Project Deliverable F

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I. Introduction

No matter how simple or complex an idea is, the development of a prototype allows the inventor to communicate their ideas. Prototypes can serve many different purposes, ranging from analytical to physical, and focused to comprehensive. Once a prototype has been developed, it is crucial to test it and get feedback from the user. By doing so, our group can learn and reapply our knowledge toward the development of a better prototype. This document contains a comprehensive outline of the criteria and strategy used to test our prototype. It also contains documentation of our first prototype and the feedback received on it.

II. Prototype Testing Plan

Featured below is an extensive list of criteria and methods to ensure rigorous testing of our prototype.

A. Why are we doing this test?

1. What are the specific test objectives?
   The specific test objective of our prototype is to show a proof of concept for each component of the prototype. The test will include criteria on visual appeal and simplicity, along with technical criteria on the feasibility of the prototype.
2. What exactly is being learned or communicated with the prototype?
   - The prototype will demonstrate the ability to implement models of a project design into a Virtual/Augmented Reality environment.
   - Through user feedback, we plan to learn and gain insight into how we can further progress the prototype.
3. What are the possible types of results?
   There are three main types of results that can be achieved in this test. The first is that it completely succeeds, and the prototype meets all of the requirements and standards outlined in this document. The second possibility is that the prototype succeeds in some categories and fails in others. The final possibility is that the prototyping completely fails all of the testing requirements outlined in the document.

4. How will these results be used to make decisions or select concepts?
    - The hardware usage data of a device will demonstrate how intensive the application is on components of different platforms/smartphones. This information can also indicate whether the application is consuming too much battery life of a device. Ie, how well an iPhone runs the application on IOS? How much of the CPU is being utilized? How much ram is the application consuming to operate?
    - By recording the time intervals of processes within the application, it will help with deciding what elements to eliminate. This is so the application operates as smoothly and quickly as possible as per the customer's project criteria.
    - The test space area will give us an idea of how much space will be required to run the application efficiently. This would give an idea of the size of UI elements that should be considered to make the real estate of the screen as seamless as possible. For example, big cluttered buttons would not be ideal if the workspace is small and the range of motion is restricted, this would result in the 3D model getting relocated in the workspace or glitch the app into further chaos.
    - These concepts will provide us with an opportunity to overview how
5. What are the criteria for test success or failure?
    - All features of the interface view and app layout, are easy to understand
    - We have a clickable button
    - We can load the 3D model into the software properly
    - Time will be an important factor test variable when developing the initial prototype. (boot times, load times for models, etc)
    - The size of the test space required to efficiently run the application will also be a factor that must be considered during trials.
    - Hardware usage (CPU usage, ram usage, etc.) could provide important insight as to how devices are handling the software and also should be considered during trials.

B. What is going on and how is it being done?

1. Describe the prototype type (e.g. focused or comprehensive) and the reason for the selection of this type of prototype.
   For the first prototype, we are developing a physical comprehensive prototype. We selected comprehensive because we want to simultaneously test each part of the prototype: interface view and app layout. Although each of the components works independently of one another, the criteria they are being tested upon are very similar. This prototype is physical as the test it is to undergo are
2. Describe the testing process in enough detail to allow someone else to build and test the prototype instead of you.
   - Test functionality of in-app gestures
   - Ease of use rating
   - Design buttons and test functionality
   - Have external opinions on the prototype
   - Record time intervals for initial application start time (home screen to application menu), the load time for a few different sample models (time to load the model into test space), operating time of application before all available battery is consumed (battery 100% to battery 0%). For best results, multiple trials on a variety of devices should be conducted.
   - Hardware usage of device components (CPU, RAM, battery) on a variety of different smartphones.
3. What information is being measured?
   - How the prototype will look in the real world, a more 3-dimensional perspective
   - The functionality of in-app features
   - Boot times, load times
   - Impact on battery life
   - Usage of system components
4. What is being observed and how is it being recorded?
   - Layout and visual appeal of app home page and file view
   - The functionality of navigation gestures (on the app)
   - The functionality of buttons, upon clicking a button it will take the user to the corresponding button name
5. What materials are required and what is the approximate estimated cost?
   - The materials required for our first prototype are a computer and the software Unity which is provided by the school at no cost.

