GNG1103 Report

Project Deliverable - H

Submitted by

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Date

Nov 26, 2020

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Abstract

This report details the organization of a prototyping test plan to develop a fully functional prototype that fulfills the previously identified design criteria and the needs of the client, EllisDon Construction, represented by Patrick Lalonde. The plan for the team includes identified objectives that will be achieved in the final prototyping phase. The main part of this report outlines the prototyping plan for prototype III: the final prototype is based on developments made to the previous two prototypes using the testing summary and analysis of feedback from potential users/clients (as outlined in previous deliverables). This report includes the results of the previous protypes, and improvements made to further develop the product in order to fulfil the needs of the client.

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1 Introduction

This report outlines a detailed prototyping test plan which was created to advance and integrate the six focused prototypes, from prototype I and prototype II, into a fully functioning comprehensive prototype III. After the six focused prototypes were identified: main menu interface, navigation toolbar, camera navigation system, multi-user interface and programming, safety warning pop ups, and a dimensioning tool, they were combined to form the previously discussed prototype II. From prototype II, solutions were further developed to improve the user interface and functionality of the program to fulfil the design criteria as outlined by the client.

Similar to the focused first two prototypes, prototype III was further tested and appraised based off of user and client feedback. Based on the analysis of this prototype, within the last few weeks of the design process, the final product is subject to debugging and final adjustments to then be distributed to the client: EllisDon Construction, represented by Patrick Lalonde.

2 Prototype III Testing Plan

The prototype testing plan is developed based off the ‘Prototyping Testing Plan’ template from lecture 11.

2.1 Prototype Objectives

Capture the reasons for the test, giving enough background information to justify doing any prototyping at all. Is the general objective one of: learning, communication, de-risking, etc.

In order to create an application that fulfills all the needs and criteria requested by EllisDon Construction, prototyping is being done in stages which began with prototype I; the alpha prototype which was several focused prototypes, the second prototype was then developed by implementing consumer and client feedback and combining the various focused prototypes, now as outlined in this document the third and final prototype will be a comprehensive high fidelity version of the final product.

The objective of the prototype presented in this document is to represent the final product that the client requested. Prototyping and prototype evaluation was very important to ensure that the product we create satisfies the clients needs.

What are the specific test objectives?

The ultimate objective of prototype testing is to confirm that the prototype fulfills the clients needs and satisfies the outlined target specifications. As well, the prototype should address the problem statement posed by the client; "Design a technology that allows construction workers to view all aspects of 3-D Building Information Models (BIM), including mechanical, electrical, structural and architectural systems in Virtual or Augmented Reality. The product should be cost effective, user friendly and accessible on all mobile devices."

Testing will also serve as a learning experience to determine where our concept needs to be improved or modified in order to provide a seamless user experience while providing all the functionality requirements which the client asked for. The specific test objective of prototype III is to confirm that all subsystems are represented in a functioning application.

What exactly is being learned or communicated with the prototype?

This prototype is communicating and displaying a single high fidelity comprehensive prototype that will be distributed to the client. This prototype is the final one which was developed by integrating all crucial client and consumer feedback which was gathered during the client meeting 2 and 3 as well as from peers. This prototype was about integrating and bringing the last 10 weeks of work into a final product.

What are the possible types of result?

Prototype III is thoroughly outlined and displayed in the following sections and is tested against the previously determined metrics. The results of testing will indicate the strengths and weaknesses of the prototype based on the client's needs which were used in developing the metrics. The results of the testing will indicate whether or not our concept satisfies the client's needs.

How will these results be used to make decisions or select concepts?

The results of the testing will be analyzed to ensure that this prototype like prototype I and II fulfill the needs of the client. If it does not fulfill its purpose and provide the client with what they requested decisions will have to be made promptly to modify problematic subsystems with a new idea or one of the previously eliminated ones in order to satisfy as many needs of the client as possible.

What are the criteria for test success or failure?

In the case of the prototype testing outlined in this document, the metrics will be used to measure whether the prototype was a failure or a success. The comprehensive prototype is a success if it fulfills the criteria and it is a failure and will need to be modified or replaced if it doesn't fulfill its required specifications.

2.2 Prototyping Process

Describe the prototype type (e.g. focused or comprehensive) and the reason for the selection of this type of prototype.

As aforementioned the prototype documented in this report will be a single comprehensive high fidelity prototype comprised of the previously developed focused prototypes in prototype I and prototype II. A comprehensive prototype was created at this stage to distribute to the client and allow for adequate testing and sufficient feedback from the client as well as consumers.

