Use-Case ID	U8
2.	Objective	Admin can delete and update the user data.
3.	Priority	High.
4.	Actors	Admin
5.1	Flow of Events	1. 1. Admin Sign in 2. List of users display 3. Admin can delete and update records.
5.2	Basic Flow	Flow of Event
5.3	Alternate Flow(s)	No.
6.	Preconditions	No.
7.	Notes/Issues	No.

2.8 Other non-functional requirements

Non-functional requirements of this project are:

2.8.1 Performance Requirements

Since this software is going to be an android-based application which will build 3D modeling, it requires high-end computer graphics. Required CPU is x86, x64 architecture with SSE2 instruction set support and required operating system is Windows 7 (SP1+) and Windows 10 to develop this application. DX10, DX11, DX12 capable graphics are required so that the development can run smoothly. Online storage is required for storing data. As we are going to use online storage, so it requires a good internet connection.

2.8.2 Safety Requirements

In order to provide best user experience, we will bring updates according to user need in our application to prevent any bugs and try to fix that bugs and errors..

2.8.3 Security Requirements

In order to provide best user experience, we will bring updates according to user need in our application to prevent any bugs and try to fix that bugs and errors.

2.8.4 Software quality attributes

Software quality attributes of this project are:

- **Availability:** All features of the application will be available for the user

24/7.

- **Flexibility:** The application would be flexible for the any type of user.
- **Usability:** The application must be user friendly for the user. The users can conveniently understand how to use the application.
- **Testability:** The application should be able to test at each level and the bugs/defect at each level of development should be removed.
- **Reusability:** The application is divided into different modules of coding. These modules can be used in across the application.
- **Maintainability:** The application will be convenient to maintain and removing bugs/errors and upgrade the application features according to the need.

CHAPTER 3

DESIGN SPECIFICATION

3.1 Domain Model

Domain models represent the set of requirements that are common to systems within a product line. There may be many domains, or areas of expertise, represented in a single product line and a single domain may span multiple product lines. Domain models represent the set of requirements common to a product line's systems. The requirements represented in a domain model include:

- Definition of scope for the domain
- Information or objects
- Features or use-cases, including factors that lead to variation
- Operational/behavioral characteristics

A product line definition will describe the domains necessary to build systems in the product line.

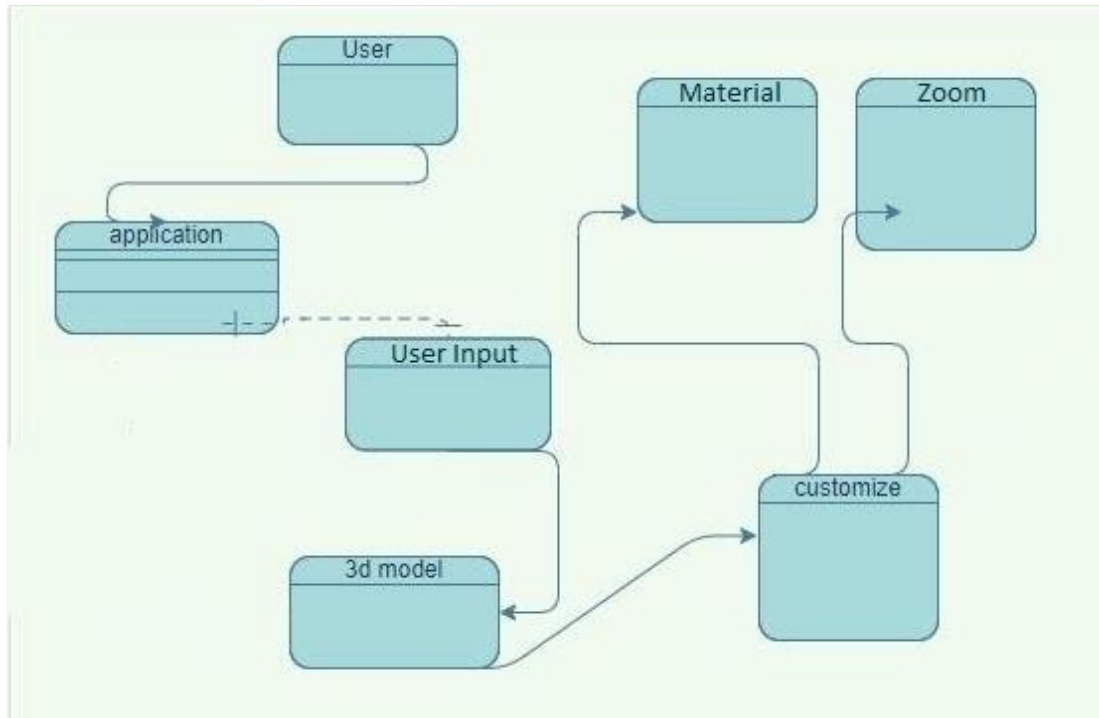


Figure 3.1-1: Domain Model

3.2 Sequence Diagram

The series of actions that occur in a system is shown in a sequence diagram. In a sequence diagram, the invocation of methods for each object and the order in which the invocation occurs is captured. This makes the Sequence Diagram a very helpful tool for the dynamic behavior of a system to be easily represented.

