Deliverable F:

Prototype I and Customer Feedback

Team 1

Engineering Design - GNG 1103 - Section B03

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Abstract

The purpose of this report is to devise a concise test plan and to develop the first prototype to attain the objectives the team detailed in past deliverables. In addition, customer feedback will be obtained to ensure the quality of the application.

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1.0 Introduction

This first prototype plays a vital role in the development of the final product for the client. It paves way for more prototypes to be developed as it is the fundamental starting point of our ideas. This prototype provides us with a vision of our final product as it allows us to view and modify areas of improvement and errors in functionality. The purpose of this deliverable is to summarize the current progress with the creation of our Augmented Reality software for EllisDon. Initially, this first version of our application exhibits a basic interactive user interface, language changes, and certain augmented reality features. Since not all aspects of the application have been entirely integrated, certain features planned for the future will not be able to be discussed and improved upon in this specific prototype report. During the prototyping process, many aspects of the application have been tested, fixed, changed, and improved, which will continue in the future of the project. Over the course of the final developmental weeks, aesthetics and other AR features will be implemented. The purpose of the current prototype (Prototype I) is simply a proof of concept to demonstrate the aspects of the application that are not specific to the STEM building project being built for EllisDon. This deliverable will also include an explanation of the testing methods involved in the prototyping process (Why, What, When), the testing results, an analysis of the results, as well as a summary of the feedback received from the customer regarding the current prototype design.

2.0 Prototype Test Plan

2.1 Purpose of the Test

The purpose of this test is to determine the areas of improvement regarding prototype 1 in order to efficiently build new features to integrate into prototype 2. An effective development process to construct the best version of the application goes through a multitude of modifications. In this aspect, we verify if there is a need to purchase new assets, modify scripts, or integrate new features. It is critical to run testing via Unity and through devices that the application will be available on in order to test it accurately. For instance, testing the prototype in the Unity platform demonstrates the interaction of the user interface in regard to the user's perception when wearing VR equipment. Additional testing allows for us, the creators, to pinpoint the precise areas we must modify to improve user experience. In detail, it enables us to differentiate between where more effort and time is required and where less investment is needed. After effectively developing the first prototype, we will exhibit it to our client in order to obtain feedback to guide us in our upcoming version. Completing the first prototype is the fundamental stepping stone to developing our final solution and from client feedback through testing we can construct the ideal solution for our problem statement.

2.2 Dependencies of the Test

It is critical to attain the requirements the team detailed from client meets to establish the first prototype. For instance, the client aims to utilize this application on their mobile devices with an offline and cloud capability. Additionally, the ability to annotate certain features on components within the building is another beneficial attribute to integrate. It is important to run this test prior to the development of the second prototype, as another test for new features at that stage will be done. Testing in this manner will allow for efficient application development. It is critical to conduct this test prior to the next client meeting as this document also obtains and analyses the client's feedback for this prototype and with the results of the test, we can also detail that information to the client.

2.3 Testing Method

As this project is primarily based on Unity, which is a software no real testing other than application testing can be conducted. Therefore, testing will consist of ensuring each function of our application is running correctly and to determine any errors within Unity scripts. Additionally, the layouts are verified if they exhibit an aesthetic perspective to the user. Additionally, testing our prototype is the chief method we are utilizing in order to receive effective results to further develop our project. The main purpose of this prototype is to verify all the basic functionalities and requirements the client asked has been met effectively, the next prototypes aim to integrate other features to make our application unique and professional.

2.4 Test Objectives Description - the 'why'

*What are the **specific** test objectives?*

We aim to complete all requirements the client has detailed for us by the final prototype, however, this particular test will attain the goals in section 3.0 of this document.

*What **exactly** is being learned or communicated with the prototype?*
The basic functionalities are implemented in this prototype. We attained all buttons possible at this time and began developing a neat layout for our user interface. We simply constructed a basic proof of concept as our BIM files have not been received.

What are the possible types of results?

There are no known possible outcomes of this testing other than errors in script or functionality. In terms of client feedback, we aim for our client to be pleased with the team's progress.

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

The results of these tests will only develop our application for the better. We certainly will fix the bug errors that arise immediately and respond in a timely manner to address the feedback of the client. We will keep the fundamental functionalities and build upon them unless the client specified removal of certain aspects. We also aim to integrate new features to establish the best possible solution for our client.

What are the criteria for test success or failure?