Describe the testing process in enough detail to allow someone else to build and test the prototype instead of you.

The testing process will involve interaction with the prototype in order to determine if it fulfills all associated metrics. In the case of the prototype outlined in this document, to execute prototype testing the tester would need to use unity and navigate through the individual scenes of the prototype and determine if it satisfies the metrics of which the majority are yes or no answers.

What information is being measured?

The protypes competency to fulfill the client's needs is being measured based off of the metrics and specified target value.

What is being observed and how is it being recorded?

The prototype's features are being observed in order to determine if it satisfies the metrics outlined in this document. The results are being recorded by the designers in tabular format.

What materials are required and what is the approximate estimated cost?

Like the initial prototypes, there will be no cost associated with prototype III, only Unity and the Unity asset store will be required as no physical materials will be required to create the application.

What work (e.g. test software or construction or modeling work or research) needs to be done?

The completion of prototype III will require vast improvements and the implementation of all features into prototype II. The user interface will need to be updated and additional AR camera scripting will need to be done. After these changes are made, we then will have to re-verify compatibility with the mobile platforms before the prototype can be finalized.

2.3 Prototyping Schedule

How long will the test take and what are the dependencies (i.e. what needs to happen before the testing can occur)?

Testing of this prototype will not require much time, however before testing can occur the prototype will need to be complete which will require a significant amount of time. Development was slowed due to not having the building file therefore testing will not be able to occur until we have this file integrated into the interface with all the required scripting. Total testing time should not exceed one day, we do however plan to distribute this prototype to peers for feedback which will take up to 3 days.

A separate test planning Gantt chart can be created to help making sure that the testing fits with the overall project schedule or it can be defined as part of that schedule (i.e. as a sub-task).

In the project deliverable E a Gantt chart was created, in which subtasks were defined to account for prototype testing time to ensure our team stays on track with prototype development and testing. This schedule has been followed thus far without issues and we are on track for successful competition of prototype III by Design Day.

When are the results required (i.e. what depends on the results of this test in the project plan)?

The results of the testing of prototype III are required by November 26th for the submission of this deliverable as well as Design Day.

3 Prototype III and Prototype Appraisal

This section of the report thoroughly and concisely documents prototype III using figures and explanations, this prototype is then appraised and analyzed through testing.

3.1 Prototype III

The final prototype is sequentially displayed using screenshots that begin with all the interface screens of the application, these screens are available in English and French but only English screens are included in this report.

