A VR Training System for Learning and Skills Development for Construction Workers Requirements Document

Griffin Thenell and Shiyao Wang

Client: Raffaele De Amici

CS 461: Senior Software Engineering Project

Section 001, Fall 2019

Abstract

The purpose of our VR application is to teach people how to build walls. We have some constraints to our project as the amount of time to develop and the size of our team is small. We have a full list of user stories that will act as our feature list for users of our virtual reality application that is both reasonable and feasible in the given time. We have a general schedule for development which will start in January 2020 as well as a general plan for the testing of our application.

Keywords: Virtual Reality, Construction, Training

1. Purpose

The purpose of our Virtual Reality Training System for Learning and Skills Development for Construction Workers is to create a virtual reality class that walks a user through building a wall and then allows them to build one themselves. Our client expects a working prototype by the end of our Capstone project that can show the user how to build the wall, walk them through it and let them try on their own.

2. User Interaction (User Stories) Requirements

Interactions between the user and our system would generally be in a workplace environment. Given that, we will still need a set of interactions between the user and the system. This is a list of user stories that defines what exactly the user will need to be able to accomplish by the completion of our project. These user stories double as our client's list of requested features into the virtual reality application.

As a user. . .

1. I want to pick up virtual objects so that I can examine them
2. I want objects to be highlighted when I am looking at them so that I know that I can pick them up.
3. I want to rotate and see all of the angles of an object when I am holding it so that I can see all of the details in the object.
4. I want to be able to move around the virtual environment so that I can view things from different angles.
5. I want to be able to measure the distance between objects so that I can accurately place objects to my specifications in the world.
6. I want to be able to pause and play tutorial videos so that I can fully process the information.
7. I want to be able to replay tutorial videos so that I can learn the information I may have missed.
8. I want to be virtually walked through building a wall, so I can learn by doing.
9. I want the process to be broken up into different steps as not to overcomplicate the process.
10. I want to be able to repeat steps of building so that I can retain information.
11. I want to be able to go back to specific steps so that I can refresh my knowledge on specific steps.
12. I want to be tested on my knowledge so I know that I learned the steps
13. I want there to be no help so that I know that it was just me building

3. Deliverables

To break up the user stories into a more digestable format, here are our two deliverables for the project.

1. *Sandbox*: A complete open world where the user is given all of the tools needed to build a wooden lightframe wall.
2. *Tutorials*: A grouping of animations that the user can view in real time that show them how to build a wooden lightframe wall.

4. Requirements Analysis

Our requirements within our deliverables in the virtual reality application is to take the above list of user stories and adapt it into a feature list for the two portions of our VR application. Many of these "features" go hand in hand with each other. So not only are these user stories applicable, they are feasible. As mentioned earlier, importance will be put on user stories and features related to the building of the wall first.

5. Constraints

Due to the lack of time and the size of our team, there are some restrictions to our project.

- First, graphics, animation and environment details will be kept at a low level of detail as to allow us enough time to finish all of the features that the client has asked for. We are supposed to work only start working on the coding portion of the project in January so we will prioritize the creation of the walkthrough tutorial with the free wall building being secondary and the walkthrough "videos" being tertiary. This will mean that creating a full written out guideline for the future development of interactive AR training systems design will be conditional on finishing the rest of the project.

- Given that there is no budget for our project, we will work with whatever virtual reality equipment and software is easily accessible to us either from the university or our client specifically.

- Our client's measure of success will be user testing, so we must find people and use them to measure overall user satisfaction. We must take into account that some people may get motion sick from the virtual reality headset.

- The build that we have at the end of the capstone project will be our final build.

