**Project Deliverable D:**

**Conceptual Design**

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**Abstract**

Killer robots are autonomous weapons designed to kill without human intervention. The existence of such weapons leads to many ethical dilemmas such as accountability, proportionality and digital dehumanization. Mines Action Canada is an organization that stands against the development of autonomous killer robots. As per request, a VR experience and a short video are to be developed to show the dangers of killer robots. The document contains design ideas for the creation of the VR environment and short video. After discussing different ideas and benchmarking, a design concept was developed. The VR experience is to focus on simplicity and show destruction through both audio and video. The VR experience will show adaptations that allow the civilians to not be detected by the robots as easily. These adaptations include silence, blackout curtains, protective gear and more. The VR experience will show the ethical and technical concerns, such as accountability, lack of control, and civilian damage. The VR experience will utilize audio such as screams and visuals of injured individuals to provoke emotion. The experience will be simple, it will take place in a singular location with not much interaction with the environment, it will be visual, and audio driven. The short video will use this environment but through narration, provide a storyline to show the devastation caused by the killer robots and the constant fear the humans live in.

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# 1.0 Introduction

In this stage, a set of conceptual designs for the problem statement were developed, based on the user benchmarking, technical benchmarking, and list of prioritized design criteria developed in the last stage. Conceptual designs for subsystems were developed and refined independently before being organized into a system that would ideally become unified in such a way to deliver the whole VR experience that Mines Action Canada needs. Global concepts that described the whole VR experience were then analyzed and evaluated to elucidate the best combination of concepts that be further developed, in future engineering design stages. The reasons for these decisions were discussed in detail.

## 1.1 Problem Statement

Mines Action Canada needs an accessible VR experience and a short video (1 min) demonstrating the dangers and ethical concerns of autonomous weapons and how civilians adapt their environment to survive.

## 1.2 Prioritized Design Criteria

Efforts in the last stage, leveraged user & technical benchmark. These efforts concluded by prioritizing three overarching design criteria to deliver on our problem statement.

Fundamentally, the VR environment must:

1. Provoke emotion,
2. Accurately represent the ethical concerns of autonomous weapons, and
3. Be simple.

Not to mention, it was also defined that the VR environment (video) must:

1. Be accessible

Defined using these metrics;

1. No flashing lights
2. No loud noises
3. 1 minute duration

## 1.3 Iterative Amendment

At this stage of the project, questions were raised about the rank of priorities defined in the last stage. It was hypothesized that it would be most productive to switch criteria 1) & 2). Communicating concepts about the ethical implications of autonomous weapons is the primary goal of Mines Action Canada and should, therefore, rank #1. Moreover, it seems fair to say that the creative process to realize the criterion, ‘the project must provoke emotion,’ is deeply dependent on the ideas being communicated.

# 2.0 Subsystems: Conceptual Designs

The three overarching design criteria served as the basis for conceptual design subsystems; the final functional solution has 3 subsystems. The subsystems are well-documented below, including a description, their boundaries, and sketches for visual aid. The benefits and drawbacks of the different concepts were considered and documented, enabling a new reader, unfamiliar with the problem, to easily grasp the details of the product to be developed.

Each project team member generated at least one concept for each **subsystem**, or overarching design criteria; with the goal to produce completely new or modified concepts for each subsystem.

