

Project Deliverable D

Conceptual Design

GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

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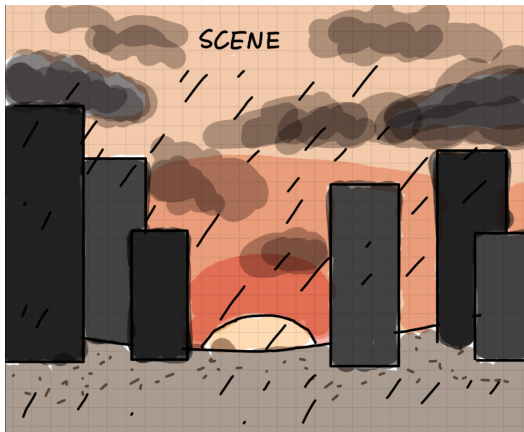
1.0 Introduction:

Derived from user and technical benchmarking, this document compiles ideas from design criteria and classifies them into 4 subsystems, namely **environment/scene**, **evidence of autonomous weapons/evidence of plot**, **user design/program**, and **audio**. These ideas are illustrated by group members, through original hand and digital sketches, and organized in tables.

2.0 Subsystems:

2.1 Subsystem 1: Environment/Scene

The first subsystem is for the concept designs related to the virtual environment, setting, and scene. The aspects of design that are in this subsystem include: time period, skyline, what city or region, weather, landmarks, and design of buildings/roads. The boundaries for this subsystem are strictly within the setting/scene of the environment and does not include objects that relate to the autonomous weapons. Furthermore, the environment must be simple, yet realistic, and it can't have too many people or movement. Below is a table of all the concept designs created by each group member:

Group Member	Design	Analysis
Jeanine	 <p>Skyline/Weather (sunset, raining, orange sky, cloudy)</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Orange Sky - Dark clouds/rain - Sunset (moody/sets scene) <p>Cons:</p> <ul style="list-style-type: none"> - Rain could be difficult to program

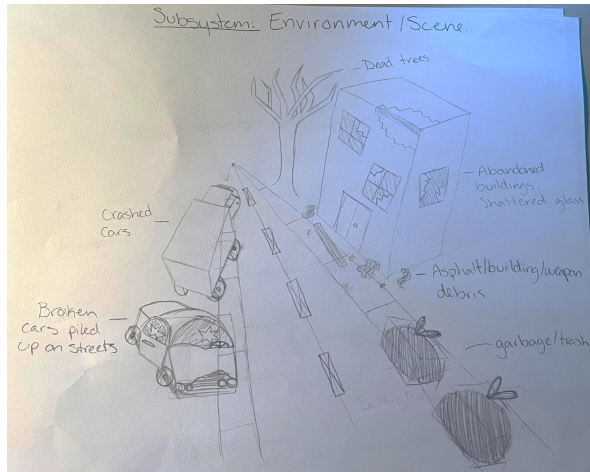
Jon



Destroyed buildings / landmarks

- Pros:
- Destroyed buildings
 - Shows collateral damage
- Con:
- Not too much destruction because city would be inhabitable

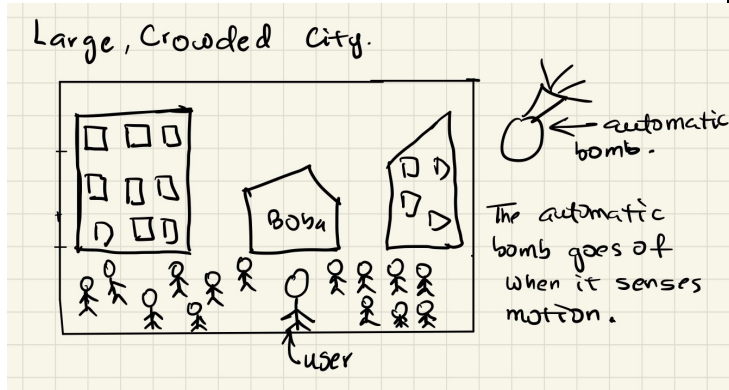
Hannah



Abandoned city (garbage, trash, broken windows, barricaded windows)

