**Project Deliverable C: Design Criteria and Target Specifications**

GNG 1103C – Engineering Design

Faculty of Engineering – University of Ottawa

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**Design Criteria**

**Immersivity –** It is clear from the client’s needs that to convince decisions makers, the environment must be immersive to the user. This criterion is multi-faceted as it will involve both audio and video. The video aspect is both what the user will see and *how* the user sees, such as field of view, height of camera, and other video settings. Immersivity is partly subjective, and we will have to take this into account. However, we can still improve the chances of someone being immersed. Graphics and objects modelled will also play a big role.

**Complexity –** The clients have voiced many times for their desires for a simple VR environment. From their comments on the previous year’s attempts, we propose their emphasis on this criterion is due to students biting off more than they could chew, which in turn affected other parts of the project such as immersivity. Solutions to the problem will be compared by evaluating their complexity, both in terms of the programming side, but also from the perspective of the user. Because the experience is very short, the user should spend a minimal amount of time orienting themselves. Ideally, the user will need no instructions to navigate the space.

* **Duration (s) -** The duration of the VR experience will be measured from the moment the program begins to the moment the user has completes it. Alternatively, if we opt for filming ourselves through the VR and producing a video, the duration will be measured as the length of the video.
* **Total explorable areas (#) -** Simply the number of rooms / environments.
* **Amount of time required for the user to become familiar with the controls** **(s)** - The amount of time the user needs to understand how to navigate the VR simulation should be almost negligible. Alternatively, in the case of a video recording, the user should situate themselves again after a negligible amount of time.
* **Number of buttons that must be used (#)** - To improve the speed at which the user can use the VR, it should require the least number of buttons.

**Stigmatization of Killer Robots –** It is extremely important for the project to only portray Killer Robots in an extremely pessimistic light. It should not let the user leave the experience thinking that the example we show is an edge-case, and that killer robots are a viable, ethical, and moral solution.

**Tailored to Decision Makers –** As the goal of the entire project for our clients is to sensibilize decisions makers to the issue of killer robots, special attention must be carried to tailoring the experience to these kinds of people. As the users mentioned, decisions are being made between countries on the international stage. Therefore, the experience should not require the user to come from a specific background or have any preceding knowledge on killer robots but could make assumptions about the user knowing some level of international / warfare laws. Further, the user might already be pro-killer robots. We could explore the

**Demonstration of Average Human Adaptation –** This criterion is conjoined to immersivity. As mentioned above, there is a pitfall to avoid. If the example we give in our demonstration is not sufficiently based in reality or on lived experience, a user that is already pro-killer robots (which might happen when it comes to politicians) might disregard the experience entirely as an “edge-case”. They might argue that it is an absurd example and that killer robots would never be programmed that way. Our task then is to come up with an experience that cannot be dismissed easily. One way of implementing this (from the clients’ suggestion) is to show how an average citizen would adapt to their city landscape in the presence of killer-robots deployed. The advantage here is that there are many examples of how humans adapt to their environment under war. Therefore, even though killer robots have never been deployed yet, we can still inspire ourselves from lived human experiences, giving credibility to our VR experience.

Due to the nature of this project, it is not possible to attribute measurable quantitative metrics to every design criterion. The effectiveness of this project is inherently dependent on users’ lived experiences, biases, knowledge of the issue, etc. Any humanitarian campaign will struggle with determining causation: if the issue is ever resolved, is it due to the campaign? Is it due to a shift in socioeconomical values? More likely than not, it is a complicated mixture of various factors. No one effort can claim to be solely and entirely responsible for the end to the issue raised. Causation is blurred.

Similarly, how are we to measure immersivity? It is fundamentally qualitative, as a VR environment for one user might be extremely immersive, while not at all for someone else. To evaluate the overall user perception, we can ask them to rank it on an arbitrary scale, such as five stars. But the key here is collecting feedback from as many people as possible, to build a representative sample of user experience.

**User and Technical Benchmarking**

The Immoral Code (Stop Killer Robots Organization, 2022)

This 20-minute documentary shows the ethical and moral dilemmas we face in war, and the impact killer robots will have in this decision-making process. Civilians are asked questions about morality in identifying individuals, situations of war and death, followed by intermissions with scholars and leaders of this campaign to denounce the current issues regarding the development of such technologies in our society. This documentary showcases the dehumanizing effect killer robots would have on war, and the importance of humane decisions made behind war crimes.

Our perceptions — The video is too long to deliver the intended message. There is no interactive concept which limits the reflective impact the viewers can have. We think that their focus on one main aspect of killer robots, which is the dehumanization of the decision-making process of life and death, was effective in achieving their goal. Multiple techniques were used, from testimonies and interviews, to deliver this message.