Figure 3.1.1 Application Icon

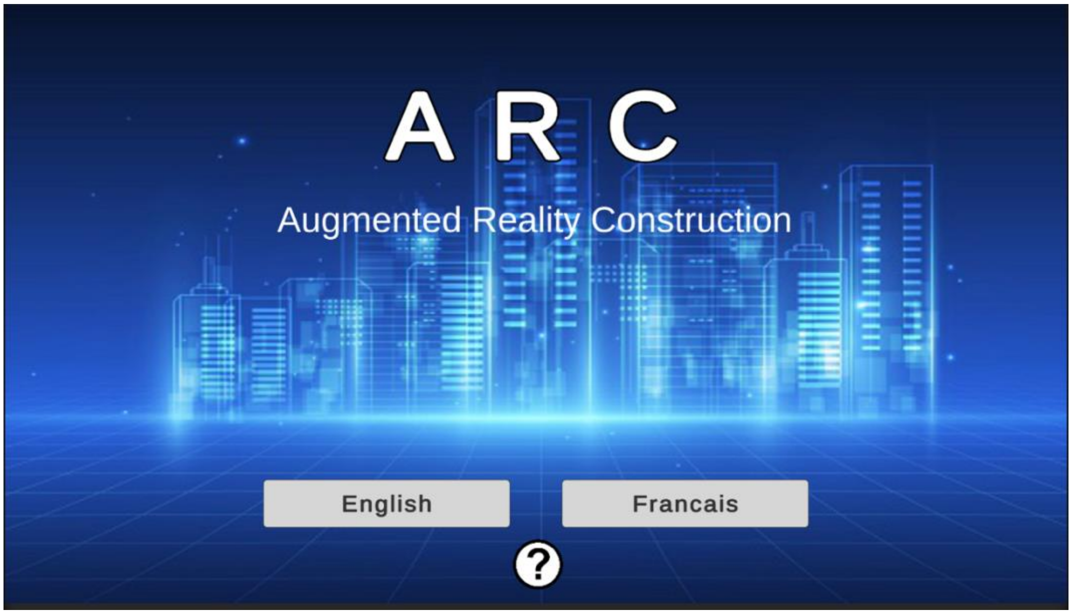


Figure 3.1.2 Home Screen Interface

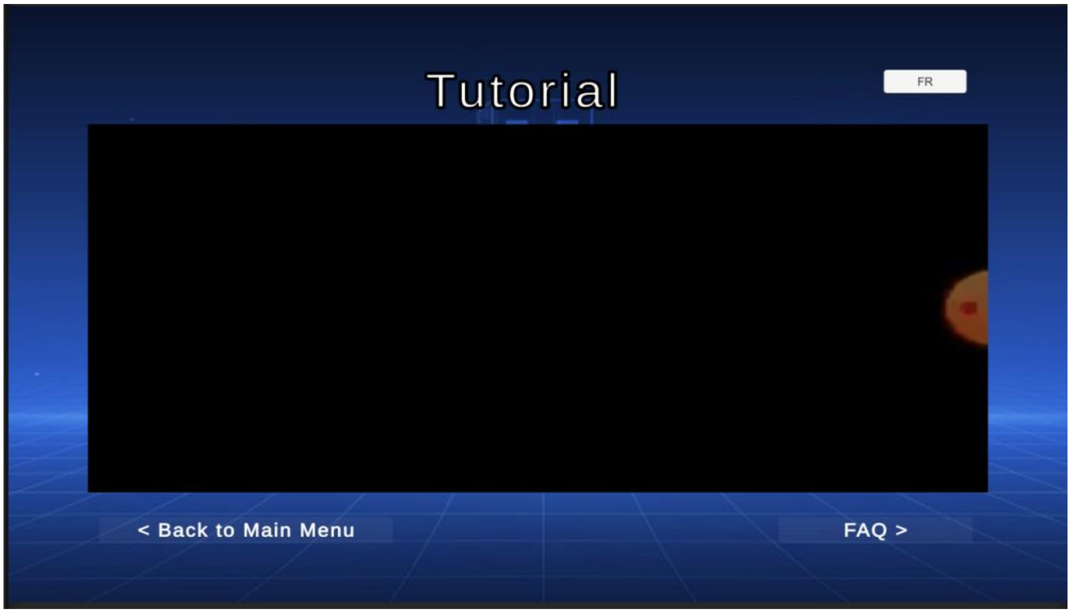
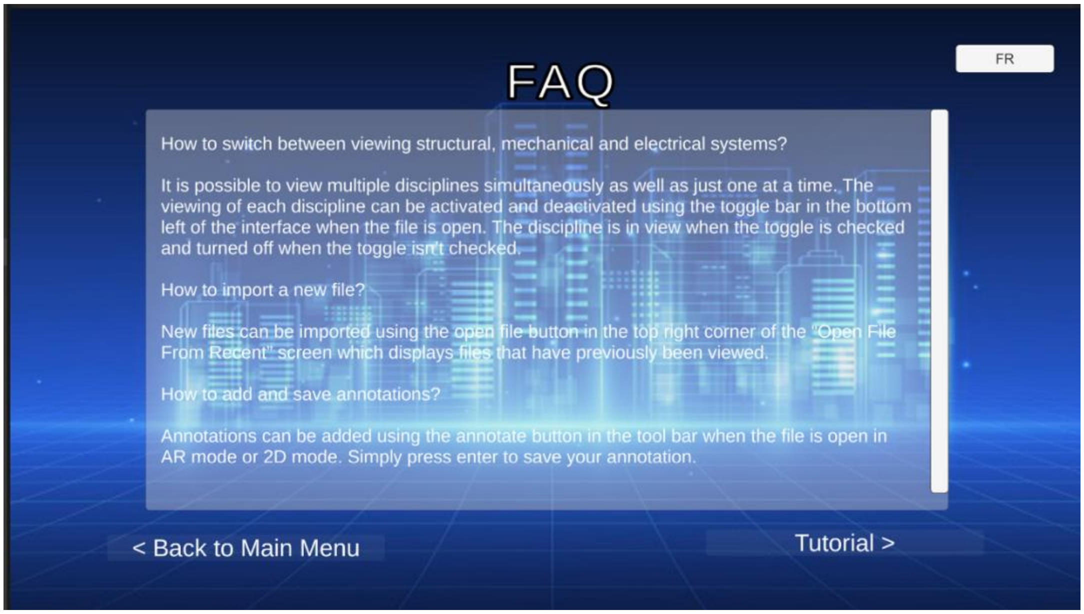


Figure 3.1.3 Tutorial Screen Interface



How to switch between viewing structural, mechanical and electrical systems?

