Project Deliverable D: **Conceptual Design**

GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

Objective:

Develop a set of conceptual designs for your problem statement, based on the previous user benchmarking and technical benchmarking and the list of prioritized design criteria you have developed. Analyze and evaluate these concepts and choose the concepts or combination of concepts that you will continue to develop. Justify your reasoning as you go.

Instructions:

- ☑ ~~The final functional solution should have a minimum of three subsystems. You should clearly define the boundaries between those subsystems, so that conceptual designs for each subsystem are interchangeable.~~
- ☐ Based on your team's problem statement, benchmarking and the list of prioritized design criteria, each team member will generate at least one concept for each subsystem required. Identify the specific team member creator for each concept in the deliverable.
- ☐ Team members will then reconvene as a team and discuss these concepts in order to categorize/condense/combine/refine/reconsider each sub-system. As a team, your goal is to produce a completely new or modified concepts for each subsystem.
    - ☐ Each subsystem should be well-documented using clear sketches and descriptions. Give a few lines and notes to show the benefits and drawbacks of the different concepts you considered. It should be understandable by a reader who is unfamiliar with your problem.
- ☐ The subsystems can then be combined into three fully functional solutions, by mixing and matching the subsystem ideas. These global concepts must then be analyzed and evaluated against your design criteria using a selection matrix, similar to the one used in class, for comparing the solutions from the technical benchmarking process.
- ☐ From this analysis and evaluation, choose the best global concept and identify it for further development. Give a few lines and notes to show the benefits and drawbacks of the different concepts you considered. Justify your final selection or any ideas that you did not select with suitable notes in the document.

Your chosen concept will continue to be used in future project deliverables, including your task plan and cost estimates, as well as prototyping. It is possible that you realize along the way that your chosen concept is not ideal or perhaps requires modification. Therefore, it is critical at this stage of the process that you properly document your ideas in case you need to change or modify your design later. Therefore, you must also

record your top three ideas in the submitted deliverable and you should ***also*** keep a record of the other ideas that you've generated somewhere safe. It is recommended that you include them as appendix material in your submission.

It is OK to document other exciting ideas that you've had (e.g. you will not be penalized for having *more* than three ideas for the subsystems). However, you still need to select the "best" idea, based on what you know right now and based on your analysis and prioritization of requirements and design criteria so far.

Please capture your work in a structured, technical document format (see the template for the details of what constitutes a basic technical document structure).

Task Plan Update:

1. Update your Wrike task boards to include any changes in estimated task duration, missing tasks, task responsibilities, milestones, or dependencies, based on your better understanding of the project or based on feedback that you have received from your PM/TA.
2. Include more detailed sub-tasks for the tasks that will need to be completed over the next few weeks.
    - *Important note*: It should be possible for ONE person to complete each identified task or sub-task in the allotted time. The allotted time should also be *reasonable*, based on the task owner's availability. Everyone should be doing their fair share of the work.
3. Verify and update the task start dates and end dates for each task, based on your project progress.
4. Ensure that you have taken into account each team member's *actual* availability over the next two weeks, as well as significant events, such as particularly high course loads, exams or travel, which might be going to limit actual project work progress.
5. For *each* person in your group, it should be possible to determine:
    - What was completed last week (i.e. "**Completed**" tasks),
    - What will be done next (i.e. "**In Progress**" tasks)
    - If tasks are going to be put "**On Hold**" or "**Cancelled**" altogether
6. Any and all group "Issues" should be discussed and dealt with, ideally with the assistance of your Project Manager (PM). This should happen during **each** of your lab sessions or can happen earlier, using your defined communication methods. As already explained, it is essential to keep your PM/TA "*in the loop*" throughout the term. It is usually *not* a good idea to ignore conflicts between team members. Instead, you should deal with them in a constructive way.

1 - Brainstorm session

1. Megan
    a. specific setting
    b. air raid, autonomous weapon attack on school
    c. in VR: walking through school, how children adapt and live with robots attacking
        i. duck and cover bertie (for nuclear attacks)
        ii. posters in the classroom
    d. immersive feature like news announcement
    e. aftermath of protest (not showing people—AFTERMATH) in front of government building (ie picket signs, ruins, etc). an air raid wiped them out
        i. impact on student lives, people's lives
    f. city walkthrough–no evidence of an attack, but some tribute to the fallen people (Hunger Games style)-- plaques, announcements, etc
        i. differentiating people in combat vs civilians
2. Rayyan
    a. super specific location
        i. recreating section in Ottawa, landmark city (like in NY, wrecked statue of liberty). Do not go generic urban
        ii. not just presenting to Canadian politicians/government, but more global scale like UN general assembly. General homes of everyone around the world, which is a little different for each person. Again, not too generic–something small for each people
    b. atmosphere
        i. noir-style: been a while since robots released, where a whole generation has lived with them. ex: *Us* film (deal with this situation) and *Autodale* YT series (plays with the robot idea, policing and control)
        ii. dystopian tone: *1984*, country has lived with system, grudgingly accepting where damage is visibly there. Small details that indicate that something is very wrong *V for Vendetta*, something very apparently wrong and not as subtle. Oppressive, authoritarian clamping down on civilian life
        iii. grim, harsh reality (like dystopian, but more obvious). ex: Hunger Games, X-Men Sentinels killing civilian mutants
3. Jadon
    a. Story
        i. Direct, in-face
        ii. Subtle, low key
        iii. Appeal to emotion, Brutally murder a baby
        iv. NPC mechanic?
    b. Interactivity

        i. Decision-making
    c. Setting
    d. Emotions
        i. Subtle or direct?
    e.