Group F13’s Project: Stop Killer Robots — A VR Experience (Alex Laver et al., 2023) (Won Design Day)

The project resulted in a video of the VR simulation walkthrough where killer robot interactions are shown in a neighbourhood. In terms of interactivity, the project follows a storyline where the user listens to an interview with the Chief of Police at his office. We then see his child and his friends playing in front of the house with a water gun when the killer robot comes in. He detects a weapon in the child’s hand and eliminates him.

Comments from client throughout the development process:

* The team focused on one ethical issue and made it obvious, which they liked.
* The storyline was brief and easy to follow. It conveyed the message effectively.

Our perceptions—This is a simple and effective VR simulation that highlights the impact of killer robots if implemented in our society. No graphic imaging was shown to present concern to the user, which is our goal in our project as well. Finally, the familiarity of the environment of the VR simulation is a great idea to reach our target audience.

Home After War—VR Documentary (NowHere Media, 2020)

We follow Ahmaied Hamad Khalaf on his personal journey as he comes back home after the war against ISIS in Iraq. Viewers are provided with a glimpse of the devastating consequences the Islamic war had on the returning refugees, who fear for their lives as their houses could be booby trapped. This interactive VR documentary allows the user to walk through a typical Iraqi house in Fallujah, where the main character narrates the hardships, his family has been through since coming back. This powerful narrative underscores the painful aftermath of war, allowing users to empathize with their struggles.

Our perceptions—This single user VR simulation was incredibly immersive and provided a realistic and detailed landscape of an Iraqi house. This simulation is accessible because it can be done standing or sitting, and in many languages. The testimonies of the main character were very effective in conveying the damages of war on refugees and did not require graphic material to represent that. It presented a simple interactive concept, where the user had to move (or teleport) closer to Ahmaied to follow him. Multiple areas of a single home were explored, adding to the simplicity of the concept.

A Story of Survival—Ban Assault Weapons (BradyUnited Organization, 2023)

This campaign banning assault weapons in communities starts off with a war veteran describing the trauma lived after being shot. The campaign’s focus is on the soldier’s discomfort while recalling the events, who is shaking and nervous as he is talking. The short story ends abruptly when the main character declares that he is reading the letter of 6-year-old Josh, who was shot with his friends in a school shooting.

Our perceptions—This campaign video is short, simple, and effective, and delivers its message well. We also like their approach to incorporate a shock factor so quickly and it was a great way to create a parallel between what soldiers have lived and what a child is now going through because of assault weapons. This campaign concentrates on the trauma inflicted on the community by the weapons and why they should be banned. This campaign is not interactive and is only provided as a video form, but the testimony really immerses the viewer and catches their attention.

Table 1: Benchmarking comparison of similar products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Products**  **Specifications** | **The Immoral Code** | **F13’s Design Project** | **Home After War** | **A Story of Survival – Ban Assault Weapons** |
| Duration (min) | 20 | 1-2 | 15 | 1-2 |
| Cost ($) | Not Disclosed | 40 | Not Disclosed | Not Disclosed |
| Explorable Areas (#) | N/A | 3 | 10 | N/A |
| Time of setup (s) | N/A | N/A | 15 | N/A |
| Buttons used | N/A | N/A | 1 | N/A |
| Immersivity | N/A | Yes | Yes | N/A |
| Stigma of topic | Yes | Yes | Yes | Yes |
| Interactiveness | No | Yes | Yes | No |
| Type of media | Video | Virtual Reality | Virtual Reality | Video |
| Size of file (GB) | N/A | N/A | 1.59 | N/A |

**Target Specifications**

Table 2: Ideal Target Specifications

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Metric** | **Relation** | **Value** | **Units** | **Verification Method** |
| Duration | =, > | 0.5 | min | Given by MAC |
| Cost | = | 0 | $ | Estimate |
| Explorable Areas | > | 1 | # | Analysis |
| Time of setup | = | 10 | s | Test |
| Buttons used | > | 0 | # | Test |
| Size of file | = | 1 | GB | Estimate |
| Size of play area | < | 2 | m2 | Analysis |

Table 3: Acceptable Target Specifications

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Metric** | **Relation** | **Value** | **Units** | **Verification Method** |
| Duration | > | 2 | min | Given by MAC |
| Cost | < | 50 | $ | Estimate |
| Explorable Areas | = | 2 | # | Analysis |
| Time of setup | < | 15 | s | Test |
| Buttons used | < | 6 | # | Test |
| Size of file | < | 2 | GB | Estimate |
| Size of play area | = | 3 | m2 | Analysis |

**Wrike Project Plan Screenshot**

**https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=yYF46TceacrEnUr2fwQnk80HVPzD77sA%7CIE2DSNZVHA2DELSTGIYA**

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