It is possible to view multiple disciplines simultaneously as well as just one at a time. The viewing of each discipline can be activated and deactivated using the toggle bar in the bottom left of the interface when the file is open. The discipline is in view when the toggle is checked and turned off when the toggle isn't checked.

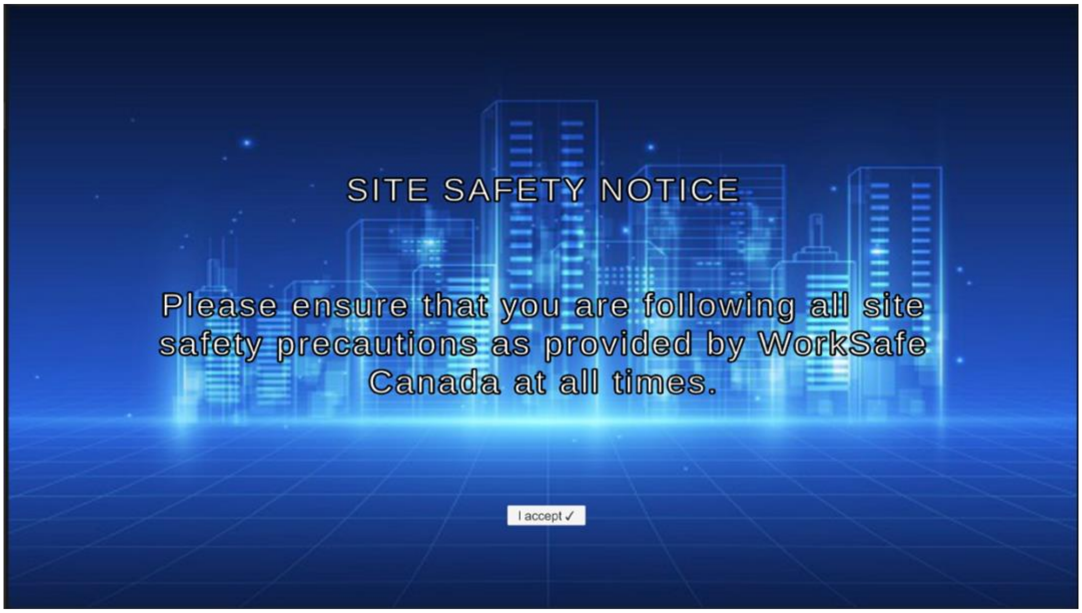
How to import a new file?

New files can be imported using the open file button in the top right corner of the "Open File From Recent" screen which displays files that have previously been viewed.

How to add and save annotations?

Annotations can be added using the annotate button in the tool bar when the file is open in AR mode or 2D mode. Simply press enter to save your annotation.

Figure 3.1.4 FAQ Screen Interface



Please ensure that you are following all site safety precautions as provided by WorkSafe Canada at all times.