3.2.1 Signup

Figure 3.2-1 shows the interaction of the admin with the Signup screen to enter credentials and create an account.

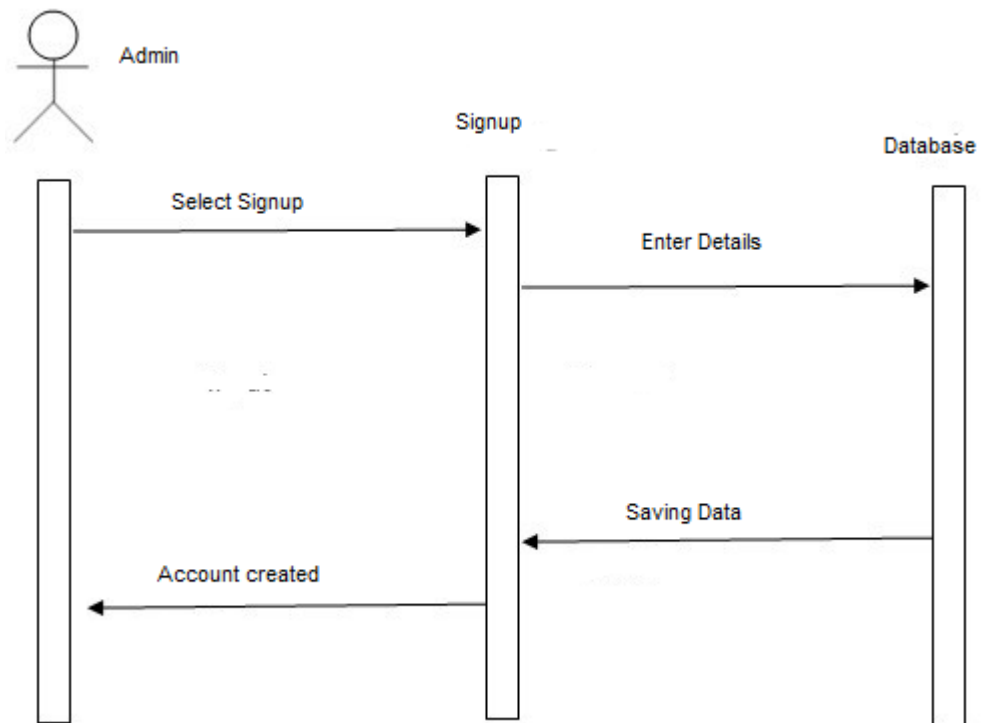


Figure 3.2-1: Signup Sequence Diagram

3.2.2 Signin

Figure 3.2-2 shows the interaction of the admin with the login screen to enter credentials and sign in to the application.

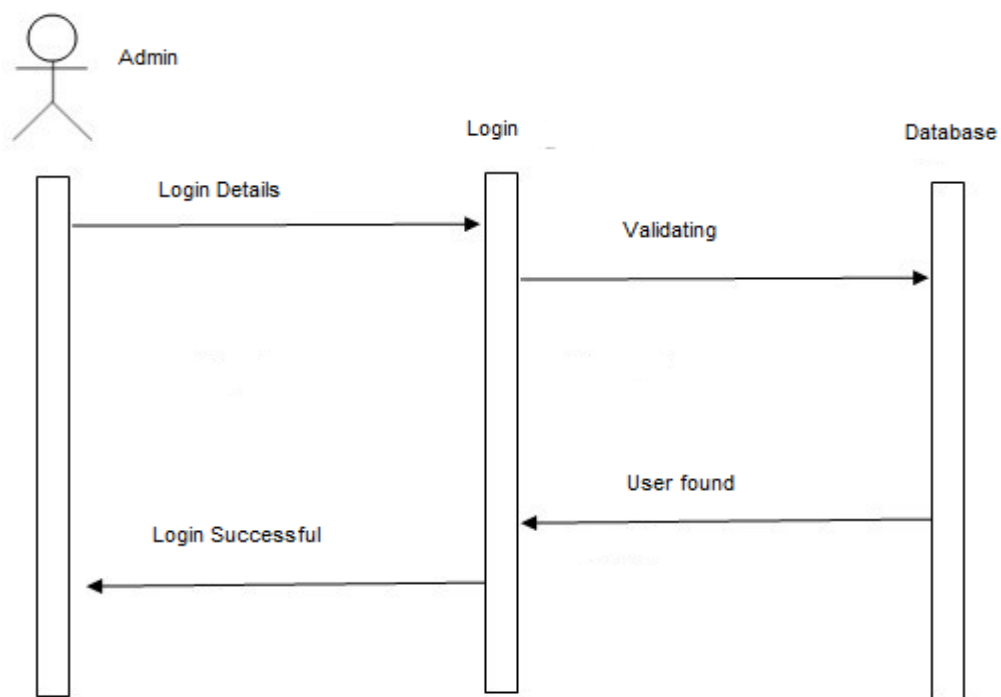


Figure 3.2-2: Login Sequence Diagram

3.2.3 Signout

Figure 3.2-3 shows how Admin/User can Sign out of the application.

