Department of Engineering

GNG 1103

Deliverable E - Project Schedule and Cost

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Introduction:

To foster an understanding of what being a minority is and what discrimination they face, Professor Anis Hanan of the University of Ottawa has asked for a virtual reality (VR) simulation to increase the amount of empathy and understanding a person can feel. This deliverable will cover the design of our chosen concept, the equipment needed to make it, the cost of these materials, major risks associated with this concept, and our prototype test plan.

Design:

The narrative will depict a person in a wheelchair having memories / flashbacks of previous instances in their life. These memories will illustrate times they struggled in ways that might not be as obvious as others, and will depict everyday life struggles that they had to endure.

For example:

→ their friend group was going on a walk through a path in a forest and they got to a spot where there was a pretty view but the friend in the wheelchair couldn't look at it as she couldn't climb the rocks.

→ the friend group wanted to try out a new restaurant in the area but when they showed up, there wasn't an accessible ramp for the friend in the wheelchair

→ the friend in the wheelchair couldn't reach the soap dispensers in most public washrooms whereas most able-bodied people would never consider this limitation

→ the friend in the wheelchair always had to split up with her friend group while walking to class on campus because not every building had an accessible ramp

→ During fire alarms at their school, the students were not allowed to use the elevator, so the friend in the wheelchair was often left behind, or had to wait for someone to carry them.

→ The friend in the wheelchair couldn't go on trips to the beach with her friends as it was very difficult to maneuver their chair through the sand.

→ the friend in the wheelchair can't go on the high school graduation trip with all her classmates because it was not accessible

The user will embody this character and live through these experiences. They will see themselves struggle with things that an able-bodied person would simply overlook. It will be

these smaller, everyday limitations that they will watch themselves go through that will really be eye-opening and make them empathetic towards the community of people using wheelchairs. They will experience common emotions that this community faces, such as feeling left out, sadness, and feeling like a burden. By showing the less obvious struggles this minority group faces, this will allow the user to feel more empathetic towards the character rather than showing larger acts of struggle which might be more common or obvious to the user.

In order to go through this experience, the users will need to be in an environment that is as close to 'walking in someone else's shoes' as possible. The experience needs to be immersive enough so the user can feel the same emotions the character is feeling. Since the most realistic environment is reality itself, we wish to bring this realism into our project by recording snippets and putting them into VR. Therefore the main way we're going to generate the environment is through videos recorded in 360 degree or 180 stereoscopic view.

There are many ways to capture this footage. However for a 180 degree stereoscopic view there is only one camera that can accomplish this. The Vuze XR camera 5.7k 'HumanEyes' has two cameras which record with an eye's distance between them. These two instances matched together gives the 3 dimensional feel your eyes tell you when looking at the world. This camera is unfortunately very expensive, costing usually a few hundred dollars, but using one would give the most realistic feel.

The other camera options are 360 degree cameras. Which captures a single instance in a 360 degree view around the camera. Since it's only one instance, the footage will only be 2 dimensional. However you do get the ability to see what's behind you.
Whichever camera we use, this footage will be placed in our project to display on the VR. Our goal for this prototype would be to see if the footage looks good enough to create this immersion.

Lastly, we have the interaction component. We want a way for the user to interact with the scene. However, interacting with a recorded video can be challenging to say the least. Hence we are thinking of different ways for the user to make decisions like choosing text scripts.

Table 1: Bill of Materials

Item	Description	Unit	Quantity	Singular Item Cost ($)	Total Cost ($)	Link
Unity text assets	Text assets like textMeshPro	unit	1	0 (free)	0 (free)	[Link](#)
180 stereoscopic footage of scenario	Can be obtained via camera or by finding existing recordings	videos	3-4	0 (free)	0 (free)	[Link](#)
SteamVR plugin	A plugin to make Unity work with VR	unit	1	Free if we can borrow one	Free if we can borrow one	[Link](#)

Table 2: Analysis of Equipment

Equipment	Analysis
Unity program	-Program we will use to create simulation -It is free through the university -There are many free tutorials on how to use it
Vuze (stereoscopic) camera	-It is a camera that will record the video clips -If we cannot it because it is out of our price range, so we can see the cost for renting -The Maker Space has these cameras, so we can see if we can rent them there at a cheaper price (we will need to talk to someone)
360 degree video camera	- Camera that can record in 360 degree angle - Single instance so only 2D - Can use this if no Vuze camera is available as this is much cheaper.
Virtual reality kit	- Includes a headset and controllers. - Needed to test the scenes in 3D view

	- Makerspace has one so we can borrow one.