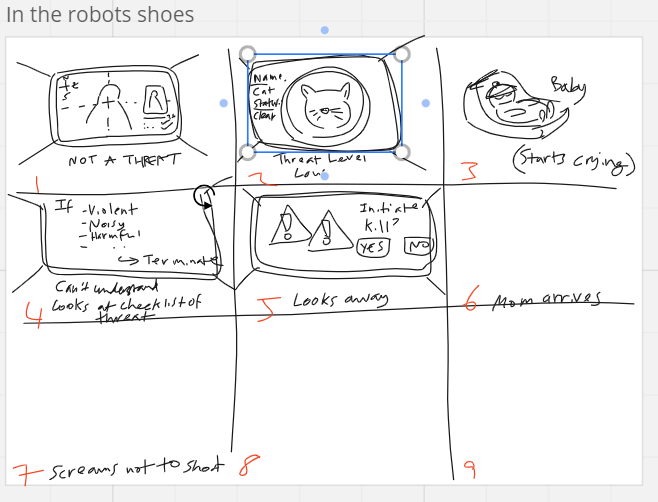
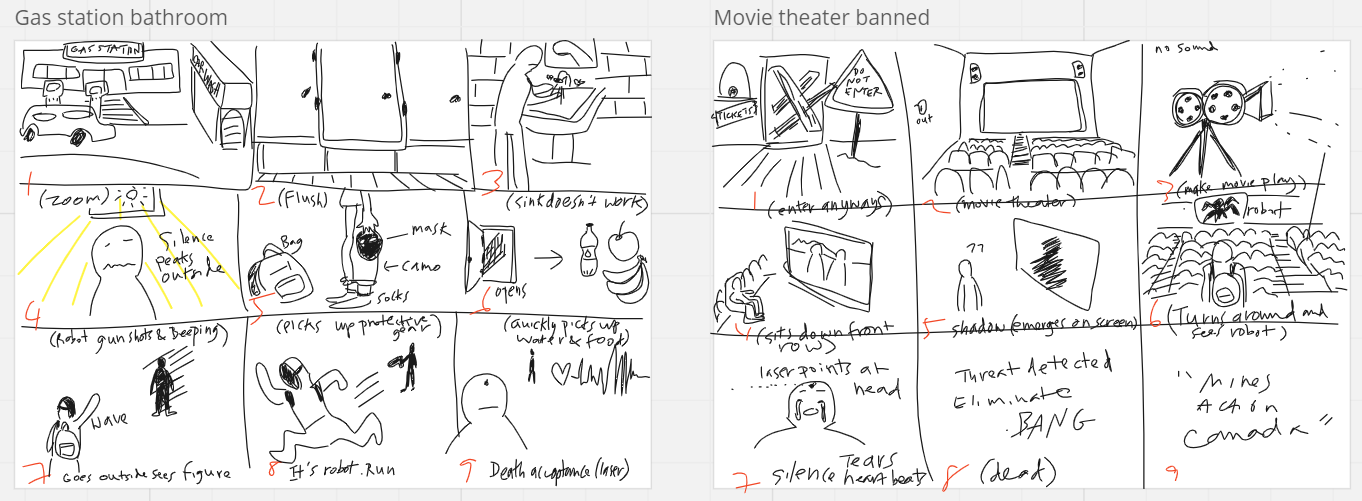
## 2.1 Subsystem 1: Accurately Represent the Ethical Concerns of Autonomous Weapons

The first overarching design criteria defined was that the project must *accurately represent the ethical concerns of autonomous weapons*. It was defined that this criterion could be measured by the i) number and diversity of ethical scenarios depicted, ii) complexity of the ethical scenarios, and iii) user engagement time with ethical scenarios. In this project, the ethical concerns of autonomous weapons are the backbone of how the remaining components will be structured.

The reality humans may face when autonomous weapons lose control requires an understanding of both 1) the technological aspects of autonomous weapons and 2) the human strategies for adaptation and survival.

### 2.2.1 Catherine

Storyline ideas:

* New storyline: SEWAGE SYSTEM tunnels: You quickly peak outside from sewage tunnels through the manhole covering you, while no one else is around. You sigh when you realize there’s still robots around as usual and retreat back down the ladder to what you call your new home, ever since the invasion started. Further into the tunnel you get to see groups of hungry people scared for their life. Some of them are families with children, others are just lonely people who lost their friends and or family members. A couple of tents are set up as rooms because down here it is way safer than anything you could hope for above the tunnels. Even further down, a couple shops have been set up to buy safety gear and there’s a space for shared rations. You can hear a fight break out over someone stealing a piece of food that wasn’t theirs. This new life isn’t what you would’ve ever wanted. You get mad and leave the tunnel despite warnings because you have hope something out there must be better than this. Eventually a robot sees you and -----
* **Prior brainstorm for story ideas (images below) :**
  + Movie theater
    - You start the VR in a disastrous street where everything is quiet except for the sounds of robots flying over. You look around and find a closed off movie theatre (boards put up and all) and decide to take a look. Once you go inside, everything looks pretty much as it used to, except no one is there. In the utility room (?), you find a movie to play, so you go sit in the front row and enjoy the show. Suddenly, you notice a strange black figure covering the characters on the screen and think there must be a technical issue with the film you put on. When you go to turn around to find the problem, you see a bright red beam directed towards you.... It’s a robot. You know there’s no escaping their precision, so you accept your fate.
  + Gas station
    - The scene starts outside your town’s gas station convenience store. The scene cuts and pans to the bathroom where our character is first introduced. You go to wash your hands but forget that the faucet no longer works in this new world. You look up at the mirror to take a breather when suddenly from the open window behind you, bright lights appear! The robots are close! Alarm-like noises continuously beep in the background, and you try to get out of the window view. When the noises fade away, you assume it’s safe to come back out and pick up all your safety gear. Shoes can’t be worn like before; it’s too noisy, Pants have to be some form of camouflage to avoid being detected, masks are worn to be more anonymous, and every day you carry a bag filled with rations and necessities because you never know when you’ll be able to get more. While you still have the chance, you pick up a couple necessities in this store and go back out. No one seems to be there so you run forward but... there’s actually a figure in the distance... looks like someone else trying to get food, oh must be your old neighbor, you think. Soon enough you notice that you were very wrong: it’s a robot. A human like robot?! When did they create such human-like robots?! You’ve never seen this before and get terrified, you try to escape but it’s too late. The robot has caught up to you, and the gun is pointing at your head. It’s over.
  + Robot perspective
    - This is a new take on a potential storyline in an apocalyptic world where robots have taken over. Instead of looking at what life may look like for a human, we can see how the robot itself struggles to make the “right” decisions due to it’s program. A robot will be going around the city where almost no one is outside. It examines a cat and reads it’s supposed qualities and finally dtermines it’s not a threat. It then sees an average person and the person passes the threat test as well. From a distance it can hear a baby crying. It quickly marches/ flies over and starts scanning him. Although it wasn’t causing any harm, the robot looks over it’s threat criteria, and decides that too many boxes were ticked so the baby has to be eliminated. In the background you can hear a mother screaming not to shoot not to shoot over and over but the robot has one task, to eliminate the child, so -----.. Scene ends
  + Calling a loved one
    - (no image for this idea) Phone ran out of battery inside shelter, you must go out to find one of those phone booths. You scramble to find a coin to pay for one call in the phone booth but eventually get it. You look around distressed that this one call may alert the robots around you, but no one seems to be there. Your dad finally picks up and you’re relieved. He’s was on a trip when this whole robot invasion started and he’s stuck at the border trying to get back. You talk for only a couple minutes when you see a robot emerge from the corner. You struggle to let go of the phone but there’s no other choice but to hang up. You leave the phone dangling with your dad shouting in concern and you run away to a safer space.
* 
* Some Ethical concerns:
  + Misidentification - Can’t detect what is a threat or not
  + Can detect movement easily (forced to live in silence)
  + Alliances will be formed; people might be unjustly sacrificed
  + Some may lack protection and or shelter
  + Phycological effects can cause irrational fights
* Does it follow the design criteria?
  + number and diversity of ethical scenarios depicted
    - Not a huge diversity but shows the despair, and anger that people feel when their home and past lifestyle is suddenly changed.
    - Robots attacking the protagonist in the end can show the fear that one can feel.
    - Not too focused on robots
    - Lack of food
    - Unhealthy living conditions
    - Wanting to go back to an old life
  + complexity of the ethical scenarios
    - A good mixture of emotions when listening to different people’s life stories of their losses, robot encounters, and separated family members.
  + user engagement time with ethical scenarios
    - Very high because in the tunnels, you get to talk to a lot of people, and get to travel to different locations within the tunnels.
    - Finally, you go outside and get to understand why no one wants to risk this. Robots are too dangerous, and unpredictable.

### 2.2.2 Fahad

Proliferation

Once the technology has been made, it would be easier for bad actors to copy it. Small scale terrorists can be shown misusing the technology, displaying that even if the robots don't lose control, the technology can be harmful.

Threshold for war

As the autonomous robots are supposedly going to cause less casualties and make warfare “easier”, wars may start for lesser reasons.

Accountability

User runs into people arguing who to blame for the killer robot's attack.

Resources  
 As resources are now scarce, humans can be seen fighting over them.

Environment

The land is desolate, people are using scraps to survive, everything is broken down, many items are repurposed.

Health

Outside of the physical damage caused by the robots, humans are also traumatized/depressed, in constant fear for their life.

### 2.2.3 Jennifer

The VR will show the ethical concerns of AI autonomous weapons by displaying how it negatively affects civilizations. Our VR will show how humans react, adapt, and protect themselves from these concerns.

* Lack of accountability
  + Include interactions with civilians that express how they have no one to blame for their loved ones' passing. Express how frustrating, confusing, and draining that feels.
  + Show how we only ever see the aftermath of the strike, witnessing the devastation but never seeing who is accountable.
* Lack of control
  + An Ai weapons would work based on an algorithm. Therefore, it is likely that the attacks are very systematic. If the technology loses control, the attacks will become more sporadic and unpredictable.
    - The humans find out how often strikes happen. If the number increases drastically, it is deemed as “out of control”. The people of the city have created an alarm system for when this happens.
* Inaccurate detection
  + If the AI weapons use sensors to detect its victims, it will have no way to detect if the target is a threat or not. Therefore, humans must do everything possible to hide themselves from the various types of sensors.
    - Audio Sensors
      * Soundproof rooms
      * No outdoor talking
      * Quiet clothing and shoes
      * No motorized vehicles
      * Adapt to sign language and non-verbal communication
    - Heat Sensors
      * Non- conductive clothing
      * Heart rate monitors
      * Temperature monitors
      * Insulated blankets/clothing
    - Motion Sensors
      * Only travel at night (strict curfew)
      * Where all black clothing at night
      * Travel through tunnels wherever possible
      * Set up decoys
      * Block windows with boards and blankets

