CMPT 401 Group: The Learned Owls

Caleb Wollf, Jason Yue, Justin van Heek & Maxwell Stow

January 27, 2018

Figure 1: Virtual Reality Headset

Figure 2: Virtual Reality Controllers

Contents

1 Team Members and Their Specialties

Caleb Wollf #531003

- 3D Art
- 3D Modelling
- User Interface
- Textures
- Maya Animation

Jason Yue #492329

- 3D Modelling
- Programming
- User Interface
- Git

Justin van Heek #553895

- Story Events
- Environment Design
- VR User Interaction

Maxwell Stow #481254

- Sound Design
- Git
- Programming
- User Interface
- 3D Modelling
- Script

2 Motivation and Background

The motivation that our team had to come up with this idea to use VR as an engaging and fun study tool was because of the simple fact that we are students ourselves. We have all gone through the tedious and boring process of writing down notes on flashcards and lined paper only to read and reread them over and over again until the day of our exam. This process has no engaging or amusing value to it which greatly reduces one's motivation to study. So we thought, why don't we make a VR app that takes the boring process of studying and make it fun? By doing so, we would make studying much more enjoyable to the students and encourage their motivation to study as well. This process will help students engage with their course material in a new and unique environment as they grow in knowledge. Ultimately the purpose of this game is to promote students to break free from the routine tedious mode of study and allow them to improve their academics through amusing and engaging experiences.

3 Purpose

The purpose of this program is to provide a digital learning environment to help students study for their classes in a more imaginative and enjoyable way. People learn better when they are motivated and a trend that has seen major success in providing motivation in studying is the idea of gamification. This has been seen in language learning apps such as Duolingo amongst others. Our purpose is to take this fun of gaming and motivation it provides for learning and to put it into VR in such a way that novel content can be added of any sort with flash cards. Other VR apps help people learn specific aspects, such as space or history, but our app, using flash cards and multiple choice questions can be tailored to any content providing a much more versatile platform. Our ultimate purpose is to create a framework in an app that can be taken to make learning of any content fun and engaging resulting in greater motivation and ultimately greater education.

4 Target Audience

The target audience of this project are university students of all genders and disciplines from any background or country in the world.

Users playing this game should know how to:

1. Use a unity compatible machine, such as a Windows PC
2. Use a HMD VR Device
3. Understand English
4. Understand what a video game is

We are assuming that the user

1. Owns a HMD VR Device (one that has the ability to work with motion tracked controllers) item Owns a unity compatible machine, such as a Windows PC
2. Is tired of studying in the conventional way
3. Likes playing games

5 Project Description

This project is to develop a study tool for students that takes a tedious and boring study process and instead transforms it into an engaging experience through simple games. The user will compete in games like a first person shooter where they must identify and shoot the correct answer to a question. Their performance of correctness and speed will contribute to their overall score while the program will also keep record of which portions of study material need to be reviewed more thoroughly and which material has already been learned. The goal of this application is that the games are fun and amusing while also being educational and practical for studying. Through this engaging experience and competitive scoring, students will continue to practise and improve their scores.

6 Requirements and Technologies

A. Technical Guidelines

1. All 3D modelling will be done using Autodesk Maya 2018
2. Visual Art will be done using Adobe Photoshop CS6 or newer
3. Development will be done using Unity 2017 or newer
4. The programming language will be C#
5. The operating system will be Windows 10 Version 1709 or newer
6. The medium through which the game will be played is with the Oculus Rift with Touch Controls
    - The props within the game will be interacted with the via the Oculus Touch Controllers
    - Movement will be done through teleportation or waling within the boundary of the play area
7. Sound production will be done using Audacity 2.2.1 or newer as well as LMMS 1.1.3 or newer
8. All files will be uploaded to our Github project page during development
9. All changes and updates will be documented through Google Docs and Trello
10. The game will compile and run successfully after each development session

B. Ethical Guidelines

1. Folders will have short names and simple hierarchical structure
2. File names will be information rich and specific
3. File names will use underscore instead of spaces
4. File name elements will be ordered from general to specific details
5. Dates will be written in YEAR, MONTH, DAY (YYYYMMDD) format
6. Times will be written in HOUR, MINUTES, SECONDS (HHMMSS)
7. Files with personal names will have family name first followed by first names or initials
8. File and folder names will be abbreviated whenever possible
9. Version control will be located at the end of the file name and start with V followed by at least 2 digits

