Axolotl Industries

Team B03-2

Deliverable D - Conceptual Design

Engineering Design - GNG1103

Team Members

Tasfiq Hossain (300117342)

Aisven Devanand (300143937)

Tatiana Tomas-Zahhar (300116906)

Yasser Al Zalak (300114380)

Faculty of Engineering
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ABSTRACT

In the previous deliverable, design criteria and target specifications for the application were derived from the interpretation of needs and benchmarking. Then, these were used to design three conceptual designs. The purpose of this report is to outline and explain all three conceptual designs, and to benchmark the group design to the other AR model visualization apps offered in the market.

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1. Introduction

We want to make an application that will project a B.I.M using AR and VR technology on a mobile device. In this report, we will discuss each member's conceptual design for the app and do some benchmarking to come up with 3 viable solutions. These solutions will use parts of each of our designs and even improve on them, to ultimately offer the best collaborative design.

The three conceptual design mentioned in the report are the following:
- Concept 1: Group Design
- Concept 2: Yasser's Idea
- Concept 3: Aisven's Idea

Concept 1 is the best design for this project as it is built upon all other proposed designs. The other two solutions are acting as backup and reference designs.

2. Group Design

To make this conceptual design, all members of the group pitched in their ideas and came up with this representation of the app. In regards to figure 1., it depicts the application's home screen. It will include a menu bar with five different functions: searching parts of the opened model, sharing, editing sections (part selected in red), selecting views, and seeing the street view. It will also offer the user the ability to view the B.I.M model as a whole, rotate it, and pan across it. Figure 3. portrays how the B.I.M. would look on the main screen. Additionally, the model can be manipulated through touch (ie: two fingers to pan, pinch to zoom, three fingers to rotate), or can be manipulated using the dedicated buttons. To offer clear views of the model, all widgets such as the menu bar, or tips box, can be minimized or moved around the screen. Overall, the main screen is mainly for quick, easy to access, overall visualizations of the model.

In regards to figure 2., it illustrates what the application will show when the edit/pencil icon is selected. Based on the highlighted face or part (in red in figure 1.), this part of the app will offer the user to view isolated parts of the model, as well as all B.I.M. layers. It also includes additional features such as "timelapse", which would allow the user to view the phases of construction (ie: where would construction be in 5 years since development?"), and the option to annotate parts of the model with comments or audio recordings, to allow users to comment on issues and communicate with shared users. In the edit mode, as well as the home screen, there is