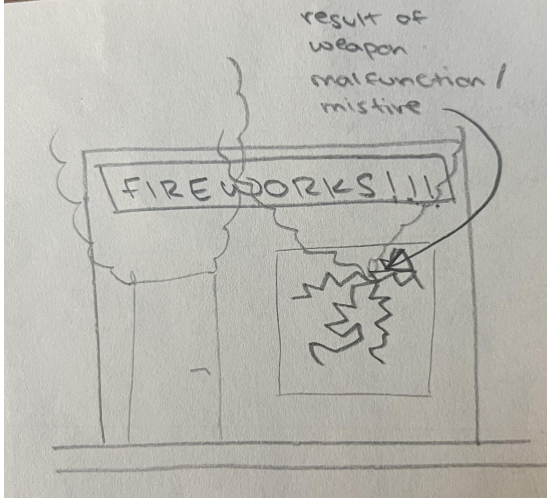

- Pros:
- Road
 - Destroyed buildings
 - Trash/rubble/debris shows unkept city
- Cons:
- Not simple enough
 - Too many objects/difficult to find and model some objects

Marho



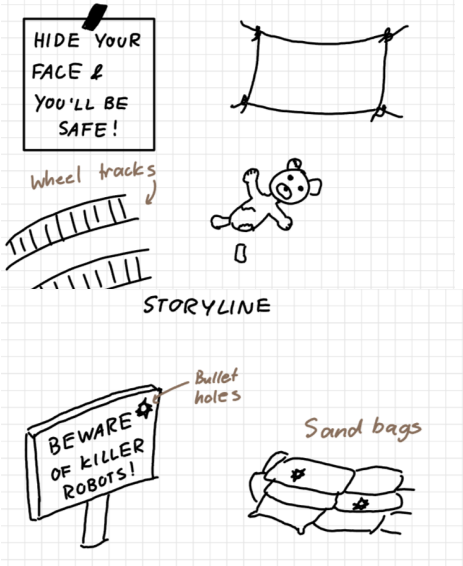
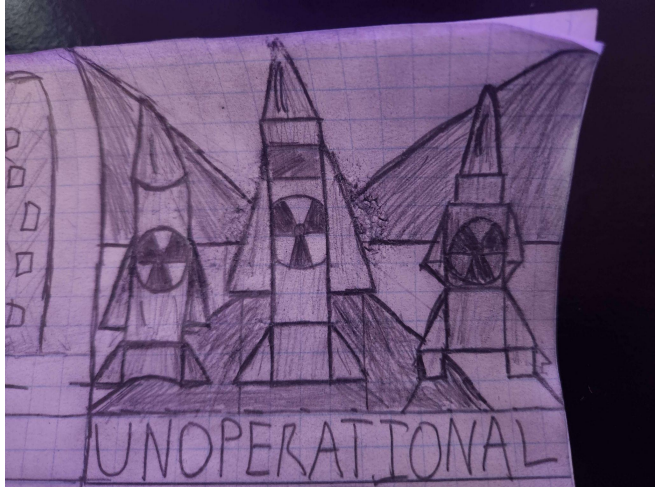
A large, crowded city.

