GNG 1103-B

Project Deliverable G

Prototype II and Customer Feedback

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Group B03-4

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Introduction

Last week, the UOttawa Engineering students came up with a plan for a set of three prototype iterations in order to test their design for the AR application being produced in collaboration with *Ellis Don.* They started with a “proof of concept” prototype, which they tested successfully, and they were able to receive feedback from their client following a brief presentation.

This deliverable will describe the second prototype, which aims at refining the first iteration according to the test results and feedback which were previously documented, as well as beginning to implement the more complicated features needed in the finished product.

Prototype Test Plan

Why are we doing this test?

What are the specific test objectives?

The test objectives for the second prototype are mainly centered around the main AR functionality. This includes setting up an AR plane, an AR camera, and being able to place objects (or build files) into the application. Additionally, we want to refine our current Unity scenes (Main menu, Settings, Files) so that they are more compatible with a mobile screen.

What exactly is being learned or communicated with the prototype?

Since this prototype is more comprehensive than the last, we hope to learn a multitude of things about our project. We are learning extensively about the placement of objects, how we want to orient a user within a build space, how we plan on implementing the BIM layer toggles, and the interfaces required to make “file selection” and “account” subsystems possible.

What are the possible types of results?

The types of results we expect to receive from the testing in this iteration are similar to those of the previous, in that these will mainly consist of binary, qualitative results i.e. whether or not a subsystem is functioning the way we intended it to or not. For example, if we are not able

to place our objects onto the AR plane, we will consider it a negative result. Alternatively, if that same feature happens to function as intended, it would be considered a positive result.

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

The results will assist us in deciding where it would be best to compromise, if a given subsystem is not working the way it was originally planned to. All negative outcomes from the tests will be followed up by an evaluation of the feasibility of a given concept's implementation. This will allow for a determination to be made as to whether we need to change this concept or keep working towards a solution. Alternatively, if some subsystem works particularly well, we may choose to build onto it and thus modify the original concept for positive reasons.

What are the criteria for test success or failure?

As previously mentioned, the criteria for test success or failure is a binary qualitative scale of whether or not the subsystem functions the way we intended, based on our initial design criteria. If a subsystem does not meet the standards or goals previously specified, then it may be deemed a failure. However, this will mainly be evaluated on a case-by-case basis, as we might have to alter our initial design criteria to keep balance with time constraints.

What is going on and **how** is it being done?

Results of the Previous Prototype

The previous prototype was successful overall, being a good first step on the track to the success of this project. Despite its barebones features, it did function as a fairly competent proof of concept. In particular, we were able to get our buttons to function as planned, allowing us to easily move between the different scenes (Main menu → AR View → Settings), on a mobile platform.

However, it wasn't without fault. The main issue we saw was that the default resolution and button layouts were sub-optimally compatible with our mobile screen, size-wise. Furthermore, it was an overall incomplete product, albeit intentionally.

Description of Current Prototype

The current prototype is a more comprehensive version of the previous. It is a physical prototype which consists of an upgraded version of our main scenes (Settings, Main Menu, AR screen, Hazards) as well as the addition of a new 'File select' scene. We have also enabled the AR camera functionality and want to test the AR plane function to place an object from a file onto a surface in the real world.

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

We have increased the scale of all of the buttons in Unity and switched the game resolution to one more fitting of a mobile device in landscape (Specifically an iPhone X/XS). Using the AR Foundations plugin, we implemented a camera and AR plane to our “AR view” scene. To test the functionality of these, we will build and run the updated unity package to an iOS device through Xcode, at which point we will open the app on our device and test to see if our AR camera is functioning as it should and if our files system is integrated properly with the other scenes. Once this is done, we will attempt to choose a file (any random object) and place it in our AR scene using the AR plane.

What information is being measured?

The information being measured includes the accuracy with which the AR plane can detect horizontal surfaces and how easy it is to place an object on a plane and observe it through AR. We also are measuring the limits to this plugin, so see how close we can view an object (and its resolution), how far we can detect a surface, and how stable the object is on the plane.