Figure 3.1.5 Site Safety Reminder

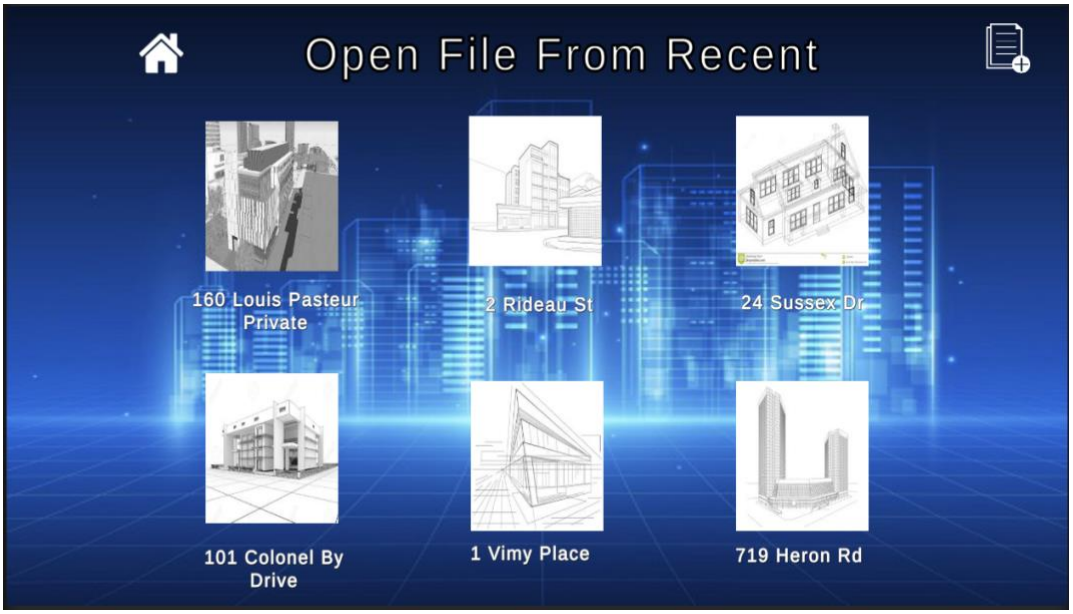


Figure 3.1.6 Open File Screen Interface

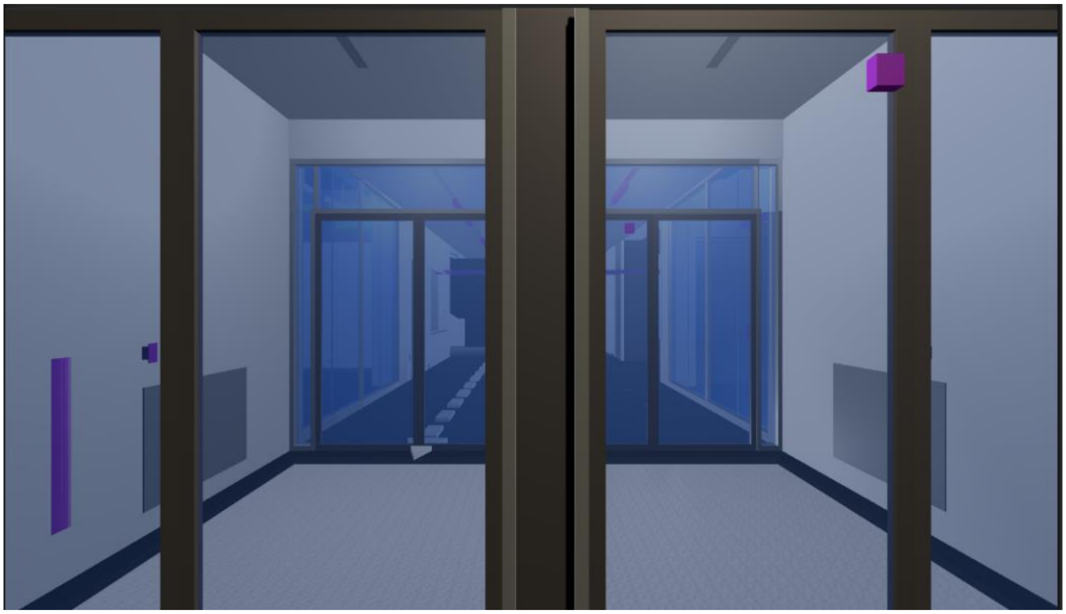


Figure 3.1.7 AR Scene STEM Entrance