10. Minor version revisions will be reflected with the use of Vx-01 to Vx-99, where x=0-9
11. Major version revisions will be reflected with the use of V1-00 to V9-xx, where x=0-9
12. Block comments describing the file functions will be located at the top of each file
13. Block comments will only appear above functions or large bodies of code
14. Comments will be placed directly above any snippet of code that requires explanation, according to the developer's choice
15. Warnings will be considered as errors
16. Type names (classes, structures, enumerations, protocols, etc.) will be capitalized
17. Method names and variables will start with lower letters
18. Abbreviations and initialisms will be uniformly uppercase or lowercase
19. Protocols names that describe what something is will be a noun
20. Protocols names that describe an ability will end in -ing, -able, or -ible
21. Enumeration values will use lowercase
22. Genetic type parameters will be descriptive, uppercase names
23. Traditional single uppercase letters (T, U, V) will be used in the case where the type name does not have any meaningful relationship or role
24. US English spelling will be used to match Apple's API
25. Unused (dead) or placeholder comments will be removed
26. Imports will be efficiently used (minimal imports, remove if unused)
27. Indent will use 2 spaces, rather than tabs
28. Method braces and other braces will open on the same line and close on a new line
29. There will be exactly one blank line between each method
30. Colons will always have no space on the left and one space on the right
31. Structures will be used to things that do not have an identity
32. Classes will be used to things that do have an identity

33. self will not be used unless required to differentiate property names and arguments
34. Read-only properties will omit the get clause
35. Classes will be marked final if inheritance is not intended
36. Short function declarations will be on one line
37. Long function declarations will have line breaks at appropriate points
38. Native Swift type will be used when available
39. Constants will be defined using let
40. Variables will be defined using var
41. Type inference will be left up to the compiler, unless required
42. The guard statement will be used in place of nested if statements
43. Parentheses will be wrapped around conditionals
44. Any arguments will be settled by a non-participating project member or democratic vote
45. Any major decisions will be settled by a democratic vote
46. All project members will obey all laws and regulations, and should avoid any conduct or activity that would cause unjust harm to other

C. Legal Issues

1. Any code that does not belong to us will be given credit via comment directly above, containing the name of the author, name of the program, description of the program, and link to the source

7 Description of Navigation and Interactivity in Your Virtual Environment

Movement navigation will be done via physically walking around within the boundaries of the Oculus play area or through teleportation using the controllers. Menu navigation will be done either through throwing a basketball at the menu screens or shooting a button with the guns during play or by pressing a button to return to the lobby. The user will be able to interact with:

1. Basketballs - throwing
2. Guns - shooting and reloading
3. Knives - throwing
4. Zombies - shooting
5. Shooting targets - shooting

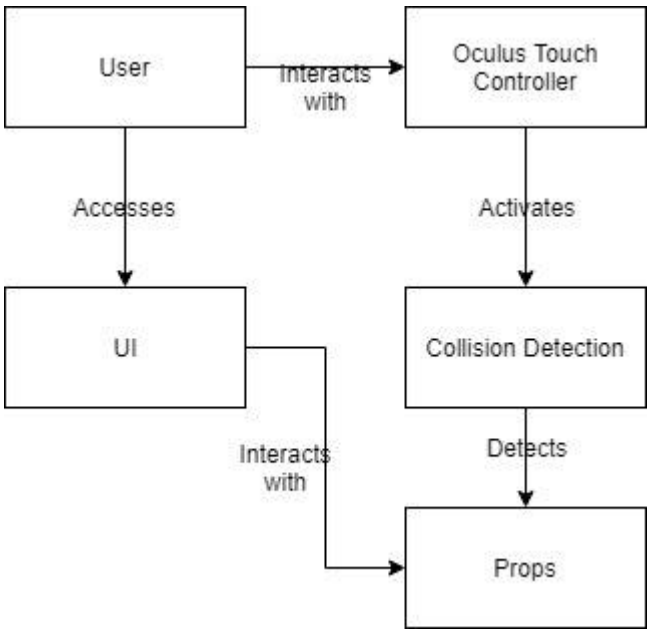


Figure 3: Navigation and Interaction Flow Diagram

8 Project Plan

This project will alleviate the struggles and hurdles of the old studying process and introduce a new, fun, and more effective way to study. The work process will involve creating 3D models of the environment and props in Maya. A UI and various textures will be developed in Photoshop. The models, UI, and textures will then be imported into Unity and programmed for interactive use of the user. The final product will be a playable virtual reality game.

The work that will be done to complete this project is the development of a virtual reality program that allows for a student to learn subject material in a digital environment using a HMD with motion controllers. The deliverable is the finished program that can be used by the client.