also a "Tips" box that will offer suggestions and information to the user. Overall, the edit feature allows users to isolate sections of the model for a more personal experience with it.
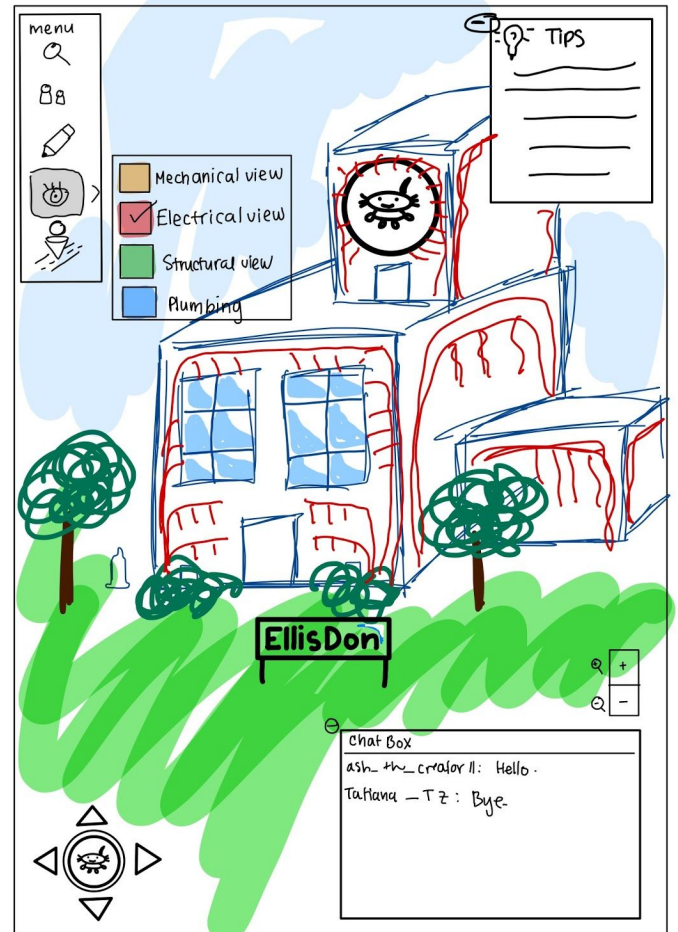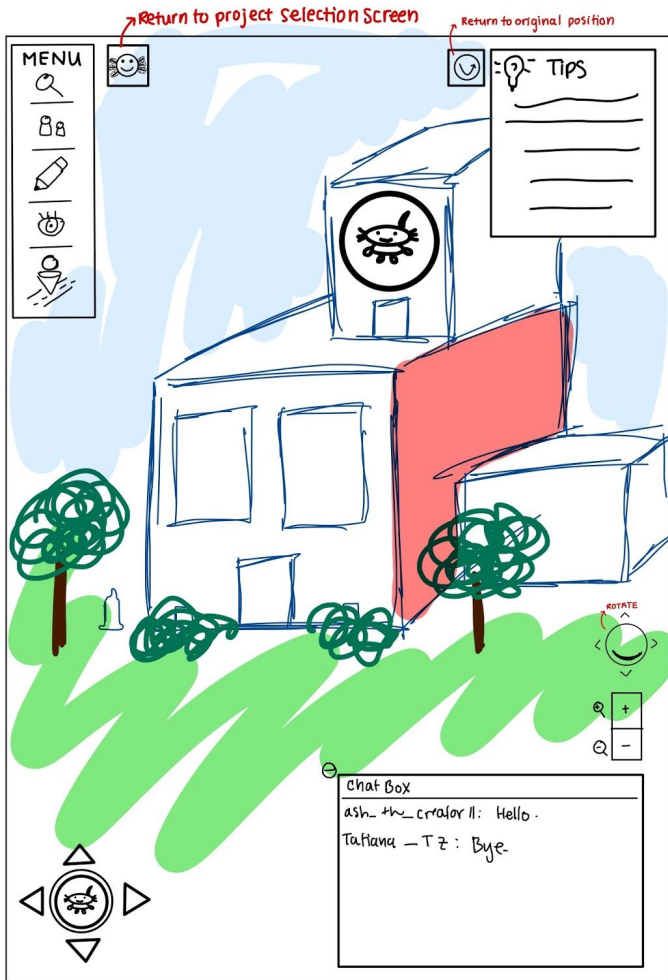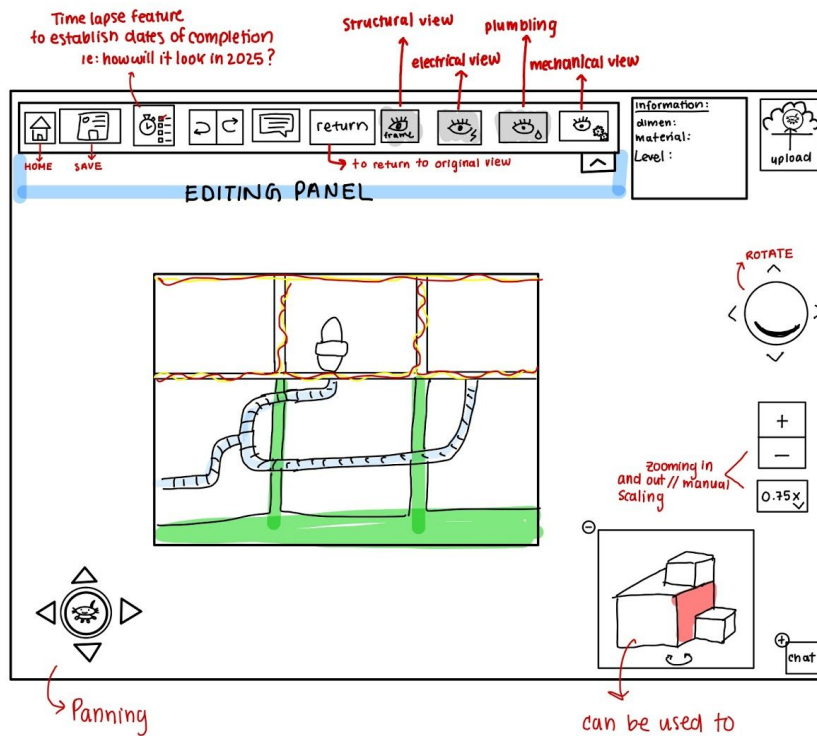