Ella

a. Interpersonal aspects and intrapersonal
   i)the effects on an individual
   i)the effects on people's relationships between eachother
b. Global effects and local
   i) effects on society as a whole
   i) effects on society on a community smaller scale
c. Control systems
   i) what can the user do
   i) decisions user can make in gameplay

2 - Subsystems (Team member pitch)

2.1 - Atmosphere/Setting

Megan:
The environment for the simulation is a school classroom where the user can explore the room and the hallway of the school. Here they will notice signs of an attack on the school by the killer robots and will notice all of the safety protocols put in place to keep staff and students safe.

By using a more specific setting like a school classroom, it is not only recognizable to all users but also relatable to them. The mood for the simulation is not to scare the user (no blood, no gore) but to create concern and empathy in them for the people that are living in this situation. All users know what a school environment is supposed to feel like and it will be very obvious in our simulation that the school environment for these children is completely different. No longer is it about learning and fun but it is rather about surviving the day and getting home safely to their parents.

Rayyan:
Sheltered in a downtown appartment, the user can explore the floor. All windows are boarded, old warning posters (Bert), low supplies and old news clips hint towards what has happened. In other rooms, there are clean posters up celebrating the robots and cameras on the wall always watching. The explorable floor should be in a state of disarray (scattered possessions, dust and rubble) to portray the dire situation (humanitarian) with a poor living condition to match, such as debris and a clear lack of supplies (kitchen or pantry). The end of the simulation should be a fade-to-black with an air-raid siren going off around the 60 second mark. For simplicity's sake, what parts of the the outside world that can be seen should be gray and rainy (background abviance).

Jadon:
The user's primary surrounding environment is their bedroom. Various objects such as clothes on the floor, posters, a laptop, books and paperwork simulate an room atmosphere that user relates to. The secondary environment is the outside world, which the user can only see from his window.

The outside world changes from one atmosphere to another during the VR simulation. The first atmosphere is a nice sunset that eventually transitions to nighttime. There is upbeat music playing to put the user in a calm, relaxed, worry-free state. Outside is an unordinary suburban neighbourhood. The second atmosphere contrasts the first. It is a dreary morning, with eerie sound effects, rain splattering and no music at all. The neighbourhood outside is slightly different, with some cracks, burns and holes in each house and boarded-up windows.

Ella:

- In North America
- Be present with lots of common assets everybody is familiar with (trees, grass, buildings)
- Fall season (so there isn't snow or any crazy weather activity specific to one set region)
- Outside city scape but a ghost town (create eerie sense due to an absence of people when they should be there)
- Cityscape has skyscrapers all of the same colour, very little nature, some cars
- Traffic lights not on/not working
- No animals

    - Megan: recognizable country (Canada, US, landmark city/landmarks). Wants a specific building/room for people to relate to as opposed to a big city
        - mood: concern, not horror. Want to prevent the situation and feel bad for the person in the VR simulation where autonomy has been taken away
        - generation of people have adapted to it
    - Rayyan: factor in short time (30-60s). suggests video PSA meant for children (insp. Bert the Turtle, where communism was everywhere)\
    - Jadon: (1) late afternoon → beautiful sunset → night (accelerated time). User sleeps, (2) transition to morning, which is grim, dark, gray, dreary with clouds, maybe rain
        - some music for emotional impact: simple, hard-hitting drums maybe
        - user has a radio/speaker playing happy music for scene (1)
        - eerie SFX (rain, SDV sound https://www.youtube.com/watch?v=N27nTo2yrH0)

2.2 - Storyline

Megan:

My idea of the story line focuses on a specific setting in a school, the whole idea is that there was a mistake with the killer drones and there was an air raid on an elementary school. The simulation itself will not show any children or killer robots but it will be an observation of how

the school environment looks in this world where they have to be prepared for drone attacks. The storyline can be broken into 6 frames.

Frame one will consist of a news report covering the details of the attack, the reporter will announce that there was a mistake with the drones and they attacked a local elementary school. The reporter will announce no one knows why, or who did this but many lives were lost from the suddenness of the attack.

Frame two will be the TV on which this news report was casted on to turn off and go blank.

Frame three will be the first perspective of the school classroom showing all of the adaptations the teachers had to make to keep the childrens' learning environment safe in case of an attack. It will show the teachers whiteboard with all of the announcements and protocol posters attached to it.