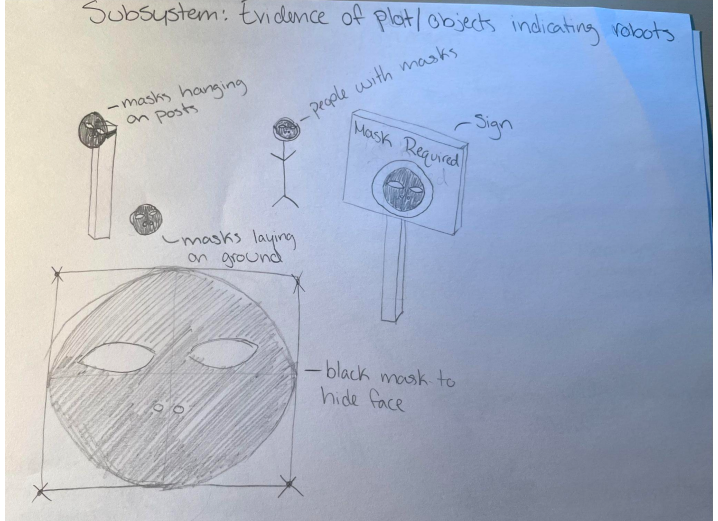
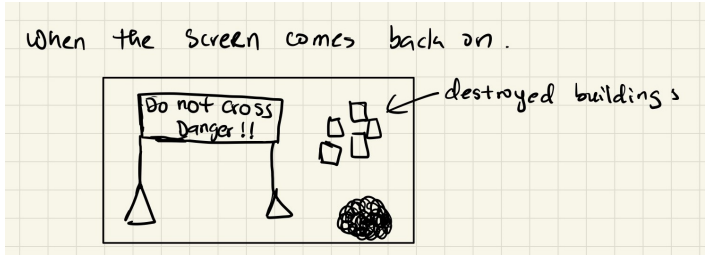
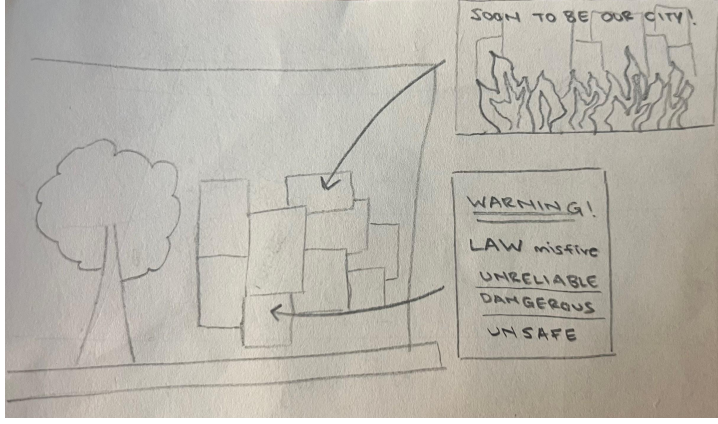
- Pros:
- Large city
 - Fear/emotion
- Cons:
- Bomb is too violent
 - Large population hard to program

<p>Rohan</p>	 <p>Special effects (smoke, fire)</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Fire/smoke - Special effects (immersive) <p>Cons:</p> <ul style="list-style-type: none"> - Building too specific (not enough time/cost to make each building unique)
<p>Kwab</p>	 <p>Dead vegetations / unseemly animals (groups of rats, racoons, to illustrate the unkept state of the city)</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Rats (unkempt city) - Dead tree (from fires) <p>Cons:</p> <ul style="list-style-type: none"> - Too many rats (hard to program) - Might be hard to design/program/find models

2.2 Subsystem 2: Evidence of Autonomous Weapons/ Objects Indicating Robots

The second subsystem we have chosen was evidence of the plot, which indicates the existence of the autonomous robots. The purpose of these objects is to show the user potential sensors which the autonomous weapons could be using to detect their targets. These could also be objects which evoke emotions from the user. The boundaries for these objects are that they cannot show any violence or gore. For example, there should not be any dead bodies, blood etc.

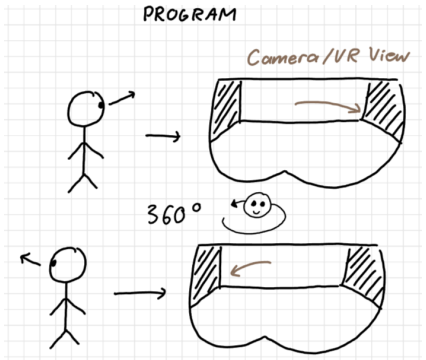
Group Member	Design	Ranking
Jeanine	 <p>Teddy bear left behind from a child + poster warning</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Sandbags (protection/cover) - Signs and message - Tarps (cover, and simple model) - Teddy bear adds emotional value <p>Cons:</p> <ul style="list-style-type: none"> - Bullet holes could be difficult to implement in model - Wheel tracks difficult to model
Jon	 <p>Unoperational and damaged representations of the autonomous weapons in question.</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Unoperational (shows mistakes with weapons, failures, etc.) - Incorporate autonomous weapon debris (bullets, metal scraps, etc.) <p>Cons:</p> <ul style="list-style-type: none"> - Constraint: can't show weapon