Figure. 1. Group Design

→ when we press the " ✏ " icon on the home page

Figure. 2. Group Design

3. Yasser's Idea

With Yasser's idea and design, He mainly focused more on the possible useful commercial use. The ability to change the scale and view of a file allows real-life discussion about the building in a meeting room. The manipulation of scale allows the user to view finer details.

The most important feature is the ability to view a timelapse of the building. It allows the user to keep up with due dates and have a digital photo to follow and complete the construction. The user would have a digital photo to refer back to.

Finally, the ability to highlight different materials and parts in the program and help construction workers and engineers, if there was any misunderstanding.
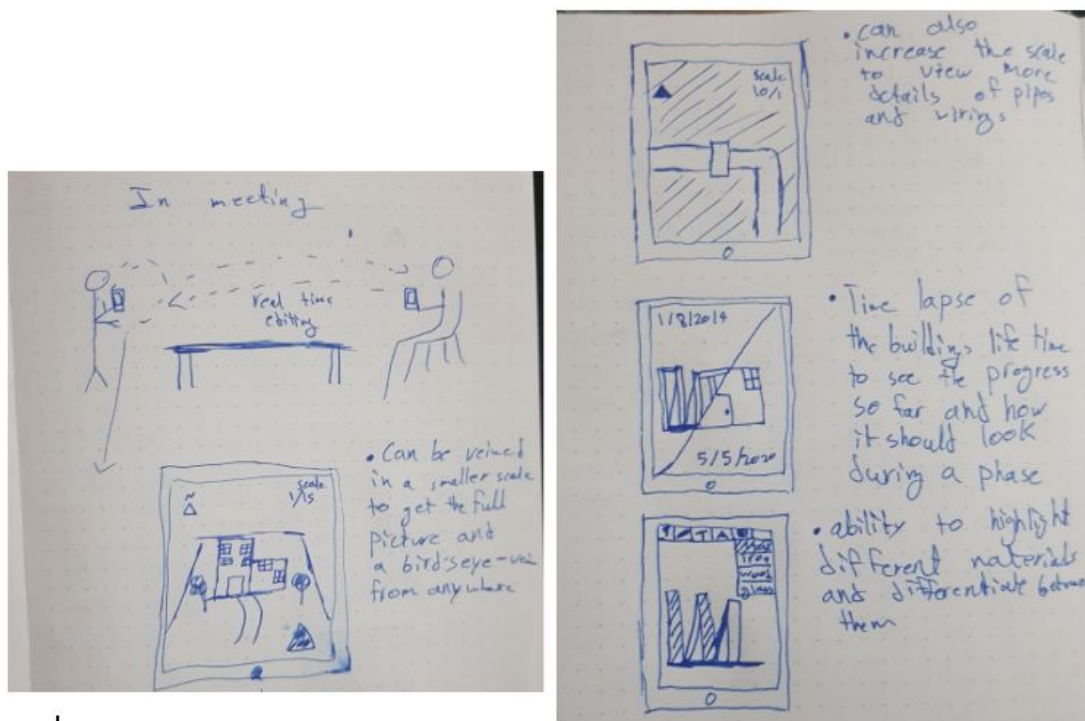