6. What work (e.g. test software or construction or modelling work or research) needs to be done?
    - Basic designs which show proof of concept are required (ideally a unity application in VR)
    - Test criteria needs to be implemented over multiple trials

C. When is it happening?

1. How long will the test take and what are the dependencies (i.e. what needs to happen before the testing can occur)? A separate test planning Gantt chart can be created to help to 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).
    - Fabricate analytical model (i.e. graphic editor design) using concept designs
    - Replicate model using Unity
    - Test functionality of the model
    - 2-3 weeks to replicate the model and test functionality/ease of use
    - Navigation of interface through finger gestures (AR)
    - Clickable button designs
    - Replicate visual models into the app (i.e implement all visual features whether they work or not)

2. When are the results required (i.e. what depends on the results of this test in the project plan)?
   The results of this plan will depend on how well we implement the different features (superficially or in detail), they will be required 2-3 weeks from the date of the creation of this document (October 24, 2020)

D. Stopping Criteria

After getting feedback from the user and the test results, we will implement the feedback and results in the designing of the next prototype, or the redesigning of the current prototype. We will keep doing this until the prototype is a final product, or the time runs out.

III. Prototype Progress

Featured below is an update of the progress made on the development of our first prototype. It includes a recap of the critical components, user feedback, and updated pictures of the prototype.

A. Critical Components

App Layout: The app layout is the first screen when the app is opened, it includes the interface to select the desired file, adjust the settings, access the user manual and create a welcoming environment.

Interface View: The interface view contains the chosen 3D model desired for viewing purposes. The screen will contain all the controls to manipulate and change the discipline view. It will also contain additional features such as the angle of rotation, measurements, current view, and task lists.

B. Feedback

We were unable to get feedback from our client, as the development process began after our client meeting. We intend to show the client our current prototype in the next meeting. We decided that feedback from friends and family would be quite useful, as the project is supposed to be user friendly, and simple to navigate. The main feedback we received was to improve the size of our buttons, the text, and button images. We also received feedback that our colour pallet was too light. For our next prototype, we will focus on improving this while furthering the prototype.

C. Progress

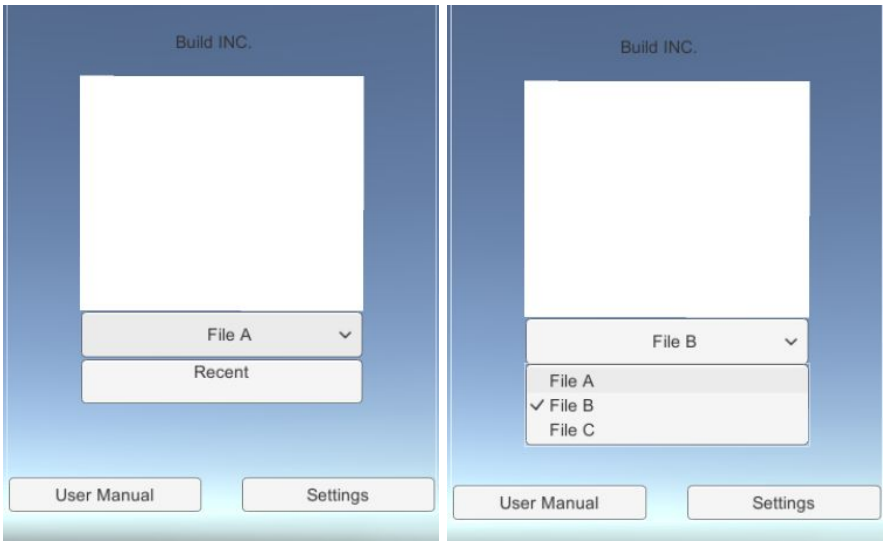
Each group member took on a task to learn smaller sub-tasks of the main project, this included, the final visual layout of the app, making working buttons, creating an object in AR, and learning gesture controls.

App layout

Featured below is a prototype of our app layout, created using the software Onshape. This is a 3D model of our app layout displayed on an iPhone.

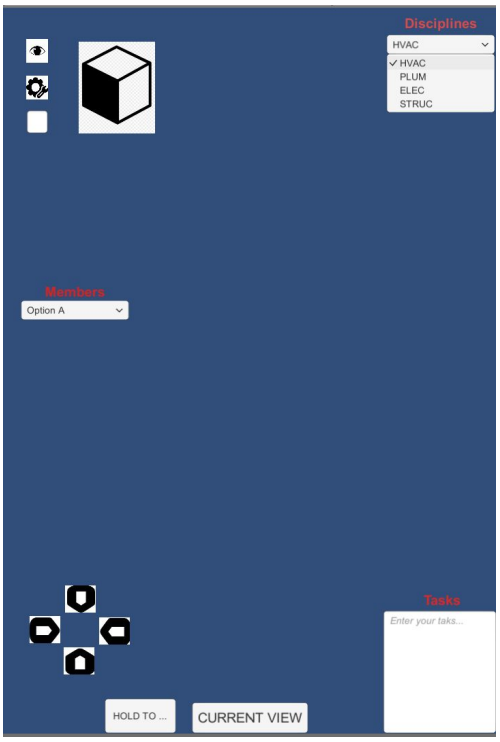
Interactable Buttons

Featured below is a workable dropdown menu along with two clickable buttons.