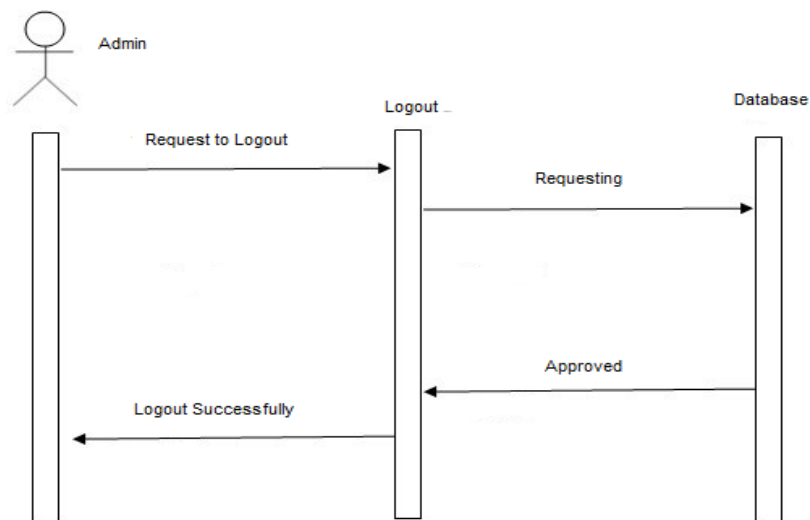


Figure 3.2-3: Signout Sequence Diagram

3.2.4 Create Model

Figure 3.2-4 show how to user create a Model. When the user launches the application, the user given the option to create own custom model.

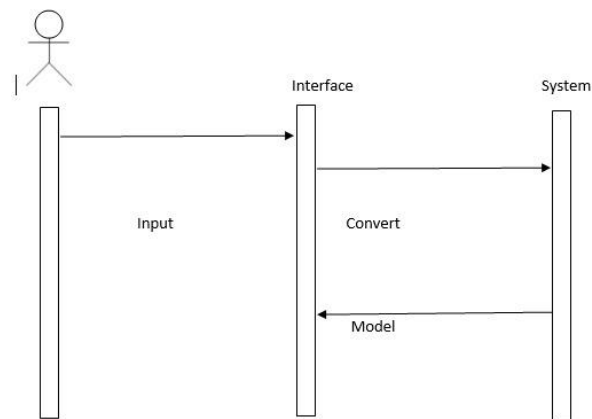


Figure 3.2-4: Create Model Sequence Diagram

3.2.5 View Model

Figure 3.2-5 shows when the model has been created and shown to the user, he can then adjust the rotate slider to increase and decrease the speed of rotation of the model.

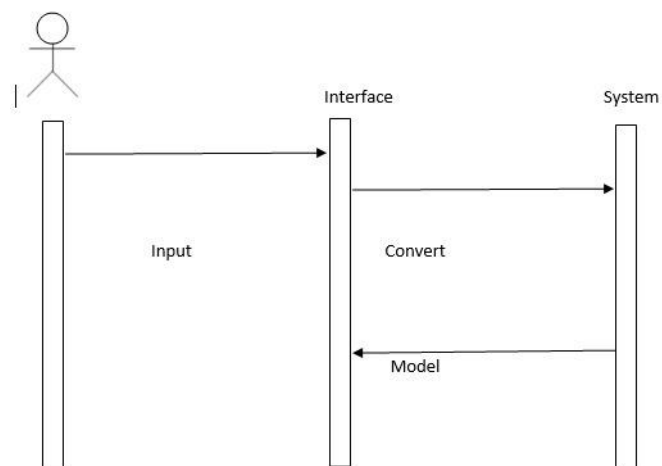


Figure 3.2-5: View Model Sequence Diagram

3.2.6 Zoom in and Zoom out

Figure 3.2-6 shows the model has been created and shown to the user, he can then adjust the Zoom slider to increase and decrease the speed of zoom of the model.

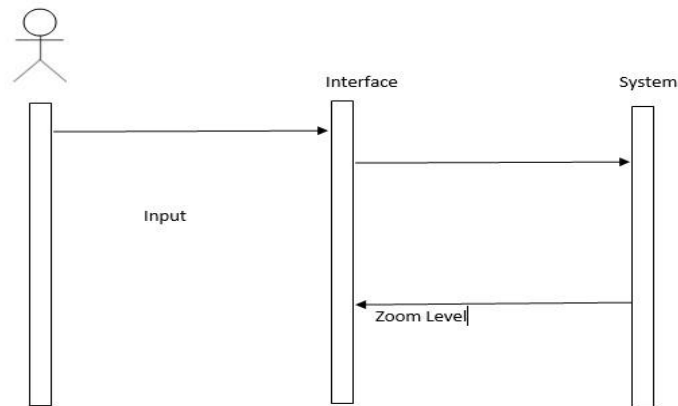


Figure 3.2-6: Zoom in and Zoom out Sequence Diagram

3.2.7 Apply Texture

Figure 3.2-7 shows when user presses the change texture button the system iterates between the set list of textures and applies them to the model.