Figure. 3. Yasser's Idea

4. Aisven's Idea

For Aisven's design, he designed a home screen to access the B.I.M by uploading it to the app. Before launching the B.I.M, the application will ask the user to sign in to the cloud network storage, and then, the user will have the option to either use their camera and utilize AR software to project their B.I.M in the real world. They also can use Google Street View, which uses VR to function. There is also a Tutorial option to help new users better integrate themselves into the app. The Settings tab is for more technical stuff the user can change.

When visualizing the B.I.M through the app, the user will be able to toggle between 3 icons in the Tools bar. The View icon has a drop-down menu with every B.I.M layer and the user can click on the box near it to show the dedicated view. Each view will be color-coded to distinguish between them. The Pointer can be used to select a piece of the B.I.M and a description of it will appear below it. The user will be able to modify or add a comment on the part. It can even be used as a reference point when moving the B.I.M as a whole. The Level button is used to choose which floor the user will be on and the B.I.M will descend (or ascend) so that the user will be on the specified floor without having to move there physically. When choosing the level, the whole B.I.M will be displayed with each floor highlighted.

There will be other buttons with different functions, as a return button if the user is lost or wants to quickly go back to where they were. The chat box is used for communicating with other users and the comment button can be seen and modified by other users if so desired.
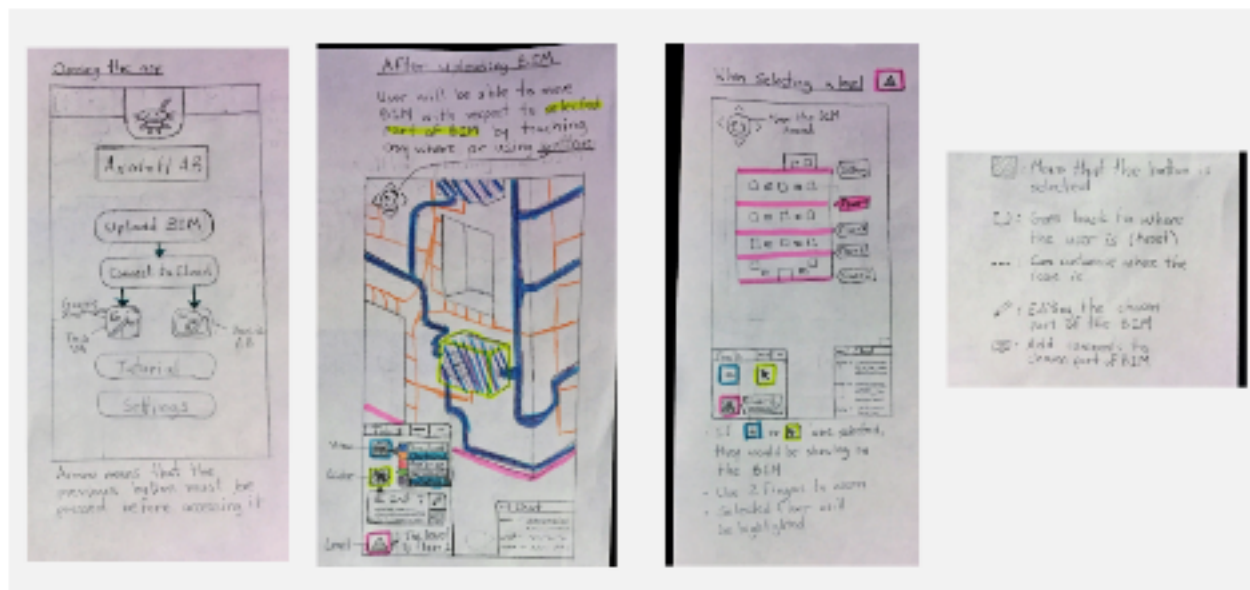

Figure. 4. Aisven's Idea

5. Benchmarking and Verdict

In this section, the group design described in section 2 is compared to the other AR model visualization applications offered in the market. The benchmarking was done to quantify how the proposed design suits the target specifications described in deliverable C.