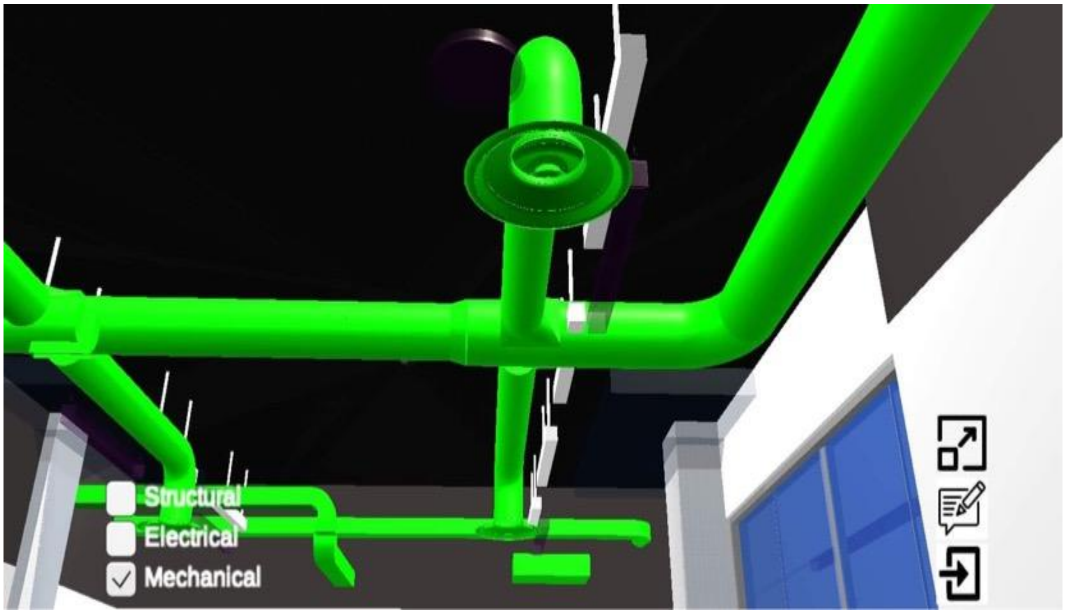


Figure 3.1.8 View of Mechanical Systems in AR Mode

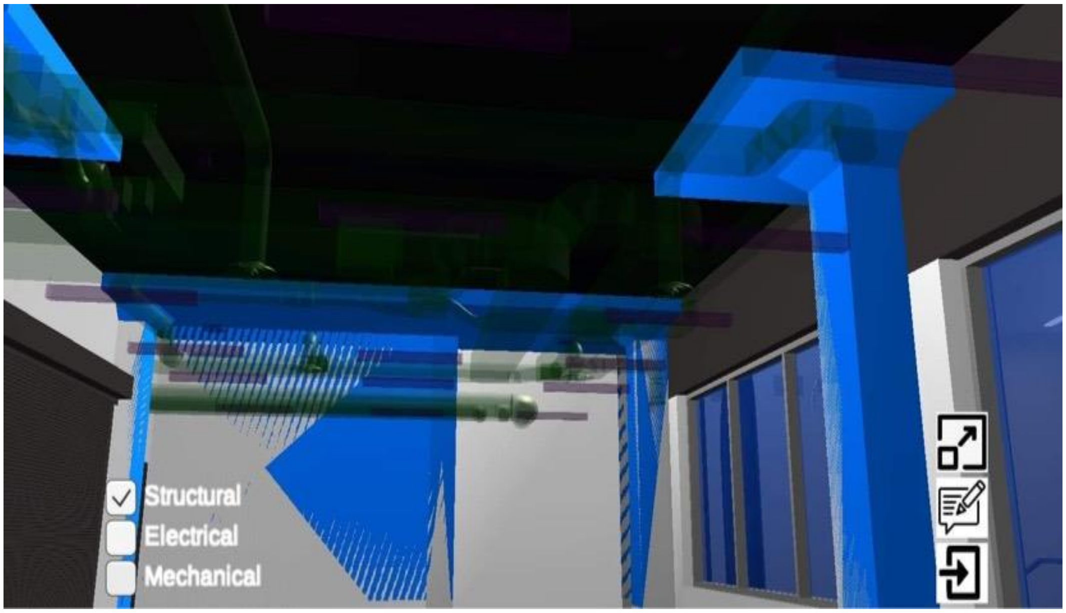


Figure 3.1.9 View of Structural Systems in AR Mode

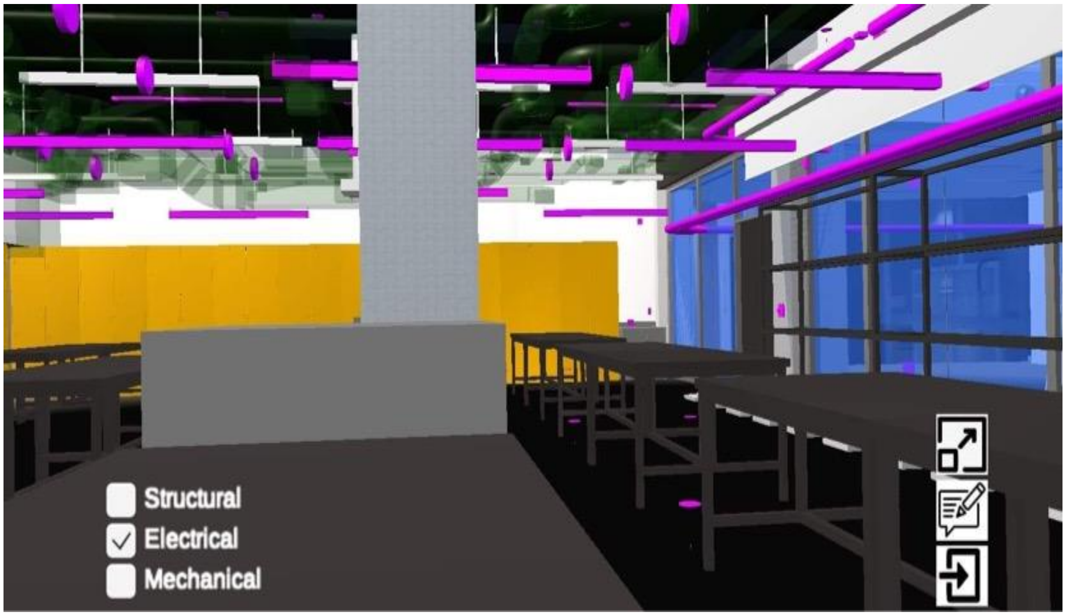