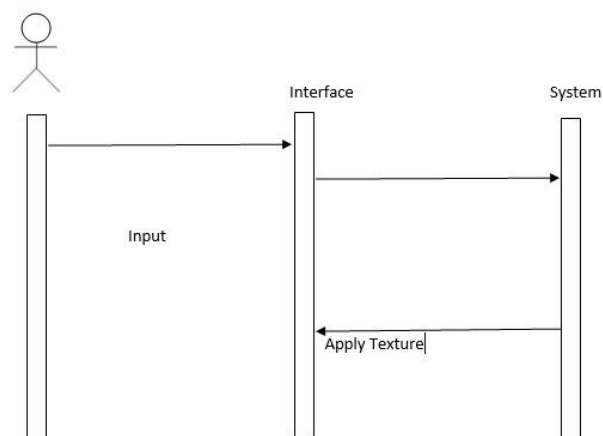


Figure 3.2-7: Apply Texture Sequence Diagram

3.2.8 View Records

In this figure 3.2-8 shows admin can view the data of signed up users.

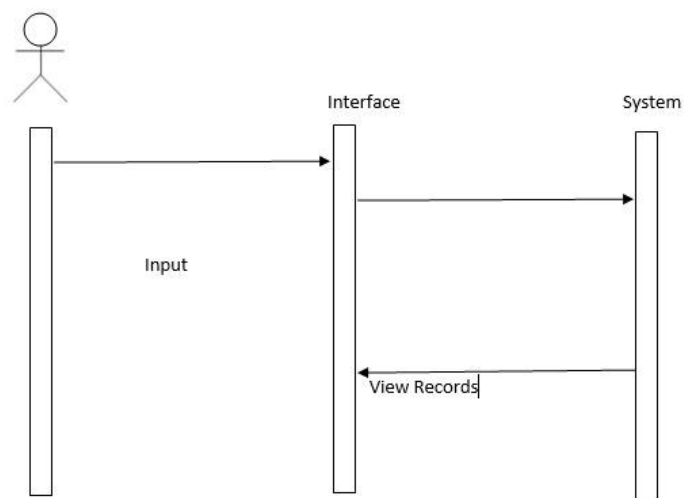


Figure 3.2-8 View Recors Sequence Diagram

3.2.9 Delete and Update

In this figure 3.2-9 shows the admin can delete and alter the data of signed up users.

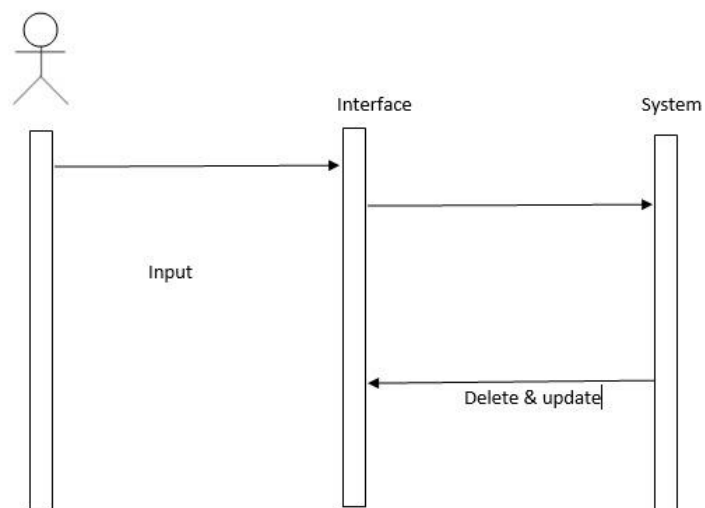


Figure 3.2-9 Delete and Update Sequence Diagram

3.3 Collaboration Diagram

A collaboration diagram explains the pattern of interaction between objects. It demonstrates the objects involved in the interaction by linking to each other. Collaboration diagrams are used to illustrate how objects communicate to execute the actions of a particular use-case or a part of a use-case. In addition to sequence diagrams, collaborations are used by designers to define and clarify the roles of objects performing a particular flow of use-case events. Collaboration diagram of our application is as follow;