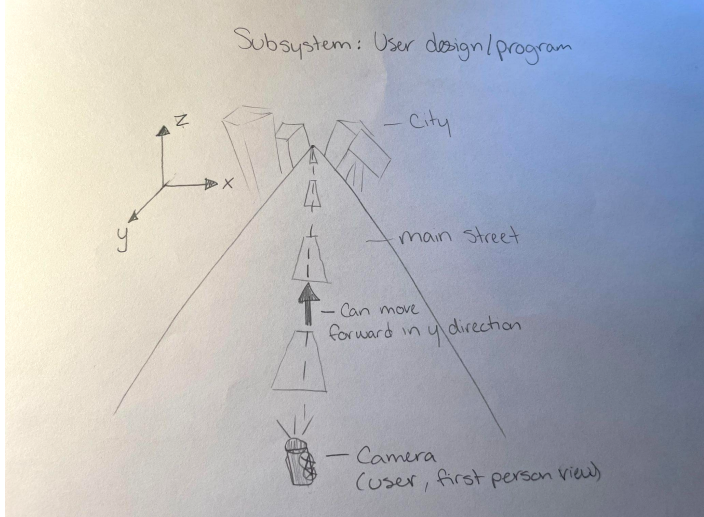
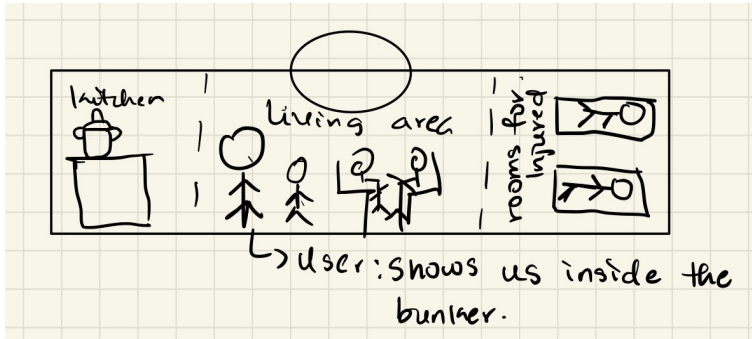
<p>Hannah</p>	 <p>Subsystem: Evidence of plot/objects indicating robots</p> <p>Masks that hide faces for facial recognition</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Demonstrates how people would adjust - Easy to model on our own - Sign (masks required) - Shows how autonomous weapons work (facial recognition) <p>Cons:</p> <ul style="list-style-type: none"> - Too many masks make too crowded - Would have to model ourselves (time sensitive)
<p>Marho</p>	 <p>When the screen comes back on.</p> <p>Barricades/Sandbags/Cars blocking</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Shows danger, and how people find safety - Shows people won't be living normally <p>Cons:</p> <ul style="list-style-type: none"> - Hard to have before and after (time frame is 30s-60s)
<p>Rohan</p>	 <p>Posters warning about autonomous robots' sensors</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Warning signs - LAWs (realistic) - Strong emotional value (induces fear/worry) <p>Cons:</p> <ul style="list-style-type: none"> - Small texts (hard to program into display) - Time consuming to add individual posters on buildings
<p>Kwab</p>	<p>Newspapers</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Super realistic

		<ul style="list-style-type: none"> - Easy to copy/paste into Unity <p>Cons:</p> <ul style="list-style-type: none"> - Small texts (hard to program into display) - Time consuming to add individual newspaper on roads
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2.3 Subsystem 3: User Design/Program

The third subsystem we have chosen is User Design/Program. The purpose of this subsystem is to make sure the user's point of view is properly portrayed. This subsystem helps us visualize the specific program/actions we will need to consider when designing the virtual reality environment and helps realize constraints. The boundary for this subsystem is that there can only be 30-60s of movement.