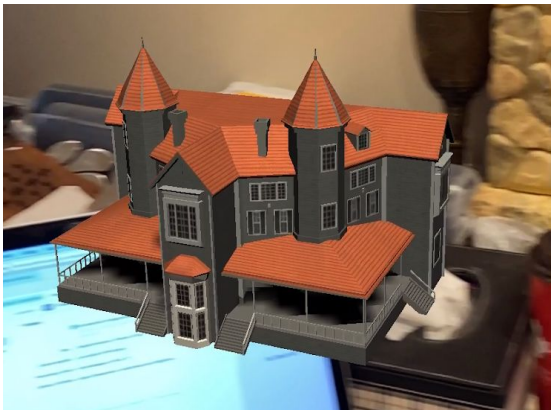
Interface view

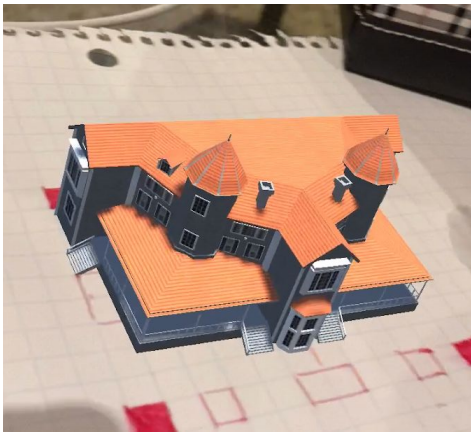
Featured below is the prototype of the interface view of our project. All components of this screen are workable buttons and other UI components.



AR objects

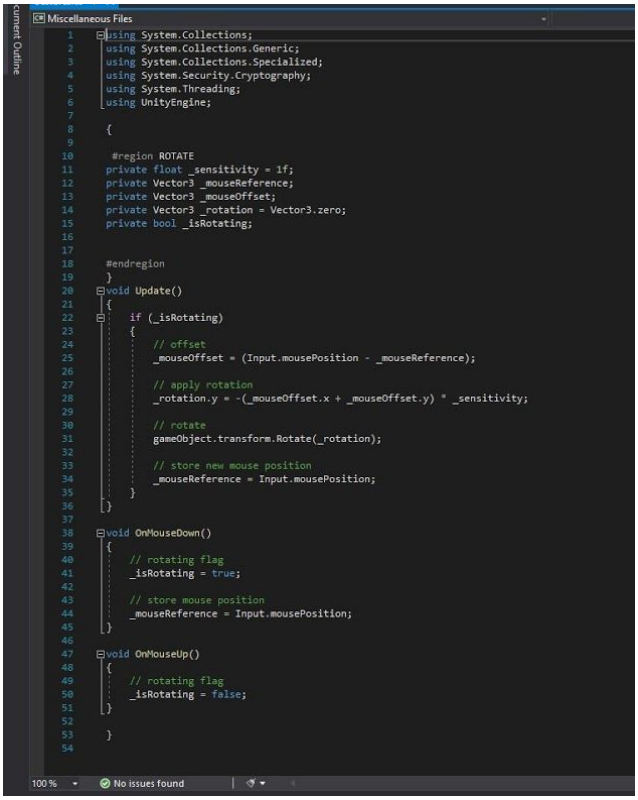
This feature demonstrates the ability to load models into an AR environment in two ways, loading a model into a fixed location in the environment, or attaching a model to a target image which the camera recognizes.





Gesture controls

The code featured below is an attempt to model what the interactions within the app will look like, including zooming in (pinching), panning and rotating the model. So far only a rotation script has been applied to the game object. Some problems encountered include rotating the object on different axes at once, and applying multiple gestures to the same script proved to be very difficult. Another iteration was to write multiple scripts with different gesture commands and add them to the game object however that does not function properly.



IV. Conclusion

This document outlines the development of the first prototype. It consists of the prototype testing planning, customer feedback and prototype status. A variety of techniques were demonstrated in the development of the prototypes in this report. The prototype models included proof of concept for gesture controls, loading models into an AR environment, interactive buttons such as drop-down menus, and a representation of the app layout. A variety of criteria were also set into place throughout this document indicating success and failure standards, methods of benchmarking, test objectives and future targets in the form of feedback.