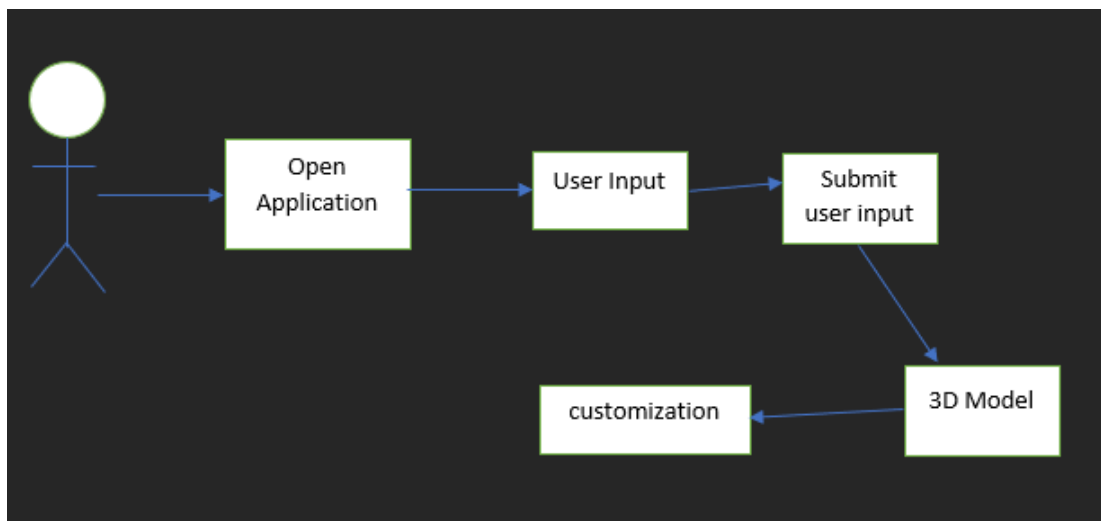


Figure 3.3-1 Colaboration Diagram

3.4 Design Class Diagram

Classes are the work-horses of the design effort, who carry out the system's real work. Subsystems, packages and collaborations, the other design components, simply explain how classes are grouped or how they interoperate. Class diagram of our application is given by the figure:

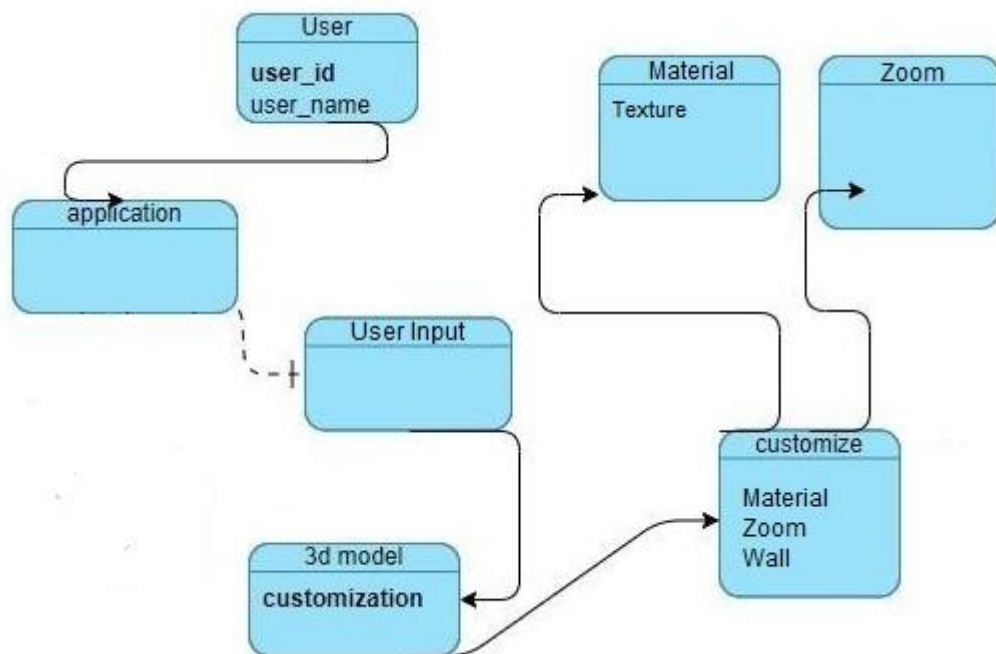


Figure 3.4-1 Class Diagram

3.5 Data Model

The data model describes the logical and physical representation of persistent data in the system as a subset of the implementation model. This data model describes the attributes of entities and their logical relation and abstract normalization. Data Model diagram of our application is given by the figure:

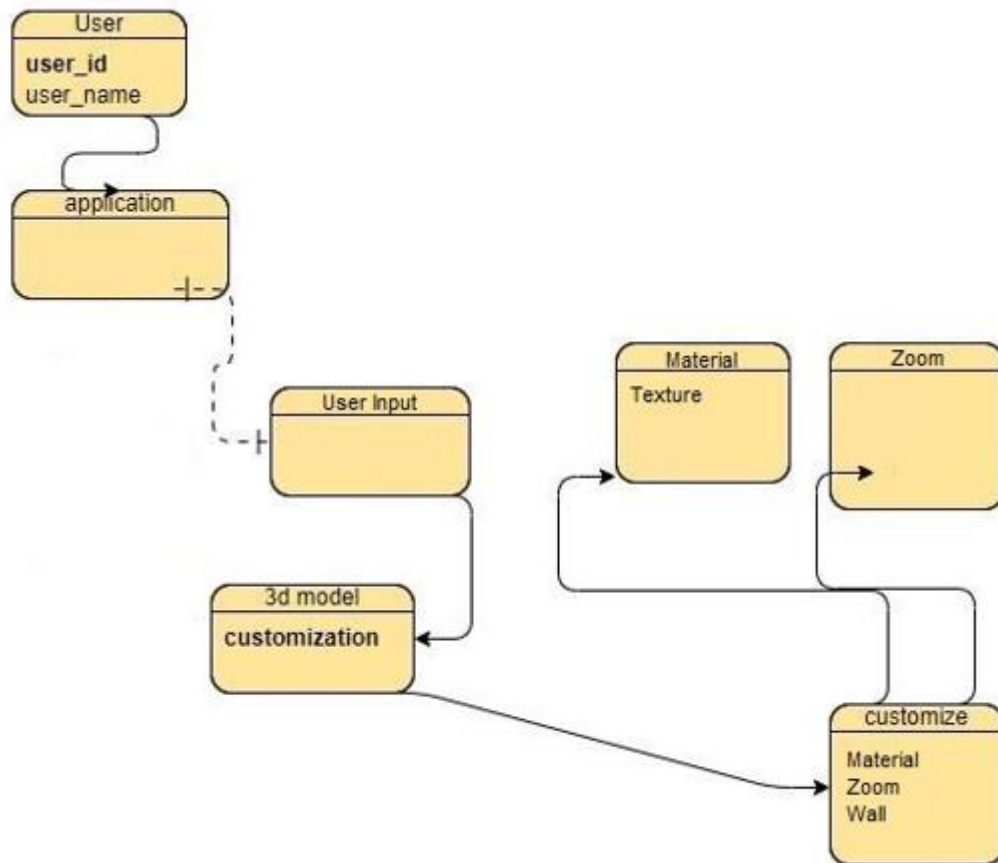


Figure 3.5-1: Data Model

CHAPTER 4

DATA, EXPERIMENTS, AND IMPLEMENTATION

4.1 Software

Our Software will predict Face masks and Social distance from a live video.

4.1.1 Splash Screen

This is our splash screen. When user open our application it takes 3 to 4 seconds to load during that time splash screen will be shown to user.

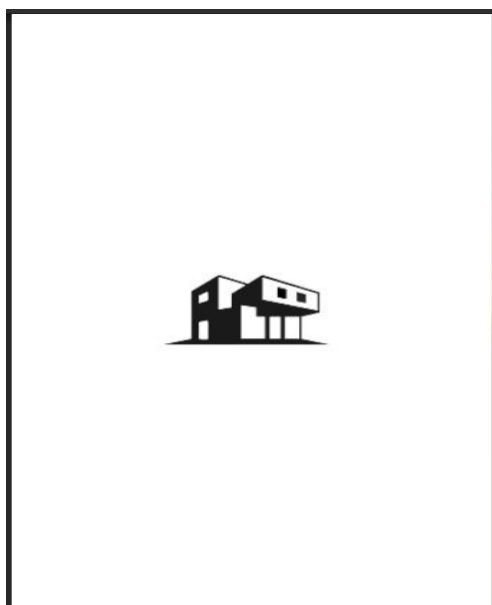


Figure 4.1-1 Splash Screen

4.1.2 Introduction Screen

This is our Introduction screen. Logo and title of our application is at top and our sample model of our house also shown in it. It has a Get Started button. On clicking at Get Started button user can move to Sign up screen.

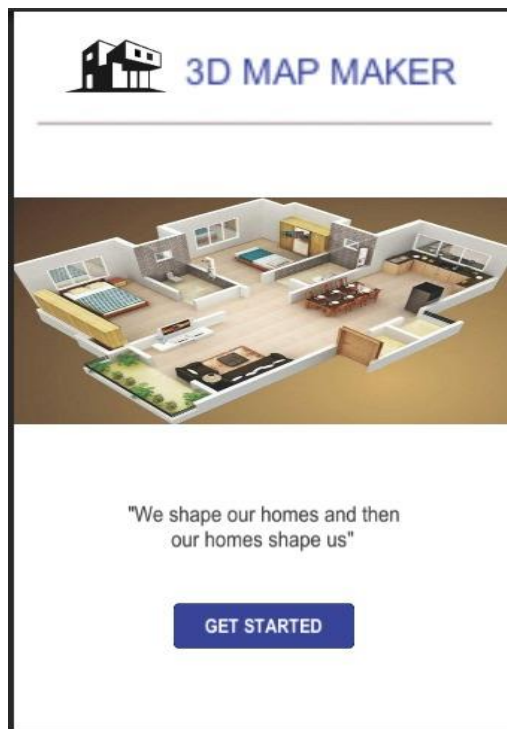
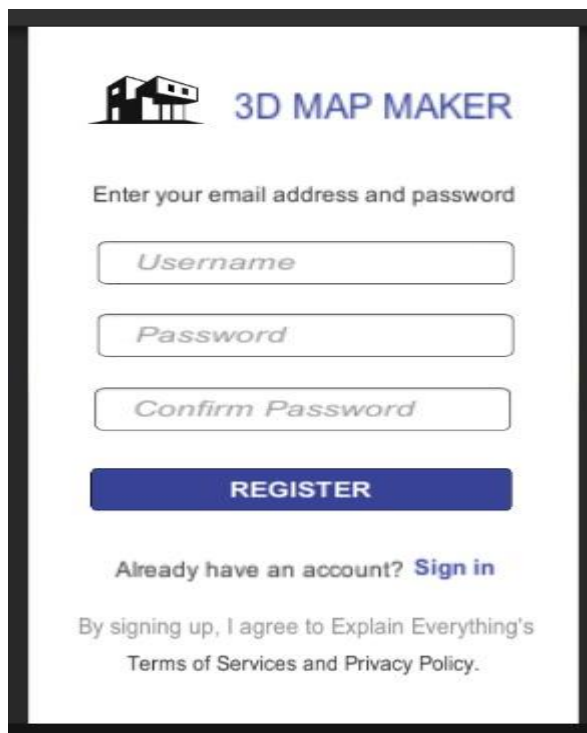