Significant Risks:

The table below details about the risks and how they will be dealt with. For the probability, priority, and impact section, they are scored between 1 to 5. For probability, 1 means unlikely and 5 means likely. For priority, 1 means unimportant and 5 means important. For impact, 1 means a small impact and 5 means a large impact to our VR.

Table 3: Project Risks and Their Contingency Plan

Specific Risk	Probability	Priority	Impact	Contingency Plan
Difficulty editing audio in Unity	3	5	5	We can ask the PM and TA for help.
Difficulty finding/ renting the camera within our budget	2	5	5	We can use video clips instead and rely more on stitched images. We might also check if we need to pay someone who has a camera to film something for us.
Difficulty finding environments to film scenarios	5	4	5	We can try finding clips online to use instead. We could also pay someone else to do some of the filming, but that would likely cause us to go over our budget.
Inability to find suitable actors for the characters	4	2	5	Try finding clips online or try to portray the characters ourselves
Storyline does not convey empathy to the user as expected to	3	3	5	Ask others for opinions/advice about our storyline and any suggestions they might have on how to improve. Research other books/ short stories that convey empathy and try to take some ideas from there.
Difficulty editing videos in	4	2	5	Look up tutorials or ask TA/PM for help. We can also ask the specialist,

Unity				Ebin Joseph.
Cannot exit at any time in the simulation.	2	5	5	Look up tutorials or ask TA/PM for help. We can also ask the specialist, Ebin Joseph.

Prototype Test Plan:

Each prototype will be testing a different subsystem or different integrations of different subsystems. Listed below are the expectations for the subsystems.

Subsystem A: Narrative Content

- The storyline should make the user feel empathy
- The storyline should take the user 5 minutes or less to complete

Subsystem B: Visual Simulation

- The video clips should be good quality and play properly (not freeze midway, take too long to load, or play when they are supposed to)
- The images should be good quality and appear when they are supposed
- These visuals should be non-disorientating for users

Subsystem C: Communicative Elements

- Options should appear when they are supposed to
- Certain events (both visuals and audio) should play out after a selection (simulation should not freeze or take too long to load)
- Audio should be coherent and play properly (not freeze and plays when it is supposed to)

Subsystem D: Main Menu

- Menu should be intuitive
- Should help the user find whatever they're looking for, whether it be starting a scenario or changing the settings
- The planned components should ideally be there ("About the Project" button, character list, etc.)

Below are the prototype test plans summarized in tables.

The Prototype 1 testing will focus on the storyline. The client's feedback on our presentation included us focusing more on the narrative aspect of the simulation because it will be vital in making the user feel empathy. So Subsystem A, the narrative content, will be examined for eliciting any empathetic emotional responses from users. This part is vital for the effectiveness of the simulation, so if our storyline is not working, we can use a short story that emulates the empathetic response we want and give credit to the author. We can also change the criteria for what we consider an empathic emotional response from users if the results are not good.

Table 4: Prototype 1 Test Plan

Test ID	Test Objective	Prototype and Testing Description	Results and Their Usage	Estimated Test Duration
1	To make the user have an empathetic response to our narrative.	Showing several people (ideally those who do not have EDI training) the storyline and seeing their response and their review of it.	Average review on scenarios/ storyline. This will indicate whether Subsystem A is working.	5 to 10 minutes per person Start: February 23, 2022

For the Prototype 2, getting the video clips to function properly in Unity is another important aspect that we need to test. This is because it will be what the majority of Subsystem B, the visual component, will rely on as mentioned in further detail in Deliverable D. The main goal is to have the video clips playing properly in the program and having it and the images be legible. We also test the start and exit buttons to see if they work. The exit button is especially important because the user should be able to leave if they feel uncomfortable.