Specifications	Competition Augmented Reality Model Visualization Apps			
	AKULAR	GAMMA AR	ARKI	AXOLOTL AR
Annual Subscription Cost	$1200 (per year)	$280 (per year)	$340 (per year)	Free
Cross platform usage	Android and iOS	Android and iOS	Only iOS (Android soon)	Android and iOS
Cloud saving	Yes	Yes	Yes	Yes
Able to transpose BIM models	Yes	Yes	N/A	Yes
Tutorials	Standalone Tutorial Videos	Standalone Tutorial Videos	Website for Tutorials and Standalone Tutorial Videos	Website for Tutorials and Standalone Tutorial Videos
Ability to see various layers	Yes	Yes	Yes	Yes
Max upload file size	500 MB	Unlimited	40 MB	Unlimited

Table (1) Benchmarking the values from Design Criteria of similar products [1]–[3]

Specifications	Importance	Competition Augmented Reality Model Visualization Apps			
		AKULAR	GAMMA AR	ARKI	AXOLOTL AR
Annual Subscription Cost	2	1	3	2	3
Cross platform usage	5	3	3	2	3
Cloud saving	3	3	3	3	3
Able to transpose BIM models	5	3	3	1	3
Tutorials	5	2	2	3	3
Ability to see various layers	4	3	3	3	3
Max upload file size	3	2	3	1	3
Total		69	76	58	81

Table (2) Benchmarking of similar products using Design Criteria [1]-[3]

6. Conclusion and Recommendation

The final design will be presented to the client and will receive feedback for any changes that need to be made (preferences or other the client might have).

7. Bibliography

[1] "GAMMA AR - BIM Construction Management and Facility Management App," *GAMMA AR*. https://gamma-ar.com/ (accessed Oct. 11, 2020).

[2] "Akular."
https://akular.com/?utm_term=akular&utm_campaign=USA+-+Brand&utm_source=adwords&utm_medium=ppc&hsa_acc=1643061550&hsa_cam=10192044630&hsa_grp=102126991575&hsa_ad=438724729119&hsa_src=g&hsa_tgt=kwd-910949269609&hsa_kw=akular&hsa_mt=e&hsa_net=adwords&hsa_ver=3&gclid=Cj0KCQjw8fr7BRDSARIsAK0Qqr70nx_TxrBTIBn6eeaJhbRPquHLlFd_S92n2X5_ZgviiCn9J2KzhfwaAnHvEALw_wcB (accessed Oct. 11, 2020).