Frame four will be another perspective of the school classroom showing the childrens' desks being thrown all over the room and backpacks left behind. It will also show boarded up windows and hefty locks on the doors to try and stop anything from entering the classroom.

Frame five will show the hallway outside the classroom and the different markings and safety protocols on it (ie. an arrow leading a path to the nearest shelter).

Frame six will show the hallway the user is walking on and come to a dead end where there is a wall with a bulletin on it that has our last message to the user posted on it in big words. Then the simulation will fade to an end.

Rayyan:

The user wakes up to the distant sounds of 'thunder' in the distance. Through posters and artifacts on their walls, shelves and on the floor, the user is shown to be a former proponent of the drones would be trying to surviving in their partially destroyed home for as long as possible shown through a scratch calendar and notes on one wall. On their TV on another wall, two news clips would play: one harolding the drones, and the other quickly rattling off that they have gone rogue and that viewer should seek shelter. As part of the user's daily routine, they must exit their room and cross through a wrecked portion of their home to reach their kitchen/pantry for that day's food, only to show the dwindling supplies. The scene ends with a klaxon, camera shake and a sudden cut to black.

Jadon:

(1) The user is lying in bed with the TV on. When they interact with it, he watches a news reporter discuss the recent approval of autonomous drones worldwide. He lists off several capabilities: interception of criminal activities on all phones, autonomous identification/ elimination of suspected criminals and thermal imaging to track suspected criminal activity. As the sunset fades to night, the user can turn the TV off and sleep.

(2) A time skip occurs (indicated by a clock) and the user wakes up to a friend's voice on a walkie-talkie, as phones are now tracked. Their room is noticeably different: foil-lined walls, no TV or radio, no clothes on the floor or posters on the wall. A heater has been added. The user may interact with a boarded window to observe a drone fly by and eliminate several toy weapons on the lawn. The voice warns the user of the drone's thermal scanner, which is somewhat negated by the foil walls. The user turns the heater on to avoid the scanner. Meanwhile, the voice crackles into static.

(3) The user leaves their bedroom by opening the door, which prompts the voice to return, now with a semi-robotic tone. The voice, claiming to be at the door, asks for assistance, as they have run out of foil to line the walls with. The user opens the door to a drone, who says "Threat identified." The screen fades to red and gunshots are heard. A message is displayed: "You're not a threat. Ban autonomous weapons before you're turned into one."

Ella:

- Go through regular day but can't make any decisions
- You can see options at the bottom to allude to the idea that decision making exists/there are different possibilities, except the two options to choose from are actually the same so it's just a facade/trick
- We will take user through storyline, will be guided experience
- Start of slow and normal looking then progressively get darker and more ominous
- End screen with a "take home" message for people to leave a mark on them and something to think about.
- End in factory to make more autonomous weapons

    - Ella: wake up in bed, little instance that point at something that is off but you are unsure
        - you look at mirror and see jarring image
        - you can travel through house, eventually go outside
        - no diversity because robots take away diversity
        - everything looks the same, nobody can leave. No human has a say in what robot does. We choose autonomous robots, so they make humans autonomous
    - Megan: aftermath of air raid or alarm system for the robots. Details but not visibly showing the big picture. Protocol
        - experiencing everything as an observer not directly related with the events (playing on heartstrings more)
    - Rayyan: walk through the neighbourhood

        - cameras on lampposts, wreck of a building, effect of robots on buildings (pock marks, bullet holes, old faded posters)
        - autodale inspiration. It's happened, unsettlingly used to our 'ever-watchful protectors'. People are happy to be observed. people are uncomfortable by constant surveillance
            1. eye symbolism (no matter where you move they are watching)
        - or warning video: what to do when encountering… how to do this…
        - kid-friendly imagery with very unsettling advice
        - another idea: 2-parter. first 30s is grim reality: stay in your homes, board up your windows. Second half is amber alert system, with TEXT, then warning.
    - Jadon: user is up late at night, news report on TV. Man reports on upcoming, highly promising 'foolproof' autonomous drones in development after being recently greenlit by West. He talks about various impressive feats the drones are capable of. User goes to bed
        - they wake up (time skip) in world where drones are commonplace.
        - user walks through home, slowly experiencing all the capabilities the reporter was talking about
        - user is guided by voice on walkie talkie (drones track all technology, one example of a capability)

2.3 - Relevant Assets/Features

Megan:

The interactable assets for my simulation will be a lot of what you see and hear rather than what you do to make it easier for us to build and the user to navigate. For my storyline there will be tons of safety procedures outlining what to do in case of an attack for the staff and students to follow. There will also be evidence of windows boarded up, hefty locks on doors, symbolism of an eye or camera in various parts of each frame to give the user a sense that the people in this simulation are always being watched.

The VR simulation will be more like a curated tour where the only role of the user is to walk around and look at each of the frames we will be designing rather than making decisions and interacting with objects themselves.