Table 5: Prototype 2 Test Plans

Test ID	Test Objective	Prototype and Testing Description	Results and Their Usage	Estimated Test Duration
1	Testing if the simulation begins when the start button is chosen. The simulation/ prototype does not have to be complete (ie. only have a couple of scenes from the narrative).	Going into the simulation and seeing if it will run once the start button is chosen. We will see if the simulation starts. This is one test that will let us see if Subsystems B and D are properly integrated.	Seeing if simulation begins, and timing (in seconds) how long it takes to load. This is a test that can show us if there is something wrong with the code.	1 minute. Start: February 27th, 2022
2	Testing if the video can play in the simulation. The simulation/ prototype does not have to be complete (ie. only have a couple of scenes from the narrative).	Going into the simulation and running only a couple of scenes. This will test if the video is playing properly.	Seeing what clips will play. This will be used to determine what clips play the best (like clips that do not take up a lot of space).	5 to 10 minutes. Start: February 28th, 2022
3	Testing if the images and video clips are legible. The simulation/ prototype does not have to be complete (ie. only have a couple of scenes from the	Going into the simulation and running only a couple of scenes. We will see how blurry or clear the visuals are.	Seeing what clips and images are legible/ good quality. This can show us what visuals users find disorientating, This is one of the tests that will	5 to 10 minutes. Start: February 28th, 2022

	narrative).		determine what clips and images we will use.	
4	Testing if the clips freeze or if images are not loading. The simulation/ prototype does not have to be complete (ie. only have a couple of scenes from the narrative).	Playing through a couple of scenes in the simulation. We will see what clips are freezing and what images are not appearing.	Seeing what clips and images are not working, and timing (in seconds) how long it takes to load. This is one of the tests that will determine what clips and images we will use.	5 to 10 minutes. Start: February 28th, 2022
5	Testing if the user can exit out of the simulation at any time. The simulation/ prototype does not have to be complete (ie. only have a couple of scenes from the narrative).	Going into the simulation and running only a couple of scenes. We will see if exiting at any time is possible. This is one test that will let us see if Subsystems B and D are properly integrated.	Seeing if exiting at any time is possible (only from a couple of scenes of what we have created so far), and timing (in seconds) how long it takes to load. This is a test that can show us if there is something wrong with the code.	5 to 10 minutes. Start: February 27th, 2022

Prototype 3 will focus on testing Subsystem C, which involves audio and text dialogue, and some components of Subsystem D, mostly the ones that were not covered in Prototype 2. We will need to test if the audio from our video recordings / clips from youtube / possible voice overs properly function in Unity as good quality audio allows for a more immersive experience. Additionally, it is important that the user is able to make their own decisions and select options displayed on screen. Moreover, subtitles for users with auditory disabilities must be functioning

to allow for an inclusive experience. For Subsystem D, the "About the Project" and "How Can I Help" button will be tested to see if they work, and the list of characters and their descriptions will be tested to see if it works. We will also be testing again if the user can exit at any time throughout the entire simulation because it is such an important non-functional requirement that we are testing it again, just with a greater scope instead.

If we are behind on schedule, we can take out the "About the Project" button from the simulation entirely to save time. If the time constraints are too extreme for us to overcome, we can take out the "How Can I Help" button and the character description/ list, but this is only if it is truly impossible to fit them in. Tests 5, 6, and 7 can technically be taken out because they are not requirements.

Table 6: Prototype 3 Test Plans

Test ID	Test Objective	Prototype and Testing Description	Results and Their Usage	Estimated Test Duration
1	Testing if the user can select options. The simulation/ prototype does not have to be complete (ie. it needs all scenes from the narrative but it does not to be polished).	Going into the simulation and playing through only a couple of scenes where decisions can be made. This will show us if the user can select options. This will test if Subsystem C is working.	See if the user can make a selection, and timing (in seconds) how long it takes to load. We can also see how easy it is for user's to do this (ie. is this uncomfortable for people with limited hand motion). This is a test that can show us if there is something wrong with the code if the	10 to 15 minutes. Start: March 12th, 2022

			selection is not working.	
2	Correct events happen based on the user's selections. The simulation/ prototype does not have to be complete (ie. it needs all scenes from the narrative but it does not to be polished).	Going into the simulation and playing through only a couple of scenes where decisions can be made.