What is being observed and how is it being recorded?

What we will be observing corresponds closely with the aforementioned information being measured. Observations will be recorded in a word document along with our previous prototype information, allowing us to analyze our results and compare them to our target specifications to determine if the tests were successes or failures.

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

Similar to the previous prototype, there are presumably no costs associated with this project. The only materials needed are the Unity software, Xcode, Apple ID, and two mobile phones (Apple and Android).

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

Much work still needs to be done for this project. We need to finalize all of our scenes, integrate the BIM layer selection with a build file, finish our tutorial, finish our files scene, and perform testing for all these subsystems. We also have more research to be done pertaining to the limits of AR in Unity. We want to make sure that we stay true to our original design criteria as much as possible so that the client's needs are still met.

When is it happening?

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

The testing will only take a few hours over one or two days. Before the testing takes place, however, we need to finish our ‘file selection’ scene, integrate the AR place plugin, and obtain an object file to place within the AR screen.

When are the results required (i.e. what depends on these tests in the project plan)?

The results required for this prototype are due by November 20th at the latest so that we have time to implement the final subsystems for our last prototype before design day (on December 3rd).

Prototype II

Figure 1 - File Select: Menu Allows for selecting the 3D file to view in AR View.

Figure 2 - Main Menu: Menu Allows for choosing between files, tutorial, AR, and share features.

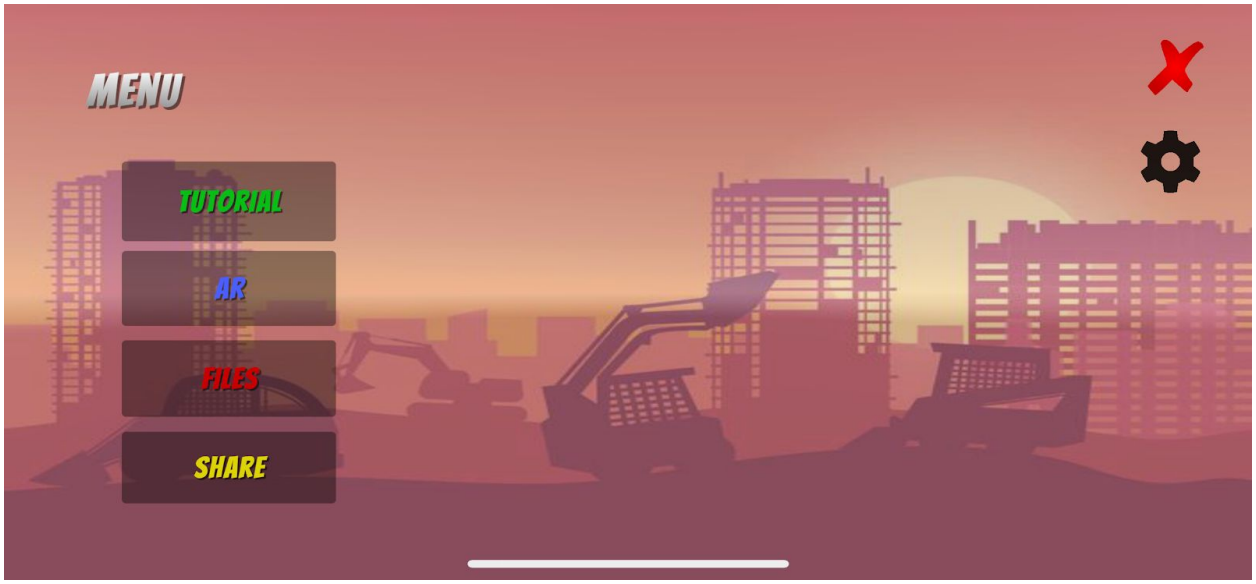


Figure 3 - AR Screen: Allows to view a building in your surroundings with AR camera and overlay.