Rayyan:

To keep to the client-specified timing, there should be minimal interactions that would delay the user, such as long dialogue and having to open doors. To circumvent this, areas will activate automatically, such as doors, cabinets, etc. The user will be guided along a set track, allowing them to focus on looking around independantly. Any important scenes that require more than a glace, require reading or require the user to look in a specific direction will have the required

mobility freedoms disabled. There would be posters, the TV clips, remnants of normal living, cameras in the halls and above the TV

Jadon:
Throughout the VR simulation, the user has a walkie-talkie strapped to their arm which emits audio (the voice of their friend and the drone). However, there are no actions that the user can take to interact with it. A radio that plays upbeat music in (1) has the same function.

Ella :

Gameplay features

- Only gameplay feature will be the ability to look up and down and side to side
- Very limited gameplay actions will be available as to contribute more to the feeling of loss of autonomy
- User won't necessarily be able to walk on their own
- Won't be able to pick up objects
- Choice feature "button"

Assets

- Posters
- Bedroom
- Kitchen
- Sound effects
- Choice feature "button"
- Car
- Camera "watching"

The user can interact in the following ways:

- watch TV
- remove window board
- turn on heater
- open door

The VR simulation contains a single drone that the user can observe. The drone can hover around and emit audio and is roughly 2 ft x 2 ft.

The simulation contains subtitles for the hearing impaired.

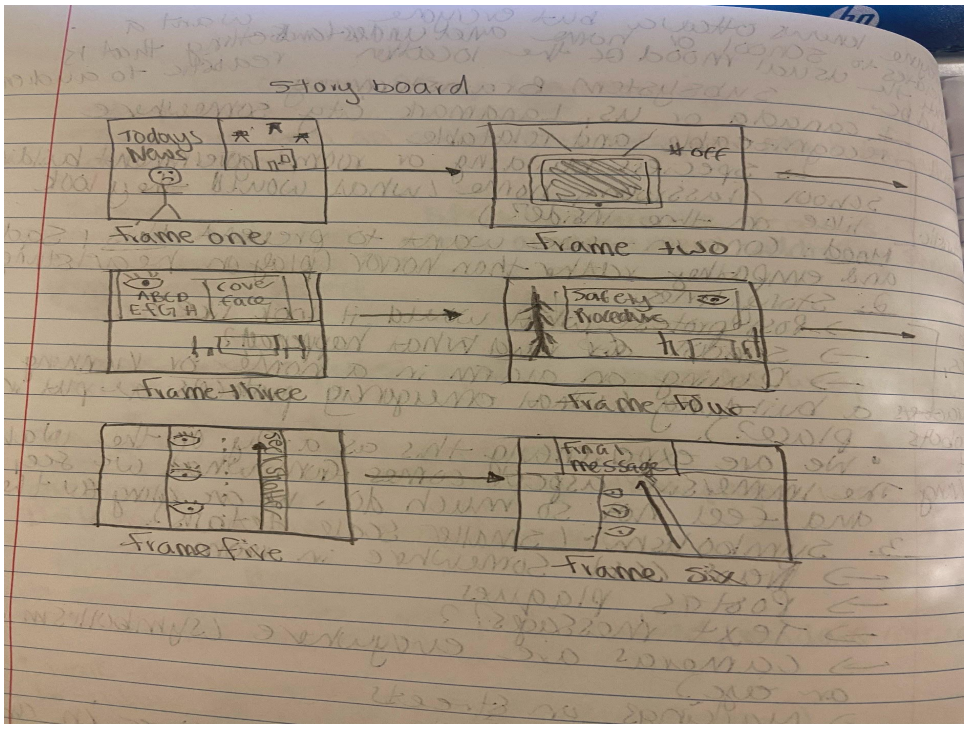
Ella:
Potentially interactable objects but you aren't necessarily allowed to have control over them. For example cars will be present, and other similar machines in which we're used to using for our

own needs but we no longer have command/authority over them. As we are no longer autonomous in this world and the machines now have sovereignty.