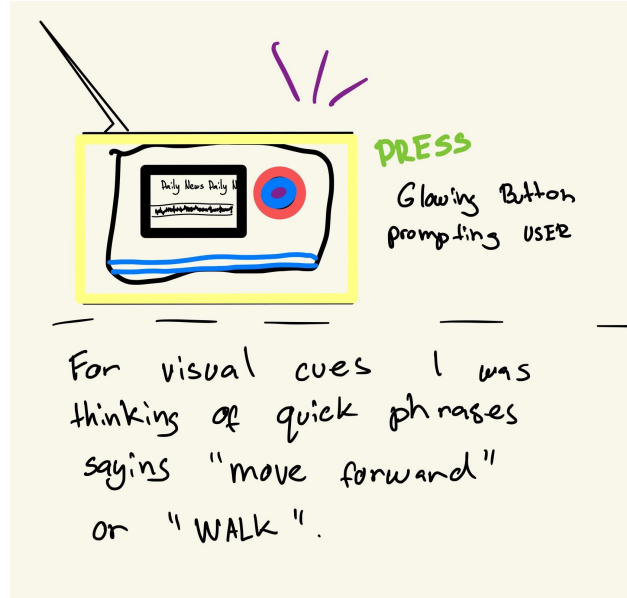
Group Member	Design	Ranking
Jeanine	<p style="text-align: center;">PROGRAM</p>  <p>Camera points to different sides when the user moves their head, has a 360° view</p>	<p>Pros:</p> <ul style="list-style-type: none"> - 360 view is immersive <p>Cons:</p> <ul style="list-style-type: none"> - Time constraints

<p>Jon</p>	 <p>- BUTTONS AND DIALS PROMPT AUDIO.</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Immersive (user can interact the environment) <p>Cons:</p> <ul style="list-style-type: none"> - Difficult to code - Could be time consuming
<p>Hannah</p>	 <p>Subsystem: User design/program</p> <p>City</p> <p>main street</p> <p>- Can move forward in y direction</p> <p>Camera (user, first person view)</p>	<p>Pros:</p> <ul style="list-style-type: none"> - User restricted to one axis (simpler) - Increases immersion, interaction, and realism <p>Cons:</p> <ul style="list-style-type: none"> - Means creation of more buildings down the road - Difficult to code
<p>Marho</p>	 <p>kitchen</p> <p>living area</p> <p>rooms for injured</p> <p>user: shows us inside the bunker.</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Very immersive - User interactive - Realistic <p>Cons:</p> <ul style="list-style-type: none"> - Designing inside of buildings - Difficult to program

Button that activates the audio file.

Walk straight through the cityscape (on road), look left and right at signs, buildings, etc.