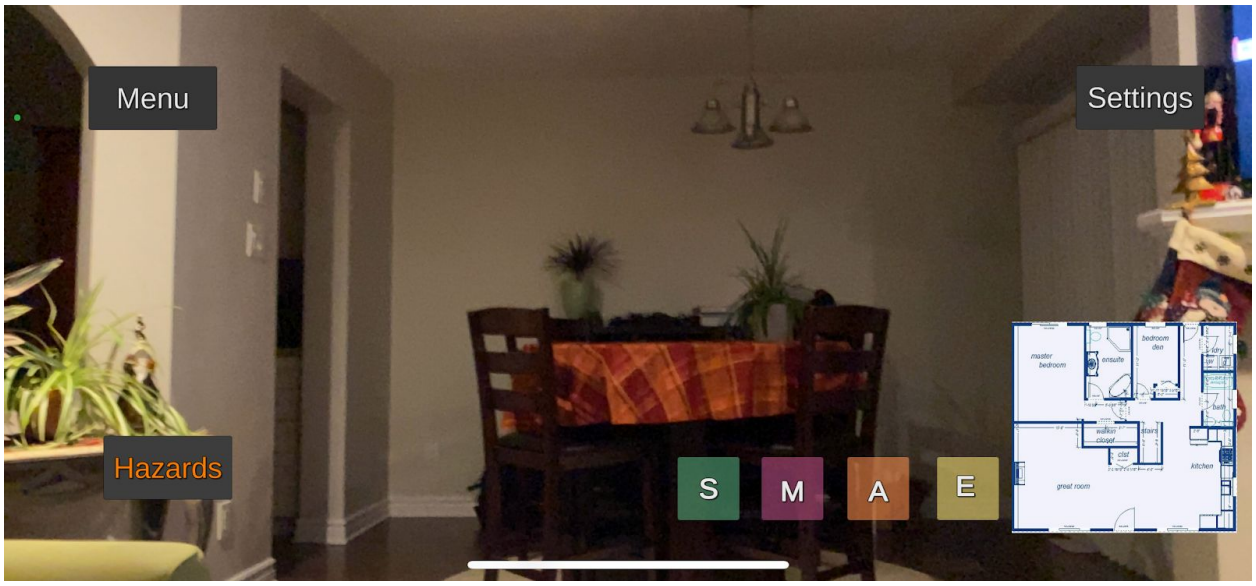


Figure 4 - Hazards Screen: Displays a message to alert the user of potential hazards in a construction zone or tells the user what PPE they should be wearing on site.