story line idea

The VR environment is in a dystopian city. Postered propaganda monopolizes the buildings to stress the rules and regulations of the strict lockdown measures. AI sensors cover every corner to detect targets through heat, audio, and movement. Along with the weapon sensors, there are government-controlled surveillance drones to ensure everyone is following lockdown protocol, stressing the lack of freedom and privacy. You can't walk anywhere without seeing posters selling you things for your "safety." While navigating the city at night, you interact with civilians during the limited time the strict curfew allows. Due to the audio sensors, all communication must be done non-verbally or within soundproof walls. The interactions display the loss of individuality; everyone must wear the same, nonconductive, quiet, and black clothing. They talk about the struggle to complete everyday tasks as every action has a constant threat of violence. People who have lost loved ones often experience survivor's guilt and frustration due to the inability to assign blame for their losses. You see each civilian's perspective as they share their dreams and struggles. The city is being devastated by uncontrolled weapons, with no reason as to why or how it happens.

### 2.2.4 Manning

**Human Safety**

* civilians prioritize their safety against unpredictable threats.
  + Designs could include makeshift shelters, hidden passages, or reinforced structures indicating adaptations for survival.

**Unpredictability and lack of accountability for humans**

* Digital dehumanization
  + Legal/moral?
* arms race
  + Current industrial complex may have major consequences on the realization of autonomous weapons

**Tech failures & hacking**

* Cannot distinguish between hostile participants (or military objects) & civilians
  + Hague’s Law – Distinction
* Symbolized by areas of the city showing damage from misidentified targets, emphasizing the potential for innocent lives to be unjustly affected.

**Adaptation to Invisible Threats**

* Low-tech solutions that civilians might realistically implement to protect themselves from surveillance or attacks by autonomous systems.
  + Camouflage techniques, use of materials that interfere with sensors, or community watch groups

**Social Cohesion and Division**

* The threat of autonomous weapons could both unite communities in mutual defense efforts and create divisions
  + Represented through communal shelters versus isolated, heavily fortified homes

**Psychological Impact**

* Constant state of fear and anxiety through the environment's ambiance.
* Achieved with visual cues like propaganda posters warning of autonomous drones, or audio cues like distant drones or alarms, emphasizing the psychological toll on civilians.

### 2.2.5 Reese

* Technical Difficulties
* The AI weapons use different types of sensors that are programed within them. The programming went wrong somehow when setting up the algorithm so there is no way to control or override the robots.
  + Sensory issues include unpredictable behaviors, since the AI weaponries use facial features, body language, heat sensors, motion sensors, audio sensors, to detect their enemies the algorithm will make it almost impossible to decipher from civilians to supposed enemies.
  + When these weapons were programed, the programmers made sure it was impossible to shut the weaponry down incase their enemies were to decode/reprogram them
* Safety
  + People within this environment will have to use resources to help protect them from these weapons since they can detect almost everything you do.
    - People will have to mask their faces by wearing masks so that the weapons will not be able to read their facial expressions or read their lips, they also wear masks so that the weapons will be unable to detect what their face looks like or what their voices sound like, they will be unidentified.
    - Non-conductive clothing will have to be worn when exiting their “hide-outs” so that the robots will be unable to detect heat coming from their bodies.
    - Make the hideout that is being occupied soundproof so that the weapons cannot detect anyone and adapt to sign language for going out so that the weapons will not hear voices. Do not use/do anything loud when going out of hideout.
    - Travel at night wearing black clothing so that it will be hard to detect people, do not travel during daylight hours. In hideout make sure there are no windows for the robots to look through.
* Emotions of the attack
  + The civilians do not know who planned this attack or anything about the startup of the weapons. Their community will have to make rules and work together to stay alive. After the attack the environment has changed since they will have to adapt to the rules that have been set and the robots who are always monitoring the area around them.
    - The rules in place will be curfew, boundaries, etc. to keep the community safe.
    - Emotions will be all over the place, there will be no one to blame for the attacks since the community does not know how/what happened or how to stop the attacks so there is a sense of confusion, sadness, and anger.

## 2.2 Subsystem 2: Provokes Emotion

The second overarching design criteria defined was that the project must *provoke emotion*. It was defined that this criterion could be measured by the degree of i) concern (fear & anger), ii) motivation/inspiration, the type of iii) visual (objects & setting), iv) audio (sound effects and music) used, and if it was a v) fluid video. A VR experience that excites, not just the audio-visual, but the mental senses have a higher chance to succeeding in meaningfully communicating the main message.