Figure 3.1.10 View of Electrical Systems in AR Mode

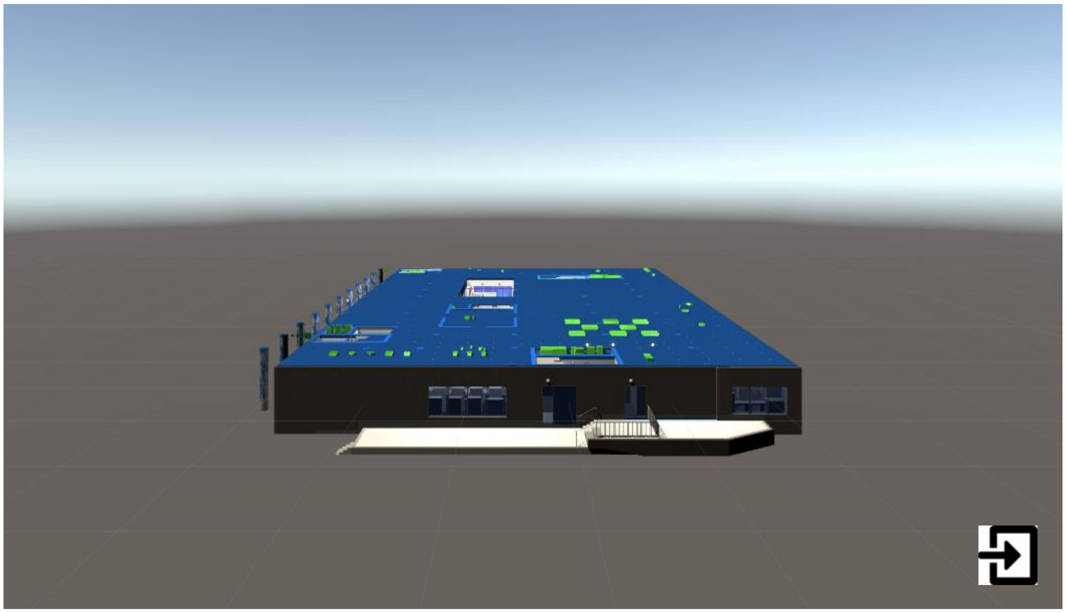


Figure 3.1.11 Aerial Mode Sample View (1/3)

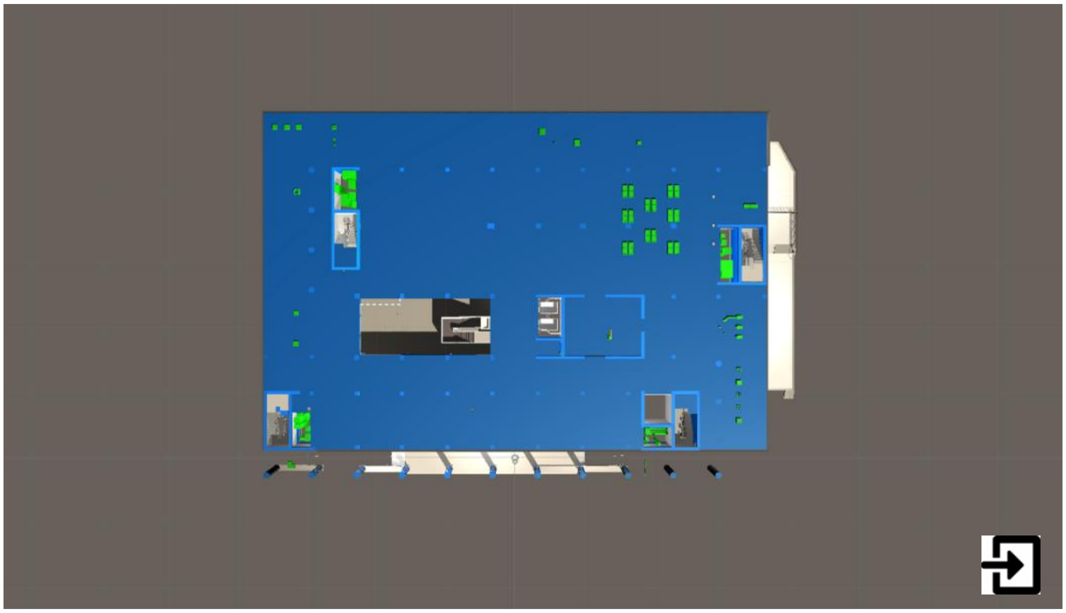


Figure 3.1.12 Aerial Mode Sample View (2/3)