Figure 4.1-2 Introduction Screen

4.1.3 Signup Screen

This is our Sign up screen. If user don't have account so he can create an account by entering Username and Password. If user have already an account so by clicking on sign in he will navigate to sign in screen.



 **3D MAP MAKER**

Enter your email address and password

Username

Password

Confirm Password

REGISTER

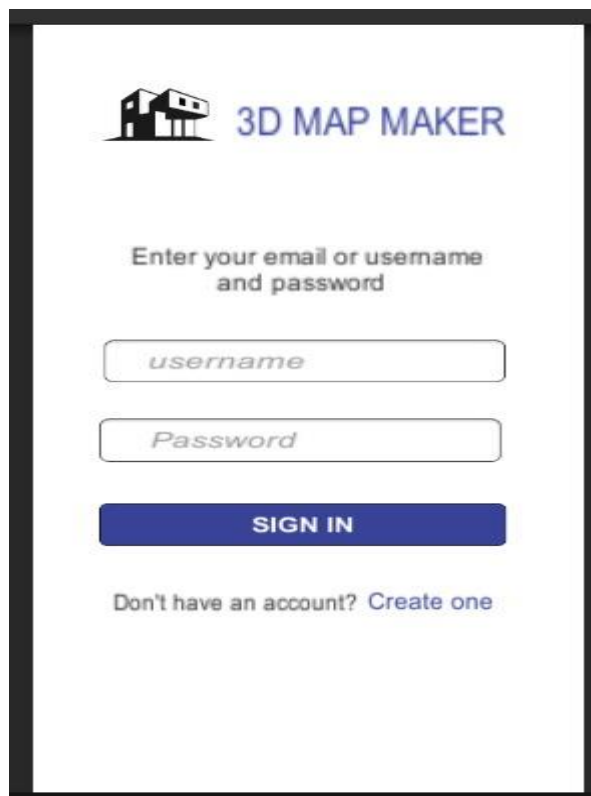
Already have an account? [Sign in](#)

By signing up, I agree to Explain Everything's
Terms of Services and Privacy Policy.

Figure 4.1-3 Signup Screen

4.1.4 Signin Screen

This is the Signing screen. If user have account so he can login to his an account by entering his correct Username and Password. If user don't have account so by clicking on create one he will navigate to sign up screen.



The image shows a sign-in screen for '3D MAP MAKER'. At the top left is a logo of a house with a chimney. To its right, the text '3D MAP MAKER' is displayed in a blue, sans-serif font. Below the logo and title, the instruction 'Enter your email or username and password' is centered. There are two input fields: the first is labeled 'username' and the second is labeled 'Password'. Below these fields is a blue button with the text 'SIGN IN' in white. At the bottom, there is a link that says 'Don't have an account? Create one'.

Figure 4.1-4 Signin Screen

4.1.5 Home Screen

This is Home Screen screen. There are two option one is Input Coordinates and second is Sample Input. If user see how to put values so he will click on Sample Input button and if he is already know how to enter values he will click on Input Coordinates button.



Figure 4.1-5 Home Screen

4.1.6 Profile Screen

This is Profile Screen. On this screen information about the user. There is also a Home button user will navigate to Home Screen by clicking Home button.



Figure 4.1-6 Profile Screen

4.1.7 Sample Input Screen

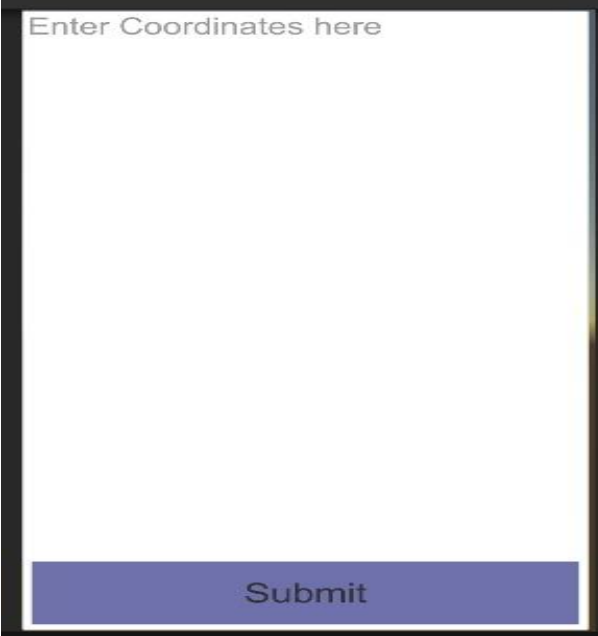
This is sample input screen. Here instruction are given for new user who don't know how to enter values.