### 2.1.1 Catherine

\*\*\*Referring back to the storyline above,

Does it follow the design criteria?:

* Show concern/fear/anger
  + Absolutely. Anger can be seen from both the protagonist and the figths breaking out over food.
  + Concern can be seen when empathizing with other members of the tunnels and people that have lost their loved ones
  + Radars are set up; news can still be heard so fear is built up from this
  + Fear is shown when stepping out of the tunnels
* Show motivation/ inspiration
  + Protagonist really wants their old life back, decides to take a risk and go venture on their own despite the robot warnings.
  + Motivation to make a change, or fight back against the robots can be felt
* Show visuals:
  + Tunnels,
  + Tents
  + Fmailies
  + Food
  + Outisde robots and crumbled streets
  + Icky conditions in the tunnels
* Use audio:
  + Quiet music plays in the tunnels
  + Dystopian, somber music plays when going outside
  + Fast, panicked sounds play when protagonist runs from robot doom
* Fluid video:
  + No jump cuts just starting in the sewers and eventually going outside, so yes

### 2.1.2 Fahad

* Add a story of a “hero” who died saved many people from the robots but died in the process. This may serve as inspiration.
* Narrate the story through background chatter as it makes the experience feel more real.
* Have sounds of a robot attack in the background to indicate a nearby area was attacked
* Show aftermath of the attack (destroyed environment)
* Show a famine inflicted environment

### 2.1.3 Jennifer

* In a realistic scenario, a society would become very government-controlled during a time like this. Strict lockdowns, dress codes, and curfews would be set in place. Stressing the lack of freedom and control will make the viewer empathize with the dystopian society.
  + Surveillance
  + Propaganda
  + Interactions with civilians about powerlessness
  + No individuality
* Interaction with other civilians that discuss their survivor ‘s guilt will provoke emotion with the viewer
* Stress the challenge to complete simple, everyday tasks under the circumstances
* Humanizing potential victims.
  + Make the interactions have personality
    - They could mention what they wish their life to look like when this situation ends, if it ever does
    - Talk about personal but relatable struggles
* End with the sound of a strike (beeping, silence) right before the credits to make the viewer think about the ending.
* Video Storyline:
  + The video starts inside a house with soundproof walls and blocked windows. The protagonist displays all the safety precautions they must take before leaving the house, including wearing black, quiet, nonconductive clothing and their heart rate and temperature monitors. They walk to the city food bank, whose resources are depleted. They talk to a couple of pedestrians that express their struggles. Eventually, they get a notification on their cellphone telling them to return to safety immediately. Once the autonomous weapons have lost control. We hear beeping and silence before they return to their protective house. A black screen with the credits leaves the viewer questioning what happened to the protagonist.

### 2.1.4 Manning

* You wake-up in this giant tent encampment
  + Unfamiliar place, feel lost
  + Multiple wards/departments of people
* There was **curfew**, you got up early so when the gates opened you could start your day.
  + You look at your legs and arms from the cuts you sustained
  + You've already put on all your gear
    - Masks to make you unrecognizable
    - Reflective clothing
* You've made your walk through the camp, from the barracks at the back to the front, passing a hospital ward where there is no consistency in the victims
  + The robots are never certain about your they target
  + Pass the robot safety store
    - Disguise material
  + Pass the food hall
    - Concern for family eating
    - Empty pantry
  + Posters to describe community concerns
  + Complete blackout from world, only torched lights
  + You count down the seconds on your watch
* When you exit the tent, you look back at the disguised city – building camouflage looks like an upright fox hole
  + The location is far enough away from the metropolitan area where most of the energy and charging infrastructure is.
  + There is some human dignity in the order that they've built but the longevity remains uncertain
    - Proud of the community & culture they built, but concern for its safety
  + Hidden passages
    - Prioritize safety against unpredictable threats
* Humans mostly live in makeshift shelters because autonomous weapons have impacted urban cities the most,
  + This area has the most amount of artifacts which the AI has the possibility of misidentifying.
    - The error in their code propagated to a tremendous state that can never be reversed. The energy infrastructure is
  + Humans relocate in the direction of resources when the seasons change
    - When the sun isn't out as much & charging stations can’t charge as much
* School loudspeaker & siren
  + Siren goes off
  + People run for covering, leaving hospital ward
* Interactive Elements to Foster Empathy
  + Incorporate interactive elements that require users to make decisions like faced by civilians

### 2.1.5 Reese

* Have a narrator for the story line so feel more humane/real and provoke more emotions (king of like you're getting an insight of what is going on in a character's mind)
* Show the environment and the damage to it from the robots
* Have a story that will provoke emotions in the listener (a family member passes, their world has just been destroyed, living in fear of their life, not knowing where they are anymore or who they are, everything has changed)
* Show how a community has changed, how there is rules in place to keep everyone “safe” from the robots

## 2.3 Subsystem 3: Be Simple

The third overarching design criteria defined was that the project must *be simple*. It was defined that this criterion could be measured if it was i) non-interactive (static), ii) easy to follow, iii) focused on environment, and had iv) one location, and a v) clear message.