The ones that will be undertaking this project are the members mentioned at the beginning of this document. Their tasks will be assigned as the follow

Caleb Wollf:

1. 3D Modelling - Props
2. Texture Design and Sourcing
3. Visual Art
4. Animations

Jason Yue:

1. 3D Modelling - Characters
2. Programming
3. Git Management
4. UI Design - Player Interface

Justin van Heek:

1. Content Development and Creation
2. 3D Modelling - Environment
3. UI Design - Main Menu
4. Event management

Maxwell Stow:

1. Sound Design
2. Programming
3. Git Management
4. 3D Modelling - Misc

All Task will be completed at the specified times that will be decided at the first team meeting after the proposal is approved.

9 Risk Management

5 Severe	A risk event that, if it occurs, will have a severe impact on achieving desired results, to the extent that one or more of its critical outcome objectives will not be achieved
4 Significant	A risk event that, if it occurs, will have a significant impact on achieving desired results, to the extent that one or more stated outcome objectives will fall below acceptable levels.
3 Moderate	A risk event that, if it occurs, will have a moderate impact on achieving desired results, to the extent that one or more stated outcome objectives will fall well below goals but above minimum acceptable levels.
2 Minor	A risk event that, if it occurs, will have a minor impact on achieving desired results, to the extent that one or more stated outcome objectives will fall below goals but well above minimum acceptable levels.
1 Minimal	A risk event that, if it occurs, will have little or no impact on achieving outcome objectives.

Figure 4: Risk Severity Scale

Descriptor	Frequency of event occurring
Rare	Can't believe this event would happen - will only happen in exceptional circumstances
Unlikely	Not expected to happen but definite potential exists - unlikely to occur.
Possible	May occur occasionally, has happened before on occasions - reasonable chance of occurring.
Likely	Strong possibility that this could occur - could occur several times.
Almost certain	This is expected to happen frequently / in most circumstances - more likely to occur than not.

Figure 5: Risk Frequency Table

Risks	Potential Impact On Project	Likelihood of Occurrence	Mitigation Strategy
Technical Risks			
Storage (HDD, SSD) failure (data loss)	4	Rare	Store main project files elsewhere (github and/or USB)
Project not Compatible with new Windows or Unity update	4	Possible	Revert to previous working version of Windows or Unity
Software crash (Maya, Photoshop, Unity, Windows)	3	Possible	Fix cause of crash if possible or switch computers, save frequently
Project file corruption	5	Possible	Prepare multiple backups (physical and virtual)
Project Size Underestimate	2	Possible	Research all aspects of project early on
Lack of access to Hardware	3	Rare	Virtual machine or purchase/rent
Team Member Risks			
Member Availability	2	Unlikely	Shift workload to others
Someone drops class	3	Unlikely	Make sure more than one person knows about every area
Someone sick shortly before deadline	3	Possible	Spread out work so not all is in the last week
Lack of necessary skills	4	Possible	Define early which skills we need and learn

10 Quality Assurance Plan

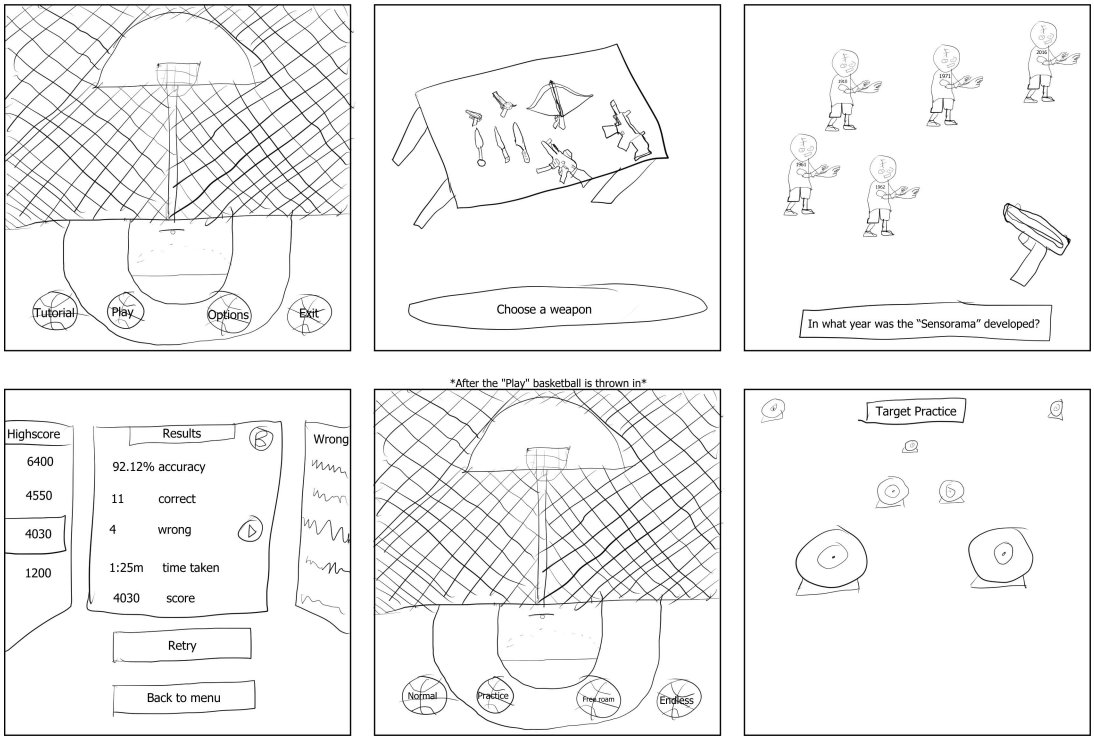
A. Software Tools In order to ensure our game fulfills our requirements, we can use external tools to generate test cases. We have chosen the following tools to perform case testing:

1. MonkeyTalk - Open Source (Primary)
2. NativeDriver - Open Source (1st Backup)
3. qTest - Free Trial (2nd Backup)
4. Zephyr - Free Trial (3rd Backup)

B. User Testing The final version of the Project shall be available before the end of the semester. We shall run a test campaign a few weeks prior to release in order to encourage students from TWU to help us in verifying the practical use of our game at the Neufeld computer lab. A survey will be handed out to the participants to gather their insight on the practicality of our game and the state of the game. C. Other Quality Assurance Precautions

1. Google docs and Trello will be used to keep track of updates and changes
2. We will keep up with homework and documents through the semester
3. Meetings will be held every Friday until the end of the semester
4. Internal audits (peer-review)

11 Storyboard



12 Script

INT. NEUFELD BUILDING TRINITY WESTERN UNIVERSITY - DAY (INTRO)
FADE IN:

As a new student at Trinity Western University you do not have a study group yet, but you want a more interesting way of studying. During your search you came across an intriguing program that was on the desktop of the lab computer you were working on in the Computer Lab.

```
NEW STUDENT
Why not, lets see what it has to offer.
```

As you click the shortcut icon you vision goes black.
FADE OUT:
EXT. OUTDOOR BASKETBALL COURT NEAR NORTHWEST BUILDING – EVENING
FADE IN:

You wake up in the center of the court next to a few basketballs. You go up to the basketballs to investigate. All the balls had different designs and colors on them. You pick one up and shoot it at the hoop. It goes in. As it goes in your vision goes black again.

FADE OUT:
EXT. SOME RANDOM BATTLEFIELD TRAINING CENTER - NIGHT
FADE IN:

```
NARRATOR
   Welcome to the tutorial stage in the Enhanced Learning Leveling
Environment, or E.L.L.E. for short.  To begin please pick up a weapon.
```

After listening to what the strange voice said you look around you and realize that you are in a battlefield. In front of you is a table with an assortment of weapons.

```
 [SELECT WEAPON]
```

- Handgun
- Revolver
- Crossbow
- Throwing Knives
- Rifle

You choose a weapon and as you do so the table disappears and the environment around starts to get noisy. A text bubble pops up in front of you with a question.
[In what year was the “Sensorama” developed?}

After the text bubble appeared some zombies had begun to make their way towards you. Each one had a plank of wood hanging from their neck with

different years on them. You try to remember back to what the answer is from the class lectures. You kill the zombie with the year "1952" around its neck. Nothing happens, and the Zombies keep getting closer. You kill another one, again they keep coming. But when you kill the one with the year "1962" around its neck, all the remaining Zombies disappear, and you return to the table with the weapons.

NARRATOR

Congratulations on completing the tutorial stage of E.L.L.E., now here are the rules.

1. To clear a level, you must kill the enemy with the correct answer of the question in front of you.
2. In the lobby (Basketball Court), choose one of the available basketballs corresponding to the desired environment and shoot it into the hoop.
3. You may only return to the lobby at the end of a Stage
4. Have fun

Now that you know the rules. Please select how you will proceed.
[SELECT WEAPON]