A successful test consists of receiving good feedback in pair constructive criticism from the client. Additionally, minimal errors arising from Unity testing is another sign of success. This paves way for areas of improvement to improve our app to make it more user friendly, accessible, aesthetic, etc. The test would result in failure if our application is not functional or receives many errors during testing. In this scenario, solely negative feedback will be received.

2.5 The 'what' and 'how' Aspects

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

The prototype is comprehensive in this developmental stage. We solely want to integrate the basic functionalities and as well as construct the fundamental components to our application. Additionally, any other extra features won't and can't be integrated as BIM files are not yet available.

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

The individual must have access to a Unity license and have some prior knowledge to C# scripts in order to build and test this prototype. There are a multitude of tutorials available on YouTube and the internet that they can reference in order to attain some more knowledge of this concept. After, they simply have to create the introductory scenes, an in-game menu, and integrate plane detection along with image tracking to construct this version of our application.

*What information is being **measured**?*

The information has a qualitative measurement as we are solely measuring the quality of the design and function of this prototype. No quantitative data is being collected in order to assess the application as there is relatively no numerical values to be attained.

*What is being observed and how is it being **recorded**?*

The observation is of the design of the format and functional elements of our application. As no BIM files are readily available, there is no set environmental feature as of yet but mere scenes and buttons along with some additional elements we integrated. Client feedback is recorded by a designated team member.

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

As of the moment, no assets have been purchased but by prototype 2 some of our budget will be used. The only tool we are currently utilizing is a powerful personal computer that can run Unity efficiently along with a coding software. The estimated budget is $100.

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

If the BIM files are unable to be imported or are not modified, we aim to purchase another building from the Unity asset store and build the annotated features within it. Additionally, UI features will be purchased to make the application more user friendly and aesthetically pleasing.

2.6 The ‘when’ Factor

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

The test will consist of the time allocated to our group during the lecture period in terms of client testing and in terms of bug fixes during Unity testing, we allocated 1 hour. The dependencies of the test are detailed in section 2.2 of this document, but to reiterate the members must be prepped for the meeting and roles should be assigned.

A separate test planning Gantt chart can be created to help make 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).

A new Gantt chart was developed particularly for prototype development in the prior deliverable, therefore, refer to the document 'Deliverable E' to attain this plan.

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

The results are required prior to the due date of this deliverable which has been pushed to November 14th. As the plan currently relies heavily on the results of this test, we must receive feedback prior. We will build upon or revisit aspects of this prototype based on the results of this testing.

3.0 Design Concept

This prototype is constructed from the developmental schedule the team organized in past deliverables, in particular, deliverables D and E. In line with the current schedule, this prototype aims to attain the following minimum tasks within its' structure:

- Scripting in Unity - i.e. implementing code structures that allows the user to spawn a specific scene when clicking on a button in the menu
- Determine a tutorial format and establish 1-2 options for demo purposes
- Construct distinct scenes (not necessarily all of them, merely a couple to have the ability to efficiently build the first prototype)
- Generate a functional main menu and in-game pause menu
- Assemble the application for mobile devices and begin testing of the product. Ensure the testing is done a few days prior to the due date to give leeway for bug fixes and solutions for other problems that come up.
- *Milestones*:
    - Ability to spawn an object from the main menu on a mobile device - completed by November 3rd
    - Completion of the first model and script. Ensure the application has the ability to spawn a room from the main menu on a mobile device - completed by November 3rd
    - Submission of prototype 1 - November 5th

4.0 Prototype 1

This section demonstrates the current progress we have achieved with the first prototype of the augmented reality application. As previously mentioned, the current prototype is incomplete, as not all of the expected features have been implemented into the application. As such, only the features included in the current prototype build can be included in this report. The figure below demonstrates the current iteration of the application's main menu. It includes an "Internal Views" button for viewing different floors and rooms of the selected building, an "External Views" button for viewing the outside of the selected building, the "Tutorials" button for re-watching the video tutorial, and the "Change Language" button to switch between English and French language settings. The user may also exit the application from here. All buttons are functioning properly at this time.