This will show us if the right event occurs based on the selection. This is one test that will let us see if Subsystems A and C are properly integrated. | See if events play out properly.

This is a test that can show us if there is something wrong with the code if the correct events are not happening. | 10 to 15 minutes.

Start: March 12th, 2022 |
| 3 | Testing if audio plays, and it plays at the correct times. The simulation/ prototype does not have to be complete (ie. it needs all scenes from the narrative but it does not to be polished). | Playing through the entire simulation.

This will show us if the audio is playing properly. This is one test that will let us see if Subsystems A, B, and C are properly integrated. | See if the audio is properly working (not stopping or playing randomly, it plays in sync with the events, etc.).

This is a test that can show us if there is something wrong with the code. | 10 to 15 minutes.

Start: March 12th, 2022 |
| 4 | Final test to see if the user can exit out of the simulation at any time. The simulation/ | Playing through the entire simulation.

We will see if exiting at any | Seeing if exiting at any time is possible and timing (in seconds) how long it takes to | 10 to 15 minutes.

Start: March 12th, 2022 |

	prototype does not have to be complete (ie. it needs all scenes from the narrative but it does not to be polished).	time is possible. This will be the final test to see if Subsystems B, C, and D are properly integrated.	load. This is a test that can show us if there is something wrong with the code.	
5	Testing to see if the "About the Project" button works. Prototype 2 can be used for this part to save time.	Run the simulation and select that button. We will see if the correct window pops up and if we can close it. This is one test that will let us see if Subsystems B and D are properly integrated.	We will be timing (in seconds) how long it takes to load the correct window and close it. This is a test that can show us if there is something wrong with the code.	1 minute. Start: March 12th, 2022
6	Testing to see if the "How Can I Help" button works. Prototype 2 can be used for this part to save time.	Run the simulation and select that button. We will see if the correct window pops up and if we can close it. Also check if the links work. This is one test that will let us see if Subsystems B and D are properly integrated.	We will be timing (in seconds) how long it takes to load the window and close it. We will also check if the links work. This is a test that can show us if there is something wrong with the code.	1 minute. Start: March 12th, 2022
7	Testing to see if	Run the	We will be	1 minute.

	character list and descriptions work. Prototype 2 can be used for this part to save time.	simulation.

We will see if the correct window pops up and if we can close it. This is one test that will let us see if Subsystems B and D are properly integrated. | timing (in seconds) how long it takes to load the window and character descriptions. We will also be timing (in seconds) how long it takes to close the window.

This is a test that can show us if there is something wrong with the code. | Start: March 12th, 2022 |
| 8 | Testing to see if subtitles work. Prototype 2 can be used for this part to save time. | Going into the simulation and playing through only a couple of scenes.

We will see if the correct subtitles for the dialogue shows up. This will test if Subsystem C is properly working. | We will be timing (in seconds) how long it takes for the correct subtitles to load.

This is a test that can show us if there is something wrong with the code. | 5 to 10 minutes.

Start: March 12th, 2022 |

Conclusion

By using a modified design from Deliverable D based on the client's feedback, the budget and equipment can be determined in detail. Then, the significant risks, contingency plans, and prototype plans were outlined to keep ourselves accountable with the information and schedule we have created. Prototype 2's and 3's functionality are independent of Prototype 1, so even if Prototype 1 is not approved by the client, then we can still move forward with the second and

third prototypes even with changes to the first one. If Prototype 2 and 3 are successful and the client approves of them, then the project is likely to be successful.

Wrike Link

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=mJYlCCiIHVP09WykgUQ2KdLabtAYfHBF%7CIE2DSNZVHA2DELSTGIYA