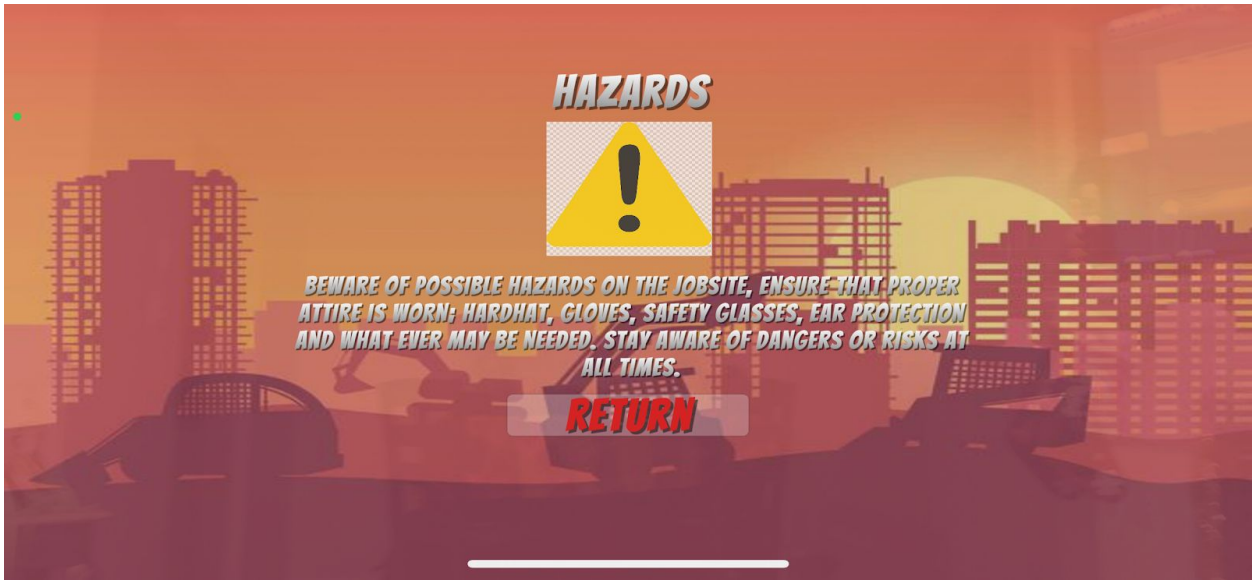
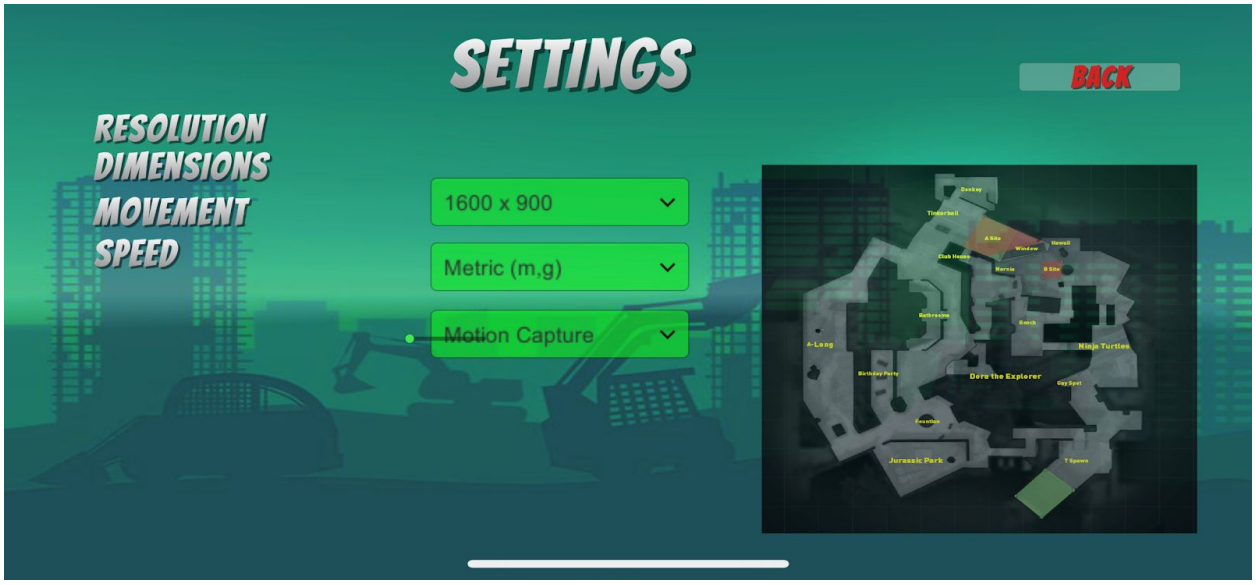


Figure 5 - Settings Screen: Displays different options for settings of your AR scene to allow for customization of things such as resolution and units of measurement.



Feedback

So far, testers have expressed mostly positive feedback with regards to the functionality of prototype 2. They've made positive observations regarding the clarity and ergonomics of the user interface and the addition of new subsystems.

They also provided some constructive criticism regarding the relative incompleteness of certain features, in particular the file selection screen and the tutorial.

Conclusion

In this deliverable, the students were able to take their first prototype and improve on it, in a second iteration, by taking into account their preliminary results and client feedback. Thus, the second prototype is proving to be a more comprehensive and complete product, with significant improvements in ergonomics as well as functionality.

They have also made efforts to outline a detailed testing plan, to ensure that the prototype works in a way that fulfils the needs expressed by their client. With this, students should have the data necessary to successfully complete the third and final iteration of their project in time for their presentation to the *Ellis Don* representatives.