- Stay in this environment
- Return to Lobby (Basketball Court)
- Quit

FADE OUT

13 Virtual Environment and Props

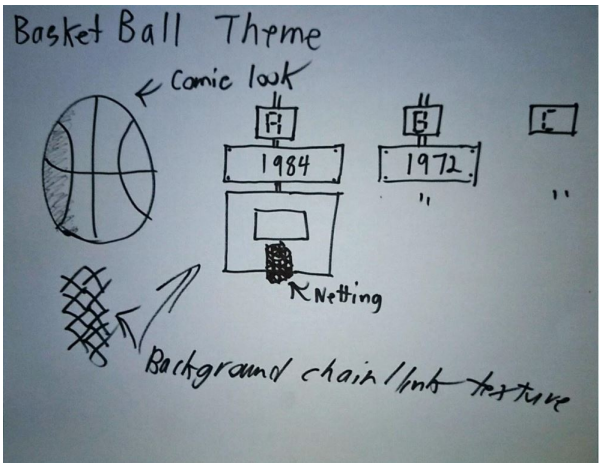


Figure 6: Environment and Props 1

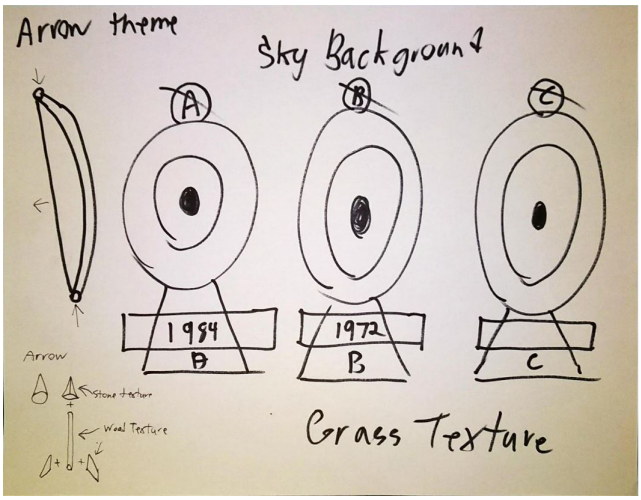


Figure 7: Environment and Props 2

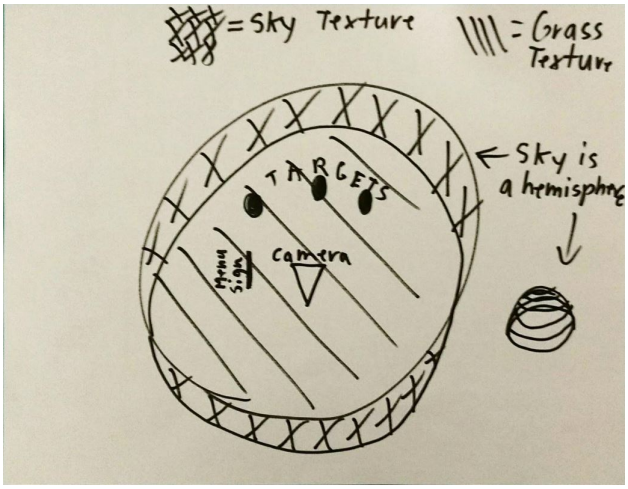


Figure 8: Environment and Props 3

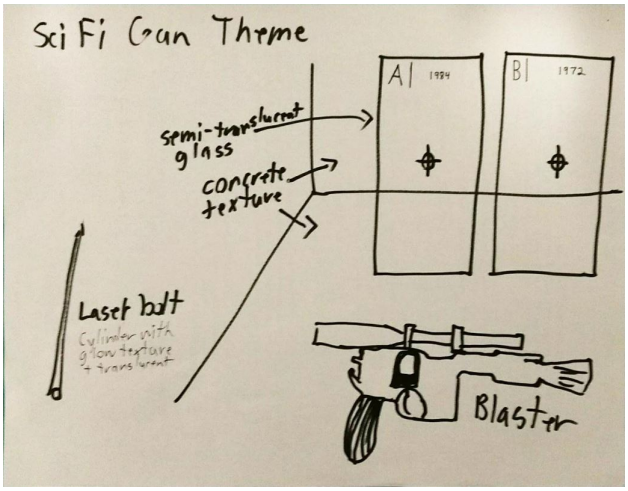


Figure 9: Environment and Props 4

14 References

1. Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students learning outcomes in K-12 and higher education: A meta-analysis. Computers Education,70, 29-40. doi:10.1016/j.compedu.2013.07.033 - https://www.sciencedirect.com/science/article/pii/S0360131513002108

2. Folder and File Naming Convention 10 Rules for Best Practice. (n.d.).Retrieved January 27, 2018, from http://www.exadox.com/en/articles/file-naming-convention-ten-rules-best-practice

3. B. (2015, July 20). C# Coding Conventions (C# Programming Guide). Retrieved January 27, 2018, from https://docs.microsoft.com/en-us/dotnet/csharp/programming-guide/inside-a-program/coding-conventions