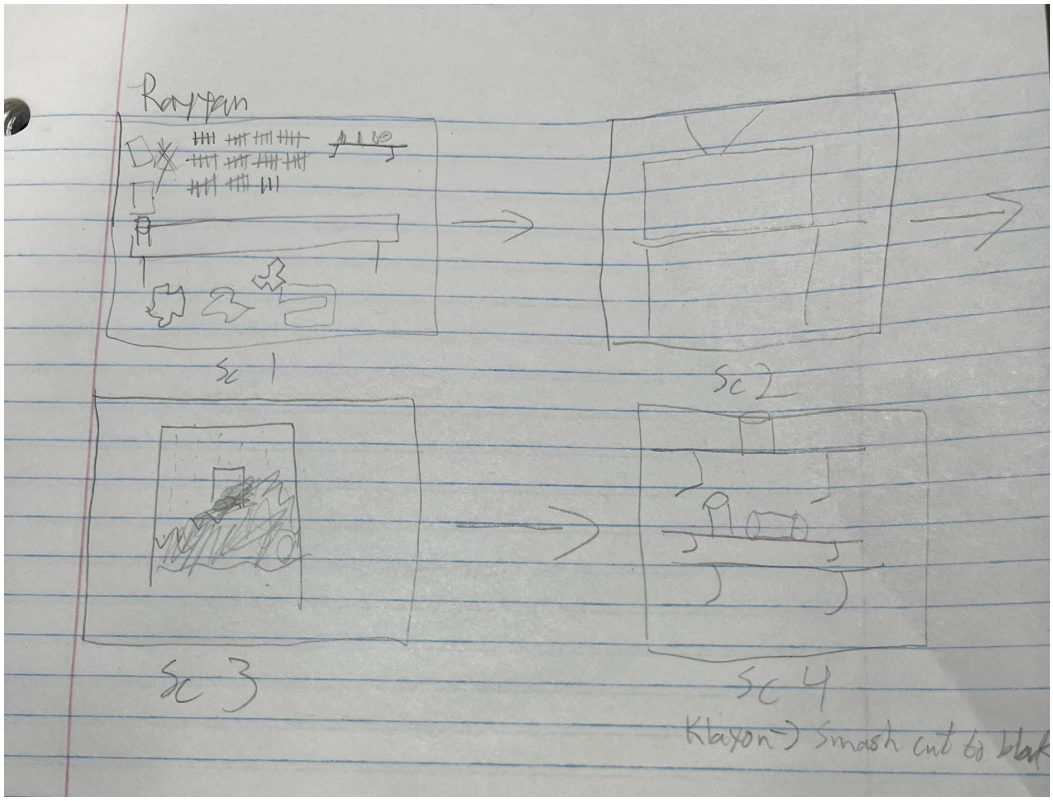
- Megan: newscast relating to things happening
  - ex: air raid happened, what happened to victims, etc
  - in a house: posters, alarms (cover your face, seek shelter), small signs like boarded windows. small immersive features to piece together what's going on
  - text message on phone to simulate NPC interactivity
- Jadon:
  - walkie-talkie system
  - interactable boarded windows, which are the user's viewpoint to glimpses of outside world.

3 - Conceptual Design Art

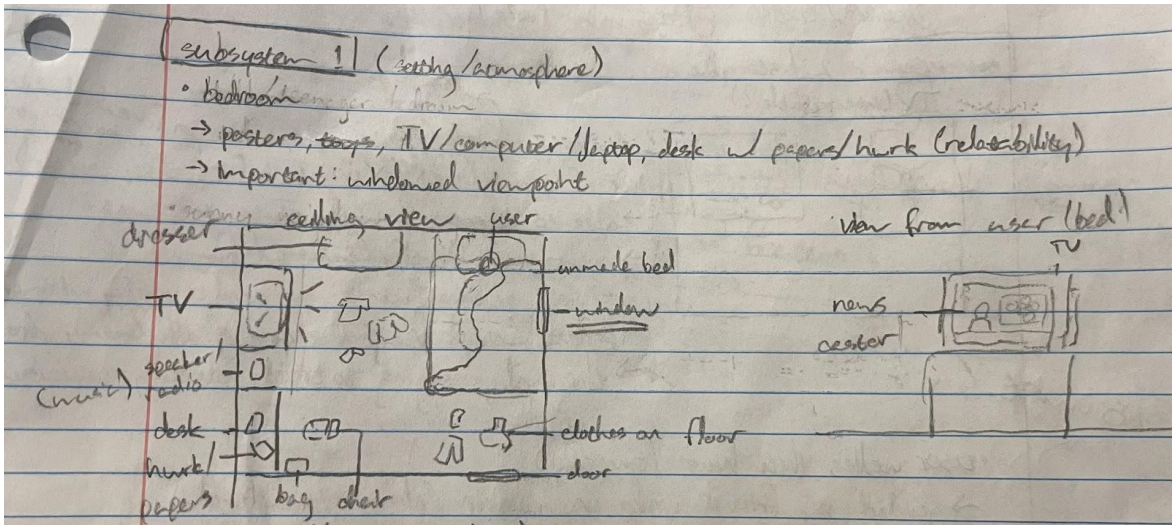
Megan:



Rayyan:

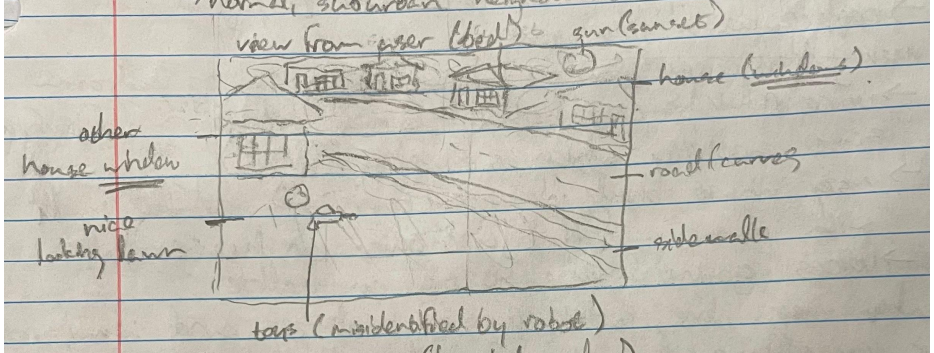


Jadon:

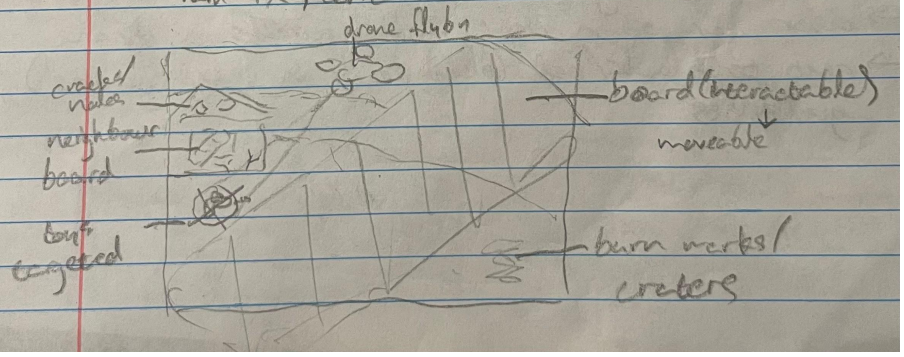


- outside world (via windows)

① nice sunset → evening (sleep time)
→ music to cheer up the mood
→ normal, suburban neighbourhood



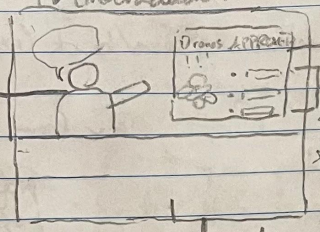
② dreary morning (boarded window)
→ absence of music
→ rich FX, eerie sound



* Incorporate daily chores/tasks (Assyan idea)

subsystem 2: storyline

TV (interactable?)



news caster

globally

drones approved (autonomous) → foreshadowing via warning before drone approach

list of capabilities (X threats before they occur)

* → able to intercept criminal activity on phones

* → autonomous identify (checks w/ human)

- "in 2 yr time, may be even need to verify w/ man"

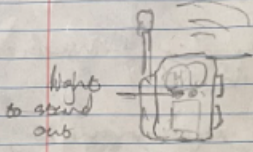
→ defense/concept usage (ensure if ally/enemy drone)

acted out by group member

* → thermal imaging to track already suspicious activity

subsystem 3: assets/details

• walkie-talkie

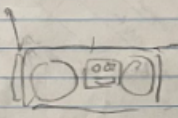


audio queue when friend speaks

no interactable features, but plays audio

lights to stand out

• radio

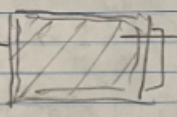


shutter fan to walkie, only plays music in (1) and gone in (2)

