Deliverable C: Design Criteria

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GNG 1103: Engineering Design

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Contents

Introduction 3
Problem Statement 3
Design Criteria 3
Technical and User Benchmarking 4
Target Specifications 6
Reflection and Conclusion 7
References 7

Introduction

Now that we have learned what Mine Action Canada is looking for in this product; a VR experience to demonstrate the impacts of autonomous weapons and to draw a response of fear and anger to instill urgency to make decision makers decide. Now we must be more specific in our design criteria such as target specifications and non-functional components vs functional ones. We will need to benchmark existing products and compare them with our own, we need to rank and prioritize the importance of certain components of the design.

Problem Statement

Killer robots are a readily available technology that could be deployed in warfare any day, but raise ethical, moral, and humanitarian concerns. A concise, catered, and potent VR experience can demonstrate to decision-makers on the national and international stage the negative impacts that these robots could pose, ending the possibility of killer robots in its tracks.

Design Criteria

After meeting with the client, we developed a greater understanding of what their wants and needs are. During the meeting, they stressed the importance of the storytelling and emotional impact of the product, rather than the complexity and design of the product. In *Table 1,* these needs were rated on a scale of 1-5 (where 5 is the most crucial) based on the emphasis made by the client and our deductions. These wants and needs were then categorized into functional, non-functional, and constraints in *Table 1* and *Table 3.* Client needs were placed in the functional category if that need directly changed the final functionality of the video. If the need did not directly affect the functionality but rather were attributes the client wanted in the video, they were classified as non-functional requirements. Lastly, any mandatory requirements such as the length of the video, generic background, etc., were classified as a constraint, as they lessen the degree of design freedom. Finally, metrics were developed to quantify and calibrate our approach towards adhering to the identified design criteria. *Table 3* highlights the metrics, coupled with the identified target specifications for each requirement and constraint (further determined through benchmarking).

Table 1: Design Criteria derived from Interpreted Needs outlined in Deliverable B

Interpreted Needs	Design Criteria	Non/Functional/Constraint
Simplicity (3)	• Few VR environments within video • One minute length • Simple landscape components	Functional
Civilian Adaptations (4)	• Show technical adaptations in VR environment	Functional
Instil a sense of urgency & empathy (5)	• Use of powerful visual/auditory/ conceptual elements • Quick reaction time • Engaged attention spans	Functional
User accessibility (3)	• Restrain from the use of flashing lights, and explicit/gory content • Easy VR use	Constraint
Effective storytelling (5)	• Video narration	Nonfunctional

	• Implement storyboarding to plan visuals	
Interactive VR experience (1)	• Functional VR software • High-quality resolution imagery • Minimal loading time	Functional
Cater to random people's knowledge (3)	• Avoid tailoring content exclusively to knowledgeable users	Nonfunctional
General video environment/content (3)	• Restrain from using identifiable geographical components	Constraint
Target audience: Decision makers (5)	• Implement conceptual components targeted towards a higher socioeconomic audience	Functional

Technical and User Benchmarking

- *I, Robot (by Issac Asimov publish on December 2nd, 1950)*

In this book, positronic (humanlike, with a form of artificial intelligence (Lowne, 2024)) robots are present in this world. A conflict between morality and ethics are present, in each on the nine short stories, because of the "*Three Laws of Robotics"* that follows:

1- A robot may not injure a human being or through inaction, allow a human being to come to harm. (Lowne, 2024)
2- A robot must obey the orders given it by human beings except where such orders would conflict the First Law (Lowne, 2024)
3- A robot must protect its existence if it does not conflict with the First and Second Laws. (Lowne, 2024)

The story *Reason* talks about a robot named Cutie who starts to believe that he is superior to human beings and gathers other robots to join her cause. By tricking the two main characters, it imprisons them and takes the role of the captain. This finds a loophole in the three laws and thus points out the unpredictability of the development of AI.

The reason why his stories became so popular is not because of the theme but because of the presentation that many loved. The readers loved the ethical dilemmas and philosophical conundrums which require deep consideration and contemplation (Baldwin, 2023). With Casey Dorman opinion on the subject which is: "Asimov, who was knowledgeable in a variety of scientific and mathematical fields as well as literature and philosophy, used his ample imagination to deal with issues that were far from reality at that time, but not so far now." (Why, n.d.) Dylan James Quarles's opinion is the one to remember: "Far from the killer robots of Terminator, Asimov's I, Robot instead takes a more measured, hopeful approach to the subject." (Why, n.d.)

Our perspective:

With this *p*erspective, we can conclude that to catch the audience's attention we mention we don't necessarily need to have killer robots all over the place but instead create a philosophical subject that the audience will be able to think deeply of it. Plus, we should create a

conflict between morals and ethics which will make the audience think about our project even after they finish watching it.

- *Rust in peace's project: Stop Killer Robots (fall 2023's winners)*

Their project takes a different approach from the previous winner. Instead of having a POV (point of view), they have decided to have a drone-like experience that will replace walking with flying in this new environment. The storyline used in this video is not following a single person but making the user omniscient and making them go through the city. They also added a narrator who is living in this world where he describes not the autonomous weapons but the adaptation of humanity. They explain how clothes, houses and living conditions have changed to survive.