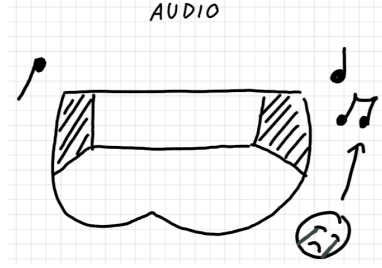
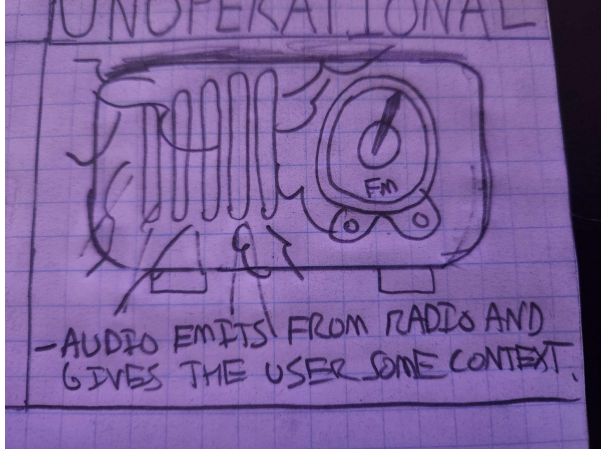
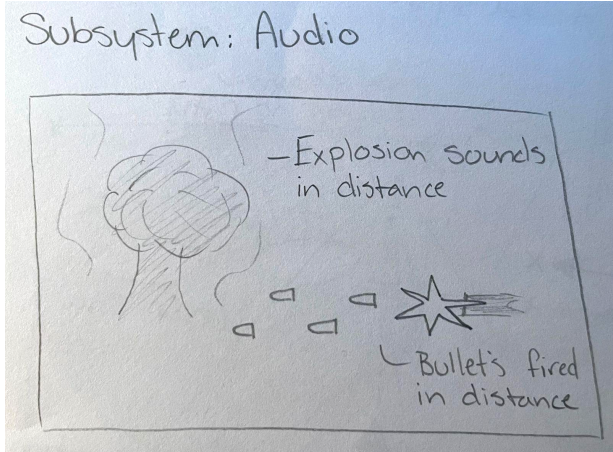
Camera should be able to go into small holes. E.g if the user is hiding under a bed or going into a bunker, we should be able to see the user's POV.

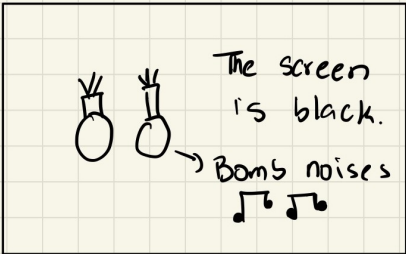
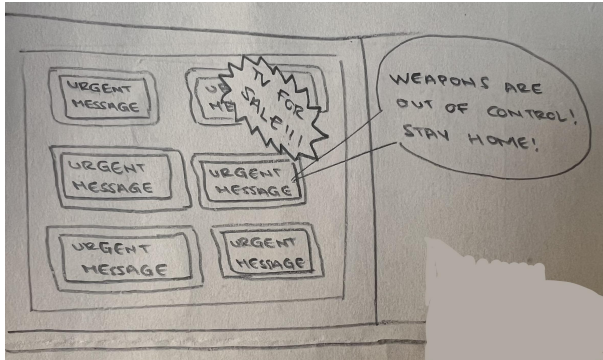

Rohan	<ul style="list-style-type: none"> - Fade in transition; from completely white screen to scene - Introduction scene (black screen with blinking eye, user waking up) - Example: https://www.youtube.com/shorts/v_I_3RJpNrc 	<p>Pros:</p> <ul style="list-style-type: none"> - Immersive (makes user feel as if actual in virtual environment) - Develops storyline <p>Cons:</p> <ul style="list-style-type: none"> - Difficult to code
Kwab	 <p>For visual cues I was thinking of quick phrases saying "move forward" or "WALK".</p> <p>Guiding user using sound and visual cues, such as: Sounds lessening as use movies away or increasing as user moves closer, glowing objects we want the user to interact with, ie a radio button, triggers for events such as objects enlarging objects as user gets close</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Visual cues - Emotional value (warning sounds) - Interactive <p>Cons:</p> <ul style="list-style-type: none"> - Difficult to program

2.4 Subsystem 4: Audio

The last subsystem we have created is for the audio. This subsystem includes all of the audio included in the environment and ideas for how it can be activated in the VR setting. The boundaries include: no gore or violence, no dialogue, and ensuring the audio depicts the correct emotional value.