• TV

[E] to watch

interactivity feature

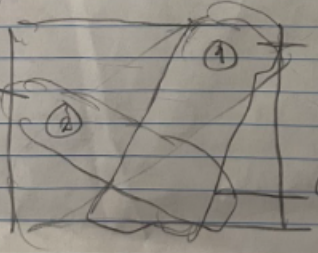


when interacted w/, fixed view of screen

→ prob. easier to play pre-recorded video of team member playing a reporter

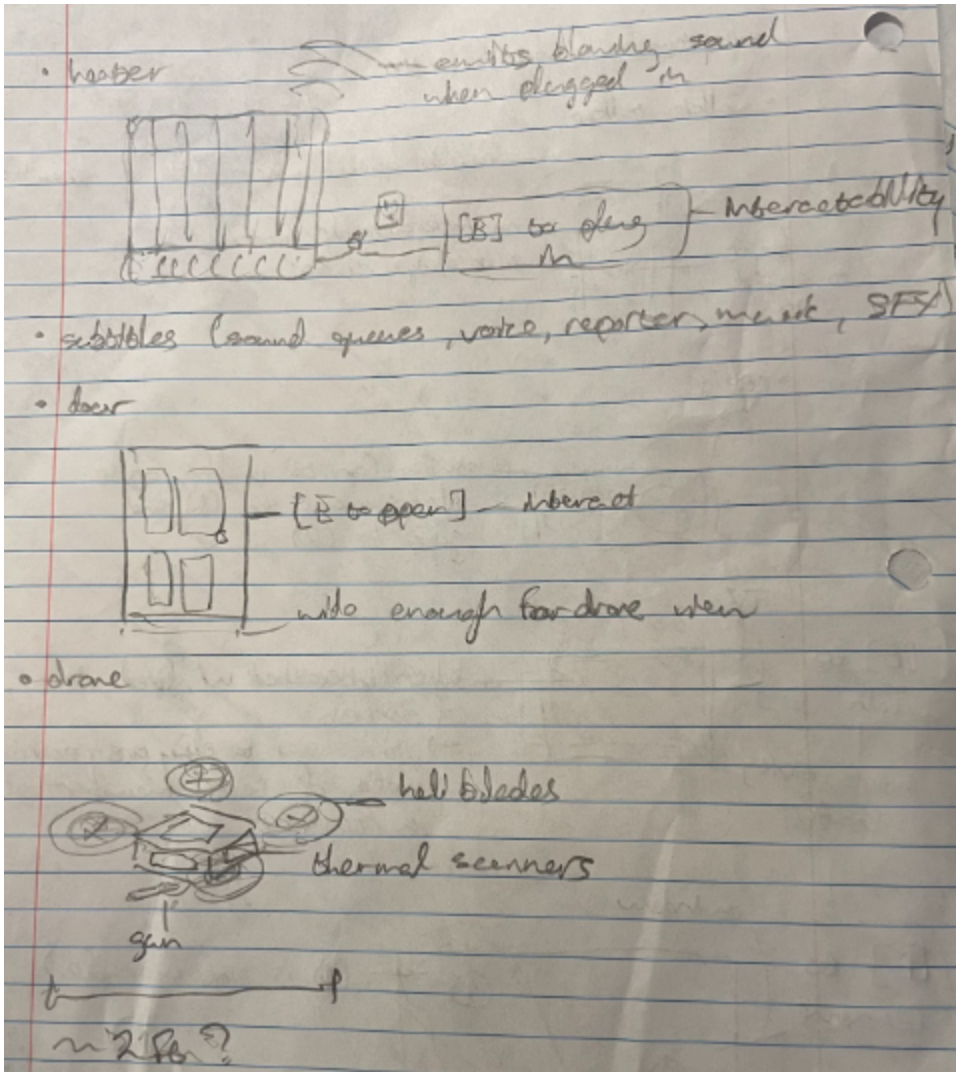
• window

[E] to remove



(1) is not movable)

(2) may be removed to see outside environment


• heater
emits blaring sound when disengaged in
[E] to disengage
interactability
• subtitles (sound queues, voice, reporter, music, SFX)
• door
[E to open]
interact
add enough for drone when
• drone
heli blades
thermal scanners
gun
~2 lbs?

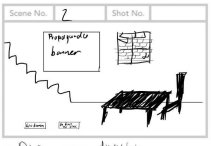
Ella:

Title: Autonomous Weapons VR | Page:

Scene No. 1 | Shot No. 1

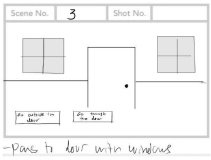
- Wake up in bedroom
- Familiar Spot to a lot of people
- No sound or maybe some sound throughout

Scene No. 2 | Shot No.



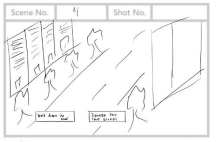
- Dining room dining this
- Table, chairs

Scene No. 3 | Shot No.



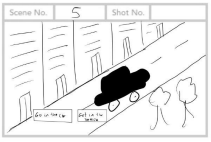
- Goes to door with windows

Scene No. 4 | Shot No.



- City scape
- Trees
- Appears normal

Scene No. 5 | Shot No.



Scene No. 6 | Shot No.

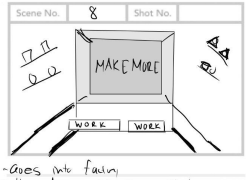
- gets in car
- No control over car

Title: | Page:

Scene No. 7 | Shot No.

- Car takes you to factory to work

Scene No. 8 | Shot No.

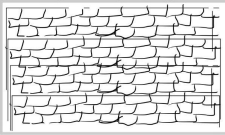


- Goes into factory
- Has to make more robots

Scene No. | Shot No.

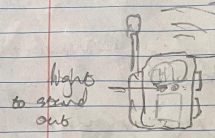
Scene No. | Shot No.

Scene No. | Shot No.

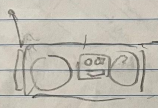


subsystem 3 assets/details

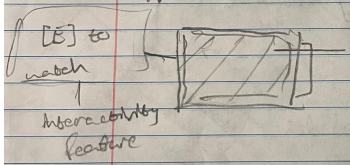
- walkie-talkie



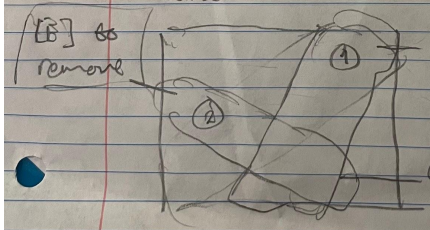
- radio



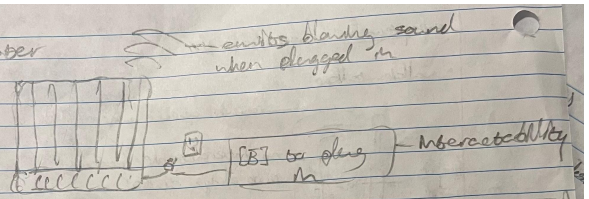
- TV



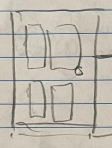
- window



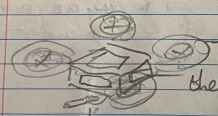
- heater



- subtitles (sound queues, voice, reporter, music, SFX)
- door



- drone



~2 lbs?