Table 2: Comments from client throughout development process (Bohémier, 2023), Deliverable F & G

Categories	**Feedback (Positive and Negative)**	**Comments from client**
City Environment	+ Environment has realistic sounds	"Wow the city sounds alive - what are those sounds?" "Oh cool, you can hear people moving around"
	+ Realistic environment	"Environment looks very good - it looks very real" "The environment is scary - I wouldn't want to be there"
Humanities Adaptations	- Looks generic, needs to highlight adaptation	"The city looks generic, what robots are you talking about?"
VR Experience	+ Simple	• Limited experience
	+ Accessible	• Include a text for hearing impaired
	+ Interaction with external element	• Highlighted elements • Sound when user is directed towards element
	+/- Intuitive and comfortable	• Comfortable but dizzy • Easier if user moves with left joystick and adjust vision with the right

Our perspective:

With the feedback of the client and the result, we know what are the points that should be priorities. The city environment needs to have realistic sounds. Plus, the environment needs to be gloomy enough to so that people wouldn't want to live in a world like this, but still realistic. The adaptation of humanity needs to be highlighted and not generic. That means we must dig deeper than simply the clothes and talk about the behaviors. Finally, the VR experience needs to be simple, accessible to anyone, the interaction needs to be on point, and it needs to be intuitive and comfortable to navigate through it.

- *Black Mirror*

The representation of technology in this show is used as a reminder of their dark side using themes such as blackmailing or even tracking devices. The most interesting season with the theme of AI is the fourth which had the IEEE executive director John C. Havens say: "These aren't just idle TV musings" (Han, 2018).

The episode “Hang the DJ” is about a dating system that determines the duration of a relationship based on an algorithm. n this episode, there is a man and a woman who are on a date and have a great time, but once they check the compatibility test it says that they only have 12 hours together. But instead of ending things here as they should have, they rebel against the system. Then those who watch the episode find out that that was one of many simulations to find their real-life partner and so they are forced to log out. In the end he dates another girl, but there is no chemistry.

Many found “Hang the DJ” interesting for many reasons. The article by Louisa Mellor states that these following points are what make the episode so great:

- Very neat and cleverly seeded
- The simplicity of the environment where everything make sense
- Poetic visual moment
- The chemistry between the two characters (makes it easy to root for them)
- The end (audience know that the app doesn’t always work) (Mellor, 2017)

Our perspective:

By knowing what makes this episode so captivating for the audience, we can reproduce a well-structured storytelling that with an ending that will make the audience question themselves and make subtle poetic visual moments. In addition to that, we need to make a clear and simple environment.

Target Specifications

Using technical and user benchmarking, coupled with feedback received from the client meeting, target specification has been developed. These target specifications will be used to produce the first prototype of Mines Action Canada’s product, however, are subject to review and modification, as additional feedback is obtained.

Table 3: Functional, Non-Functional Requirements & Constrains

Design Specification	Relation (<, >, =)	Target Value	Units	Verification
FUNCTIONAL				
VR Environments	=	2	# of Scenes	Measure
One minute video	=	60	Seconds	Measure
Technical adaptations	=	Yes	N/A	N/A
Visual elements	=	Yes	N/A	N/A
Auditory elements	=	60-70	Decibels	Measure
Avoid use of autonomous robots in video	=	None	N/A	N/A
Evoke empathy		10	1-10	Testing
Evoke anger	>	7	1-10	Testing
Evoke urgency	>	9	1-10	Testing
NONFUNCTIONAL				
Video narration	=	Yes	N/A	N/A
Complexity of concepts	=	Yes	N/A	N/A
Reaction time	>	Yes	Seconds	Measure

Attention Span	>	Yes	Seconds	Measure
CONSTRAINTS				
Avoid graphic content	=	4	1-10	Testing
Generic background	=	Yes	N/A	Testing
Avoid geographical identifiers	=	None	N/A	N/A
Cost	<	50	$ (CDN)	Measure

Reflection and Conclusion

During the client meeting with Mines Action Canada, the client emphasized their design criteria. We confirmed assumptions about impactful visuals but adjusted our plan based on the client's emphasis on avoiding excessive horror elements and the need for societal adaptation portrayal. However, we have knowledge gaps, that include specifics such as language preferences, hardware choices, and the client's preference for storytelling on adaptation processes or current living situations. This gap of knowledge highlights the need for ongoing collaboration with the client. In conclusion, both the client's needs and our benchmarking emphasized storytelling over visual representation and thus will be the priority in this project. In addition, we aim to create a simple, authentic, and user-friendly VR experience. Utilizing these insights, we crafted a design specifications table, breaking down our prioritized needs so that they are clearly defined and can be generated. This approach ensures our VR experience meets Mines Action Canada's needs while adhering to the data gathered with the use of benchmarking. As we move forward, the synthesis of client feedback will guide the creation of a VR experience that compellingly conveys the urgent message of the negative impacts of autonomous weapons to decision-makers like governors or diplomats.

Trello:GNG 1103 Group 3 | Trello

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