### 2.3.1 Catherine

* Only 2 locations, inside the tunnels and outside
* Boundry will be set so protagonist can’t explore too much
* Linear path so that a story can be followed
* Characters they will meet = 4 or 5 at most
* Narration can easily be done by our team
* Objects used will be easy to find: Food, Shelves, News reports, Robots, Man hole etc. (at most 10)

### 2.3.2 Fahad

* Limit where the user can go with barriers does not have to be physical barriers and can be invisible walls or events preventing the player from going forward.
* Have posters scattered with contexts, mainly through newspapers. Keep the text short to improve user engagement.
* Show a destroyed area, have conversations in the environment be whispers to avoid detection.
* Have a “roof” blocking robot view to avoid detection
* Show mini scale farms and water collectors as the area does not have a sustainable means for food and water.

### 2.3.3 Jennifer

* Ensure the interactions and overall message is clear and easily understandable
* Keep the graphics of the less important aspects very simple
  + Posters may be very detailed but outside visuals like the sky or buildings are simple.
* Limit the amount of branching pathways
  + Allow the user to “explore” but in a naturally guided way

### 2.3.4 Manning

As outlined, the objects in the VR environment/scene are chosen specifically to represent some ethical concern in whole or in part; meaning that time will not be wasted on VR production efforts that do not directly contribute to meeting our client needs. To dial-in the visual messaging, narration will highlight some of these objects implicitly or explicitly. The scene will take place in one location, the tent encampment; it will be easy to follow because there will be one path from the back of the camp, the barracks, through the different camp wards, and then to the front entrance; it is focused on environment because each different camp ward represents a different group of ethical concerns (one or more) and emotions to make the concern more meaningful. The messaging is clear because similar concepts and VR objects, like posters or sound effects, may be reused to repeat messaging.

### 2.3.5 Reese

* Have the story line easy to follow, one location, make sure that the story is clear and has a clear message.
* Have limited areas of where people can roam before getting detected, the people in the VR can view and walk around the environment but it will be limited so that it will not make it too complex for the viewer and so that the story line is also guided
* Have posters of warning signs, or context of what has happened to the area make sure that they are simple and easy to follow.
* Show how the environment has changed by attacks on the area (damages to buildings and the earth)
* Have boards put up around the buildings so that it will not show where people are, or make them look abandoned
* Have blacked out clothing and masks on the people in the environment so that the people will not be detected
* Have security cameras that the robots use to help detect where the people are, and have security cameras put up by civilians for when they can come out when the robots are not there

## 2.4 Concept Evaluation

A weighted sum was scored to determine the product that fit the design criteria best.