6. Schedule
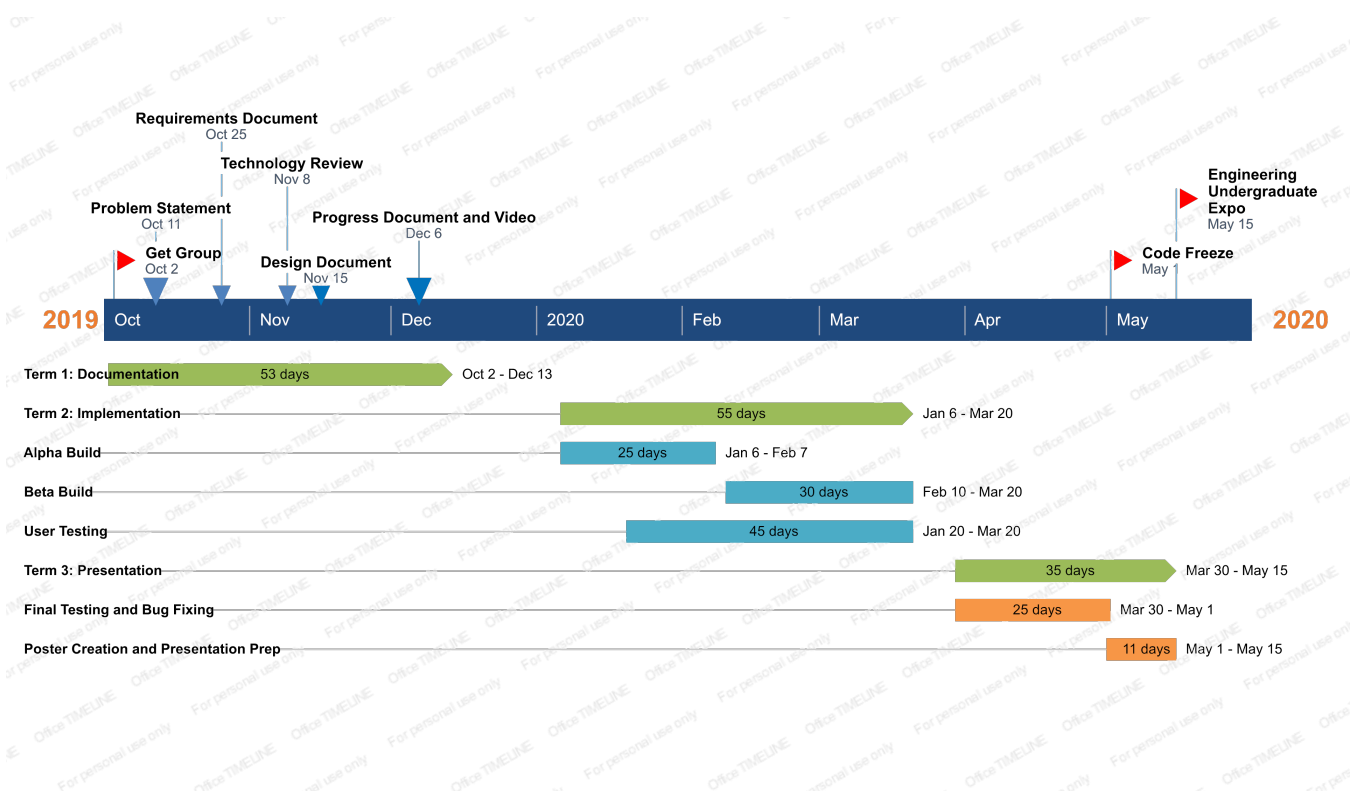
7. Verification Process

We will be using user testing as our verification method to know that our application works. Since we as developers are naturally biased to our own work, we will bring in outside people to test out software. We will work with our client to fill out the necessary paperwork with the university but as soon as that is done, we will accept volunteers and advertise via a flyer based system. We will need to determine a date and time, but that is heavily dependent on the process of the project. We will also need to determine a specific location to hold tests, but we will need to find a space where we can operate our app on a virtual reality headset.

When users test our project, we will have them run through the building walkthrough section of the project and then test them on their wall building skills through the free build section of the application. After their time with our application, we will ask them questions about their experience with the application in terms of construction learning, training and general usability. We will use this data as well as our own we are colluction from the testing to determine if our project is ready.