**Project Deliverable D: Conceptual Design**

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**Abstract**

 This report contains a list of all the design criteria that we need to fulfil to realise this project within the client’s constraints, three conceptual systems that will solve the client’s problem, and a brief conclusion. The three solutions will be answering Mines Action Canada’s need for a video of a VR environment that will demonstrate the threat of autonomous weapons with a compelling narrative.

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# 1. Introduction

Mines Action Canada wants an accessible video of a VR environment that depicts the reality of people trying to survive and adapt to the threat of autonomous weapons through a storyline that the viewer can empathise with and feel inspired to act. As the threat of autonomous weapons looms on the horizon, organisations like Mines Action Canada are feeling compelled to show decision makers the true consequences of the legislation they vote on. An immersive VR environment is a useful tool for capturing the user’s attention and soliciting emotion. Since VR equipment can be troublesome to transport to diverse conferences around the world, Mines Action Canada wishes to have a video that they can broadcast to decision makers and share to the public.

# 2. List of Design Criteria and Pertinent Subsystems

## 2.1 Design Criteria

1. Minimum video duration
2. Amount and type of locations in the VR environment
3. Complexity of themes shown in the video
4. Music and audio
5. Video accessibility (colour blind friendly, subtitles, etc.)
6. Amount of elements in the VR environment
7. Aesthetics of the VR environment
8. Maximum video duration
9. Pace of VR walkthrough
10. Cost

## 2.2 Subsystems

1. Creation of VR environment
2. Gameplay and use of VR environment
3. Audio and soundtrack
4. Subtitles
5. Script and narrative
6. 3D elements
7. Video

# 3. Conceptual System One *(by Aris)*

Creation of VR environment

We would like to use Unity as our VR environment creation software. It is intuitive to use, contains many useful functions, and has the Unity Asset Store which is beneficial for us. It is overall a good software to use for this project as we are required to create a VR environment.

Gameplay and use of VR environment

Since the client will not be literally taking a VR headset to every meeting and conference they have, the use of the VR environment will be focused on creating a “movie”-like ambiance. We will focus on the cinematic value of our environment rather than its playability.

Audio and soundtrack

It can be put in video editing. This will lessen the workload as many of us already know how to do basic video editing. It will ensure audio levels are appropriate and easily adjustable. The downside to this will be getting the timing exactly right, there may be a delay between an action and the sound it creates which hurts the immersion we are trying to create. The soundtrack can be found online as many royalty-free songs will evoke the emotions we would like.

Subtitles

If there is speech in our video or our environment, we will use a video editing software to manually add subtitles to our production. We do not plan on creating a dialogue heavy scenario, and we would like to use our VR environment and the music to get any message across.

Script and narrative *(by Emina and Vitelma)*

Our script for the video will be created using a storyboard that we will draw by hand either electronically or traditionally. The storyboard will be composed of snapshots of each scene we’d like to include in our video.

3D elements

3D elements in the VR environment can be purchased or downloaded from the Unity Asset Store, but they can also be made by us in SolidWorks or Blender. Acquiring ready made 3D elements will save us time, but some specific elements we need could cost money. If we want to stay within our budget while also having all the elements we want, we may need to create some ourselves with CAD software. It is possible to import parts and assemblies from CAD softwares into Unity, but it could take a third party software or some file conversion software. For example, we could export a SolidWorks part in STL format, and use another program to convert it to OBJ, DAE or FBX format which Unity can understand.

Video

We can use a screen recording software to film what is seen by the VR user during the playthrough of our VR environment. Unity has a “Game View” tab that we can play the environment through, and then we can screen record our playthrough. We will also use a video editing software to add the subtitles and edit our video accordingly: we could use Filmora or another. We may need to cut out parts, slow down parts, or add effects to perfect our final product. The specifics are still to be determined, and we will decide more about the video editing once we have a better idea of how we will film our video.

# 4. Conceptual System Two *(by Caden)*

**Creation of a VR environment:**

 We will use Unreal Engine 5 as it is the most advanced video game engine on the market. Two of our team members already know the basics of this software so we are not learning a completely new skill. I already have assets that could be useful in our environment.