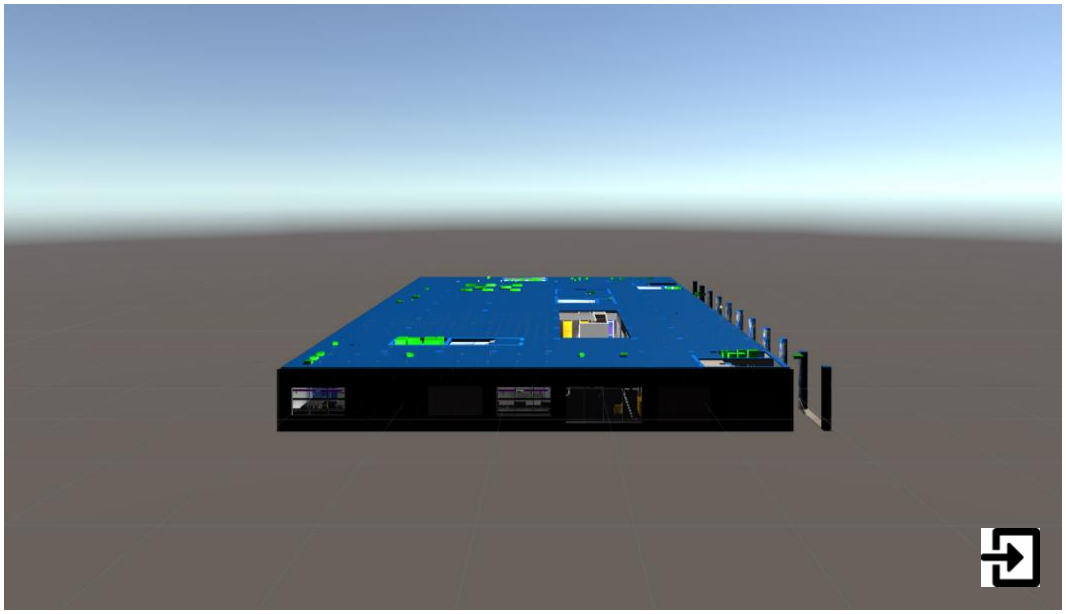


Figure 3.1.13 Aerial Mode Sample View (3/3)

3.2 Testing and Appraisal

This prototype was tested against the previously defined target specifications. The results of the prototype testing are detailed in table 3.2.1. The test results indicate that the prototype fulfills and in some instances even exceeds the needs of the client.

Table 3.2.1 Prototype III Test Results

No.	Metric	Units	Target Value	Tested Value
1	Ability to view 3D Building Information Models (BIM) in Virtual Reality.	Y/N	Y	Y
2	Compatible with common Mobile Devices (iOS or Android).	Y/N	Y	Y
3	Viewing of BIM is available offline and cloud syncing available online.	Y/N	Y	N
4	Ability to view 3D internal systems in BIM's in Virtual Reality.	Y/N	Y	Y
5	Navigation and interface must be user friendly.	Subjective Rating*	6	8
6	In app safety reminders and warnings for hazards on work site.	Y/N	Y	Y
7	Software application must be open source or free to use.	Y/N	Y	Y
8	Training and implementation documentation must be provided.	Y/N	Y	Y
9	Software application must be free to users.	$	0	0
10	At minimum be accessible in the form of a mobile application.	Y/N	Y	Y

4 Prototype Testing Summary and Feedback

In the previous deliverable, prototype II was done and documented with thorough testing and analysis. This prototype was presented to our client; EllisDon and we received good feedback.

Lalonde was very impressed with our progress so far and offered no criticism or suggestions that would need to be implemented into the final prototype. We as well gathered feedback from peers and colleagues, the main suggestion we received was to improve the user interface by ensuring everything including font sizes etc was consistent throughout all scenes and to add additional accessibility features. The implementation of these features as well as many other improvements to the functionality of the application resulted in very good testing results for prototype III. The results indicate that a product has been created that satisfies the needs of the client.

5 Conclusions and Recommendations for Future Work

In conclusion, by creating and following a thorough prototype testing plan three prototypes were created, the final one as outlined in this document, is a high-fidelity comprehensive prototype of an application that fulfills the needs of the client, EllisDon construction. The implementation of feedback received from the first two prototypes resulted in the development of the third and final prototype which exceeds the targeted metrics in ease of navigation and user experience. Next, this prototype will be presented to a panel of judges on Design Day and a user manual will be created which will completely document the design of the entire app and all the features.