* Green = best (3pts),
* Yellow = moderate (2pts),
* Red = least (1pt)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Specification** | **Importance** | **1.“The tunnels”** | **2. “Calling a loved one”** | **3. “city”** | **4. Morning @ Camp** | **5."The Concealed Town”** |
| **Ethics** | | | | | | |
| Number & diversity of ethical scenarios depicted | 4 | Fear of going outside to do regular tasks, People irrationally arguing over food, Sanitation, Freedom taken away, | Not very high, only focuses on the lack of communication this world has created. Can’t even contact family members, people on trips got stuck in the other country unable to see one another. | Inaccurate detection, lack of accountability, lack of control. | Human safety, family & friends; uncertainty in targets, personal freedoms restricted, insufficient food | Accountability,  Lower threshold for war, proliferation, resource conflict, Trauma |
| Complexity of ethical scenarios depicted | 5 | Fairly high, shows the psychological effects it has on an individual and as a community. Stories from each new character met, and thoughts of the protagonist hating this new life. | Again, not very high because shows one person’s need to call their dad but phone charger doesn’t work anymore and has to go to another phone booth, even then calling is too difficult wihtout getting noticed by robots | Ethical issues will be shown by interacting with npc’s who share their stories, viewing posters in the environment, and through the video storyline. | Complexity will be achieved by identifying a group of VR objects that could effectively express the concern | The ethical scenarios are layered and discovered by NPC chatter and text in the environment. Shows the psychological and physical damaged caused, and other issues created due to the creation of the technology |
| User engagement time with ethical scenarios | 3 | Can fit in a minute, packs all of the interactions with other civilians stuck in the tunnel, protagonist faces issues facing the new reality and gets to see robots running after hum | So so, one on one calling with their dad on the phone shows the intensity of fear that occurs when trying to do a simple task like calling a loved one. | Users are free to engage with different displays of the ethical concerns however they want | Each ethical scenario will have equal time | User will see conversations and interactions between NPC’s, displaying their feelings and the complications of their situation. |
| **Emotion** | | | | | | |
| Concern (Fear and anger) | 5 | Very high. Seeing the torn apart families and unhealthy conditions they have to live in cause immense stress and sadness. Things need to change and causes protagonist to escape out of the tunnls | Very high because the daughter and dad’s voice are clearly in panic | NPC’s talk about their struggles to complete everyday tasks, their survivor's guilt, and frustration for having no one to blame for their loved ones passing. | People in hospital beds, family in empty kitchen, death of relatable character | People in fear, hurt, shown venting and in pain. People are in constant fear of detection and in conflict of resources. |
| Motivation/Inspiration | 4 | Not direct motivation, but concern and fear that this life is undesirable gives user the feeling of inspiration to make change | Fear created from stress inducing scenario inspires user to not let their life get to this point where communication is near impossible. | NPC’s talk about how their “dream” life would look like if the devastation never happened. This will make the viewer empathies with the relatable and complex emotions. | You follow the character through a relatable morning only to observe unfortunate circumstances | NPC chatter tells tragic events, and how heartbroken and damaged the people are. Story of a person who died saving people from the robots is told to gain sympathy. |
| Visuals (objects and settings) | 3 | Dark tunnels, yucky with nasty water... Little fires started around tents families have set up, peaking out the manhole shows outdoor conditions, objects like food, weapons, masks, gear etc... | Not many visuals involved, just setting wise a house, and a phone booth in a street. Iphone can’t recharge so phone booth needed, robot comes and the end | Postered propaganda on buildings to stress the rules and regulations of the strict lockdown measures. | Hospital beds, posters, empty pantry, putting on protective gear, wounds on legs and arms | Newspaper and flyers scattered. Civilians in varying conditions. Concealed environment. |
| Audio (sound effects and music) | 2 | Will be chosen appropriatley but: Sound effects for fights, and radios. Narration of characters will be done by the team, so will be failry complex. Background music that is sentimental, sad, and inpiring can be found. 2 – 3 songs for different sections of the story. | Somber music will be playing, eerie music while robot approaches, sound effect when robot chases daughter. Narration for 2 characters. | NPC’s talking, eerie music, and beeping. | Narration, NPCs with different sounds/stories, sensational ambient sounds, eerie radio news | Story is narrated by background chatter. Destructive sounds can be heard in the distance of another location being attacked. |
| **Simplicity** | | | | | | |
| Non-Interactive (static) | 2 | Is quite interactive, relies on interactions with NPC’s but also inner narration of thoughts. Maybe too much interaction with NPC’s?? | Is very interactive but just with one person. Over the phone, Robot can be seen | Passive engagement with NPC’s. Most interaction is with visuals (ie. Posters) | Different spaces with select groups of contextual objects, passive NPC engagement | User does not interact with objects. User simply can walk around, hear and read. |
| One location | 4 | 2 in total, outdoor and inside sewage, meeting NPC’s creates quite a long path so maybe too much area is covered in the short amount of time. | Yes. Basically all outdoor at the phone booth | The VR environment is in a dystopian city. | Tent encampment | The environment is a very small, concealed “town”, which is mostly destroyed. |
| Easy to follow story | 5 | Most likely easy enough because no jump cuts or anything will be applied. Person is sad in these conditions, wants to get out, finally does and robots come after him. | Very easy. Just a call with one person and a robot coming after the user | The story will be clear and concise. ([See Jennifer’s video story line in 2.1](#_2.1_Subsystem_1:)) | Single path through camp, to outside; narration | Story is not provided directly, there are parts of information scattered throughout the location as conversation and text. |
| Focused on Environment | 4 | Yes! Gets to visit a lot of different parts of the tunnel to show the physical impact this invasion has caused. | Not so much, user constantly looks around in fear that robot is approaching but other wise focused on conversation | Inside a “protected” house and a dystopian cityscape. | Camp has different spaces to represent different ethical concerns | Destroyed environment with mini scale farms to fight against the food shortage. The environment is concealed with a roof of sorts to prevent ai from noticing civilians and attacking. |
| Clear Message | 5 | Could be more clear but focuses on how robots have made people retreat into unsanitary, living conditions with a lack of freedom, always fearing death. People want to go back to their old life. | Very clear message. Communication is vital and having that cut off or hard to access can cause a lot of panick | Focus on how government controlled a city would become under these circumstances and how that affects everyday life. | The lifestyle of humans is severely affected in this reality | Needs to be more direct, message is not directly stated. |
| **Total** | | | | | | |
| **-** | - | 115 | 116 | 116 | 129 | 102 |