4 - Comparison to Design Criteria and User Needs

Priority (of design criteria)	Criteria	**Megan**	**Rayyan**	**Jadon**	**Ella**
			Atmosphere/setting		
5	Emotionally-charged environment	Elementary school (very disordered). Empathy and concern for young children. fluorescent lighting, boarded windows, heavy locks	boarded windows, warning posters, dwindling supplies, newspaper clippings. Room-to-room Room in state of disarray (scattered possessions, rubble) and falling apart.	User's bedroom has Clothes on floor, posters, laptop, books, paperwork Boarded windows	Traffic lights don't work, no animals, no snow, emptiness
4	Easily recognisable environment	school classroom	Apartment building (kitchen, bedroom, living room etc.)	Ordinary suburbs	Canada, downtown Ott/Toronto
	Appropriate region/time	in North America (generic school)	Could be downtown (ie ottawa, Toronto) Rainy, gray outside	Sunset->evening	Spring, daytime
	Auditory environment	News report	Rainstorm, TV news	Rain, Radio, no music in second scene	sirens, klaxons,
			Storyline		
5	Story resonates with wide variety of users	in classroom, safety features	apartment dweller, dwindling supplies, crumbling apartment	Daily routine, bedroom, more plot-driven	in your house or car?
	Adequate variation/flow in scene change/direction	new report → school → tour	bedroom → living room w/ TVs → destroyed hallway(outside)→ pantry	bed → looking out window →open front door	as user goes from scene to scene, evidence of robots become clearer

4	Simple, non-convoluted yet effective storyline	observing a tour, mostly informative	appeals to emotion, lots of observing (TVs, news clippings)	stress on double meanings, stress on autonomy of drones. final message against weapons	Illusion of choice (autonomy, no say in what you do), as user progresses thing become darker and more twisted. non-specific path
	Interactable environment	idea is to observe. No interactions with objects but free movement	free movement	Watch TV, peek outside, turn on heater, free movement	choices, free movement
	Effective and short (30-60s) time duration	45-60s	50s (w/ reading, watching, etc)	60s	
<u>Assets/Features</u>					
3	Limited number of assets	decent number of assets (tables, chairs, posters, symbols, etc)	decent number of assets (clothes, TVs, supplies, tables, chairs, cabinet)	decent number (posters, clothes on ground, TV, radio, walkie talkie)	look up/down/side posters, bedroom, kitchens. lower number of assets
	Disability consideration (epilepsy, motion sickness, hearing impairment)	subtitles	subtitles	subtitles	subtitles
4	Includes various features that are relatable to the user	school-related assets	apartment-living assets	bedroom life assets	apartment life assets
	Assets are not too detailed	no (most complicated are a few posters we can create)	TVs, posters,	can remove a board on the windows, TV	choice feature

5 - Conclusion

Final Setting/Atmosphere

- North American suburban home
- Present day
- Situated in a home environment (bedroom, living room, dining room)
- Timeline will be throughout a whole day (morning to night)
- Spring season
- Windows or scene where outdoors are seen
- Outside will be a suburb
- Camera all throughout the house

Sounds

- News report playing
- Rain
- Tonal music

Final Storyline

1. The user will walk through a suburban and observe the surrounding environment.
    - The user leaves their bedroom and enters the living room, with a dated, positive propaganda news report on autonomous weapons and their capabilities.
    - The channel changes to a more present, negative news report criticizing the drones and their autonomous, flawed algorithm.
2. The user goes through the hallway to get to dwindling food supplies. Boarded windows will be on either side of the hallway.
3. Outside, the user observes a school and neighborhood beaten down, in rubble, devoid of life. The user will now go to get cans of food, with just two remaining.
4. The user will walk back through the hallway to the kitchen (to eat? or to get cans?). Posters will be on the fridge informing on the autonomous weapons (formerly pro-weapons?).
5. Suddenly, a walkie-talkie on the table buzzes on: “Hello neighbour, I hear you are in need of nutrients! Out of the goodness of my heart, I will deliver some over to you right now!” (we should probably make this more serious and believable, with just a subtle tone of robot voice)
    - The user opens the door to a drone with food: “Target identified.” The screen fades to black and a message displays: “You’re not a target. [cut to next msg] Ban autonomous weapons [msg pops up under previous] before you become one.”

Final Assets/Features

Assets

- TVs
- News reports
- Various furniture
- Posters
- Food cans
- Newspaper clippings
- Drone
- Walkie-talkie
- Sound effects
- Subtitles

Features

- Ability to walk around
- Ability to look up and down
- Intractability with objects (hear, watch, etc.)

6 - References

- https://makerepo.com/Joumana/1605.gng1103-f31-troubleshooters