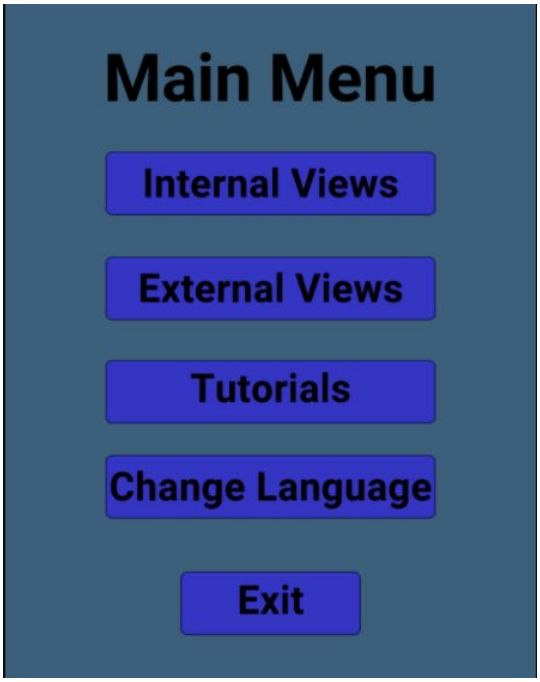

Figure 1. Current main menu prototype

Once the user has selected a building and a view, their phone camera will turn on, allowing them to view the building, room, or floor they have chosen using augmented reality. The current prototype includes a menu accessible via the button in the top right corner of the screen. This menu, appearing when selected, includes the options to re-watch the tutorial, change the room or floor of the building being viewed, as well as return to the main menu.

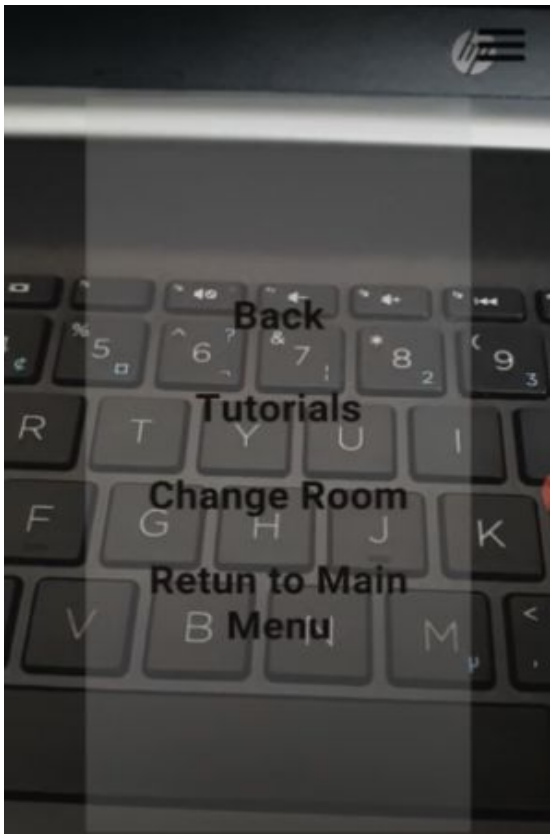

Figure 2. Current In-View menu prototype

One of the features to have been implemented in the current prototype is plane detection, which can be seen using a model house as an example below. Plane detection allows for the application to detect a plane (such as the carpet in the room of a house, or the grass in a field) using the phone camera, and display the building accordingly. Further features are being implemented into the application, which will be discussed in later prototyping reports.

Figure 3. Plane detection using a dummy house for example purposes

Further features are being implemented into the application, which will be discussed in later prototyping reports. The current menu designs and features may also be modified, which will also be discussed accordingly.

5.0 Conclusion

A myriad of tests were run on the basic functionalities of our first prototype and from the analysed results we concluded that it is effectively functioning according to all the requirements of the client. Further, an efficient user interface that is both user-friendly and has a clean layout has been implemented with functioning scripts and interactive buttons. For the upcoming prototype, we plan to build upon this first prototype as all the basic functionalities are in place, we aim to integrate new features to upgrade our app. Also, bug errors that arose in testing will be fixed within Unity to have a smooth interface without glitches. As we haven't gotten the BIM files to this date due to the size being large to import within the Unity file, we will be purchasing new assets to better the layout of our application along with practicing manipulating an actual building with our features.

6.0 Customer Feedback

Regarding the current prototype build for the augmented reality application, our team has received feedback from EllisDon on what can be improved and/or changed for the future prototypes. One piece of feedback received was regarding the location of the tutorial menu in the menu navigation section of the application. Originally, the tutorial would automatically begin after the initial login of a new employee, and the tutorial could be accessed again by selecting the “options” button in the main menu, and then selecting “tutorial”. The feedback received was to modify the location of the “tutorial” button in the main menu, effectively allowing a new employee to bypass the need to search for the tutorial. The modification of which can be seen below.

Figure 4. Earlier configuration of the main menu. Notice the lack of a “Tutorials” button

Aside from the initial feedback given regarding the placement of the tutorial menu, the feedback received from EllisDon has been positive at this time, indicating that we are in a good position moving forward in the project.