[3] "Augmented Reality platform for Architecture, Engineering and Construction," *DARF DESIGN*. https://www.darfdesign.com/arki.html (accessed Oct. 11, 2020).
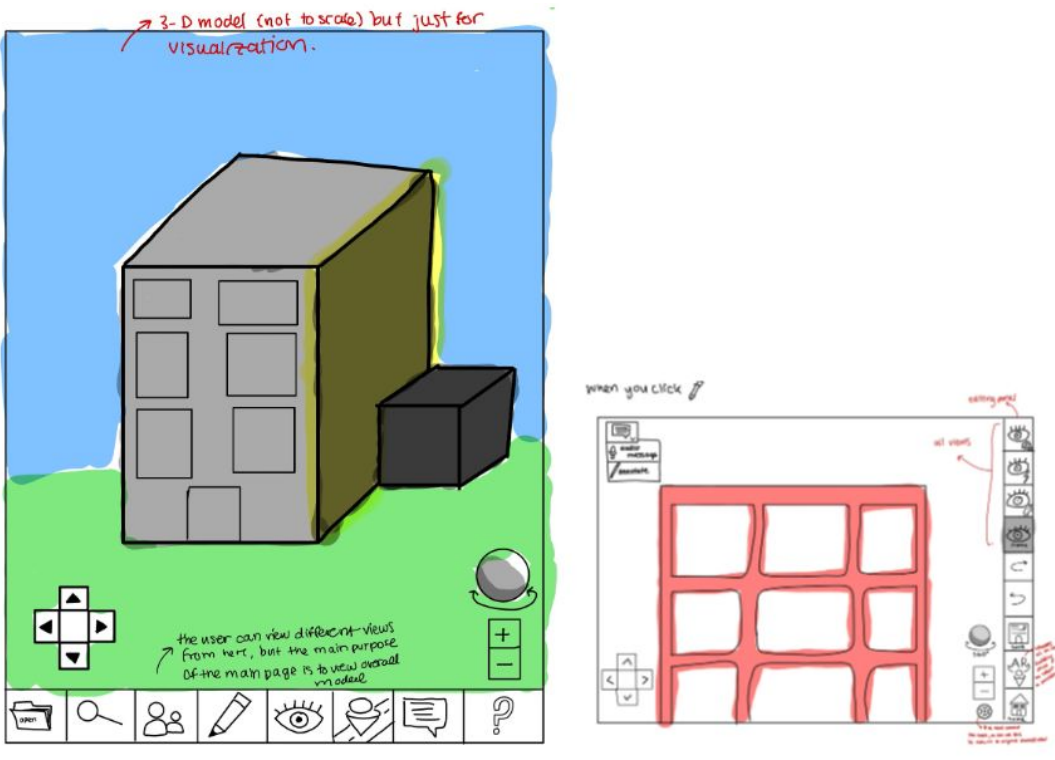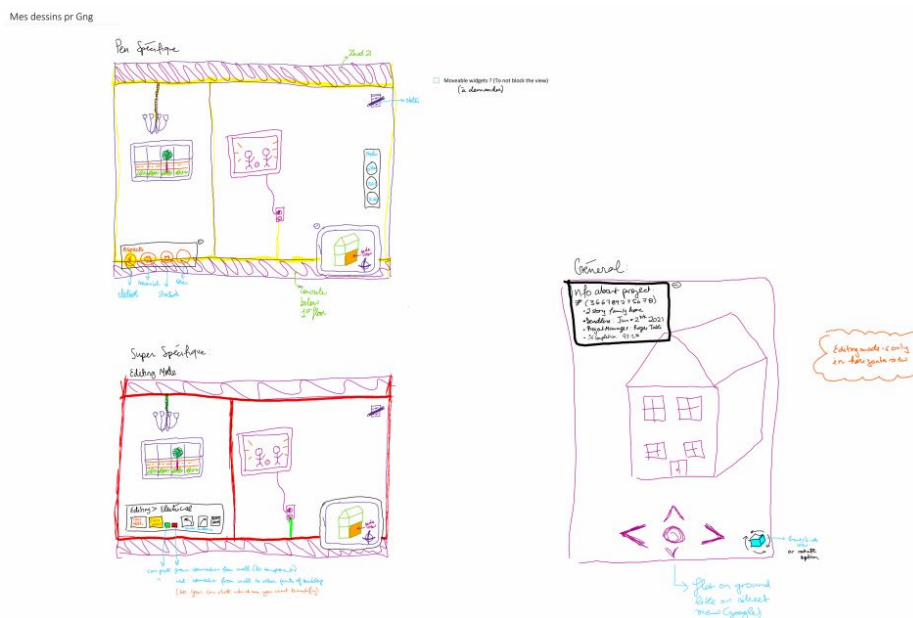
8. Appendix

Figure. 5. Tasfiq's Idea

Benefits: Moveable apps, isolating of the different subsystems

Figure. 6. Tatiana's Idea