Group Member	Design	Analysis
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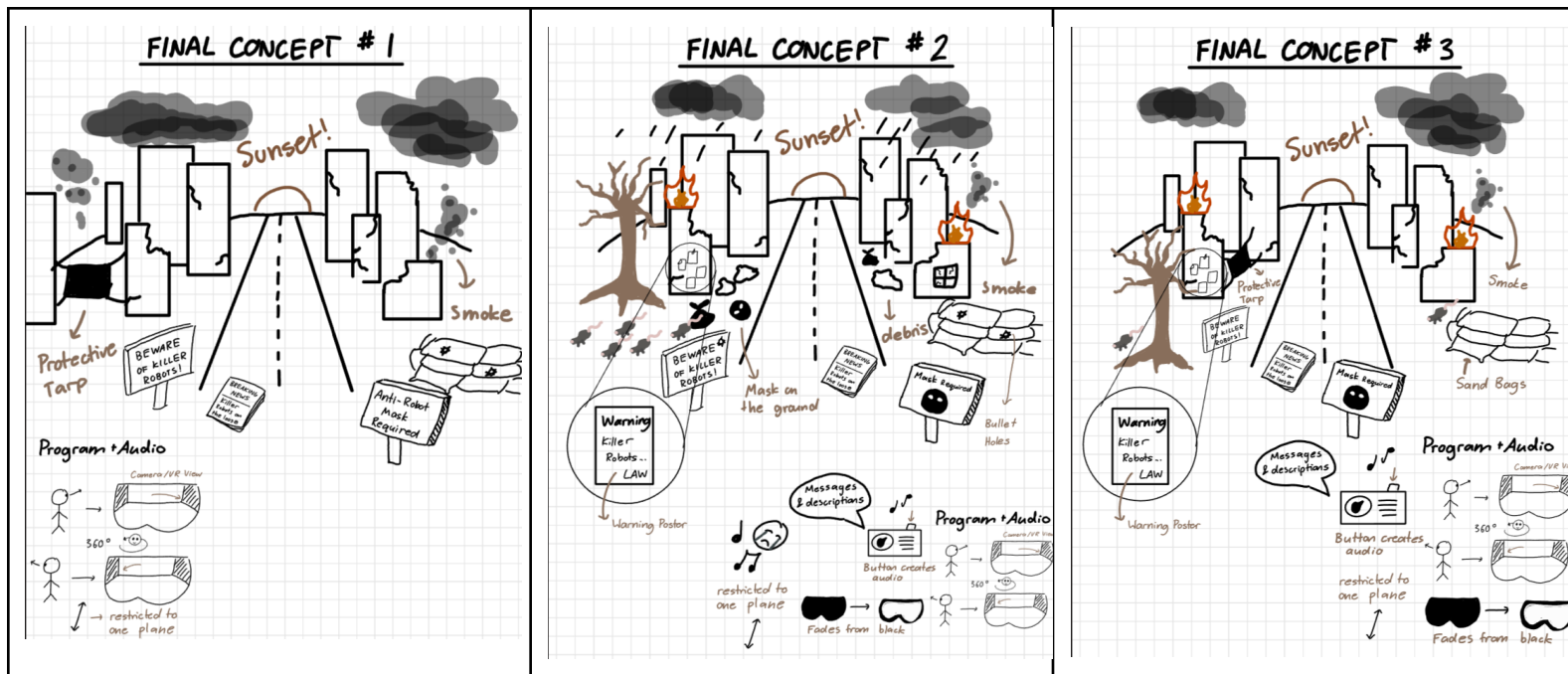
<p>Jeanine</p>	 <p>AUDIO</p> <p>Sad background music</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Deep emotional value <p>Cons:</p> <ul style="list-style-type: none"> - Silence is more dramatic - Background music is not realistic (contradicts design criteria)
<p>Jon</p>	 <p>UNOPERATIONAL</p> <p>-AUDIO EMITS FROM RADIO AND GIVES THE USER SOME CONTEXT.</p> <p>Setting the scene: Expect the audio descriptions to vividly set the scene in your chosen central city, providing a detailed sense of the environment normalcy before the autonomous robot crisis.</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Give user context - Immersive/realistic <p>Cons:</p> <ul style="list-style-type: none"> - Difficult coding - Difficult to create/find
<p>Hannah</p>	 <p>Subsystem: Audio</p> <p>-Explosion sounds in distance</p> <p>Bullet's fired in distance</p> <p>Bullet sounds and bomb sounds</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Dramatic and inflicts fear in user <p>Cons:</p> <ul style="list-style-type: none"> - Possibly too violent/gore