**Gameplay and use of VR environment:**

 Our VR environment will act as a set that we can film our movie on. As the scenes do not have to be very large or exist in all directions, we will focus on detail and quality.

**Audio and Soundtrack:**

 We will hire a local composer and music producer to create a soundtrack for us. We are aiming to have a song of a duration of 2 minutes made, so that it is certain to be long enough for our later video. We are trying to solicit emotions with our production, so the music will also be emotional. It will immerse the viewer into the storyline of our VR environment. Depending on our chosen narrative, the music will either be inspiring and hopeful or devastating and sombre.

**Subtitles:**

Subtitles can be put in post. This will ensure they are easily readable and large without having to redo video shoots. Depending on the script we create we may have varying amounts of speech.

**Script and Narrative:**

 Our script for the video will be created using a storyboard that we will draw by hand either electronically or traditionally. The storyboard will be composed of snapshots of each scene we’d like to include in our video.

**3D elements:**

 We will use elements found on the Unreal store that we can place and adjust in our scenes. There are many items that we can buy or even use for free so there will be everything we need. It is possible to create objects ourselves but that will take a large amount of time and research.

**Video:**

We use the script and narrative to create a storyboard for the video. After we have planned out the scenes and events we can recreate the storyboard in the finished environment. The video we capture can be edited and tuned in video editing software such as Adobe Premiere.

# 5. Conceptual System Three *(by Sam)*

Creation of VR environment

Our team will use Unity to make our VR world. It's a great tool that lets us create and design our virtual space easily. We'll use it to build everything you see and interact inside the VR game.

Gameplay and use of VR environment

We will be adding SteamVR to our project so it will work well with different VR headsets. This means more people can use our experience no matter what VR equipment they have. It will help us make sure that everything you do within the experience, like moving and touching things, feels real.

Audio and soundtrack

For the audio aspect, our team will use Audacity to make and mix all the sounds and music in the e xperience. The sounds in the game help tell the story and make the experience more fun.

Subtitles

We will be using Wondershare Filmora to put subtitles in our video presentation as well as be able to convert audio to subtitles. This is important so that everyone can understand what's being said, even if they can't hear it well.

Script and narrative

Our script for the video will be created using a storyboard that we will draw by hand either electronically or traditionally. The storyboard will be composed of snapshots of each scene we’d like to include in our video.

3D elements

We will use Blender to make some assets as well as the built in asset store that Unity offers. The asset store has a lot of free content that we can potentially modify in Blender to net the results we are looking for.

Video

As previously mentioned, we'll use Wondershare Filmora. It's an easy tool for making and editing videos, so we can add edited video content to our experience.

# 6. Analysis of Systems

| **Subsystems** | **System 1** | **System 2** | **System 3** |
| --- | --- | --- | --- |
| ***Creation of VR environment*** | Unity | Unreal | Unity |
| ***Gameplay and use of VR environment*** | Cinematic | Stage scenes | Steam VR |
| ***Audio and soundtrack*** | Royalty free music | Original | Audacity |
| ***Subtitles*** | Added manually | Added in editing | Added in |
| ***Script and narrative*** | Storyboard | Storyboard | Storyboard |
| ***3D elements*** | Purchased or created | Found online | Blender |
| ***Video*** | Screen recorded and edited with video editing software | Recorded with a script and edited with video editing software | Filmora |

# 7. Conclusion

 To conclude, we have three viable solutions to the problem that Mines Action Canada is facing. We will continue forward with these solutions in mind while remaining flexible and open to feedback from the client. It is important to note that these solutions are prototypes in a sense, and we will continue to optimise our product.

 The global solution that we will use is Conceptual System 1. The benefits of this system over the others are that the music we use will be already-made which is simpler than hiring a local composer, that Unity is more compatible with the school’s hardware, and that the 3D elements will be simpler to acquire. The other systems do have their benefits, but they are lacking in efficiency and value in comparison to System 1. As such, we decided to select System 1 instead of Systems 2 and 3.