# 3.0 Global Concept

Following the independent development of the various conceptual subsystems and team meeting was held to elucidate the best combination of the concepts. The individual concepts (above) contributed by each member was discussed as a team to:

* + Categorize
  + Condense
  + Combine
  + Refine
  + Reconsider each sub-system.

The biggest observation during this meeting was that most members converged on many conceptual designs that would satisfy the defined design criteria. These overlapping ideas were chosen as the main global concepts and were combined into fully functional solutions. Character was added to the design by mixing and matching the unique instances for expressing ideas. This new system of ideas will be further developed.

|  |  |  |
| --- | --- | --- |
| **Design Criteria** | **Importance** | **Global Concept Hierarchy** |
| **Ethics** | | |
| Number & diversity of ethical scenarios depicted | 4 | Curfew, need to be quiet |
| Complexity of ethical scenarios depicted | 5 | Interactions with NPC’s and objects surrounding us will be used to express different ethical concerns |
| User engagement time with ethical scenarios | 3 | Appropriate time will be allotted to each NPC conversation and look at objects. |
| **Emotion** | | |
| Concern (Fear and anger) | 5 | Screams in the background, |
| Motivation/Inspiration | 4 | A heartbreaking story described by the user’s own narration will motivate user to choose a different life. Want a life that isn’t in shambles like what they see. |
| Visuals (objects and settings) | 3 | Posters displaying rules and propaganda |
| Audio (sound effects and music) | 2 | NPC talking, narration, sensational ambient sounds, eerie radio news, distressed civilians |
| **Simplicity** | | |
| Non-Interactive (static) | 2 | Interactions w/ tools replaced by people. Different sounds/stories/expressions. Proximity? |
| One location | 4 | 2 locations, connected to each other. Outdoor, beyond protected. Indoor, protected area. |
| Easy to follow story | 5 | Inside protected space. Puts on gear (mask, sensor protective clothing), listen to news, leaves safe space, dies |
| Focused on Environment | 4 | Camp has different spaces to represent different ethical concerns |
| Clear Message | 5 | The lifestyle of humans is severely affected in this reality, horrible living conditions |

As can be seen above, and mentioned in the iterative amendment (1.3), the primary global concept is communicating the ethical concerns of autonomous weapons. We have prioritized the number and complexity of the ethical scenarios depicted in the VR experience and see this as a benefit because it exposes the user to a diverse range of ethical implications. However, this is a complex goal and to avoid any drawbacks a table has been made to map the ethical concerns to an object in the VR experience. This purposeful selection of VR objects will make developing this complex solution, in the next stage, straightforward and unambiguous.

|  |  |
| --- | --- |
| **Ethical Scenario** | **Emotion driver (VR object, sound, emotional trigger)** |
| Need to be quiet | Plug-in headphones to radio |
| Technology use affected | Smartphones would still exist. No sound, no vibration alert. Missed alert! |
| Control of movement/freedom | Curfew -> clock bouncer  Security/bouncer double-checking if people  Security might be wrong about drone storm |
| Uncertainty in your own life | The protagonist dies!! Injuries on arm and leg |
| Uncertainty in target | Hospital beds with different types of people |
| Tech is misused by other groups of people (hackers) | Small terrorist groups. Lower barrier for war. Communicated to users through radio news. |

# 5.0 Conclusions & Recommendations for Future Work

**Storyline:** After benchmarking all our storyline ideas individually, in Global concept we determined an overall story that brought together the best parts of our ideas. This story focuses on the user showing all the freedom this invasion has taken away from everyone. This has caused people to hide away in a protective shelter of sorts where new routines like putting on safety gear, checking a robot radar and listening to news broadcasts has become the norm before going outside for food.

**Virtual Reality:** Designing a VR environment that effectively communicates the impact of autonomous weapons on society involves a balance of technical creativity with ethical considerations. This immersive experience will convey the gravity of living under the constant threat of autonomous weapons, raising awareness for ethical guidelines (e.g., policies) and international regulations.

## 5.1 Future Work

The global concepts developed in this stage will be presented to our client in a meeting to determine the feasibility of these conceptual designs. Not to mention, the Unity Asset Store will be explored to narrow our understanding of the feasibility of the global concepts.