<p>Marho</p>	<p>It goes dark and we hear bombs</p>  <p>Sound effects(i.e sound of bombing)</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Dramatic and inflicts fear in user <p>Cons:</p> <ul style="list-style-type: none"> - Possibly too violent/gore
<p>Rohan</p>	 <p>Safety Instructions: ('clear the area', 'target acquired', 'Urgent message: Autonomous systems active. Human isolation advised,' siren sounds)</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Siren, easy to find/record - Simple and short phrases <p>Cons:</p> <ul style="list-style-type: none"> - Difficult to program the timing (when it should go off) - May need to be user activated
<p>Kwab</p>	 <p>Radio reports of the state of other cities: ("In Tokyo, pedestrians and commuters are</p>	<p>Pros:</p> <ul style="list-style-type: none"> - Induces fear/worry <p>Cons:</p> <ul style="list-style-type: none"> - Long message (time constraint) - Difficult to program the timing (when it should go off) - May need to be user activated

	<p>encountering challenges due to autonomous robots impacting Shibuya Crossing. Locals are urged to exercise caution and choose alternative routes for their daily commutes.")</p>	
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3.0 Analysis of this subsystem and our concept designs:

The ranking system we have created is based on feasibility, accuracy to the design criteria, acknowledges constraints/boundaries, and is within the range of time and cost. Our first concept design includes a variety of ideas but within more clear restrictions. It is the most simple out of the three concepts. The environment is set in an unkept city scene where buildings and stores seem to be abandoned and run down. This environment illustrates how humans would have adapted to their new reality with autonomous robots and now have priorities to survive. This design also includes signs protesting against autonomous robots in war which signifies the humanities' distrust and opposed position on autonomous robots and how it has negatively impacted their lives. Dark clouds are used to enhance and emphasize these messages. It would not necessarily be a clear indication of autonomous robots but it shows an unseemly reality that one would not want to live in. For the programming aspect of this design, our VR movement would be constricted to an X & Y plane where the user can only move back/forth, and a 360° view of our VR environment. This allows simplicity while still giving the user an immersive experience. The second concept design includes the most amount of detail, which is beneficial for realism and for emotional value. However it includes too much detail, and is not feasible to complete with the time and resources we have. Some additions we made specific to the second concept design was music which we chose because it would invoke a feeling of concern which our client specified was important to them. It includes many objects all relating to the design criteria, however it contradicts the constraint of it needing to be simple. We have chosen the third concept design as the best global concept since it demonstrates a balance between each subsystem. The environment is the most immersive and detailed, yet it is feasible to design within the time and cost constraints.



4.0 Conclusion:

In conclusion, our team was able to independently brainstorm original ideas before we combined forces to create our final conceptual design. We first took a look at our problem statement, our list of priorities from before, and our clients needs. Then we identified the four subsystems of our design. These subsystems are environment, objects indicating the presence of autonomous weapons, the program itself, and the audio within our design. After the subsystems were identified, we came up with our own ideas regarding the subsystem. We then decided what features of each idea we were fond of, then we implemented them into our conceptual designs. Through this process, we were able to collaboratively construct a final conceptual design which we could all appreciate.

5.0 References:

Hannah's Concept Designs:

- <https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.economist.com%2Furope%2F2022%2F10%2F06%2Fthe-war-in-ukraine-has-awakened-memories-in-the-balkan&psig=AOvVaw15o8n3EGcqUaUAadhpO5mL&ust=1697403263650000&source=images&cd=vfe&opi=89978449&ved=0CBEQjRxqFwoTCMiovoa29oEDFQAAAAAdAAAABAY>

Rohan's Concept Design; subsystem 3:

- https://www.youtube.com/shorts/v_I_3RjPnrc