Figure 4.1-7 Sample Input Screen

4.1.8 Input Screen

This is input screen where user can enter coordinates in Jason or text fromate to create a building model. On clicking on submit button user will navigate to Model Screen.



Enter Coordinates here

Submit

The image shows a rectangular input screen with a black border. At the top left, the text "Enter Coordinates here" is displayed in a light gray font. At the bottom center, there is a blue rectangular button with the word "Submit" written in white text.

Figure 4.1-8 Input Screen

4.1.9 Model Screen

This is model screen. Where a Model will be built according to the values enter by the user. User can view the Model and also zoom in and out and user can also rotate and view it from different angels.

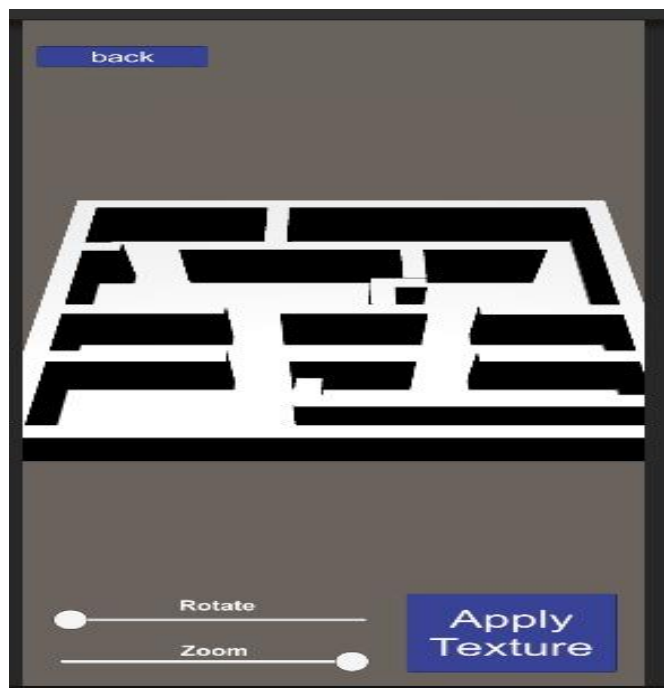


Figure 4.1-9 Model Screen

4.1.10 Menu Screen

This is menu screen. There are 4 options in this screen user Home, Profile, About and Sign out user will navigate to Home screen by clicking Home. User can navigate to Profile screen by clicking on Profile. User can navigate to About screen by clicking on About and in last user will sign out by clicking on Sign Out.



Figure 4.1-10 Menu Screen

4.1.11 About Us Screen

This is About us screen. On this screen we have given description about this application.



Figure 4.1-11 About us Screen

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Survey 2021

In the way to get successful results from our project, our team decides to take surveys from customers. In this event we use google form for that purpose and market both forms on WhatsApp, Facebook, and Instagram.

5.2 Customers Survey

- Name
- Email
- Profession
- Opinion

Timestamp	Your Name	Profession	Your opinion	Email Address
7/25/2021 16:43:36	Abdullah Amir	Developer	nae	abd Amir468@gmail.com
7/25/2021 16:47:30	Haris	Student	It's a good and effective thing. Also it save our time and money.	mharis.butt19@yahoo.com
7/25/2021 17:10:25	Syed Muhammad Ali	Business	amazing app	ali00799@gmail.com
7/25/2021 18:46:07	Syed Hamza Hussain	Computer Science	Benefits the architecture	hhamza0333@gmail.com
7/26/2021 9:43:48	Abubakar Saeed	Student	This app will be very helpful full in the future. This is just a base version of the main technology. Big	abubakarsaeed201@gmail.com
7/26/2021 11:32:26	Fatima Raza	Aptech teacher	This app facilities artitecture as well as civil engineer in construction and to preview the prebuild mc	fatimaraza1057@gmail.com
7/26/2021 11:41:12	Atzal Shaukat	Student (Civil Engg)	This application is based on a very good idea that can assist civil engineers during and before cons	afzaljd12@gmail.com
7/26/2021 15:26:28	Iffat Butt	Web developer	Excellent	it.iffatbutt12@gmail.com
7/26/2021 17:46:26	Aqeel yaqub	Architect	Application is helpful for an architect to show the 3d view of map to clients	aqeelyaqub337@gmail.com

Figure 5.2-1 Customer Survey

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

Now we are concluding that 3d Map Maker app is a solution towards describing 3d world in a 2d map for architects. In addition, users will be able to visualize their construction ideas before construction so that they can customize and turn it exactly into a real world and get the chance to shape their houses. Our application will also help engineers to view 3d model before or during construction. It will reduce the gap which is in between 2d map and a real world.